

Birla Institute of Technology & Science (BITS), Pilani
Practice School Division
Practice School-I course (May 26th – July 19th, 2025)

PS Chronicles (Core Engineering – Cement, Steel, Chemical, Civil, Mechanical & others)
(A compilation of student experience during PS-I)



Pilani Campus



K K Birla Goa Campus



Hyderabad Campus



**PIONEERING EDUCATION
PARADIGMS**



BITS Pilani
Pilani | Dubai | Goa | Hyderabad | Mumbai
An Institution of Eminence



From the Desk of the Editor

It is my great pleasure to bring forth the 7th edition of the PS-I Chronicles. This edition features over 950 articles from PS-I students sharing their experiences during summer 2025.

The basic premise behind the release of PS-I Chronicles is to document the PS-I learning experience of students keeping the below objectives in view.

- To provide more information on the learning experiences by immediate senior students and PS-I faculty about stations, and thereby enlightening the learning opportunity among the student community.
- To provide the faculty with the enhanced information about the type and nature of work carried out at the organization.
- To transform the knowledge gained at the organization into class room teaching and also to identify the scope of deepening the collaborations with organization.

The articles have been classified into five categories based on the industry domain.

- Chronicle 1: Information Technology
- Chronicle 2: Electronics
- Chronicle 3: Chemical, Mechanical, Cement, Textile, Steel, Infrastructure
- Chronicle 4; Health Care and other
- Chronicle 5: Finance and Management

I would like to thank students for sharing their experiences during their stint at the organization. I would also like to thank the entire PSD team members for reviewing the articles and providing us the valuable feedback. I would also like to extend our sincere thanks to Mr. Om Prakash Singh Shekhawat, Ms. Ankita Duggal, Mr. Shyam Sunder Saini and Mr. Varun Singh of the Practice School Division, of BITS Pilani, Pilani Campus, Pilani for their help in bringing out this edition of PS-I Chronicles.

I would be happy to receive any feedback regarding the Chronicles. Please feel free to email me at psd@pilani.bits-pilani.ac.in or at murugesan@pilani.bits-pilani.ac.in.

**The Associate Dean,
PSD Pilani.**

Table of Contents

PS-I station: 505 Army Base Workshop-Mechanical, New Delhi	15
Student.....	15
Name: DHRUV DASHORA(2023A4PS1190G).....	15
PS-I station: 505 Army Base Workshop-Mechanical, New Delhi	16
Student.....	16
Name: AAYUSH(2023B2A40759G).....	16
PS-I station: 509 Army Base Workshop, Agra	17
Student.....	17
Name: DHRUV SINGH .(2023A3PS0364P).....	17
PS-I station: Adani Solar - Mundra Solar Private Limited, Ahmedabad	18
Student.....	18
Name: HITARTH PAREKH .(2023A3PS0359P).....	18
PS-I station: Adani Solar - Mundra Solar Private Limited, Ahmedabad	19
Student.....	19
Name: CHOKSHI ADITYA AMIT .(2023A4PS0436P).....	19
PS-I station: Adani Solar - Mundra Solar Private Limited, Ahmedabad	20
Student.....	20
Name: SHREY KHANNA .(2023B3AA1007P).....	20
PS-I station: Adani Solar - Mundra Solar Private Limited, Ahmedabad	22
Student.....	22
Name: CHIRAG BIRLA .(2023B3AD0952P).....	22
PS-I station: Airports Authority of India (AAI), Delhi	23
Student.....	23
Name: PRAGNA DAS .(2023A2PS0252P).....	23
PS-I station: Airports Authority of India (AAI), Delhi	24
Student.....	24
Name: ABHYUDAY SINGH .(2023A4PS0153P).....	24
PS-I station: Airports Authority of India (AAI), Delhi	25
Student.....	25
Name: BRIJMOHAN YADAV .(2023B3A80948P).....	26
PS-I station: AMTZ, Visakhapatnam.....	27
Student.....	27
Name: AKSHIT KRISHNA VELUGUBANTLA .(2023A3PS0334H)	27

PS-I station: AMTZ, Visakhapatnam.....	28
Student.....	28
Name: DIYA MAKARI .(2023B2A30848H).....	28
PS-I station: Astera Labs, Bengaluru	28
Student.....	28
Name: AKASH GANESH .(2023AAPS0373P)	28
PS-I station: Autrik UG, Germany.....	29
Student.....	29
Name: R DHARMICK .(2023A7PS0188H).....	29
PS-I station: Autrik UG, Germany.....	30
Student.....	30
Name: ANANYA KHAITAN(2023A7PS0377G)	30
PS-I station: Autrik UG, Germany.....	31
Student.....	31
Name: ADITYA GUNEJA .(2023B5A70821P).....	31
PS-I station: Autrik UG, Germany.....	33
Student.....	33
Name: ATHARVA PANDIT(2023B5A70987G)	33
PS-I station: Bacanc S stems LLP, Ahmedabad.....	34
Student.....	34
Name: ARNAV SHARMA(2023A8PS1133G).....	34
PS-I station: Center for Materials for Electronics Technology (C-MET), Pune.....	35
Student.....	35
Name: ADITYA PATIL .(2023A8PS1144H).....	35
PS-I station: Center for Materials for Electronics Technology (C-MET), Pune.....	37
Student.....	37
Name: ABHISEK KUMAR(2023A8PS1169G)	37
PS-I station: Center for Materials for Electronics Technology (C-MET), Pune.....	37
Student.....	37
Name: ABHINAV SEHGAL .(2023B5A31121P)	37
PS-I station: Center for Materials for Electronics Technology (C-MET), Pune.....	38
Student.....	38
Name: MAHI RAVINDRA SAMANT(2023B5AA0952G)	38
PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar	39

Student.....	39
Name: AAREEN RAVINDRA KADAM(2023A3PS0136G).....	39
PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar	40
Student.....	40
Name: PRAJEET PARGANIHA .(2023A3PS0348P).....	40
PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar	41
Student.....	41
Name: ANSHUL RATH .(2023A7PS0084H)	41
PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar	42
Student.....	42
Name: MANJOT SINGH NARULA .(2023A7PS0122H).....	42
PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar	43
Student.....	43
Name: HARSH NIGAM .(2023A7PS0396P)	44
PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar	44
Student.....	44
Name: SACHIN AGRAWAL .(2023A7PS0492P)	45
PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar	45
Student.....	45
Name: ISHAN KUMAR .(2023A7PS0511P).....	45
PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar	46
Student.....	46
Name: AMRITPAL SINGH .(2023A7PS0590P).....	46
PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar	47
Student.....	47
Name: PATEL VANSH MAHENDRA .(2023A7PS0629P)	47
PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar	48
Student.....	49

Name: PRATEEK AGARWAL .(2023A7PS0656P)	49
PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar	49
Student.....	50
Name: ASHISH SAM .(2023A7PS0677P).....	50
PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar	51
Student.....	51
Name: KAUSHAL RAM S L .(2023AAPS0173H)	51
PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar	52
Student.....	52
Name: ISHWAR SARDA .(2023AAPS0736P)	52
PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar	52
Student.....	52
Name: KAVISH SHAH(2023B5A70945G)	53
PS-I station: Centre for High Impact Neuroscience and Translational Applications, TCG CREST, Kolkata .	54
Student.....	54
Name: SOURASHMI SHIL .(2023A7PS1110H).....	54
PS-I station: Centre for High Impact Neuroscience and Translational Applications, TCG CREST, Kolkata .	55
Student.....	55
Name: CHAITRA S TELI(2023B1A40657G).....	56
PS-I station: Centre for High Impact Neuroscience and Translational Applications, TCG CREST, Kolkata .	57
Student.....	57
Name: INDRAJIT MANDAL(2023B1AA0687G).....	57
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Chennai, Chennai.....	58
Student.....	58
Name: J HARISH RAJESHWARAN .(2023A3PS0393H)	58
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Chennai, Chennai.....	59
Student.....	59
Name: PRANAV CHANDRA NAGULAKONDA VENKATA(2023AAPS0013P).....	59
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Chennai, Chennai.....	60
Student.....	60
Name: PRANAV PADMANABHAN .(2023AAPS0200H)	60
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Chennai, Chennai.....	61

Student.....	61
Name: YASHWANT RAJESH .(2023AAPS0269H).....	62
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Chennai, Chennai.....	63
Student.....	63
Name: MUKUL KRISHNAN(2023AAPS0490G)	63
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Chennai, Chennai.....	64
Student.....	64
Name: HARINI SRINIVASAN(2023B1AA0653G).....	64
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Chennai, Chennai.....	65
Student.....	65
Name: MUKUND RAJA .(2023B4A31016P)	65
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Chennai, Chennai.....	66
Student.....	66
Name: BHARAT DELEEP NAIR .(2023B5AA1116P)	66
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Jaipur, Jaipur.....	67
Student.....	67
Name: SIDDHI TANWAR .(2023A3PS0315P)	67
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Jaipur, Jaipur.....	68
Student.....	68
Name: AAKASH SINGH .(2023A3PS0375P)	68
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Jaipur, Jaipur.....	68
Student.....	68
Name: KARTIKEYA SAXENA(2023A3PS0793G).....	69
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Jaipur, Jaipur.....	69
Student.....	69
Name: KANISHKA GUPTA .(2023A8PS0711P)	69
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Jaipur, Jaipur.....	71
Student.....	71
Name: KAVYA KESARE .(2023AAPS1067H)	71
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Jaipur, Jaipur.....	72
Student.....	72
Name: AARUSH MOHANTY(2023B1A81239G)	72
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Jaipur, Jaipur.....	74
Student.....	74
Name: AAYUSH AGARWAL(2023B3A30800G)	74

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	75
Student.....	75
Name: ADARSH PRAVEEN(2023A3PS0210G).....	75
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	76
Student.....	76
Name: SRIRAM NAGARAJAN .(2023A3PS0415H).....	76
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	77
Student.....	77
Name: PALLEBOYINA KARTHIK RAJ .(2023A3PS0686P)	77
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	78
Student.....	78
Name: ANTO JOSE(2023A3PS1036G).....	78
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	79
Student.....	79
Name: SHREYA DAS (2023A8PS0559G).....	79
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	80
Student.....	80
Name: SAGNIK ROY .(2023A8PS0702P)	80
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	81
Student.....	81
Name: ANIKET GUPTA .(2023A8PS0722P)	81
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	82
Student.....	82
Name: MADHAV JINDAL .(2023A8PS0967P).....	82
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	83
Student.....	83
Name: NANDITA PRASHANTH KAMATH .(2023A8PS1310H)	83
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	84
Student.....	84
Name: ROUNAK SINGH .(2023AAPS0209H).....	84
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	85
Student.....	85
Name: VIDIT SINHA .(2023AAPS0225H).....	85
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	86
Student.....	86

Name: ADITYA PARIKSHIT KHACHANE(2023AAPS0603G)	86
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	87
Student.....	87
Name: AATMAN SHAH(2023AAPS0635G)	87
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	88
Student.....	88
Name: BHAVYA SINGHANIA(2023AAPS1128G)	88
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	89
Student.....	89
Name: SUBH AGARWAL(2023B2A30769G).....	89
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	90
Student.....	90
Name: SHUBHAM PARASHAR(2023B2AA0750G)	90
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	91
Student.....	91
Name: MANYA VARSHNEY .(2023B3A70975P).....	91
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	92
Student.....	92
Name: PUNIT KUMAR .(2023B4A31138P)	92
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	93
Student.....	93
Name: CHIRAG TYAGI .(2023B5A31102P).....	93
PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	94
Student.....	94
Name: AKSHAR ANANYA VARMA .(2023B5A80799H).....	94
PS-I station: CSIR - National Aerospace Laboratories, Bangalore	95
Student.....	95
Name: NEERAV KRISHNA .(2023A4PS0416P).....	95
PS-I station: CSIR - National Aerospace Laboratories, Bangalore	96
Student.....	96
Name: PUSHKAR AGRAWAL .(2023A4PS0425P).....	96
PS-I station: CSIR - National Aerospace Laboratories, Bangalore	98
Student.....	98
Name: SATWIK SAHU .(2023A8PS0714P)	98
PS-I station: CSIR - National Aerospace Laboratories, Bangalore	99

Student.....	99
Name: ANIRUDDH MISRA .(2023ABPS0805P)	99
PS-I station: CSIR - National Aerospace Laboratories, Bangalore	101
Student.....	101
Name: DOROTHY MEHTA(2023B1A70714G)	101
PS-I station: Digitised Renewables Energy Tech Private Limited (“Digitised Energy”), Bengaluru	102
Student.....	102
Name: KSHITIJ MAHENDRA .(2023A8PS0840H).....	102
PS-I station: Embedos Engineering LLP, Mumbai	103
Student.....	103
Name: TEJAS A N(2023A8PS1075G).....	103
PS-I station: Embedos Engineering LLP, Mumbai	104
Student.....	104
Name: ANIRVAN KANAVI .(2023AAPS0741P)	104
PS-I station: Embedos Engineering LLP, Mumbai	105
Student.....	105
Name: DHARUVKUMAR ASHOKBHAI GANGANI(2023B5A81124P)	105
PS-I station: ETDC - Electronic Test & Development Centre- Hyderabad, Hyderabad	106
Student.....	106
Name: JITEN SINGH NEGI .(2023B5AA0788H)	106
PS-I station: Goa Shipyard Ltd., Goa	108
Student.....	108
Name: RAJ SHUKLA .(2023A4PS0409P).....	108
PS-I station: Goa Shipyard Ltd., Goa	109
Student.....	109
Name: SOHAM DESHPANDE .(2023B3A80959P)	109
PS-I station: IDS Infotech Ltd, Chandigarh	109
Student.....	110
Name: SOHAM .(2023A7PS0488P)	110
PS-I station: IDS Infotech Ltd, Chandigarh	110
Student.....	111
Name: SAKSHAM ARYAN .(2023A8PS0474H)	111
PS-I station: IDS Infotech Ltd, Chandigarh	111
Student.....	111
Name: VANSHIKA SINGH .(2023AAPS0214H)	111

PS-I station: IDS Infotech Ltd, Chandigarh	113
Student.....	113
Name: KASHVI KHANDELWAL(2023B3A31112G)	113
PS-I station: IMD, Pune, Pune	114
Student.....	114
Name: SUNAY YALLURE(2023A3PS0516G)	114
PS-I station: IMD, Pune	115
Student.....	115
Name: KRISHNA KISHOR AGRAWAL(2023A3PS0809G)	115
PS-I station: IMD, Pune, Pune	115
Student.....	116
Name: LAKSHMINIDHISH JAVVADI(2023A4PS1084G)	116
PS-I station: IMD, Pune, Pune	116
Student.....	116
Name: KARTHIKEYA RAGHU .(2023A8PS0294H).....	116
PS-I station: IMD, Pune	117
Student.....	117
Name: AADITYA RAJPUT .(2023A8PS0384H)	117
PS-I station: IMD, Pune	119
Student.....	119
Name: YASH KAMAT(2023A8PS0547G)	119
PS-I station: IMD, Pune	120
Student.....	120
Name: AADITYA JOSHI .(2023A8PS0695P).....	120
PS-I station: IMD, Pune, Pune	121
Student.....	121
Name: KAJAL AGARWAL(2023A8PS1150G)	121
PS-I station: IMD, Pune	122
Student.....	122
Name: KOMAL PUSHKAR APTE(2023AAPS0028G).....	122
PS-I station: IMD, Pune	122
Student.....	122
Name: ADITYA ANIKET VAIDYA(2023AAPS0619G)	123
PS-I station: IMD, Pune	124
Student.....	124

Name: SAMARTH SHREEPAD DIXIT .(2023B1AA1324H)	124
PS-I station: IMD, Pune, Pune	125
Student.....	125
Name: AMAN PATEL(2023B5A31004G).....	125
PS-I station: Indian Semiconductor Mission (ISM), Delhi.....	126
Student.....	126
Name: ARSHIKA SHARMA(2023AAPS0607G).....	126
PS-I station: Institute of Seismological Research, Gandhinagar	127
Student.....	127
Name: SAYAN PAUL(2023A1PS0120G)	127
PS-I station: Institute of Seismological Research, Gandhinagar	128
Student.....	128
Name: ANISH SAI NIMMAGADDA .(2023A7PS0027P)	128
PS-I station: Institute of Seismological Research, Gandhinagar	129
Student.....	129
Name: MRIDUL SINHA .(2023B2A10910P)	129
PS-I station: Institute of Seismological Research, Gandhinagar	131
Student.....	131
Name: NISHA LAXMAN GAWADE .(2023B3A40462H)	131
PS-I station: INTEL Solutions & Services India Pvt Ltd, Bengaluru	133
Student.....	133
Name: SHARUNDHATHYA C .(2023A3PS0255H).....	133
PS-I station: INTEL Solutions & Services India Pvt Ltd, Bengaluru	134
Student.....	134
Name: AARUSH SUMIT MATHUR .(2023A3PS0698P)	134
PS-I station: INTEL Solutions & Services India Pvt Ltd, Bengaluru	135
Student.....	135
Name: PRITHAM KUMAR JENA .(2023A8PS1308H).....	135
PS-I station: INTEL Solutions & Services India Pvt Ltd, Bengaluru	136
Student.....	136
Name: URJIT KHATUA(2023AAPS0495G).....	136
PS-I station: KeenSemi (Keenheads Technologies pvt Ltd), Noida	137
Student.....	137
Name: ARYAN KUMAR SINGH(2023A7PS0362G).....	137
PS-I station: KeenSemi (Keenheads Technologies pvt Ltd), Noida	139

Student.....	139
Name: DWITI SUCHAK .(2023B3A30958P).....	139
PS-I station: MCEME, Secunderabad	141
Student.....	141
Name: SRUTI GUDURU .(2023AAPS0285H)	141
PS-I station: MCEME, Secunderabad	142
Student.....	142
Name: BANDLA HIMA NAGA SRI HARSHITHA .(2023B4A80803H)	142
PS-I station: MCEME, Secunderabad	144
Student.....	144
Name: ROHIT KUMAR PATEL .(2023B5A30814P)	144
PS-I station: MCEME, Secunderabad	145
Student.....	145
Name: KANDLA JHA(2023B5A30954G).....	145
PS-I station: MeitY Startup Hub(MSH), New Delhi	146
Student.....	146
Name: ABHIGYAN PRAKASH SRIVASTAVA .(2023AAPS0233H).....	146
PS-I station: Mitsubishi Electric India Private Limited - R&D, Pune.....	147
Student.....	147
Name: YASH AGRAWAL .(2023A3PS0306P).....	147
PS-I station: Mitsubishi Electric India Private Limited - R&D, Pune.....	148
Student.....	149
Name: SRIJAN MUKHOPADHYAY .(2023A3PS0334P)	149
PS-I station: Mitsubishi Electric India Private Limited - Service Gurgaon, Gurgaon.....	151
Student.....	151
Name: SANKALP TATTWADARSHI SWAIN .(2023AAPS0769P).....	152
PS-I station: National Centre for Polar and Ocean Research (NCPOR) - Deciphering the Dynamics, Goa152	
Student.....	152
Name: HARSHIL DEVANG SALVI(2023A3PS0177G).....	152
PS-I station: National Centre for Polar and Ocean Research (NCPOR) - Deciphering the Dynamics, Goa153	
Student.....	153
Name: ADITYA SRIVASTAVA(2023AAPS0620G)	153
PS-I station: National Centre for Polar and Ocean Research (NCPOR) - Deciphering the Dynamics, Goa154	
Student.....	154
Name: YUGANDHAR SANDIP PATIL(2023AAPS1064G).....	154

PS-I station: National Institute of Electronics and Information Technology [NIELIT], Patna.....	155
Student.....	155
Name: SUPRIYA PRIYADARSHNI(2023A7PS0477G)	155
PS-I station: National Institute of Electronics and Information Technology [NIELIT], Patna.....	156
Student.....	156
Name: ANUBHAV JHA .(2023B2A10916P)	156
PS-I station: NRLDC-National Regional Load Despatch Center, Grid-India, Delhi.....	157
Student.....	157
Name: YASHANSHI SAJWAN .(2023B4A71029P)	157
PS-I station: Rajasthan Solar Association, Jaipur	158
Student.....	158
Name: VEDANT GOYAL .(2023AAPS0232H)	158
PS-I station: Rajasthan Solar Association, Jaipur	159
Student.....	159
Name: SNEHA DALAL(2023B5TS1241P).....	159
PS-I station: Raman Research Institute, Bengaluru	160
Student.....	161
Name: GIRIDHAR A N(2023A8PS0522G).....	161
PS-I station: Regional Remote Sensing Centre,Jodhpur, Jodhpur	162
Student.....	162
Name: JAYESH SANJAY PAREEK(2023A3PS0191G)	162
PS-I station: Regional Remote Sensing Centre,Jodhpur, Jodhpur	163
Student.....	163
Name: PALAK SADAWAT(2023B2A31242G)	163
PS-I station: Regional Remote Sensing Centre,Jodhpur, Jodhpur	165
Student.....	165
Name: GARV JINDAL .(2023B3A70995P)	165
PS-I station: Semi-Conductor Laboratory (SCL), Mohali, Punjab, Mohali.....	166
Student.....	166
Name: ARIN SAMANT .(2023A3PS0325P).....	166
PS-I station: Shalaka Connected Devices LLP, Pune.....	167
Student.....	167
Name: SHUBH MISHRA(2023A3PS0208G).....	167
PS-I station: Shalaka Connected Devices LLP, Pune.....	168
Student.....	168

Name: AADI DESHMUKH .(2023A7PS0094H)	168
PS-I station: Shalaka Connected Devices LLP, Pune.....	170
Student.....	170
Name: ADITYA NITIN GULLANAVAR(2023A8PS0523G).....	170
PS-I station: Shalaka Connected Devices LLP, Pune.....	171
Student.....	171
Name: SWAPNIL YADAV(2023A8PS1067G)	171
PS-I station: Shalaka Connected Devices LLP, Pune.....	172
Student.....	172
Name: VINIT VINOD VIBHUTE(2023AAPS0616G)	173
PS-I station: Society for Applied Microwave Electronics Engineering and Research (SAMEER), Mumbai.....	174
Student.....	174
Name: KESHAV JOSHI(2023AAPS0592G)	174
PS-I station: SRLDC -Southern Regional Load Despatch Center,Grid-India, Bengaluru	175
Student.....	175
Name: ADIT KAPUR(2023A3PS0170G).....	175
PS-I station: SRLDC -Southern Regional Load Despatch Center,Grid-India, Bengaluru	177
Student.....	177
Name: PARIN KUMAR SUSIL .(2023B5AA1130P)	177
PS-I station: Standardisation, Testing & Quality Certification Directorate (STQC), Delhi, Delhi	177
Student.....	177
Name: PANA V DEWAN .(2023B5A31089H)	177
PS-I station: UST Bengaluru, Bengaluru	179
Student.....	179
Name: KUMAR YASH(2023A3PS1134H).....	179
PS-I station: UST Bengaluru, Bengaluru	180
Student.....	180
Name: SREEHARI V S(2023A8PS1068G).....	180
PS-I station: UST Trivandrum, Thiruvananthapuram	181
Student.....	181
Name: JUAN ANTONY AJAY(2022A4PS0901G)	181

PS-I station: 505 Army Base Workshop-Mechanical, New Delhi

Student

Name: DHRUV DASHORA(2023A4PS1190G)

Student Write-up:

PS-I Project Title: Re-designing of external components for reduction in thermal signature, thereby enhancing Tank protection.

Short Summary of work done: For the 1st week, we brainstormed ideas to reduce thermal signature and visited T72/T90 tanks to observe and understand their working. We started researching existing technologies in IR stealth domain. We identified critical areas to work upon in the tank and proposed "Hydrogen Fuel Cell based APU". We then made its placement drawing and contacted vendors for cost analysis. After midsem our focus shifted to building a prototype using "Bio mimetic approach" using magnetic sheet, scotch tape and aluminium foil and tested this plate on T72 in front of T90 tank having IR camera and observed positive result. We presented our progress to army officials in form of 3 presentations during the internship.

Objectives of the project: To come up with innovative solution to tackle the problem of IR guided ammunitions on T72/T90 Tanks.

Tool used: Infrared Cameras and sensors, MS Powerpoint

Details of Papers/patents: NA

Brief description of the working environment: The working environment in Indian Army was great. Our Directing Staff [Army mentor] focused on equipping us with practical knowledge and made us aware of challenges in implementing various solutions in the project based on their experience. We used to visit workshop to observe and understand subsystems in tanks. They were friendly and dedicated time and effort for us to have maximum learning and a fun experience. Their expectations from us was to propose innovative solutions that can be implemented in T72/T90 tanks for Indian Army.

Academic courses relevant to the project: Thermodynamics, Applied Thermodynamics and Heat Transfer.

Learning Outcome: Learnt a lot about Auxillary Power Unit and passive methods to reduce thermal signature with ground observation of various systems of T90 tank.

PS-I station: 505 Army Base Workshop-Mechanical, New Delhi

Student

Name: AAYUSH(2023B2A40759G)

Student Write-up:

PS-I Project Title: Re-designing of External Components of T-90 Tank for Reduction in Thermal Heat Signature

Short Summary of work done: This project, conducted at the 505 Army Base Workshop, focuses on reducing the thermal signature of the T-90 main battle tank to counter the growing threat of infrared (IR) surveillance and precision-guided targeting systems. As traditional camouflage proves ineffective against thermal detection, the study explores a range of countermeasures—passive, active, and hybrid. Passive methods include thermal insulation, low-emissivity coatings, and structural modifications, while active techniques involve airflow management, heat exchangers, and liquid cooling systems. The project also benchmarks global technologies, analyzes integration challenges, and proposes an indigenous development pathway in line with the Aatmanirbhar Bharat initiative. The goal is to deliver robust, cost-effective, and field-ready solutions to enhance the operational stealth and survivability of Indian armored platforms across varied combat environments.

Objectives of the project: Advancements in modern warfare have elevated the threat posed by thermal imaging and infrared (IR) surveillance, which can detect armored vehicles based on their heat signatures even in complete darkness or visually obscured conditions. The T-90 main battle tank, a key asset in India's armored corps, remains vulnerable to such detection due to the heat emitted by its engine, exhaust, and onboard systems. This thermal visibility poses a significant risk during reconnaissance, stationary operations, and prolonged deployments. Although visual camouflage offers limited concealment, it is largely ineffective against IR-based systems that are now standard in modern targeting platforms. To address this vulnerability, the 505 Army Base Workshop in Delhi Cantt initiated this project, aiming to explore indigenous

solutions to reduce thermal signatures. The initiative aligns with the Aatmanirbhar Bharat mission and emphasizes the importance of self-reliant, context-specific defense innovation.

Tool used: Solid works

Details of Papers/patents: None

Brief description of the working environment: The working environment was decent. But the people there were inspirational so overall it was a good experience.

Academic courses relevant to the project: Various mechanical engineering courses like material science and engg. , applied thermo etc. aligned with the project

Learning Outcome: Experienced the industry's work culture.
Applied mechanical engineering knowledge in real life problem.
Learnt about the functioning of Army.

PS-I station: 509 Army Base Workshop, Agra

Student

Name: DHRUV SINGH .(2023A3PS0364P)

Student Write-up:

PS-I Project Title: Reverse Engineering of PCB

Short Summary of work done: Learnt various electronic testing equipment at ARCC. Learnt the various components on a PCB , such as various kinds of resistors , capacitors and transistors. Learnt how to create datasheet of single layer PCB and how to implement a model PCB on a breadboard.

Objectives of the project: Reverse engineer PCB of radar of flycatcher.

Tool used: Multimeter , BoardMaster , Single layer PCB , Breadboard , electronic components such as resistors , capacitors , transistors and diodes , etc.

Details of Papers/patents: None.

Brief description of the working environment: Very supportive and friendly people , learnt a lot during the period.

Academic courses relevant to the project: All electronics courses.

Learning Outcome: Learnt to create datasheet of single layer PCB , and then implement a demo model of the PCB on a breadboard using the datasheet , and then testing it using the BoardMaster.

PS-I station: Adani Solar - Mundra Solar Private Limited, Ahmedabad

Student

Name: HITARTH PAREKH .(2023A3PS0359P)

Student Write-up:

PS-I Project Title: Wind aided thermal management of Solar Panels using COMSOL

Short Summary of work done: At Adani Solar, I worked with the Simulation and Design team, where I used COMSOL Multiphysics to simulate how sunlight heats up solar panels and how wind helps cool them down. The aim was to understand how temperature changes affect panel efficiency. This gave me a solid grasp of thermal simulations and real-world solar performance. The work culture was one of the best parts of the experience. I was based in Ahmedabad and also got to visit the Mundra plant, which was very insightful. The environment was flexible and non-hierarchical, with friendly and approachable team members. My mentor, Arun Sir, was especially supportive—he constantly gave valuable feedback and always made time to guide me, no matter how busy he was. A personal highlight was seeing my work featured in the company’s monthly achievements.

Objectives of the project: To simulate and analyze the heating of solar panels by sunlight and their cooling by wind using COMSOL, and evaluate how temperature variations affect power output and efficiency

Tool used: COMSOL Multiphysics

Details of Papers/patents: none

Brief description of the working environment: already written

Academic courses relevant to the project: not many, I learnt everything after joining

Learning Outcome: Gained hands-on experience in using COMSOL for thermal simulations and understood how environmental factors like sunlight and wind affect solar panel temperature and performance

PS-I station: Adani Solar - Mundra Solar Private Limited, Ahmedabad

Student

Name: CHOKSHI ADITYA AMIT .(2023A4PS0436P)

Student Write-up:

PS-I Project Title: ENHANCING SOLAR MODULE STRUCTURAL INTEGRITY AND COST-EFFECTIVENESS THROUGH ADVANCED MLT TESTING AND SIMULATIONS

Short Summary of work done: During my PS-I at Adani Solar – Mundra Solar Private Limited (Ahmedabad), I worked on a project focused on enhancing the structural integrity and cost-effectiveness of solar modules through advanced Mechanical Load Testing (MLT) and simulations. My responsibilities included conducting laboratory tests (static and dynamic MLT), developing and running finite element analysis (FEA) models to simulate stress and failure modes under various loading conditions, and applying multi-objective optimization algorithms (such as NSGA-II) to optimize frame design for reduced material use and improved performance.

Objectives of the project: Laboratory Testing, Simulation and Modelling ,Quality Assurance and Compliance

Tool used: Comsol Multiphysics (Software, S/w)

Details of Papers/patents: -

Brief description of the working environment: During my Practice School I (PS-I) internship, I experienced a dynamic and collaborative workplace. The environment was professional yet friendly, which encouraged open communication and teamwork. My supervisors and colleagues were approachable and supportive, creating a positive atmosphere for professional growth. The organization provided the necessary resources and tools, ensured safety protocols, and maintained an inclusive culture, allowing me to participate confidently in various ongoing projects.

Academic courses relevant to the project: Mechanical Core courses and some knowledge of Solar Panels and technology behind it.

Learning Outcome: Enhanced Structural Integrity: Advanced MLT and simulation methods identified critical stress points and failure modes, enabling targeted design improvements. Modules demonstrated superior resistance to wind, snow, and static loads.

☑ Cost Reduction: Optimization algorithms reduced specific module costs from 25.5 €cent/WFP to 24.6 €cent/WFP, while maintaining or improving module efficiency and durability.

☑ Improved Reliability: Modules designed using these methods showed minimal power degradation and physical damage in rigorous testing, supporting long-term reliability.

PS-I station: Adani Solar - Mundra Solar Private Limited, Ahmedabad

Student

Name: SHREY KHANNA .(2023B3AA1007P)

Student Write-up:

PS-I Project Title: Perovskite Based Cells as a Potential Alternative to the Traditional Silicon Solar Cells

Short Summary of work done: We were first able to interact with the high-level officials of each sub sector of the company from sales to finance, technical and operations each of which was gracious enough to properly explain us the workings of their own department in full detail and also respond and clarify every question we had. Then it was arranged for us to visit the manufacturing Mundra facility which gave us a first-hand experience into the actual backbone of the company. We were also able to choose our own projects - from which I took up Perovskite Cells because it was the least researched upon and thus an entirely new domain for even the company. I was provided software and reading material from our Mentor, Dr, Arun Appadurai's side and were able to substantially build upon the existing knowledge and provide company with models and simulations that might help them with their future R&D when they start looking into expanding into Perovskite or tandem cells. I was also able to interact with the financial department and MBA interns and was able to understand how to read and understand TEV Reports, Financial Models and also a Deep Dive into the policies of Gujarat Gov. and Indian Gov. including but not limited to SEZ and GEP, that the company take benefit off.

Objectives of the project: Addressing Material Complexity and Identifying Pathways to Enhanced Efficiency in the Perovskite Based Cells

Tool used: PC1D, SCAPS-1D, WxAMPs, AFORS-HET

Details of Papers/patents: None

Brief description of the working environment: We were first able to interact with the high-level officials of each sub sector of the company from sales to finance, technical and operations each of which was gracious enough to properly explain us the workings of their own department in full detail and also respond and clarify every question we had. Then it was arranged for us to visit the manufacturing Mundra facility which gave us a first-hand experience into the actual backbone of the company. We were also able to choose our own projects - from which I took up Perovskite Cells because it was the least researched upon and thus an entirely new domain for even the company. I was provided software and reading material from our Mentor, Dr, Arun Appadurai's side and were able to substantially build upon the existing knowledge and provide company with models and simulations that might help them with their future R&D when they start looking into expanding into Perovskite or tandem cells. I was also able to interact with the financial department and MBA interns and was able to understand how to read and understand TEV Reports, Financial Models and also a Deep Dive into the policies of Gujarat Gov. and Indian Gov. including but not limited to SEZ and GEP, that the company take benefit off.

Academic courses relevant to the project: Digital Design, Fundamentals of Finance, Financial Management

Learning Outcome: teamwork, corporate culture and hierarchy, financial modelling, solar cell modelling and simulations, manufacturing processes and sales structure, technical reporting and documentation.

PS-I station: Adani Solar - Mundra Solar Private Limited, Ahmedabad

Student

Name: CHIRAG BIRLA .(2023B3AD0952P)

Student Write-up:

PS-I Project Title: Modeling and Simulation of Perovskite Solar Cells using SCAPS-1D and wxAMPS

Short Summary of work done: This project involved simulating perovskite solar cells using SCAPS-1D and wxAMPS to better understand how they work and compare results between tools. We tested a common cell structure—FTO/TiO₂/MAPbI₃ (or MASnBr₃)/Spiro-OMeTAD/Au—by changing parameters like bandgap, doping, and thickness. MAPbI₃ gave ~18.2% efficiency in SCAPS-1D, while MASnBr₃ (a lead-free option) gave ~17.5%. wxAMPS results were similar, with ~17.6% efficiency and a peak QE of 90%. We also looked at how temperature, light spectrum, and material choices affect performance, and found that stability, mobility, and defects matter a lot. Overall, the simulations gave useful insights into optimizing solar cells before making them in the lab.

Objectives of the project: To explore how perovskite solar cells perform using SCAPS-1D and wxAMPS, and see how changes in materials like MAPbI₃ and MASnBr₃ affect efficiency and other key outputs.

Tool used: SCAPS-1D (University of Ghent) wxAMPS (Windows-based Analysis of Microelectronic and Photonic Structures)

Details of Papers/patents: None

Brief description of the working environment: The working environment was pretty chill. We had proper guidance throughout the project, and everyone was approachable. Got to go on

factory tours, which were super insightful. The food was amazing and hygienic, which honestly made a big difference. Met a lot of cool people, including other interns. Overall, it was a fun and comfortable experience.

Academic courses relevant to the project: yes

Learning Outcome: Learned how to use both tools, understand cell behavior, tweak parameters, and saw how small changes can make a big difference in performance

PS-I station: Airports Authority of India (AAI), Delhi

Student

Name: PRAGNA DAS .(2023A2PS0252P)

Student Write-up:

PS-I Project Title: Overviewing northern region civil aviation infrastructure works

Short Summary of work done: Kept updates of various components of planning and infrastructure involved in the aviation industry. Understood works in the northern region.

Objectives of the project: To keep updates of ongoing/planning sections of northern region civil aviation projects.

Tool used: N/A

Details of Papers/patents: N/A

Brief description of the working environment: Formal government environment. Expected to learn critical details of civil infrastructure, understood more about project planning and managerial aspects.

Academic courses relevant to the project: CPT, CEM, Soil Mechanics

Learning Outcome: Understood various component of planning and infrastructure involved in the aviation industry.

PS-I station: Airports Authority of India (AAI), Delhi

Student

Name: ABHYUDAY SINGH .(2023A4PS0153P)

Student Write-up:

PS-I Project Title: PS-I Project Title * Objectives of the project * Major Learning Outcomes * Short Summary of work done during PS-I (in not more than 250 words) * Tool used (Development tools - H/w, S/w) * Details of Papers/patents (if any) * Brief description of the work

Short Summary of work done: During my Practice School-I internship at the Airports Authority of India, I was exposed to a broad array of engineering operations essential to airport infrastructure. I spent time with the Mechanical and Electrical divisions, learning how HVAC systems maintain optimal indoor air quality and temperature at terminals. I observed the working of DG (Diesel Generator) sets as backup power sources and monitored their load-sharing patterns during peak hours. Further, I assisted in the inspection and documentation of conveyor belt systems for baggage handling and studied how friction testers determine runway surface conditions for aircraft safety. My experience also involved understanding the procurement process governed by Central Public Procurement Portal (CPPP), Government e-Marketplace (GeM), and GFR 2017, where I analyzed active tenders and noted vendor selection procedures. By interacting with field engineers and section heads, I also gained awareness of regular maintenance schedules, SOPs for emergency operations, and the role of calibration in safety-critical equipment. This experience helped bridge classroom learning with practical applications in the public infrastructure domain.

Objectives of the project: To understand the functioning of mechanical and electrical systems in airport operations. To observe runway friction testing and other aviation safety protocols. To study procurement and tendering mechanisms under a government body (AAI). To gain exposure to real-time maintenance operations and project planning.

Tool used: MS Excel, MS Word (Documentation & reporting) Friction Tester (hardware) Conveyor System Hardware GeM portal (Software for procurement) CPPP (Central Public Procurement Portal)

Details of Papers/patents: None

Brief description of the working environment: The working environment at AAI was structured and professional, yet welcoming. I worked closely with engineers from both Electrical and Mechanical divisions, who were open to questions and eager to share real-world insights. Field visits were accompanied by detailed technical explanations and documentation reviews.

The company expected interns to observe, document accurately, and show curiosity and initiative. I was encouraged to read standard operating manuals, past maintenance logs, and procurement records. Safety was always a top priority—every visit to the airside or maintenance zone was preceded by a briefing.

My learning during PS-I extended beyond technical knowledge. I developed a sense of discipline in official communication, learned how a government body functions in terms of bureaucracy and public procurement, and gained soft skills such as professional conduct, time management, and formal reporting. The hands-on nature of the internship helped consolidate several engineering concepts and showed me how they apply at scale in real infrastructure systems.

Academic courses relevant to the project: Engineering Graphics

Electrical Sciences

Thermodynamics

Mechanics of Machines

Basics of Instrumentation

Production Techniques

Environmental Studies

Learning Outcome: Hands-on exposure to systems like HVAC, DG sets, conveyors, and airfield lighting.

Understanding of the e-tendering and procurement process under GFR and GeM.

Gained insight into public sector engineering operations and technical documentation.

Improved problem analysis, observational, and reporting skills

PS-I station: Airports Authority of India (AAI), Delhi

Student

Name: BRIJMOHAN YADAV .(2023B3A80948P)

Student Write-up:

PS-I Project Title: Exploring all the different unit of Dats complex

Short Summary of work done: During my PS-I at the Airports Authority of India (AAI), I gained practical insights into critical aspects of air traffic management and airport operations. I visited key units, observing and learning their functionalities. My focus included VHF (Very High Frequency) communication systems, understanding their role in establishing crucial air-ground communication between pilots and Air Traffic Controllers (ATC). I learned about the technology behind these systems, including the use of IP-based VHF radios and Voice Communication Control Systems (VCCS), and how extended VHF systems (RCAG) are deployed to ensure seamless coverage across vast airspace. I also delved into Navigational Aids (NAVAIDs), which are indispensable for guiding aircraft. This involved studying systems like Instrument Landing System (ILS) for precision approaches, Doppler VHF Omnidirectional Range (DVOR) for providing bearing information, and Distance Measuring Equipment (DME) for calculating distance from ground stations. I observed their installation, calibration, and maintenance, understanding how these aids ensure safe and accurate navigation, especially during adverse weather conditions. Furthermore, I explored Automation systems, specifically the Advanced Surface Movement Guidance and Control System (ASMGCS). I learned how these systems integrate various surveillance data sources (like Radar and ADS-B) to provide real-time information to ATC, enabling efficient control of aircraft and vehicle movements on the airport surface. This included understanding how automation contributes to collision avoidance and adherence to flight plans, significantly enhancing safety and efficiency in air traffic operations

Objectives of the project: learn all the units and how they corrdinate with each other

Tool used: make in paragraph and less than 30 wods I observed VHF radios, antennas, VCCS, and test equipment for communication. For NAVAIIDs, I saw ILS components, DVOR/DME, and specialized calibration tools. ASMGCS utilized radars, MLAT, ADS-B, and controller work

Details of Papers/patents: None

Brief description of the working environment: The working environment at AAI is dynamic and safety-critical, operating 24/7. Expectations from the company emphasize strict adherence to international standards and regulations, precision, and continuous learning to ensure safe and efficient air traffic operations. During PS-I, I gained practical knowledge of ground communication systems (VHF), learned about the vital role of various navigational aids (ILS, DVOR, DME) in guiding aircraft, and understood how automation systems like ASMGCS enhance airport surface movement control and safety. This experience provided invaluable insights into real-world aviation infrastructure

Academic courses relevant to the project: Mainly it is related to the communication part

Learning Outcome: Training at Airport Authority of India (AAI) provides comprehensive knowledge in aviation operations, air traffic management, airport development, safety protocols, and regulatory compliance. It also emphasizes practical skills for efficient airport functioning.

PS-I station: AMTZ, Visakhapatnam

Student

Name: AKSHIT KRISHNA VELUGUBANTLA .(2023A3PS0334H)

Student Write-up:

PS-I Project Title: EEG Machine

Short Summary of work done: Took signals from the brain using leads and processed those signals using ESP32 Raspberry Pi Pico and EEG Click and obtained alpha and beta waves.

Objectives of the project: Signal processing

Tool used: ESP32 , EEG Click , Raspberry Pi Pico , KiCad , Arduino IDE , VS Code

Details of Papers/patents: Nil

Brief description of the working environment: Very helping and welcoming people and onboarding process was very smooth

Academic courses relevant to the project: Signals and Systems , IOT

Learning Outcome: Signal Processing

PS-I station: AMTZ, Visakhapatnam

Student

Name: DIYA MAKARI .(2023B2A30848H)

Student Write-up:

PS-I Project Title: Patch electrodes manufacturing

Short Summary of work done: industrial manufacturing of patch electrodes

Objectives of the project: industrial manufacturing of patch electrodes

Tool used: NX cad

Details of Papers/patents: no

Brief description of the working environment: industrial manufacturing of patch electrodes

Academic courses relevant to the project: basic chemistry

Learning Outcome: industrial manufacturing of patch electrodes

PS-I station: Astera Labs, Bengaluru

Student

Name: AKASH GANESH .(2023AAPS0373P)

Student Write-up:

PS-I Project Title: AXIS Design and Scripting

Short Summary of work done: I had first studied AXI-Stream then designed 2 devices using this protocol. I had also created a scripting software that will be used by the company in their future projects.

Objectives of the project: To design 2 company IPs and help the company workflow with linting

Tool used: Python, Lint, Verilog, Bash, Make, VCS, Spyglass

Details of Papers/patents: Nil

Brief description of the working environment: The working environment was great. Everyone in the company was very useful not just my mentor. I had high hopes going into the PS and they were met because of how much I got learn while working for the company including hard skills and soft skills.

Academic courses relevant to the project: DD, MUP, Mue, Electrical Sciences

Learning Outcome: Python, Lint, Verilog, Bash, Make, Internal company working, Buffers

PS-I station: Autrik UG, Germany

Student

Name: R DHARMICK .(2023A7PS0188H)

Student Write-up:

PS-I Project Title: Anomaly Detection System for Powerline Cable Inspection with Drones

Short Summary of work done: Downloaded the CableInspect-AD dataset, trained the enhanced-patchcore model on the dataset, obtained the results

Objectives of the project: To train an anomaly detection model using Anomalib and other relevant libraries and obtain it's accuracy and further fine-tune the model accordingly.

Tool used: Google Colab

Details of Papers/patents: None

Brief description of the working environment: This was an online station. Aside from a brief meeting with the mentor around 5pm, The mentor is easily approachable when doubts arise and is willing to provide guidance on how to approach problems. Overall, a great environment to learn new concepts and apply them.

Academic courses relevant to the project: Machine Learning, Computer Vision

Learning Outcome: Machine Learning Workflow(Acquiring the Dataset, Training, Testing, etc), Usage of Github in development and storage of code, Report Writing, etc

PS-I station: Autrik UG, Germany

Student

Name: ANANYA KHAITAN(2023A7PS0377G)

Student Write-up:

PS-I Project Title: Automated flight approval platform

Short Summary of work done: Developed a fully automated Flight Approval Platform enabling UAV operators to submit flight requests and receive immediate approval/rejection feedback. Implemented a Flutter-based frontend that dynamically generated 32+ form fields from OpenAPI-generated models, ensuring consistency between client and server. The backend, built with Dart's shelf framework, validated incoming requests against operational rules such as flight time windows, altitude limits, weather conditions, and deviation thresholds. Designed CORS-compliant endpoints for seamless cross-origin communication. Integrated real-time feedback by sending detailed rejection reasons to the frontend.

Objectives of the project: Develop a flutter web app that automatically accepts/rejects flights based on realtime filtering logic, based on inputs given by the user.

Tool used: Flutter, Dart, OpenAPI Generator, Shelf, Dio

Details of Papers/patents: NA

Brief description of the working environment: Worked in a collaborative and experimental environment simulating a real-world aerospace compliance system. Expectations included designing a reliable, user-friendly interface, implementing robust server-side validation, and maintaining alignment between frontend and backend data models. Learned to follow API contracts strictly using OpenAPI, debug cross-platform issues, and ensure data integrity across layers. Acquired skills in writing maintainable Dart code, structuring Flutter widgets, handling asynchronous requests, and building middleware for logging and CORS.

Academic courses relevant to the project: CP, DBMS

Learning Outcome: Gained hands-on experience with Flutter for cross-platform frontend development.

Learned to use OpenAPI code generation for shared models and API client creation. Understood integration between frontend UI, backend APIs, and automated validation logic

PS-I station: Autrik UG, Germany

Student

Name: ADITYA GUNEJA .(2023B5A70821P)

Student Write-up:

PS-I Project Title: Anomaly Detection System for Bridge Inspection with Drones

Short Summary of work done: During my internship at Autrik UG, Germany, I developed an AI powered anomaly detection system aimed at automating bridge inspection using imagery captured by drones. The primary objective was to detect surface anomalies, such as cracks, in concrete bridge structures using unsupervised deep learning techniques. The project was implemented using the Anomalib framework, a library built using PyTorch and optimized for industrial anomaly detection tasks. I used the EfficientAD model, which is known for its lightweight architecture and low memory requirements, and is suitable for training on personal

GPU hardware such as the NVIDIA RTX 4060. The development environment was configured using Python 3.10 along with supporting libraries such as PyTorch, NumPy, and Pillow. For training, I used Kangcheng Liu's Bridge Crack Dataset, which contains over fifty thousand high resolution labeled images. Images without cracks were used for training the model, while cracked images were reserved for evaluation. The model was trained for ten epochs with tuned hyperparameters such as learning rate and weight decay to optimize performance. Each training session took approximately five hours. Testing was performed using both a dataset similar to the training set and a second dataset with more diverse real world bridge samples to evaluate generalization. The model demonstrated impressive performance, achieving accuracy scores of up to ninety eight percent on the familiar dataset and around eighty percent accuracy on real world imagery. The outputs included heatmaps showing the location and severity of cracks.

Objectives of the project: To Develop an AI-powered system to detect anomalies in drone-captured imagery of bridges using Anomalib Framework.

Tool used: Anomalib (PyTorch based framework), Python (Visual Studio Code), Nvidia RTX 4060 (CUDA enabled Machine Learning).

Details of Papers/patents: -

Brief description of the working environment: The work environment at Autrik UG was highly supportive and friendly. Our mentor, Mr. Yogesh Khedar, played a pivotal role throughout the internship period. He was very approachable and consistently encouraging, which made it easy to seek guidance or clarification at any stage. He assigned us projects based on our individual interests, which made the work not only more engaging but also personally meaningful. He provided clear directions from the beginning and ensured that expectations were clearly defined. His regular feedback sessions also helped us resolve any doubts and remain focused on our projects.

Despite the difference in time zones, since Autrik UG operates from Germany, the flexible work setup made it manageable. The autonomy offered allowed us to pace our progress effectively while still receiving timely mentorship when needed. Overall, it was a valuable learning experience and would be rewarding for anyone looking to expand their skill set.

Academic courses relevant to the project: Machine Learning, Digital Image Processing.

Learning Outcome: Machine Learning Model Training and Tuning, PyTorch enabled Deep Learning Libraries, Image Processing using Python.

PS-I station: Autrik UG, Germany

Student

Name: ATHARVA PANDIT(2023B5A70987G)

Student Write-up:

PS-I Project Title: Designing and implementing an ETL (Extract, Transform, Load) pipeline that processes drone flight logs and displays them on a Grafana dashboard to enable advanced analytics and AI-powered insights.

Short Summary of work done: This project involved designing and implementing an ETL (Extract, Transform, Load) pipeline to process DJI drone flight logs and visualize telemetry data. The workflow starts with parsing raw .txt logs using a Dockerized tool run via a shell script, followed by transforming the nested JSON data into clean CSV datasets using Python scripts. The processed data is then loaded into a ClickHouse database by another Python script, and interactive Grafana dashboards were created to display key metrics like altitude, battery levels, speed, and flight paths. The system automates the entire process through an orchestration shell script and was designed to handle large volumes of time-series data efficiently. Challenges like Docker-in-Docker limitations and client-server database version mismatches were addressed during development, resulting in a scalable pipeline for drone data analytics.

Objectives of the project: The main objective of this project was to design and implement a robust ETL (Extract, Transform, Load) pipeline for processing DJI drone flight logs and transforming raw telemetry data into meaningful insights. The goal was to automate the workflow from parsing complex, proprietary log files to visualizing key metrics like altitude, battery health, speed, and flight paths on Grafana dashboards. By building this system, the project aimed to make drone data more accessible and actionable for analysis, monitoring, and future AI-powered applications.

Tool used: Python, Pandas, DJI Flight Record Parser, Docker, Git, GitHub, Bash, Grafana, Clickhouse, Ubuntu OS

Details of Papers/patents: N/A

Brief description of the working environment: The working environment was very friendly and fun. We used to have meetings every Tuesday on Google meet to provide updates on the weekly work, and doubt clearing meets every day of the week on Discord. The coordinator was very chill and would help with all the doubts we had, and we could use Discord messages to ask doubts to the coordinator.

Academic courses relevant to the project: Some prior knowledge of Databases and proficiency in Python is required

Learning Outcome: Working on this project gave me experience in designing and implementing real-world data engineering workflows. I learned how to build modular ETL pipelines that can process complex, nested telemetry data and make it usable for analytics. Along the way, I gained practical skills in containerization with Docker, data transformation using Python and Pandas, and working with high-performance databases like ClickHouse. Setting up interactive dashboards in Grafana also taught me how to present large datasets in a way that's both intuitive and insightful.

The project also helped me understand the importance of debugging and problem-solving. Handling challenges like Docker orchestration constraints improved my ability to adapt and find alternate solutions. Overall, it was a valuable opportunity with practical applications and learning how scalable systems are built and deployed in a professional environment.

PS-I station: Bacanc S stems LLP, Ahmedabad

Student

Name: ARNAV SHARMA(2023A8PS1133G)

Student Write-up:

PS-I Project Title: FasTAG Detection System

Short Summary of work done: During the course of the project, I understood the fundamental working principles and differences between basic communication protocols such as SPI, UART, and I2C. I learned how RFID systems function and was able to classify different types of RFID technologies based on factors like frequency, range, and application. In particular, I studied the EPC Gen2 protocol and gained a clear understanding of UHF RFID systems, which differ from conventional RFID by operating at higher frequencies (860–960 MHz), offering longer read ranges (up to 10 meters) and faster data transfer rates, making them ideal for applications like FASTag. Finally, I designed and implemented a FASTag detection system using an STM32 microcontroller, successfully interfacing it with UHF RFID readers and other peripherals through appropriate communication protocols.

Objectives of the project: 1) To understand basic communication protocols - SPI, UART, I2C
2) To learn about how RFID Works and their classification 3) To learn EPC gen2 protocol and how UHF RFID works 4) Create a FASTag Detection System using Stm32 microcontroller and interfacing it with different peripherals using communication protocols

Tool used: MFRC522, Arduino IDE, RFID tags, STM32Cube IDE, stm32 microcontroller, UHF RFID reader, Antenna, LED display (Over I2C), Docklight, PuTTY, USB to TTL converter

Details of Papers/patents: None

Brief description of the working environment: The company provides a supportive and encouraging working environment where asking doubts is always welcomed, fostering continuous learning. The workload is manageable and not overwhelming, allowing time to properly understand and explore new concepts. However, consistent daily attendance is expected as part of professional discipline. The team is understanding, approachable, and always ready to help, making it a comfortable space for interns to grow and gain hands-on experience.

Academic courses relevant to the project: Microprocessor And Interfacing, C programming, Object Orientation Programming

Learning Outcome: Understood the fundamental working principles and differences between basic communication protocols such as SPI, UART, and I2C.

Learned how RFID systems work and classified different types of RFID technologies based on frequency, range, and application.

Studied the EPC Gen2 protocol and gained an understanding of UHF RFID systems and their applications.

Designed and implemented a FASTag detection system using an STM32 microcontroller by interfacing it with RFID readers and other peripherals through communication protocols.

PS-I station: Center for Materials for Electronics Technology (C-MET), Pune

Student

Name: ADITYA PATIL .(2023A8PS1144H)

Student Write-up:

PS-I Project Title: Simulation of a MOCVD reactor in COMSOL Multiphysics

Short Summary of work done: I began the internship by reviewing research papers related to my topic to understand the prior work conducted in this domain. This helped me build a strong theoretical foundation. I then learned to use CAD software and designed the MOCVD setup in COMSOL Multiphysics. Implementing the process required a deep understanding of the complex chemical reactions occurring in both the gas phase and on the surface. Defining these reactions within the software— distinguishing between gaseous and surface reactions, and specifying relevant species—was initially challenging. The next phase involved setting up boundary conditions based on the literature, which required knowledge of laminar flow, heat transfer, transport of diluted species, adsorption reactions and chemical reaction physics. This step also involved correctly implementing the associated partial differential equations (PDEs). To further refine the model, I explored the official COMSOL documentation and tutorials, studied sample simulations, and adapted those methodologies to suit the specifics of our system.

Objectives of the project: Simulation of the MOCVD Process for the growth of GaN and GaAs nanowires was done in COMSOL as reported by some Researchers. And its growth rate variation along silicon surface and the reactant 's concentration variation was studied along the reactor.

Tool used: COMSOL

Details of Papers/patents: NA

Brief description of the working environment: The working environment and expectation depends on the scientist allotted. The work involved by all the scientists is in material science domain so not much engineering principles would be used rather focus would be on basic sciences and its application in engineering.

Academic courses relevant to the project: MEMS , Fabrication courses

Learning Outcome: Learnt COMSOL software , insights into the material synthesis aspect of semiconductor.

PS-I station: Center for Materials for Electronics Technology (C-MET), Pune

Student

Name: ABHISEK KUMAR(2023A8PS1169G)

Student Write-up:

PS-I Project Title: COMSOL simulation regarding LTCC

Short Summary of work done: Simulations for non isothermal laminar flow in microfluidic channels

Objectives of the project: achieve non isothermal laminar flow simulation in comsol in a microfluid channel

Tool used: COMSOL, AUTOCAD,FUSION 360

Details of Papers/patents: None

Brief description of the working environment: It was a meaningful experience that helped me understand the real working culture.

Academic courses relevant to the project: yes

Learning Outcome: COMSOL software

PS-I station: Center for Materials for Electronics Technology (C-MET), Pune

Student

Name: ABHINAV SEHGAL .(2023B5A31121P)

Student Write-up:

PS-I Project Title: MXenes and their applications in supercapacitors

Short Summary of work done: Synthesized MXenes and CdS-MXene composites so that they can be used as electrodes in supercapacitors instead of the traditional graphite electrodes.

Objectives of the project: Synthesis of MXenes and CdS-MXene composites for use as electrodes in supercapacitors.

Tool used: None

Details of Papers/patents: None

Brief description of the working environment: Work environment was decent.

Academic courses relevant to the project: yes

Learning Outcome: Learnt about MXenes, quantum dots and how to synthesize them.

PS-I station: Center for Materials for Electronics Technology (C-MET), Pune

Student

Name: MAHI RAVINDRA SAMANT(2023B5AA0952G)

Student Write-up:

PS-I Project Title: FDM Manufacturing

Short Summary of work done:

Objectives of the project:

Tool used: -

Details of Papers/patents: -None

Brief description of the working environment: It was fine.

Academic courses relevant to the project:

Learning Outcome:

PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar

Student

Name: AAREEN RAVINDRA KADAM(2023A3PS0136G)

Student Write-up:

PS-I Project Title: RTL Design and Verification of communication protocol IP

Short Summary of work done: This project focused on RTL (Register Transfer Level) design and verification of communication protocol intellectual property (IP), specifically implementing three fundamental serial communication protocols using Verilog HDL. The project involved designing and verifying I2C, UART, and SPI protocols from scratch. The I2C implementation featured a two-wire synchronous protocol using SDA (data) and SCL (clock) lines, supporting multi-master, multi-slave configurations with 7-bit or 10-bit addressing and acknowledge mechanisms. This protocol is commonly used for sensor interfacing and device configuration in embedded systems. The UART design implemented asynchronous serial communication without requiring a shared clock, featuring configurable baud rates, data bits, parity, and stop bits for point-to-point communication with TX/RX data flow. UART is widely utilized for microcontroller communication and debugging applications. The SPI implementation utilized a four-wire synchronous protocol with MOSI, MISO, SCK, and CS signals, supporting master-slave architecture with high-speed data transfer capabilities. The design accommodated multiple slave devices through chip select signals, making it suitable for memory devices, sensors, and display interfaces. The technical implementation leveraged Verilog HDL for RTL design, incorporating state machines for protocol control logic, comprehensive testbench development for functional verification, and consideration of timing constraints and signal integrity for each protocol. This project demonstrates proficiency in digital design fundamentals, protocol implementation, and verification methodologies essential for ASIC/FPGA development in embedded systems and communication applications.

Objectives of the project: To design the UART ,SPI and I2C controller in Vivado. Integrating the UART with Asynchronous FIFO's and implementing the design in Pynq Z-2 Board

Tool used: Xilinx Vivado

Details of Papers/patents: None

Brief description of the working environment: I had an online internship. The mentors from CDAC were very supportive and helpful along way.

Academic courses relevant to the project: Digital Design

Learning Outcome: Design Methodology and Verification Methodology in Verilog. Communication protocols

PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar

Student

Name: PRAJEET PARGANIHA .(2023A3PS0348P)

Student Write-up:

PS-I Project Title: Implementation of RISC-V on FPGA

Short Summary of work done: First we learnt the basics of verilog by designing and simulating basic digital components like logic gates, adders, counters etc. using behavioral, gate level and dataflow design. Then we understood the architecture of MIPS32 processor as a precursor to the RISC-V processor and implemented it in Verilog. After that we learnt the architecture of the RISC-V processor and read some research papers relevant to the same. Finally we implemented a novel RISC-V architecture called RV16 in verilog.

Objectives of the project: Learn about the RISC-V processor and implement it using Verilog

Tool used: EDAPlayground

Details of Papers/patents: NA

Brief description of the working environment: Since the station was online, we only discussed the project online through google meet once or twice a week.

I learnt a great deal about microprocessors and Verilog implementation during the project, and it has sparked interest in me for digital design.

The mentors are available for doubt clearing but you have to work on the project on your own.

Academic courses relevant to the project: Digital Design, Microprocessors

Learning Outcome: System Verilog, Microprocessors, Computer Architecture

PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar

Student

Name: ANSHUL RATH .(2023A7PS0084H)

Student Write-up:

PS-I Project Title: Supply Chain Management optimization by Quantum Computing (Cargo loading, Warehouse Optimization)

Short Summary of work done: The project began with a literature review of techniques used to solve supply chain management problems, such as aircraft loading and warehouse allocation. I analysed the research papers and explored the quantum computing methods applied in solving them. The next phase involved studying quantum algorithms for optimization, including variational quantum algorithms and the Quantum Approximate Optimization Algorithm (QAOA), and understanding how problems are mathematically formulated as QUBO before being implemented on quantum computers. The project concluded with the re-implementation of the warehouse allocation problem in Python, utilizing libraries such as Qiskit, NumPy, and others.

Objectives of the project: Apply quantum computing techniques in solving combinatorial optimisation problems, examples of which in supply chain management include aircraft loading and warehouse allocation.

Tool used: Python, Qiskit, PennyLane

Details of Papers/patents: None

Brief description of the working environment: I learned how teams collaborate to solve problems effectively.

Academic courses relevant to the project: Quantum Information and Computation (DEL)

Learning Outcome: Gained knowledge about the utility of the current era of Quantum Computers (NISQ) for solving optimization problems. Learned about combinatorial optimization problems and how they can be formulated as QUBO, which can then be implemented on Quantum Computers by programming qubits.

PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar

Student

Name: MANJOT SINGH NARULA .(2023A7PS0122H)

Student Write-up:

PS-I Project Title: QNN-based Flood Escape Routing System

Short Summary of work done: I developed a flood evacuation routing system with the use of Quantum Machine Learning in my PS-I internship at CDAC. The intended purpose of this work was to see if Quantum Neural Networks (QNNs) could be used to predict safe and optimal paths in floods, with environmental features like rainfall, slope, distance to rivers, etc. My project initially started with understanding the theoretical aspects of somethings like quantum computing and machine learning. Thereafter I collected and pre-processed the dataset. I first built and trained a classical Artificial Neural Network (ANN) model to provide a basis for

performance. Following the classical ANN baselines, I was able to use Qiskit's machine learning libraries to fit a QNN regressor and trained the QNN model on the same dataset. I continuously worked on improving model performance, evaluating results, and comparing the accuracy and efficiency of the quantum and classical models. I thoroughly researched the limitations and challenges of working with sparse and noisy data at the same time as being able to improve the models ability to generalize. Overall, my project allowed me to see some real-world applications of quantum computing in disaster management and the opportunity to learn and understand the principles of classical and quantum ML.

Objectives of the project: To develop an intelligent flood evacuation routing system using Quantum Neural Networks (QNNs). The goal is to predict safe and optimal paths based on environmental features like rainfall, slope, and river distance, and compare the performance of quantum models with classical ones.

Tool used: Python, Qiskit, NumPy, pandas, scikit-learn, Matplotlib

Details of Papers/patents: N/A

Brief description of the working environment: Working at CDAC was a very open environment. I were trusted to research things independently and we could work at our own convenience. We had regular check-ins to discuss how we working, but still had the flexibility to manage our time and approach creatively.

Academic courses relevant to the project: Machine Learning

Learning Outcome: Through this project, I gained practical experience with Quantum Neural Networks using Qiskit, understood core concepts of quantum machine learning, and learned how to preprocess environmental data for flood prediction. I also improved my skills in model evaluation, optimization, and applying ML techniques to real-world disaster management scenarios.

PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar

Student

Name: HARSH NIGAM .(2023A7PS0396P)

Student Write-up:

PS-I Project Title: QNN-based flood escape routing system

Short Summary of work done: I implemented both ANN nad QNN version on the simulated dataset provided by our mentor. Afterwards, we collected real-world data and check its usability and trained ANN and QNN models on that real data as well and compared the performance of the model with the previous models to find out which one suits our use case the most. The results measured using R^2 score showed ANN having and upper edge in both cases but the major reason behind it was the incomplete usage of the QNN, that is due to our system limitation we restricted multiple aspects of the QNN which can be improved very easily and will definitely increase the result.So, we are sure growth in technology, we will be able to use the QNN effectively and this was our final perspective we obtained.

Objectives of the project: To train a QNN based model which can predict the flood severity of a region based on data some environmental factors.

Tool used: VS code IDE

Details of Papers/patents: None

Brief description of the working environment: I improved my communication and teamwork skills during this internship.

Academic courses relevant to the project: Probability and Statistics, Mathematics-2

Learning Outcome: Quantum Machine Learning, Python (QisKit, PyTorch), GIS Data usage

PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar

Student

Name: SACHIN AGRAWAL .(2023A7PS0492P)

Student Write-up:

PS-I Project Title: Spiking neural network

Short Summary of work done: I worked on spiking neural networks. I get to research about them and then apply it on mnist dataset

Objectives of the project: Research about SNNs

Tool used: Python, vscode

Details of Papers/patents: No

Brief description of the working environment: It was online, mentor was supportive

Academic courses relevant to the project: Machine learning

Learning Outcome: Snn, ml

PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar

Student

Name: ISHAN KUMAR .(2023A7PS0511P)

Student Write-up:

PS-I Project Title: In Memory-Computing

Short Summary of work done: Researched various papers to learn about the content. Created multiple presentations to provide an update on the progress.

Objectives of the project: - Write a review paper on the state of on-memory computing systems and their architectures.

Tool used: Google Docs, Arxiv, PowerPoint

Details of Papers/patents: NA

Brief description of the working environment: The environment is slow-paced. The mentors are very helpful and relaxed.

Academic courses relevant to the project: Electrical Sciences (EEE F111)

Learning Outcome: - Learnt about in-memory computing.
- Learnt how to write a review paper.
- Learnt how to work effectively as a group.

PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar

Student

Name: AMRITPAL SINGH .(2023A7PS0590P)

Student Write-up:

PS-I Project Title: Design a framework and Review Neural Encoding Strategies in SNNs

Short Summary of work done: The work was mostly research based. I read about SNN and different strategies we can use with SNN. I read about different input encoding methods, different training methods et cetera. After having gained sufficient insight into the topic, I went through an existing SNN implementation. I made it modular such that we can iterate on different normalisation methods for input and different surrogate functions for the surrogate gradient based SNN.

Objectives of the project: To review literature on SNN and implement a SNN on MNIST dataset.

Tool used: Python, Pytorch framework, Github

Details of Papers/patents: NA

Brief description of the working environment: The work environment was very accommodating and encouraging. The work expectations were realistic and achievable. I learnt a lot about using Pytorch and how research in such research centers works. Considering it was my first hands-on experience in research, I felt the mentorship was good because by the end I ended with a good understanding and a positive outlook towards academia.

Academic courses relevant to the project: Computer Programming, Probability and Statistics, Linear Algebra, Multivariate Calculus

Learning Outcome: SNN, Deep learning basics

PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar

Student

Name: PATEL VANSH MAHENDRA .(2023A7PS0629P)

Student Write-up:

PS-I Project Title: Revitalisation of Indian tribal languages using Speech-to-Speech Translation

Short Summary of work done: Over the course of my PS1 internship at CDAC-CINE, I contributed to an AI-driven ecosystem for revitalizing low-resource Indian tribal-languages (Meiteilon, Chakma, Kirat Rai, Nagamese, and Bodo). The model we worked on was intended for Bengali-English Speech-to-Speech translation which can be easily extended to any low-resource Indian tribal-language. I began by surveying and curating available speech and text datasets. For the ASR stage, I fine-tuned OpenAI's Whisper model on Bengali data from the Mozilla Common Voice corpus, gaining practical experience with log-Mel spectrogram preprocessing, and evaluation via word error rate. In the MT phase, I evaluated transformer-based architectures, initially experimenting with BERT-based fine-tuning and then pivoting to pre-trained MarianMT models. I also benchmarked translation quality using BLEU

scores. For TTS, I explored neural vocoder and spectrogram-to-waveform models such as KokoroTTS , assessing naturalness and prosody. Finally, I prototyped an end-to-end Speech-to-Speech Translation demo by chaining ASR, MT, and TTS components in a Jupyter notebook environment and creating a GUI using Gradio. Throughout, I documented technical decisions, prepared seminar presentations, and collaborated with mentors to refine data-collection strategies for truly low-resource languages.

Objectives of the project: Digitize and preserve low-resource tribal Indian languages by collecting and curating speech/text datasets and fine-tuning state-of-the-art ASR (Whisper), MT (MarianMT), and TTS (Kokoro TTS) models. Integrate these components into a seamless end-to-end speech-to-speech translation pipeline, prototype user demos, and explore multilingual LLMs to enhance language accessibility and impact.

Tool used: Python, PyTorch, Transformers (Hugging Face), Torchaudio, Gradio, Jupyter Notebook, NumPy, Pandas,

Details of Papers/patents: None

Brief description of the working environment: The working environment at CDAC-CINE was flexible and learner-friendly. Deadlines were not rigid, giving us ample time to explore concepts in depth and complete tasks at a comfortable pace. We were encouraged to experiment, learn independently, and approach mentors when needed. This relaxed structure allowed for a balance between productivity and deep learning, making the internship both enjoyable and enriching.

Academic courses relevant to the project: Computer Programming, Mathematics-2

Learning Outcome: Developed hands-on expertise in fine-tuning and evaluating ASR(Whisper)Transformer models for low-resource Indian languages, including audio preprocessing and NLP workflows using HuggingFace and PyTorch. Gained experience in end-to-end pipeline integration, curated and managed Bengali language datasets, benchmarked performance with WER and BLEU metrics, and honed technical communication through presentations and detailed documentation.

PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar

Student

Name: PRATEEK AGARWAL .(2023A7PS0656P)

Student Write-up:

PS-I Project Title: REVITALISATION OF TRIBAL LANGUAGES USING SPEECH-TO-SPEECH TRANSLATION

Short Summary of work done: Creating an effective Speech-to-Speech Translation (S2ST) system for tribal languages faces significant hurdles due to a lack of available data, diverse dialects, and no standardized written forms. Generic solutions are ineffective, as they result in unacceptably high error rates in transcription, translation, and speech generation without models specifically designed for these languages.

Objectives of the project: 1. Digitize and preserve five target tribal languages : Meiteilon, Chakma, Kirat Rai, Nagamese, and Bodo using AI-driven methods. 2. Construct a cascaded S2ST pipeline integrating Automatic Speech Recognition (ASR), Machine Translation (MT), and Text-to-Speech (TTS). 3. Fine-tune pretrained models on small tribal datasets to optimize performance under low-resource conditions. 4. Lay the groundwork for future end-to-end S2ST architectures and large-language-model (LLM) development tailored to Indian tribal languages. 6

Tool used: Helinski MT, Open AI ASR, Hugging Face, Transformers,Kokoro TTS

Details of Papers/patents: NA

Brief description of the working environment: Working Environment was very good, expected a full model to revitalise tribal languages using S2ST.

Academic courses relevant to the project: CP, ML(Elective)

Learning Outcome: Helinski MT, Open AI ASR, Hugging Face, Transformers,Kokoro TTS

PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar

Student

Name: ASHISH SAM .(2023A7PS0677P)

Student Write-up:

PS-I Project Title: Shoplifting Detection using Artificial Intelligence and Machine Learning

Short Summary of work done: In this project, I developed a system to detect shoplifting using pose-based anomaly detection. The goal was to create a privacy-friendly and real-time solution by avoiding traditional pixel-based video analysis. I used YOLO-Pose to extract body keypoints and DeepSORT to track individuals across video frames. These pose sequences were then used as input to the STG-NF model, which assigns anomaly scores based on how much the movement patterns deviate from normal behavior. I trained the model using normal clips and tested it on a mix of normal and shoplifting clips from the DCSASS dataset. The final pipeline runs in real time and works without needing any specialized hardware. While there is still room for improvement in terms of accuracy, the project shows that pose-based methods can be a practical approach to detecting shoplifting in surveillance footage.

Objectives of the project: The objective of the project is to build an AI-based system that uses CCTV footage to automatically detect and track people in a retail setting, analyze body posture and movement to identify shoplifting behavior, work in real-time for timely response, and operate without requiring any special equipment.

Tool used: YOLO-Pose, DeepSORT, Python, PyTorch, OpenCV, NumPy, Pandas, Matplotlib, DCSASS Dataset, Jupyter Notebook, VS Code

Details of Papers/patents: N/A

Brief description of the working environment: The Practice School-I was conducted in an online setting, where I was given the flexibility to work independently while following the project guidelines. I was expected to understand the problem, explore suitable approaches, and build a working solution using the available tools. This experience helped me become more self-reliant, improve my problem-solving skills, and apply theoretical concepts to a practical task in a structured way

Academic courses relevant to the project: Probability and Statistics, Computer Programming

Learning Outcome: Through this project, I learned how to use AI tools like pose estimation and tracking for real-time applications. I got a better understanding of how to process video data efficiently and how to handle challenges like privacy and bias. It also helped me get hands-on experience with building a full pipeline for detecting unusual behavior.

PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar

Student

Name: KAUSHAL RAM S L .(2023AAPS0173H)

Student Write-up:

PS-I Project Title: A)Literature survey on in memory computing B)Implementation of FIFO buffers and SPI protocol using Verilog

Short Summary of work done: Literature survey on IMC: Several review papers and individual works were surveyed and a comparative analysis of various technologies and approaches was performed. Verilog implementation of digital modules: Synchronous and asynchronous buffers were implemented, simulated and verified using verilog. An SPI master module with support for 4 modes was implemented and verified using loopback.

Objectives of the project: A)Review state of the art research literature on IMC. B) Implement, simulate and verify FIFO buffers and SPI master module

Tool used: Vivado, GTKWave

Details of Papers/patents: None

Brief description of the working environment: Remote work.

We were expected to show our progress regularly, though exact work hours were not monitored.

Academic courses relevant to the project: Electrical sciences, microelectronic circuits, digital design

Learning Outcome: Fundamentals of IMC, verilog

PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar

Student

Name: ISHWAR SARDA .(2023AAPS0736P)

Student Write-up:

PS-I Project Title: RTL Design and Verification of Communication Protocols IP

Short Summary of work done: We implemented various protocols using HDL and EDA softwares

Objectives of the project: RTL Design and Verification of Communication Protocols IP

Tool used: Verilog, EDA playground

Details of Papers/patents: -

Brief description of the working environment: It was fine.

Academic courses relevant to the project: Digital Design

Learning Outcome: Verilog HDL , Communication Protocols

PS-I station: Centre for Development of Advanced Computing, Centre in North East (C-DAC CINE), Cachar

Student

Name: KAVISH SHAH(2023B5A70945G)

Student Write-up:

PS-I Project Title: Variational Quantum Algorithms for Solving Differential Equations

Short Summary of work done: The research explores a field that is becoming increasingly significant in quantum scientific computing: the use of Variational Quantum Algorithms (VQAs) to solve differential equations. A thorough literature review on six recent studies that used VQAs to solve both linear and nonlinear differential equations served as the starting point for the project. These studies investigated methods including quantum nonlinear processing units (QNPU), machine learning-assisted quantum regression, Lagrange polynomial encoding, and Crank–Nicolson time-stepping. Research needs were found through a comparative analysis, particularly with regard to tackling scalability and nonlinearities. After this theoretical investigation, a VQA was put into practice using Qiskit to solve a standard linear PDE, the 1D Poisson equation. Finite differences were used to discretize the domain, a Hamiltonian was created to encode the problem, and Qiskit's VQE algorithm was used to solve for the ground state. The method's low mean squared error was validated by the quantum results, which closely matched the classical and analytical answers. The goal of current work is to apply these techniques to nonlinear PDEs, such as the Shallow Water Equations, which are essential for flood modeling. Methods like floating-point quantum arithmetic and QNPUs are being investigated for managing nonlinear terms in VQAs. All things considered, the project establishes a solid theoretical and applied basis for developing quantum methods for complicated differential equation systems.

Objectives of the project: Objectives • To review and analyse state-of-the-art VQA approaches for solving DEs. • To identify and understand their mathematical and quantum design components. • To explore methods for solving nonlinear DEs using quantum algorithms. • To implement a simple VQA for solving a 1D linear DE (Poisson equation). • To lay the groundwork for future work on nonlinear DEs like the Shallow Water Equations.

Tool used: Python, VSCode (IDE), Conda (environment), Qiskit, WSL, NumPy, Matplotlib, Pandas,

Details of Papers/patents: none.

Brief description of the working environment: The working environment was very liberal and we were allowed to work at our own pace and also give project preferences as there was a diverse range of projects available. There were no specific working hours and no hard deadlines, we were assigned tasks to be completed and make progress in the project. I expected more interest and interaction from their side, however there was very less interaction than I expected. I mostly worked on the project by myself, getting weekly guidance from my mentor. I learnt about various things during PS-1, mainly about quantum computing, variational

quantum algorithms, and also doing literature review, making technical reports, presenting my work and communicating technical concepts, etc. much more effectively.

Academic courses relevant to the project: Quantum Information and Computing, Mathematics-II, Quantum Mechanics-I, Technical Report Writing, Mathematics-III.

Learning Outcome: Quantum Algorithms, quantum computing, Python, Qiskit, machine learning, numerical methods to solve differential equations, variational principles, etc.

PS-I station: Centre for High Impact Neuroscience and Translational Applications, TCG CREST, Kolkata

Student

Name: SOURASHMI SHIL .(2023A7PS1110H)

Student Write-up:

PS-I Project Title: Using Computer Vision to Detect and Track the Motion of Insects

Short Summary of work done: During my PS-I at CHINTA, I worked on a computer vision project focused on insect detection and behavior analysis using deep learning. I began by exploring classical image processing techniques with OpenCV and understanding biological image segmentation tools like Cellpose and Fiji. After rotating under two professors, I finalized my project under Dr. Subhasis Ray. I built a custom CNN-based image classifier, followed by an object detection model from scratch that predicts fixed bounding boxes and filters them by confidence score. I later implemented a YOLO-style detector using a grid-based approach, followed by training advanced models like Faster R-CNN and RetinaNet using both pretrained and from-scratch configurations. These models were trained on a custom dataset with COCO-format annotations. I also compiled all my work into detailed reports and delivered a final presentation summarizing the models, results, and key insights. This experience allowed me to bridge theoretical knowledge with real-world applications in computer vision and neuroscience.

Objectives of the project: To design and implement computer vision models capable of detecting and classifying insects in images. To explore and compare different object detection frameworks including YOLO, Faster R-CNN, and RetinaNet on a custom dataset. To assist in

developing a scalable, automated pipeline for behavior analysis of animals using image and video data.

Tool used: Software: Python, PyTorch, OpenCV, Fiji (ImageJ), Cellpose, MOOSE, COCO API, Matplotlib, Jupyter Notebook, Microsoft Word, PowerPoint Hardware: CUDA-enabled GPU for model training and inference

Details of Papers/patents: None during PS-I

Brief description of the working environment: The working environment at CHINTA was highly research-oriented and intellectually stimulating. I had the opportunity to work under the guidance of Dr. Subhasis Ray, whose lab focuses on computational neuroscience and behavior analysis using computer vision. The expectations were that interns should be independent, self-driven, and capable of learning new tools and frameworks quickly. I was encouraged to explore and experiment with ideas, design models from scratch, and critically analyze my results. This freedom allowed me to explore the full pipeline from data preprocessing and model design to training and evaluation. I also had access to necessary computational resources and was supported through regular discussions with my mentor. The learning curve was steep, but the experience significantly improved my understanding of deep learning, object detection, image annotation formats, and experimental documentation. Additionally, I gained valuable soft skills such as technical writing, problem-solving, and presenting complex ideas effectively.

Academic courses relevant to the project: Machine Learning

Learning Outcome: Acquired hands-on experience in building custom object detection models using PyTorch.

Understood and implemented various deep learning architectures such as CNNs, YOLO-style detectors, Faster R-CNN, and RetinaNet.

Gained practical skills in model training, evaluation (e.g., IoU, accuracy), and dataset preparation using COCO-format annotations.

Learned to use software tools like OpenCV, Cellpose, Fiji, and simulation environments like MOOSE.

PS-I station: Centre for High Impact Neuroscience and Translational Applications, TCG CREST, Kolkata

Student

Name: CHAITRA S TELI(2023B1A40657G)

Student Write-up:

PS-I Project Title: Experimental setup for behavioural analysis of cockroaches

Short Summary of work done: In the beginning we had to install and run MOOSE (neural system simulator) demos on our devices. Once we chose our projects, I conducted a preliminary experiment and created a non-invasive set up to observe my animals of interest, cockroaches. Then I conducted further experiments to understand food preference, maze learning and spatial navigation in cockroaches.

Objectives of the project: To conduct experiments and observe behaviour of cockroaches

Tool used: Python, Wyze Cam v3

Details of Papers/patents: None

Brief description of the working environment: Initially we got to explore the work under the professors and after 2-3 weeks we had to choose the projects we were interested in. They had projects under multiple domains, coding related, core electronics, wet lab work, clinical research etc. I was given full control of what I wanted to do with my project and my mentor in the office guided me and gave me the resources required.

The Director and professors of CHINTA are very experienced and you get to learn a lot from them. The Director is someone who's interacted with Watson and Crick and other eminent figures in biology. They have tie ups with NCBS and a bunch of foreign research centres so they could direct and connect you in that regard.

For the initial month we had biweekly lectures from the professors on neuroscience, covering a lot of work that goes on in the centre and making it easy to understand. They also invite guest lecturers. There're also weekly journal clubs where someone presents a paper they find interesting and you get to discuss it with everyone.

The people working here are extremely supportive and helpful. It's a very friendly environment and the working conditions are pretty chill. The project mentors took their summer interns on an outing too.

Academic courses relevant to the project: IMA (if you choose a project with wet lab work), cell biology, molecular biology

Learning Outcome: In depth understanding on how to conduct experiments to observe animal behaviour

PS-I station: Centre for High Impact Neuroscience and Translational Applications, TCG CREST, Kolkata

Student

Name: INDRAJIT MANDAL(2023B1AA0687G)

Student Write-up:

PS-I Project Title: Quantitative Analysis and fate determination of Hair Cell Morphogenesis through Computational Techniques in zebrafish

Short Summary of work done: Our primary objective was to extract the mask of neuromast nuclei from TIFF images using a fine-tuned CPSAM model. To achieve this, I manually segmented 700 images to train and fine-tune the model for accurate neuromast nucleus detection. Following segmentation, we extracted the gene expression data of *pcdh10b* from multi-wavelength TIFF images and mapped this expression in 3D. This enabled us to successfully identify nascent hair cells and observe asymmetry in their mRNA expression patterns.

Objectives of the project: Finetune Cellpose CPSAM model, get the mask of the neuromast and gene expression from the tif file and analyse the plot.

Tool used: Plotly, Cellpose, Matplotlib, Zfin, moose

Details of Papers/patents: Nil

Brief description of the working environment: Chinta had a very welcoming and friendly office environment. The professor was aware that we came from diverse academic backgrounds, so he arranged neuroscience lectures to help us get up to speed. The other team members were always supportive, and the professors were approachable and encouraging. During my time there, I gained valuable knowledge in neuroscience, simulators, and machine learning. I also developed a better understanding of scientific writing and the importance of clear, well-constructed plots in communicating results.

Academic courses relevant to the project: Theoretical Neuroscience, M2

Learning Outcome: I gained hands-on experience with the U-Net CNN architecture and learned how to fine-tune deep learning models for image segmentation tasks. I also explored various

algorithms for noise filtering and mask extraction. In addition, I learned about primer design and PCR techniques, which deepened my understanding of molecular biology. Overall, this project significantly enhanced my knowledge of computational methods and experimental techniques in the field of neuroscience.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Chennai, Chennai

Student

Name: J HARISH RAJESHWARAN .(2023A3PS0393H)

Student Write-up:

PS-I Project Title: Deep Learning based CT Image Reconstruction

Short Summary of work done: Got to know the problem statement CT Image Reconstruction. Studied the classical, currently existing methods, and identified the problems with those methods. Thought of a solution, developing a Deep Learning model that potentially solves our problem. Went through intense Literature Review to get relevant ideas and resources. Then, obtained high quality medical brain CT imagea, filtered, augmented and prepared our dataset. After testing with various models and implementing differernt architectures, we finally hit the sweet spot. Successfully impelemented models for different resolution images that performed way better than fhe classical methods under the given conditions. Now working on publishing the work along with our scientist.

Objectives of the project: To do a comprehensive study on the existing, classical CT Image Reconstruction methods, get the results, evaluate them and then develop a Deep Learning model that performs the reconstruction better than the classical methods.

Tool used: Python, IDLE, GIMP, VSCode, Googls Colab Notebook, Kaggle Notebook, Tensorflow, Keras, Pytorch, Numpy, Matplotlib, OpenCV, Anaconda, Miniconda

Details of Papers/patents: Currently writing a research paper to be submitted and published in the upcoming months.

Brief description of the working environment: Working environment was very professional and gave a lot to learn from. There wasn't too much work, nor was there too little, it was a perfect balance. Guided in the right direction by our scientist, whom I made sure to meet at least once a day and build a good rapport with. Mentor shared lots of ideas and views as well. Learnt a lot about the domain as well as professional details. Overall a very interesting and research-oriented experience. Would recommend to people who get the opportunity.

Academic courses relevant to the project: Digital Image Processing, Deep Learning, Machine Learning, Signals and Systems

Learning Outcome: Literature Review, Deep Learning models' theories and implementations, Dataset preparation and filtering methods, Paper writing.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Chennai, Chennai

Student

Name: PRANAV CHANDRA NAGULAKONDA VENKATA(2023AAPS0013P)

Student Write-up:

PS-I Project Title: Terahertz Image Enhancement

Short Summary of work done: Wrote a paper on image enhancement paper and a comparative study between ML models and conventional models.

Objectives of the project: To enhance and upscale noisy terahertz images.

Tool used: MATLAB, Python

Details of Papers/patents: Currently under review for publication to IEEE MAPCON

Brief description of the working environment: I learned new skills that helped me understand the industry better.

Academic courses relevant to the project: N/A

Learning Outcome: How to use matlab and python

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Chennai, Chennai

Student

Name: PRANAV PADMANABHAN .(2023AAPS0200H)

Student Write-up:

PS-I Project Title: THz Image Stitching

Short Summary of work done: This study investigated multiple image stitching techniques for THz imaging, progressing from traditional computer vision methods to deep learning and finally to blending-based approaches. SIFT, combined with FLANN and homography estimation methods like RANSAC, MAGSAC, and M-SAC, initially yielded promising results. Among these, MAGSAC consistently produced reliable transformations. However, these pipelines often overfit specific images, where parameters yielding SSIM scores of 0.999 on one image dropped to 0.98 on another due to keypoint detection sensitivity. Furthermore, while homography ensured geometric alignment, SSIM penalized minor pixel shifts introduced during transformation, revealing limitations in traditional metrics for visual quality evaluation. To overcome these challenges, deep learning models—SuperPoint and SuperGlue—were evaluated. These models performed well for single-axis stitching but struggled in multi-axis configurations (2×2 and 3×3 grids), mainly due to cumulative distortions and sensitivity to overlap thresholds. At low overlaps, reliable feature matching failed. Given the structured nature of THz image acquisition (flat samples with overhead scanning), we shifted focus to concatenation-based approaches, bypassing geometric transformation. We evaluated various intensity normalization techniques to improve stitching quality. Percentile clipping handled outliers well but discarded crucial image content when distributions were dense. Border-aware normalization was inconsistent, while global normalization consistently produced visually accurate results. Ultimately, a robust stitching pipeline was developed using global normalization, customizable stitching directions, and user-defined overlap. This method effectively addressed the limitations of previous

approaches, offering adaptability, visual fidelity, and ease of use for THz image stitching applications.

Objectives of the project: 1. Incomplete Terahertz Image Capture One significant issue involved the terahertz imaging system intermittently failing to capture the complete data of a given object. Specifically, during image acquisition, the system would sometimes stop recording mid-way, resulting in partially captured images. In such cases, the image would contain valid information in the beginning, but the remaining portion would be filled with default pixel values—typically represented by a uniform blue color in the jet heatmap (indicating zero intensity or missing data). This presented a considerable challenge in reconstructing the full image of the object. 2. Limited Field of View for Larger Objects The second challenge was related to the spatial limitations of the imaging hardware. The terahertz system was capable of scanning only up to a 15 cm × 15 cm area per image. However, in several use cases, it was necessary to inspect larger surfaces, sometimes extending to 1 m² or more. To overcome this constraint, multiple smaller sections had to be captured individually and then accurately stitched together to reconstruct a seamless, complete image of the larger object.

Tool used: OpenCV, Matplotlib, python, science direct, colab

Details of Papers/patents: NA

Brief description of the working environment: Attendance is mandatory and leave is only allowed for 3 days during the PS. We must report at 9.30 and work till 5 at the station. There are tea breaks and the work is checked regularly by meeting with the scientist once a week. Good access to papers at the library of SERC (within same campus).

Academic courses relevant to the project: BITS F459 Computer Vision
Digital Image Processing

Learning Outcome: Deep learning, Image processing, python, colab

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Chennai, Chennai

Student

Name: YASHWANT RAJESH .(2023AAPS0269H)

Student Write-up:

PS-I Project Title: Terahertz Image Stitching

Short Summary of work done: This project explored various image stitching techniques for THz imaging, transitioning from traditional computer vision methods to deep learning and finally to direct concatenation approaches. Initial experiments used floating-point feature detectors, with SIFT combined with FLANN yielding good matches. Homography estimation using MAGSAC proved most reliable, outperforming RANSAC and M-SAC. However, conventional pipelines were sensitive to parameter tuning—achieving high SSIM (e.g., 0.999) on one image but dropping to 0.98 on another due to inconsistent keypoint detection. Additionally, minor pixel shifts introduced by homography caused SSIM degradation despite visually correct alignment. To overcome these issues, deep learning models such as SuperPoint and SuperGlue were employed. They produced robust results for single-axis stitching, motivating their extension to multi-axis tasks like 2×2 and 3×3 grids. However, traditional methods and even SuperGlue failed under low-overlap conditions or accumulated geometric distortions. Recognizing the structured nature of the THz scan setup—flat samples under overhead imaging—the focus shifted to concatenation-based stitching. This eliminated geometric transformations. To improve consistency across stitched outputs, several normalization techniques were assessed. Percentile clipping failed with densely distributed intensities; border-aware normalization had mixed success. Global normalization proved most effective and stable. Ultimately, the best-performing pipeline integrated global normalization, support for multi-direction stitching, and user-defined overlaps. This approach offered high visual quality, reduced dependency on complex feature matching, and flexible adaptation to varying THz datasets.

Objectives of the project: 1. Incomplete Terahertz Image Capture One significant issue involved the terahertz imaging system intermittently failing to capture the complete data of a given object. Specifically, during image acquisition, the system would sometimes stop recording mid-way, resulting in partially captured images. In such cases, the image would contain valid information in the beginning, but the remaining portion would be filled with default pixel values—typically represented by a uniform blue color in the jet heatmap (indicating zero intensity or missing data). This presented a considerable challenge in reconstructing the full image of the object. 2. Limited Field of View for Larger Objects The second challenge was related to the spatial limitations of the imaging hardware. The terahertz system was capable of scanning only up to a 15 cm × 15 cm area per image. However, in several use cases, it was necessary to inspect larger surfaces, sometimes extending to 1 m² or more. To overcome this constraint, multiple smaller sections had to be captured individually and then accurately stitched together to reconstruct a seamless, complete image of the larger object.

Tool used: Python, OpenCV, Matplotlib

Details of Papers/patents: NA

Brief description of the working environment: Attendance is mandatory and its offline, maximum of 3 days leave is permitted. Every week the scientist expects a presentation from you. Have to be inside the CEERI building by 9:30 in the morning and have to work till 5 in the evening.

Academic courses relevant to the project:

Learning Outcome: OpenCV, Python, Deep Learning Networks, Normalization techniques.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Chennai, Chennai

Student

Name: MUKUL KRISHNAN(2023AAPS0490G)

Student Write-up:

PS-I Project Title: Driver Drowsiness Detection using ECG

Short Summary of work done: I performed some literature review on the topic, used Matlab to collect ECG signals, process them and train an ML model to detect a type of signal in a noisy environment.

Objectives of the project: To detect driver drowsiness using ECG signals.

Tool used: VSCode, MATLAB

Details of Papers/patents: N/A

Brief description of the working environment: We met once a week, there were no expectations as such asides from trying to complete the task assigned.

Academic courses relevant to the project: N/A

Learning Outcome: Python, MATLAB, Signal Processing, Tkinter

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Chennai, Chennai

Student

Name: HARINI SRINIVASAN(2023B1AA0653G)

Student Write-up:

PS-I Project Title: Detection of Driver Drowsiness Using ECG Signals

Short Summary of work done: This project addresses the detection of driver drowsiness using physiological signals, with a primary focus on electrocardiogram (ECG) data. An extensive literature review was conducted, initially surveying thousands of papers from databases such as Scopus and PubMed, which was systematically narrowed down to 304 and then to 107 highly relevant studies. Following this, 33 anonymous ECG samples were collected from colleagues. Signal processing was performed in MATLAB to isolate and analyze QRS complexes, which are indicative of cardiac activity changes associated with drowsiness. These cardiac signals were then used to train a support vector machine model to effectively analyze driver drowsiness in real time. In parallel, a facial recognition model was developed using LattePanda hardware and Python to supplement physiological data with behavioral cues. Future work aims to integrate additional behavioral metrics such as PERCLOS (Percentage of Eyelid Closure) to enhance detection accuracy. This multi-modal approach holds promise for robust, real-time driver drowsiness detection, contributing to improved road safety

Objectives of the project: To detect the driver drowsiness using physiological signals like ECG

Tool used: H/w, S/w

Details of Papers/patents: Nil

Brief description of the working environment: The work environment is good. We were asked to meet with the mentor frequently and keep giving him updates. The faculty in charge was also very supportive.

Academic courses relevant to the project: BIO F111- Gen Bio
ECE F243- Signals and Systems

Learning Outcome: Biomedical Signal Processing Algorithms
MATLAB
LattePanda functioning
Embedded Systems
OpenCV

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Chennai,
Chennai

Student

Name: MUKUND RAJA .(2023B4A31016P)

Student Write-up:

PS-I Project Title: RUL prediction of batteries

Short Summary of work done: I wrote python code for 4 different types of machine learning models used to predict the RUL curve of a lithium ion battery and performed a comparative study between them using various performance metrics

Objectives of the project: To compare and study various ML methods used to study RUL of batteries

Tool used: Python, Tensorflow

Details of Papers/patents: NA

Brief description of the working environment: NA

Academic courses relevant to the project: yes

Learning Outcome: Machine learning

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Chennai, Chennai

Student

Name: BHARAT DELEEP NAIR .(2023B5AA1116P)

Student Write-up:

PS-I Project Title: CT reconstruction using deep learning

Short Summary of work done: Helped develop a Machine Learning model to reconstruct 128 by 128 brain CT slices from sinograms.

Objectives of the project: Solving the inverse of the radon transform using Deep Learning Techniques

Tool used: Python numpy tensorflow

Details of Papers/patents: Paper to be submitted to a conference soon

Brief description of the working environment: Most of your time is spent in the training hall finishing up tasks set by your scientist. Had to report my findings / status of project to scientist 2-3 times a week.

Academic courses relevant to the project: Deep Learning

Learning Outcome: Learnt various model architectures like CNN, u-net , GAN

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Jaipur, Jaipur

Student

Name: SIDDHI TANWAR .(2023A3PS0315P)

Student Write-up:

PS-I Project Title: Developmment of NDIR based gas sensor for CO2 monitoring

Short Summary of work done: The project started with reading research papers to develop an understanding about the principle and working of NDIR sensors and their components. Then we went through the various heat transfer modules to understand their working and find a suitable Physics module to simulate Beer-Lambert's Law. Then we studied the effect of temperature on absorption of CO2 using HITRAN API with Python and did simulations on COMSOL to get the results.

Objectives of the project: Using COMSOL to simulate the temperature dependence of absorption by CO2

Tool used: COMSOL Multiphysics, HITRAN API with Python

Details of Papers/patents: None as of now

Brief description of the working environment: The working environment was good and conducive to learning. The mentors were helpful and provided guidance whenever we had any queries.

Academic courses relevant to the project: Electrical Sciences

Learning Outcome: Learning to use COMSOL Multiphysics, HITRAN API with Python, Understanding NDIR sensors.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Jaipur, Jaipur

Student

Name: AAKASH SINGH .(2023A3PS0375P)

Student Write-up:

PS-I Project Title: Design of a capacitance based lab on chip sensor for detection of cancer in blood

Short Summary of work done: We were told to learn how to use Comsol multiphysics and then use it to design and simulate the sensor. Followed by optimising it's performance and using various materials for different uses. We were also given to incorporate a microheater design into the sensor and obtain changes with temperature.

Objectives of the project: To design and simulate a capacitance based sensor using COMSOL Multiphysics Software

Tool used: COMSOL Multiphysics

Details of Papers/patents: NA

Brief description of the working environment: The working environment was very friendly and mentors were very helpful. It was a great learning experience.

Academic courses relevant to the project: Physics, Electrostatics, Heat analysis

Learning Outcome: The use of COMSOL, how to tackle a research problem

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Jaipur, Jaipur

Student

Name: KARTIKEYA SAXENA(2023A3PS0793G)

Student Write-up:

PS-I Project Title: Capacitive based lab on chip sensor for the detection of cancer cells in blood using COMSOL Multiphysics

Short Summary of work done: Developed a good understanding of using COMSOL to our advantage in real life simulations of different sensor models and calculating the change in capacitance under different circumstances to make a real life working sensor prototype that can be used in the detection of cancer cells in blood.

Objectives of the project: Developing a good understanding of using COMSOL as a tool and making real time simulations of different models in it

Tool used: COMSOL, LaTeX

Details of Papers/patents: NIL

Brief description of the working environment: The mentor was really helpful and provided key insights into our project. Other than that, the work culture was overall quite good and the industry mentors were really helpful.

Academic courses relevant to the project: General Biology

Learning Outcome: Learnt to use COMSOL as a tool in determining the change in capacitance of blood cells by changing temperature and simulating time dependent studies during the project

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Jaipur, Jaipur

Student

Name: KANISHKA GUPTA .(2023A8PS0711P)

Student Write-up:

PS-I Project Title: Design and Development of Weather monitoring system:

Short Summary of work done: During my PS-1 at CSIR-CEERI, I worked on developing a real-time weather monitoring station using the ESP32 microcontroller. My tasks included interfacing sensors (for temperature, humidity, wind speed/direction, rainfall, and air quality), integrating a 4G module for data transmission, and sending live environmental data to ThingSpeak. The focus was on hardware development and data acquisition, laying the foundation for a future web-based visualization platform

Objectives of the project: The objective of this project is to design and develop an ESP32-based weather monitoring station capable of real-time data acquisition, transmission, and visualization. The system integrates various environmental sensors to measure temperature, humidity, wind speed, wind direction, rainfall, and air quality. The collected data is transmitted using a 4G module to an online platform (ThingSpeak) for remote access and is intended to be used in a future web application for user-friendly data display and analysis. This project aims to support environmental monitoring and research through accurate, low-cost, and scalable IoT-based solutions.

Tool used: Tools Used: Hardware: ESP32 microcontroller PMS5003 (Air Quality Sensor) SHT45 (Temperature & Humidity Sensor) Anemometer (Wind Speed Sensor) Wind Vane (Wind Direction Sensor) Rain Gauge SIM7600 4G LTE Module Software: Arduino IDE (for programmi

Details of Papers/patents: We wanted to publish a paper, but our industrial mentors refused to do so, they insisted that if we want to publish a paper, we can build more on the existing project, keep taking their guidance and publish it later.

Brief description of the working environment: During my PS-I at CSIR-CEERI, Pilani, I worked in a focused and research-oriented environment that encouraged hands-on experimentation. The workspace was collaborative, with guidance from mentors and access to lab equipment essential for hardware prototyping.

I expected to gain practical exposure to embedded systems and IoT, and the experience matched those expectations. My main task was to help develop a weather monitoring station using the ESP32 microcontroller. I interfaced sensors for temperature, humidity, wind speed, air quality, and rainfall, and transmitted the collected data to ThingSpeak via a 4G module.

Throughout the internship, I learned how to program and debug the ESP32, integrate multiple sensor types, and manage real-time data acquisition. I also understood the importance of clean wiring, proper calibration, and robust communication protocols in embedded systems.

Overall, this internship deepened my technical knowledge, improved my hardware troubleshooting skills, and gave me insight into how real-world IoT projects are developed and tested.

Academic courses relevant to the project: Embedded Systems – Understanding microcontroller architecture and interfacing
Internet of Things (IoT) – Concepts of sensor networks, communication, and data platforms
Microprocessors and Microcontrollers – Programming and peripheral interfacing
Digita

Learning Outcome: Through this project, I gained hands-on experience in embedded systems and IoT by working with the ESP32 microcontroller and various environmental sensors. I learned how to interface and calibrate sensors, implement serial and analog communication protocols, and transmit data using a 4G module to cloud platforms like ThingSpeak. Additionally, I developed a deeper understanding of real-time data acquisition systems, hardware debugging, and the foundational requirements for web-based data visualization. This project enhanced both my practical electronics skills and my understanding of how IoT systems contribute to environmental monitoring.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Jaipur, Jaipur

Student

Name: KAVYA KESARE .(2023AAPS1067H)

Student Write-up:

PS-I Project Title: Design and implementation of DC-DC converter for battery charging application

Short Summary of work done: I gained hands-on experience in designing and simulating converter circuits, understanding control techniques like PWM, and working with hardware tools for implementation and testing. The project deepened my understanding of energy conversion systems and allowed me to apply theoretical knowledge to practical, real-world problems under the guidance of experienced scientists.

Objectives of the project: To design and implement a high-efficiency DC-DC converter that provides regulated voltage and current suitable for battery charging applications. It aims to ensure safe, reliable, and efficient power transfer while protecting the battery and optimizing its charging performance.

Tool used: Multimeter, oscilloscope, 12V DC supply, LCR meter, soldering station, LTSpice, DIPTRACE, Matlab , code composer, control suites ,etc.

Details of Papers/patents: NA

Brief description of the working environment: The working environment at CSIR-CEERI, Jaipur is highly professional, research-oriented, and collaborative. I found the atmosphere to be both motivating and supportive, with access to well-equipped laboratories and advanced testing facilities. The scientists and mentors are very knowledgeable and approachable, always willing to guide and clarify doubts. Regular team discussions, presentations, and reviews helped enhance both technical and communication skills. Overall, it's a great place for learning, innovation, and gaining real-world research experience in a structured and encouraging setting.

Academic courses relevant to the project: Electrical sciences like ADVD, Microelectronic circuits, Microprocessor and Interfacing, etc

Learning Outcome: Developed skills in using hardware and software tools for circuit implementation.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Jaipur, Jaipur

Student

Name: AARUSH MOHANTY(2023B1A81239G)

Student Write-up:

PS-I Project Title: Design and Development of High Efficiency Solar Charge Controller

Short Summary of work done: In this project, I designed and developed a high-efficiency solar charge controller to extract maximum power from a solar panel and safely charge a battery. I began by defining the system requirements and performing all necessary design calculations using MathCAD. I selected suitable component values based on input/output specifications, power levels, and target efficiency. I then simulated the entire circuit using LTSpice to verify functionality, analyze transient response, and ensure the converter performed as expected

under varying load and input conditions. After validating the design, I created the PCB layout using DipTrace, taking care to ensure optimal component placement, trace routing, and thermal management. I was responsible for sourcing the components, assembling the PCB, and conducting continuity and functionality checks on the hardware. To control the system, I programmed a TMS320F28027 microcontroller using Code Composer Studio. I implemented a Maximum Power Point Tracking (MPPT) algorithm along with battery charging logic to regulate voltage and current across different charging stages, including bulk, absorption, and float. Additionally, I integrated key protection mechanisms such as overvoltage, overcurrent, reverse polarity, and short-circuit protection to ensure system safety. Once the system was assembled and programmed, I carried out real-time testing using variable solar input conditions to evaluate efficiency, charging behavior, and system stability. Through this project, I gained practical experience in embedded systems, power electronics, circuit simulation, PCB design, and microcontroller programming, completing the entire development cycle of an electronics system from start to finish.

Objectives of the project: To design an interleaved boost converter and implement a Solar Charge Control algorithm based on MPPT.

Tool used: MathCad, LTSpice, Diptrace, Code Composer Studio and Control Suite, TI's TM320F28027 microcontroller, Soldering Station , Multimeter, Oscilloscope

Details of Papers/patents: N/A

Brief description of the working environment: During the course of this project, I had the privilege of working under the guidance of a highly supportive and knowledgeable project mentor at CEERI Jaipur. Despite my limited background in core electronics courses, the mentor was extremely patient, approachable, and always willing to explain concepts clearly. We were given ample time and access to excellent learning resources, which helped us understand every aspect of the project thoroughly. This exposure gave me valuable insight into the structured process followed in executing a project from scratch.

In addition to the project mentor, we received consistent support from other experts at CEERI, many of whom had extensive experience in industry and research. Their guidance and willingness to share practical knowledge greatly enhanced my understanding of real-world electronics development. The collaborative atmosphere made it easy to approach anyone for help, and I was always encouraged to ask questions and seek clarification.

We were also provided access to CEERI's advanced facilities and tools—an opportunity that is rare and highly appreciated. The research environment was disciplined, with strict attendance and timing policies, which instilled a strong sense of responsibility and professionalism in me. I attended every day without fail, motivated by the learning experience and the opportunity to work alongside brilliant scientists.

Overall, the project experience at CEERI exceeded my expectations. I am truly grateful for the mentorship, the learning environment, and the chance to work in one of India's premier research institutions. It was a transformative experience, both technically and personally.

Academic courses relevant to the project: yes

Learning Outcome: Through this project, I gained comprehensive experience in executing an electronics project from concept to completion. I learned to perform design calculations using MathCAD, simulate and validate circuits using LTSpice, and design PCBs using DipTrace. Additionally, I developed skills in embedded systems by programming a microcontroller using Code Composer Studio, enabling hardware-software integration and real-time system control. This end-to-end exposure enhanced both my theoretical understanding and practical proficiency in electronics design and development.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI)- Jaipur, Jaipur

Student

Name: AAYUSH AGARWAL(2023B3A30800G)

Student Write-up:

PS-I Project Title: Design and Development of a High Efficiency Two-Switch Forward Converter

Short Summary of work done: We developed a Two-Switch Forward converter first in LTSpice, then designed its PCB schematic. My partner simultaneously developed the logic for the system on ESP-32. We tested the logic on the printed circuit when it arrived.

Objectives of the project: As stated in the title

Tool used: Software: LTSpice, Mathcad, DipTrace, LaTeX. Hardware: Various Lab Equipment

Details of Papers/patents: NA

Brief description of the working environment: Very supportive learning environment. Expectations were reasonable, and we were able to finish our project well within the stipulated time.

The learning outcomes have been very helpful. We developed the converter first in LTSpice, then designed its PCB schematic. My partner simultaneously developed the logic for the system on ESP-32. We tested the logic on the printed circuit when it arrived.

Academic courses relevant to the project: ES, ConSys, CP

Learning Outcome: Use of software like LTSpice, DipTrace, Mathcad etc
Hands on experience in a real lab setting.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: ADARSH PRAVEEN(2023A3PS0210G)

Student Write-up:

PS-I Project Title: GaN HEMT based DC-DC Converters

Short Summary of work done: During my Practice School-I (PS-I) at CSIR-CEERI, Pilani, I worked on the development of Gallium Nitride (GaN)-based DC-DC converters for electric vehicle and satellite applications. The project involved designing and simulating a cascaded boost converter to step up voltage from 100V to 600V, addressing challenges like high duty cycles and inefficiencies in single-stage designs. Using LTSpice, I implemented a two-stage topology, reducing the duty cycle to 66% and 50%, and integrated a PID compensator to enhance transient response and output stability. Additionally, I designed a 400V to 48V LLC resonant converter, leveraging soft-switching techniques like Zero Voltage Switching (ZVS) and Zero Current Switching (ZCS) for improved efficiency. The project included PCB layout development in KiCad, focusing on component placement, thermal management, and signal integrity. Simulations demonstrated efficiency peaks of ~92% for the cascaded boost converter and highlighted the LLC converter's suitability for high-power applications. Key outcomes included optimized efficiency, reduced voltage ripple, and readiness for hardware prototyping. The work underscored the potential of GaN-based devices in high-frequency power electronics, paving the way for future industrial deployment in electric vehicles and satellite systems.

Objectives of the project: Designing a 100 - 600V 5kW rated DC-DC Boost Converter

Tool used: LTSpice and KiCad

Details of Papers/patents: No

Brief description of the working environment: It's not that strict if you are actively working and doing daily tasks. Ofcourse they want us to work and would push out limits by giving us very difficult tasks.

Academic courses relevant to the project: Electrical Sciences

Learning Outcome: Working Principle of DC-DC Converter

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: SRIRAM NAGARAJAN .(2023A3PS0415H)

Student Write-up:

PS-I Project Title: Design and Simulation of Bulk Acoustic Wave Resonators

Short Summary of work done: A program was written to implement the Mason model for piezoelectric slabs and subsequently calculate various device characteristics such as resonance and anti-resonance frequencies, Q factor and coupling coefficient. The program implemented numerical solvers to obtain optimised device parameters, such as piezoelectric thickness, electrode thickness and area of resonator, for a resonance frequency of 3.3 GHz.

Objectives of the project: The major objective of the project was to write a program that translated device physics equations of Bulk Acoustic Wave (BAW) resonators into a computer program and generated optimised device parameters for a certain target resonance frequency.

Tool used: C Programming, MATLAB, COMSOL Multiphysics

Details of Papers/patents: NA

Brief description of the working environment: The scientists and research peers were accommodating and friendly.

Academic courses relevant to the project: Electronic Devices, Electromagnetic Theory, Signals and Systems and (surprisingly) Electrical Machines

Learning Outcome: Device physics of BAW resonators, mathematical modelling, numerical solving techniques.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: PALLEBOYINA KARTHIK RAJ .(2023A3PS0686P)

Student Write-up:

PS-I Project Title: Design of low power all-MOS voltage reference circuit

Short Summary of work done: During my PS-I, I worked on the design and analysis of an ultra-low-power analog circuit. The workflow began with understanding the design objectives and studying prior work to identify a suitable architecture. I carried out schematic-level design using industry-standard tools and refined it through iterative simulations. I explored different transistor configurations, studied their behavior across corners and temperatures, and selected devices based on small-signal parameters. The circuit was validated using DC, transient, and statistical simulations. I automated temperature sweeps and post-processing to streamline data collection. In the later phase, I focused on layout-aware modifications and prepared the design for physical implementation. Throughout the internship, I documented my work clearly and regularly discussed results with mentors to guide design choices. The experience gave me a strong understanding of analog workflows—from device selection and modeling to performance tuning and design verification.

Objectives of the project: To design a highly precise all-MOS voltage reference circuit.

Tool used: Cadence Virtuoso

Details of Papers/patents: Not to be disclosed

Brief description of the working environment: During my PS-I internship, I worked in a collaborative and research-driven environment that emphasized technical rigor, independent problem-solving, and continuous learning. I was encouraged to approach challenges analytically, document progress thoroughly, and engage in meaningful discussions with mentors and peers.

I expected PS-I to offer a practical extension of my academic foundations, and it met that expectation well. The experience allowed me to gain hands-on exposure to the design process, from concept to validation, while developing a deeper understanding of trade-offs and design constraints in real-world systems.

Overall, PS-I strengthened my technical confidence, improved my communication and documentation skills, and deepened my interest in analog and mixed-signal design.

Academic courses relevant to the project: Microelectronic Circuits , Electronic Devices

Learning Outcome: Learnt about the functioning of Voltage reference circuits. Learnt about transistor characterization. Learnt about multi-stage amplifier circuits and feedback topologies. Gained significant proficiency in Cadence Virtuoso. Learnt about PVT Corner testing , W/L sizing and layout methodologies.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: ANTO JOSE(2023A3PS1036G)

Student Write-up:

PS-I Project Title: Design and Development of an Ultrasonic Transducer System

Short Summary of work done: I made an ultrasonic transducer system for which I had to study research papers and I did make the transducer system hardware

Objectives of the project: to make an ultrasonic transducer system

Tool used: Matlab Simulink, MOSFET, PCB, H bridge inverter, etc.

Details of Papers/patents: no paper published

Brief description of the working environment: the working environment is great and my mentor there was also very motivating and inspiring.

Academic courses relevant to the project: Power electronics

Learning Outcome: power electronics, ultrasonic transducer system

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: SHREYA DAS (2023A8PS0559G)

Student Write-up:

PS-I Project Title: Design and Simulation of Mini-LED Chips

Short Summary of work done: During my PS-I, I worked on designing and simulating a GaN-based flip-chip Mini-LED using SpecLED RATRO 2008. I explored methods such as introducing reflective layers, reducing GaN thickness, and improving internal quantum efficiency to target higher performance. I also addressed output visualization issues in SimuLEDView by ensuring proper output settings and file formatting. This work gave me hands-on experience with semiconductor device modeling and a better understanding of the interplay between thermal, electrical, and optical processes in LED chips.

Objectives of the project: To design a high-efficiency GaN-based flip-chip Mini-LED structure using SiLENSe software. To simulate thermal, electrical, and optical characteristics using SpecLED RATRO 2008 and analyze the results in SimuLEDView. To optimize device parameters for maximum luminous efficiency and minimal thermal losses.

Tool used: SiLENSe 6.3, SpeCLED, RATRO 2008

Details of Papers/patents: Drafting paper for future conferences

Brief description of the working environment: The working environment was collaborative, with open communication between mentors and interns.

Academic courses relevant to the project: Electrical Sciences, Electronic Devices

Learning Outcome: Understanding of LED chip architecture and flip-chip configurations.
Ability to use semiconductor simulation tools (SiLENSe, SpecLED, RATRO, SimuLEDView) for optoelectronic devices.
Knowledge of how substrate properties, optical extraction, and drive conditions influence device efficiency.
Experience with troubleshooting simulation output and file compatibility issues.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: SAGNIK ROY .(2023A8PS0702P)

Student Write-up:

PS-I Project Title: Terahertz Radar

Short Summary of work done: I began by studying the fundamentals of FMCW radar, including chirp signals, frequency mixing, filtering, FFT analysis, and I/Q demodulation. Using MATLAB, I simulated radar signal interactions, implemented beat frequency extraction, and applied pulse compression techniques. Next, I explored 3D reconstruction algorithms for radar imaging, shortlisted the fastest and most efficient ones, and tested them on experimental datasets, successfully obtaining target reconstructions. To validate robustness, I shifted to synthetic data generation using HFSS simulations. I modeled a custom L-shaped metallic target, systematically varied its distance from 0.5 m to 25 m, and extracted radar return data. This synthetic data was processed in MATLAB, and the reconstruction algorithms were applied to evaluate performance at different ranges. Finally, I prepared the pipeline for algorithm optimization using least squares methods, with the next step being validation on real experimental radar data.

Objectives of the project: To design and simulate a 102-108 GHz FMCW radar system for standoff detection of concealed objects, develop and optimize advanced 3D SAR reconstruction algorithms for high resolution imaging

Tool used: Python, Ansys, Matlab

Details of Papers/patents: None

Brief description of the working environment: My PS-I internship at CSIR-CEERI, Pilani provided a research-focused environment with opportunities to interact with experienced scientists and work on advanced projects in electronics and signal processing. The institute expected us to develop a research-oriented mindset, strengthen fundamentals, and contribute through simulations, algorithms, and analysis. I worked on the project “Terahertz Radar for Standoff Clothing Scanning”, where I studied FMCW radar principles, simulated chirp signal processing in MATLAB, and explored I/Q demodulation and FFT-based analysis. I further implemented 3D reconstruction algorithms, first on experimental datasets and later on synthetic datasets generated using HFSS simulations. This internship enhanced my technical knowledge, problem-solving skills, and exposure to real-world applications of terahertz radar imaging.

Academic courses relevant to the project: Electrical Sciences, Signals and Systems, Electromagnetic Theory, Electrical Machines

Learning Outcome: Gained a deep understanding of chirp signals and their role in FMCW radar for range and velocity estimation, implemented radar signal simulations in Matlab, studied and implemented 3D reconstruction algorithms for radar-based imaging, explored different platforms for synthetic data generation.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: ANIKET GUPTA .(2023A8PS0722P)

Student Write-up:

PS-I Project Title: Terahertz imaging system

Short Summary of work done: Made a terahertz imaging system, developed an algorithm for the system that creates multi resolution pseudo images. Also made a CAD model to make give whole project a shape of product that is compact and portable.

Objectives of the project: Develop a compact terahertz imaging system

Tool used: python, solidworks

Details of Papers/patents: none

Brief description of the working environment: They give you freedom multiple options to choose from. It totally depends on student, if he wants to learn and do things he will have to communicate properly.

Academic courses relevant to the project: c-programming, EMT, basic physics, MUP

Learning Outcome: Communication is the key to success

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: MADHAV JINDAL .(2023A8PS0967P)

Student Write-up:

PS-I Project Title: Implementation of neural networks on a microcontroller

Short Summary of work done: Developed and implemented an LSTM-based neural network on ESP32 hardware to estimate battery State of Charge (SoC) from real-time voltage, current, and temperature readings, achieving over 99% prediction accuracy in validation. Converted a trained Keras model into embedded C, using statically defined header files for weights and biases, and optimized matrix operations for memory-efficient execution on microcontrollers. Enabled on-device, low-latency SoC inference without external compute, advancing battery health monitoring and energy optimization for portable and IoT-powered systems.

Objectives of the project: To be able to deploy and run different neural networks on hardware like microcontrollers.

Tool used: Software used: Arduino IDE, Keras. Hardware used: ESP32

Details of Papers/patents: None

Brief description of the working environment: The environment is very friendly and makes you want to learn and work everyday. All the scientists are very helpful.

Academic courses relevant to the project: C-programming

Learning Outcome: 1. Deep learning
2. Arduino IDE
3. ESP32 microcontroller

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: NANDITA PRASHANTH KAMATH .(2023A8PS1310H)

Student Write-up:

PS-I Project Title: Hardware Architecture and Design Validation of Posit-based MAC Unit

Short Summary of work done: In my project, I designed and verified a parameterized Posit-based Multiply-and-Accumulate (MAC) unit in Verilog. The design supports 8, 16, 32, and 64-bit Posit formats within a single scalable module, extending the algorithmic principles from FloPoCo. To address synthesis limitations in the original VHDL version—such as wide quire buses and excessive I/O ports—I implemented an 8-bit serial I/O interface using shift registers. This significantly reduced the I/O footprint, enabling successful synthesis on FPGA. I also replaced the external addend port with a feedback loop to allow internal accumulation, aligning the design with practical MAC applications. For functional verification, I used AMD Xilinx Vivado to simulate the MAC unit with randomized test vectors and wrote output data to files. I

developed a Python XOR script to compare these outputs against FloPoCo's VHDL reference to verify bit-accurate correctness. For gate-level validation, I used Synopsys VCS to simulate the synthesized netlist with SDF timing, and analyzed waveforms in Verdi. Additionally, I used Synopsys TestMAX to perform scan insertion and generate ATPG test patterns, validating transition fault coverage. This flow ensured that my design was both functionally accurate and hardware-ready for real-world integration.

Objectives of the project: Design and optimization of a Posit number system based MAC unit, as well as verification using industry-level tools.

Tool used: AMD Xilinx Vivado, Synopsys

Details of Papers/patents: Posit MAC Unit FloPoCo by Raul Murillo

Brief description of the working environment: Scientist and PhD mentors were supportive, and were actually trying to make it a fruitful experience if you showed interest.

Academic courses relevant to the project: Digital design

Learning Outcome: Gained an understanding of the overall digital profile and experience with industry-level tools.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: ROUNAK SINGH .(2023AAPS0209H)

Student Write-up:

PS-I Project Title: Study of ISFET for Different Sensing Films using FEM Simulations

Short Summary of work done: My work mostly involved reading and understanding the existing literature on ISFETs and simulating them for different materials using the data provided to me. We found out about the sensitivity of the different materials used for thin sensing films.

The CEERI scientist assigned to me were very helpful and they even worked with me on the last weekend to finish the work.

Objectives of the project: Develop a comprehensive model by coupling semiconductor and electrochemical physics, using the site-binding approach to accurately capture the interaction of ions with the sensor's insulator surface. Simulate and compare pH sensing performance of ISFETs with four gate insulator materials: SiO₂, Al₂O₃, AlN and TiN. Analyze and quantify sensitivity (mV/pH) and linearity for each material's response.

Tool used: COMSOL Multiphysics, OriginPro

Details of Papers/patents: None as of now but we may work on a publication

Brief description of the working environment: CEERI scientists were very helpful with a very collaborative working environment.

Academic courses relevant to the project: Electronic Devices

Learning Outcome: Learned in great detail about the working of MOSFETs and ISFETs with the help of simulations, research papers, etc. Also learned about the process of research in this field in general.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: VIDIT SINHA .(2023AAPS0225H)

Student Write-up:

PS-I Project Title: Meniscus Tracking in capillary Tubes

Short Summary of work done: We had a week of orientation where all the projects were discussed. The projects were under 6 groups and then we had to rank the groups by preference and we got the group based on our CG. Then the supervisor of the group allotted us a project from that group. My project was detecting meniscus in capillary tube which basically involved

image processing. I had no experience of image processing beforehand so it was a new learning experience for me. In about 3 weeks I was done with the code but it still required rectification from time to time. I tested it on some videos of liquids flowing in capillary and it matched the data. Then I started working with Raspberry Pi, it was another new experience. Initially I learnt some basic commands and managed to run the same code in raspberry pi. Then I connected a camera to raspberry pi and learnt to operate it. We then fixed the camera on top of the device and recorded videos of multiple liquids and processed them using the same code and matched the result with the data.

Objectives of the project: Designing a device that can detect meniscus as it flows in capillary and plot it against time. The data can be used for various applications.

Tool used: Raspberry Pi 4B, Camera V2.1, python, openCV, matplotlib, libcamera

Details of Papers/patents: None

Brief description of the working environment: The work environment was nice and relaxed. I was provided a space in the office with other research scholars. I reported to my scientist regularly and he would guide me throughout the project and was responsive to my queries and suggestions. There is also a library where you can work.

Academic courses relevant to the project: Some projects required concepts of Electronic Devices but my project didn't need any knowledge of academic courses.

Learning Outcome: Learnt image processing and basics of video processing in python. Also learnt using Raspberry Pi.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: ADITYA PARIKSHIT KHACHANE(2023AAPS0603G)

Student Write-up:

PS-I Project Title: Chirp signal generation using FPGA

Short Summary of work done: Initially we learnt xilinx vivado and verilog , which helped us built digital circuit. We analysed research paper deeply and found research gap which is completed by us and learning of RTL designing was essential. Final objective of 2GHz chirp signal was achieved and conference paper is submitted in IEEE mapcon 2025 conference.

Objectives of the project: achieve chirp signal with a badwidth of 2GHz using FPGA and digital systems

Tool used: Xilinx Vivado, RFSOC, oscilloscope, matlab

Details of Papers/patents: conference paper submitted in IEEE mapcon 2025 conference.

Brief description of the working environment: working with bitsians from different campus was a great experience, we completed ps1 with major contributions that ceeri and scientist expected and learnt various new technical skills.

Academic courses relevant to the project: Digital Design, Signals and System, Microprocessors

Learning Outcome: Digital Circuit Design, Xilinx Vivado, Signal Generation using digital circuits.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: AATMAN SHAH(2023AAPS0635G)

Student Write-up:

PS-I Project Title: IoT-Enabled Technologies for Healthcare & Medical Imaging applications

Short Summary of work done: Developed and implemented a lightweight currency recognition pipeline that can classify notes. This was achieved on a microcontroller with resource constrained environment and limited computing power. Exact nature of the work cannot be shared as a paper is submitted on the same.

Objectives of the project: To train and deploy deep learning models on resource constrained edge devices like Arduino Nicla Vision and Arduino Nano 33 BLE Sense and assess its real world applications.

Tool used: Arduino IDE, OpenMV IDE, Arduino TinyML Kit, Arduino Nicla Vision, Arduino Nano 33 BLE Sense, Edge Impulse,

Details of Papers/patents: Submitted paper for review in an IEEE conference.

Brief description of the working environment: Expected to arrive on time and leave by 6, work desk provided, have to give regular updates to the mentor to better assess progress and give direction for further work.

Academic courses relevant to the project: N/A

Learning Outcome: Great

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: BHAVYA SINGHANIA(2023AAPS1128G)

Student Write-up:

PS-I Project Title: Design and Implementation of a Pipelined RISC-V Processor with Custom ISA Extensions

Short Summary of work done: Designed and tested the processor with Base RV132 ISA

Objectives of the project: Designing and Implementing a Risc-v Processor

Tool used: Vivado, Verilog HDL, Modelsim

Details of Papers/patents: no

Brief description of the working environment: The environment was good and supportive from CEERI

Academic courses relevant to the project: DD, uP, Comparch

Learning Outcome: Computer Architecture

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: SUBH AGARWAL(2023B2A30769G)

Student Write-up:

PS-I Project Title: Automation of PSA technology using programmable logic controller for green hydrogen separation

Short Summary of work done: I worked on the automation of a Pressure Swing Adsorption (PSA) system for hydrogen purification. The primary objective was to design and implement a ladder logic program using the WinProladder environment for controlling multiple solenoid valves and pressure sensors in synchronization. My responsibilities included developing the control sequence, optimizing valve switching logic, and incorporating interlocks for safety and efficiency. I also assisted in HMI design for visualizing system parameters and operational status. The project enhanced my understanding of process control and industrial automation systems.

Objectives of the project: Automation of the 2-bed PSA purifier using fatek PLC for safe and energy efficient operation.

Tool used: WinProladder (Fatek PLC) HMI Configuration Software (e.g., FvDesigner) PLC Hardware (Fatek FBs Series) Power Supply Unit (Omron S8VK-C12024) Pressure Sensors, Solenoid Valves

Details of Papers/patents: None submitted/published during PS-I.

Brief description of the working environment: The working environment was collaborative and project-focused, with regular guidance from mentors. Expectations included understanding industrial control systems, applying theoretical concepts, and delivering a functioning automation prototype. I gained hands-on experience with PLC hardware and programming, interfaced real-world devices, and improved my debugging and circuit design skills. Exposure to process instrumentation and system safety considerations added valuable practical depth to my learning. The experience bridged the gap between classroom knowledge and industrial practice.

Academic courses relevant to the project: Process Control
Digital Electronics
Instrumentation and Measurement
Industrial Automation
Chemical Engineering Principles / Unit Operations

Learning Outcome: Automation in industry, Fatek PLC, winproladder, FV Designer

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: SHUBHAM PARASHAR(2023B2AA0750G)

Student Write-up:

PS-I Project Title: Structure of magnetron on matlab for fabrication

Short Summary of work done: I made a matlab code of 4 different structures of matlab .These structures help Cnc machine to fabricate a actual magnetron

Objectives of the project: To make a matlab simulation that aid cnc machine to make a magnetron

Tool used: Matlab

Details of Papers/patents: None

Brief description of the working environment: Environment was good and sincere.

Academic courses relevant to the project: Basic maths

Learning Outcome: Matlab and vaccum devices

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: MANYA VARSHNEY .(2023B3A70975P)

Student Write-up:

PS-I Project Title: Multi Modal Face Anti Spoofing

Short Summary of work done: Project aimed to develop a multimodal deep learning model for face anti-spoofing (FAS) to improve the security of face recognition systems against presentation attacks such as photos, videos, and masks. The three modalities used were RGB, depth and infrared. A Vision Transformer-based architecture with cross-attention fusion was trained on the CeFA dataset and evaluated through both intra-dataset testing and cross-dataset testing on WMCA. Subsequently, real-time evaluation was conducted using a LIPSEdge 3D camera in indoor settings.

Objectives of the project: To train and test a multi modal face anti spoofing model

Tool used: Python, Anaconda, LIPSEdge 3D Camera

Details of Papers/patents: -

Brief description of the working environment: The atmosphere was peaceful and structured, where every researcher was deeply engaged in their own projects, fostering a professional and distraction-free zone. Labs were equipped with high performance GPU-enabled systems and a lightning-fast internet connection, there were no technical hindrances. My supervisor

maintained a disciplined yet flexible approach, visiting me every two days to monitor progress and provide feedback, which instilled a habit of consistent work and self accountability.

Academic courses relevant to the project: CS F425 : Deep Learning

Learning Outcome: Deep learning, computer vision basics, Vision Transformers, 3D camera working

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: PUNIT KUMAR .(2023B4A31138P)

Student Write-up:

PS-I Project Title: Simulation and Optimization of Solenoidal Focusing Field for Klystron Beam Transport

Short Summary of work done: The project titled “Simulation and Optimization of Solenoidal Focusing Field for Klystron Beam Transport” was carried out under the guidance of Dr. Deepender Kant at CSIR-CEERI, Pilani, as part of the BITS Pilani PS-I program. The main objective was to design and simulate a solenoidal magnetic field capable of providing the required axial (B_z) field for stable klystron beam transport, and to optimize the structure for accurate CST Studio Suite 2024 convergence. Theoretical studies were conducted on Brillouin flow and confined flow. While Brillouin flow represents the minimum magnetic field required to balance space-charge repulsion, confined flow was chosen for this work since it provides stronger focusing, greater beam stability, and tolerance to variations, making it more suitable for high-power klystrons. For a 2998 MHz klystron with electron beam parameters (142 kV, 110 A, 16 mm beam diameter), solenoid calculations were performed, leading to a coil design of ~624 turns with 100 A excitation. The CST magnetostatic simulations validated a nearly uniform B_z field of ~0.1145 T across the 700 mm active region, closely matching theoretical Brillouin values. Auxiliary coils further improved field uniformity by boosting B_z by more than 20%. This project successfully demonstrated the design, simulation, and optimization of solenoidal focusing for reliable klystron beam transport.

Objectives of the project: to design the electromagnet for the klystron

Tool used: CST

Details of Papers/patents: no

Brief description of the working environment: Good working environment, space provided for research, and a helpful and experienced mentor, good project, ample time for the project. Good learning environment and good food facilities

Academic courses relevant to the project: Electromagnetic Theory and RF & Microwave Devices and Circuits

Learning Outcome: CST, Working and design of klystron

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: CHIRAG TYAGI .(2023B5A31102P)

Student Write-up:

PS-I Project Title: PMUT as Rangefinder; Design and Simulation

Short Summary of work done: This project explores the design and simulation of Piezoelectric Micromachined Ultrasonic Transducers (PMUTs) using a 2D axisymmetric model in COMSOL. Some of the focus areas during model simulations include resonance behavior, and acoustic pressure performance. Various piezoelectric materials were studied and it was found that AlN provides good results for rangefinding applications. The primary emphasis of this work is on simulation-driven design and optimization of PMUT, while fabrication methods are referenced for practical context. The desired eigenfrequency around 40kHz was successfully achieved with the proposed design. Acoustic matching layer of AlN or ZnO proved to enhance the frequency domain response of the device.

Objectives of the project: To design a Scandium Aluminium Nitride based PMUT for Rangefinding applications.

Tool used: COMSOL Multiphysics Software

Details of Papers/patents: Paper is expected to be published in the coming months, probably titled Design and Simulation of ScAlN based PMUT for Rangefinding Applications.

Brief description of the working environment: The working environment of CEERI, Pilani is quite structured. You will be assigned a scientist under whom the project will be carried out. The time of work is quite flexible, heavily dependent upon your scientist. The lunch will be provided in CERRI Cafeteria itself.

Expectations can be of developing a research rigour, getting quality work to learn and perform. Learning during PS-1 includes, but not limited to, developing your interpersonal skills, presentation skills, having technical rigour for a specific domain.

Academic courses relevant to the project: Electronic Devices

Learning Outcome: PMUT device physics, fabrication methods like sputtering, etching. Getting proficient in COMSOL Multiphysics software.

PS-I station: CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

Student

Name: AKSHAR ANANYA VARMA .(2023B5A80799H)

Student Write-up:

PS-I Project Title: Study of CMOS Compatible Pyroelectric Materials for IR Detector Applications

Short Summary of work done: Reaseach on CMOS compatible materials was done; AlN was identified as the most suitable; A list of suitable dopants was prepared; these dopants were then doped into AlN; The DFE of these dopants was calculated; most suitable dopant was selected and optimization on concentration was done to figure out the most balanced

concentration of dopant for enhanced pyroelectricity; All the data was obtained through DFT simulations and doing those simulations is itself tedious.

Objectives of the project: To find out suitable CMOS compatible material, find out suitable dopants of that material and calculate the defect formation energy of doping through DFT simulations based on quantum mechanics

Tool used: BURAI, Quantum Espresso, Materials Project

Details of Papers/patents: None as of now

Brief description of the working environment: It is expected that students do the work allotted diligently and show interest in the project and come up with ideas on our own. Help is provided but is limited and we have to figure out a lot of things on our own. Doing more work will lead to getting more work which is a pro or a con depending on how you look at it. The final days can get hectic and demanding depending on the project especially if work done can lead to publishing. Some projects can go on after the completion of PS if both parties agree to it.

Academic courses relevant to the project: CHEM F111

Learning Outcome: How research is actually done, Solid state physics, Computational Physics, research etiquette

PS-I station: CSIR - National Aerospace Laboratories, Bangalore

Student

Name: NEERAV KRISHNA .(2023A4PS0416P)

Student Write-up:

PS-I Project Title: Design and Development of Air Foil Thrust Bearings

Short Summary of work done: The project involved designing an Air Foil Thrust Bearing (AFTB) for use in an Air Cycle machine which is an essential part of the aircrafts Environmental Control System. Over the duration of PS1, work involved reading design papers, understanding how the

various parameters had an effect on the performance of the bearings and by the end complete the design based off published design. Analytical methods were then used to estimate and check whether required load bearing capacity had been achieved. A CFD simulation was then run to cross verify the relevance of the analytical results. The work involved usage of SolidWorks and ANSYS Fluent.

Objectives of the project: To work on reviewing literature and determine a design for an AFTB and devising manufacturing and heat treatment methods for the same.

Tool used: SolidWorks, Ansys Fluent

Details of Papers/patents: N/A

Brief description of the working environment: The NAL campus is great. I was assigned to the Belur campus, which had a lot of greenery and a great working environment. there were multiple visits my mentor organized to understand the working of the various test rigs and labs present at NAL. The work hours vary and depend on your mentor, in my case, it was 10am to 3pm with some work given to take back home. Any student assigned NAL as a PS-1 station can expect to do good work over the course.

Academic courses relevant to the project: Fluid Mechanics, Mechanics of Solids, Material Science

Learning Outcome: How the industrial designing process works, Iterative designing, using analytical tools for fast approximation before conducting full-scale computational studies

PS-I station: CSIR - National Aerospace Laboratories, Bangalore

Student

Name: PUSHKAR AGRAWAL .(2023A4PS0425P)

Student Write-up:

PS-I Project Title: Development of Digital Twin Framework for Fatigue Life analysis of Aircraft Landing Gear Actuator

Short Summary of work done: During my Practice School-I internship at CSIR-National Aerospace Laboratories (NAL), I worked on the development of a Digital Twin for an aircraft hydraulic system. The objective was to simulate real-time behavior and enable predictive maintenance by integrating physical modeling with sensor-based data analytics. I began by studying the architecture and functioning of nose landing gear used in aircraft. I then used Altair Twin Activate to model the dynamic behavior of the system, incorporating physical equations, signal processing blocks, and feedback control loops. The model simulated system response under various input conditions, allowing us to identify potential failure points. In parallel, I learned to use HyperMesh for meshing and OptiStruct for structural analysis of key components, followed by fatigue life estimation using HyperLife. These tools helped assess durability and optimize component performance under variable loads, using techniques like Miner's Rule and Goodman correction. Additionally, I compiled my findings into a detailed technical report, including simulation results, interpretations, and recommendations. This experience enhanced my understanding of aerospace systems, simulation workflows, and industry practices in digital twin development. It also strengthened my skills in CAD, system modeling, and technical communication.

Objectives of the project: Develop a digital twin framework for fatigue life prediction of aircraft landing gear actuators.

Tool used: Fusion 360, Hypermesh, Optistrustruct, Motionsolve, Hyperlife, Twin Activate

Details of Papers/patents: nil

Brief description of the working environment: The working environment at CSIR-NAL was research-focused, collaborative, and technically enriching. I was mentored by experienced scientists who provided clear guidance while encouraging independent problem-solving. The expectations were to understand landing gear systems, develop a digital twin model using Altair Twin Activate, and perform structural and fatigue analysis using HyperMesh and OptiStruct. Regular updates and documentation were expected, promoting discipline and clarity in communication. I gained hands-on experience in simulation tools, learned about real-world engineering workflows, and developed a deeper understanding of system modeling, failure analysis, and technical reporting in a professional R&D setting.

Academic courses relevant to the project: Relevant academic courses that supported my project work include Mechanism and Mechanism (MnM) and Mechanics of Solids. These courses provided a strong foundation in understanding landing gear behavior, stress analysis, and the use of simulation tools lik

Learning Outcome: Digital Twin Modeling: Learned to model aircraft hydraulic systems using Altair Twin Activate, simulating real-time behavior and fault diagnostics.

Simulation Tools: Gained hands-on experience with HyperMesh, OptiStruct, and HyperLife for structural and fatigue analysis.

Aerospace Systems Understanding: Deepened knowledge of system reliability, and failure modes in aircraft.

Fatigue & Structural Analysis: Applied industry-standard methods (e.g., Goodman correction, Miner's Rule) for life estimation.

Technical Communication: Improved reporting and documentation skills through detailed analysis reports.

Team Collaboration: Worked with experienced scientists, enhancing communication and interdisciplinary teamwork.

PS-I station: CSIR - National Aerospace Laboratories, Bangalore

Student

Name: SATWIK SAHU .(2023A8PS0714P)

Student Write-up:

PS-I Project Title: Inverse Design of Metasurfaces using Latent Diffusion Models

Short Summary of work done: We were given a dataset containing pattern of meta-atoms, their configurations, the properties of material and their absorption spectra (s11). We were to generate the pattern and the configuration given the physical parameters and the absorption spectra.

Objectives of the project: To generate pattern of meta-atom of RAS based on absorption spectra of light provided and the desired physical parameters of the material.

Tool used: Python, PyTorch

Details of Papers/patents: Publication of paper is pending

Brief description of the working environment: My mentor was fairly flexible, although particular about discipline. The breakfast is good.

Academic courses relevant to the project: Deep learning, EMT

Learning Outcome: I learnt how conditional latent diffusion works and got to code the model in python.

PS-I station: CSIR - National Aerospace Laboratories, Bangalore

Student

Name: ANIRUDDH MISRA .(2023ABPS0805P)

Student Write-up:

PS-I Project Title: Characterization of Cf-SiC Ceramic Matrix Composites

Short Summary of work done: During my PS-I internship at CSIR–NAL, I worked on the fabrication and mechanical characterization of Ceramic Matrix Composites, with a focus on Carbon Fiber–Silicon Carbide (Cf–SiC) systems. I was involved in observing the preparation of fiber preforms through stitching and hot pressing and I assisted in applying interface coatings using Chemical Vapor Deposition (CVD). The matrix phase was introduced using techniques like Polymer Infiltration and Pyrolysis (PIP). After fabrication, I carried out mechanical testing, including tensile and fracture toughness tests according to ASTM C1359 and ASTM C1421, at elevated temperatures (600°C and 1000°C). I then performed detailed microscopy observations, including scanning electron microscopy (SEM), to study fracture modes and fiber–matrix interactions. Observations like fiber bridging, pull-out, and crack deflection provided insights into the non-brittle failure behavior of CMCs. In addition, I evaluated the density and porosity of the samples and correlated them to their mechanical properties.

Objectives of the project: The objective of the project was to gain hands-on exposure to the fabrication, processing, and mechanical characterization of Ceramic Matrix Composites (CMCs), particularly Carbon Fiber reinforced Silicon Carbide (Cf–SiC) composites. The goal was to understand the complete process flow—from fiber preform preparation and interface coating to matrix infiltration using techniques like slurry impregnation and polymer infiltration. A major focus was also on evaluating the tensile and fracture toughness properties of the fabricated CMCs using standardized testing methods and advanced microscopy, thereby developing a deeper understanding of their fracture behavior and suitability for high-temperature applications.

Tool used: For sample preparation, a low-speed diamond saw was used to cut composite specimens to ASTM standard dimensions, followed by surface cleaning using an ultrasonic cleaner. Polishing was performed using a grinding and polishing machine with sequential diamo

Details of Papers/patents: Not applicable

Brief description of the working environment: The PS-I internship at CSIR–NAL’s Materials Science Division provided an enriching research environment. As part of an ongoing project on the characterization of Ceramic Matrix Composites (CMCs), I had the opportunity to work alongside a principal scientist and fellow interns, in a lab setting that emphasized both hands-on learning and scientific rigor. The workspace was well-equipped with advanced tools for material processing, mechanical testing, and microscopy, and the environment encouraged self-initiative and critical thinking.

The expectations from the host organization were clear—punctuality, scientific discipline, accurate documentation of observations, and safety compliance.

Over the course of two months, I gained valuable exposure to the fabrication routes of CMCs, including preforming and Polymer Infiltration and Pyrolysis (PIP), and became proficient in key testing standards such as ASTM C1359 and C1421. I also developed skills in mechanical testing at elevated temperatures, microscopy, data analysis using software tools, and fracture mechanics concepts such as K_{Ic} . The internship significantly enhanced my understanding of material behavior in extreme environments and instilled confidence in my ability to carry out application-oriented research.

Academic courses relevant to the project: Materials Science and Engineering (MF F216), Workshop Practice (ME F112)

Learning Outcome: During the internship, I gained significant technical knowledge and laboratory experience in the field of advanced composites. I learned about multiple fabrication methods such as Polymer Infiltration and Pyrolysis (PIP), Chemical Vapor Deposition (CVD), slurry impregnation, hot pressing, and Reactive Melt Infiltration (RMI). These methods were understood not just theoretically, but also in terms of practical workflow and their advantages or limitations in fabricating oxide and non-oxide CMCs.

I personally conducted tensile and fracture toughness tests and was actively involved in preparing specimens, analyzing fracture surfaces using both optical and scanning electron microscopy, and studying critical damage mechanisms like fiber pull-out and crack deflection. I also understood how porosity and density relate to mechanical performance, and how monolithic ceramics differ from CMCs in terms of strength-to-weight ratio and fracture toughness.

PS-I station: CSIR - National Aerospace Laboratories, Bangalore

Student

Name: DOROTHY MEHTA(2023B1A70714G)

Student Write-up:

PS-I Project Title: Development of GUI for UAVs

Short Summary of work done: At first, I was given some small tasks to become familiar with GUI development using PySide6. Post that, I was asked to implement a GUI that my mentors gave me information about. We would meet regularly and my mentors would provide me with feedback on the same. Apart from this, I was also encouraged to check out AI/ML in aerospace and read a paper on the same.

Objectives of the project: To develop a functioning Graphic User Interface (GUI) for UAVs in order to monitor UAV performance.

Tool used: VSCode, Python, PySide6, SQLite, YAML, Matplotlib and supplementary libraries like Custom Widgets Package and mplcursors.

Details of Papers/patents: N/A

Brief description of the working environment: My working environment was a desktop in a wind tunnel. My industry mentors were very helpful and encouraged learning. They were also very understanding of my health flare ups. Apart from that the staff that I interacted with was also extremely friendly. However, the setup I had was one in a workshop sort of a place and not in a proper office.

Academic courses relevant to the project: OOPS, CP

Learning Outcome: GUI development.

PS-I station: Digitised Renewables Energy Tech Private Limited (“Digitised Energy”),
Bengaluru

Student

Name: KSHITIJ MAHENDRA .(2023A8PS0840H)

Student Write-up:

PS-I Project Title: Forecasting of Solar Energy at a Solar Farm

Short Summary of work done: Initially, research was conducted on clear, cloudy sky models. Literature review was conducted and report was written with aspects of implementing both models. Firstly, clear sky model was implemented followed by graphs and analysis in Excel. Then cloudy sky model was implemented along with graphs & analysis. Report was further developed over the internship.

Objectives of the project: Forecasting incident energy using clear sky & cloudy sky models, analysing the model to check accuracy.

Tool used: MS Excel.

Details of Papers/patents: NA.

Brief description of the working environment: Work environment was very good, there were two meetings per week to give updates and discuss further work. The mentor at the company provided good constructive feedback and was very supportive. There were a lot of flexibilities in terms of choosing a project according to interest, completing work at our own pace and taking the project in the desired direction. The company just expected everyone to continue making progress and giving regular updates on the work being done.

Academic courses relevant to the project: NA.

Learning Outcome: Various aspects of solar energy estimation in real-world scenarios, report writing skills, communication skills, working in professional setting and collaborating with others.

PS-I station: Embedos Engineering LLP, Mumbai

Student

Name: TEJAS A N(2023A8PS1075G)

Student Write-up:

PS-I Project Title: Development of IO-Link Master Device

Short Summary of work done: We selected proven open source IO-Link reference designs, adapted the schematics and layout to fit Raspberry Pi form factor hats, and produced a custom PCB that replicates the master circuitry (MAX14819 transceiver, power conditioning, SPI/GPIO routing) while remaining fully compatible with the Pi's 40-pin header. Developed a C-based TCP client that connects to the IOL HAT Master server (ports 12010/12011), implements a binary framing protocol, and layered modular send/receive primitives with command specific helpers. Comprehensive error handling and retry logic ensure robust network communication.

Objectives of the project: Design and validate a custom Raspberry Pi HAT PCB, integrating the MAX14819 IO-Link transceiver, power conditioning, and SPI/GPIO routing to ensure seamless hardware-software integration. Bridge IO-Link field level protocols (MAX14819 physical/data-link layers) with TCP/IP transport, enabling seamless integration into higher level dashboards and IIoT platforms. Implement a robust TCP client that connects to the IOL HAT Master server on ports 12010/12011 for reliable IO-Link communication.

Tool used: C/C++, KiCAD, Linux Systemd Service Management, Raspberry Pi-Device Tree Overlay Configuration

Details of Papers/patents: None

Brief description of the working environment: The station at Embedos Engineering was relaxed and supportive. I gained practical experience in PCB validation, protocol understanding, and teamwork, without intense pressure or steep learning curves. Mentors and team members maintained a friendly, open-door policy questions were encouraged, and collaboration felt natural rather than forced.

Company Expectations: Moderate - complete tasks on time, attend brief progress meetings, show initiative on small improvements, and collaborate across hardware/software teams.

Academic courses relevant to the project: CP(Computer Programming), DD(Digital Design)

Learning Outcome: Insight into scalable industrial networking: using a Raspberry Pi as an edge gateway that exposes IO-Link devices over standard Ethernet for integration with higher-level tools (Node-RED, dashboards, cloud).

Practical skills in designing and implementing a binary protocol on top of a stream-based transport, handling message framing, length prefixes, and end-to-end integrity checks.

Experience in modular software design: separating core send/receive primitives, protocol framing logic, command-specific helper functions, and centralized error-handling.

PS-I station: Embedos Engineering LLP, Mumbai

Student

Name: ANIRVAN KANA VI .(2023AAPS0741P)

Student Write-up:

PS-I Project Title: DEVELOPMENT OF AN IP67 RATED ENCLOSURE TO HOUSE AN I/O LINK AND ONBOARD COMPUTER

Short Summary of work done: We first began with finding ready-made parts online that could be used to build the enclosure. Once we did that, we had to start designing our own enclosure, which we did using Autocad Fusion 360. Alongside this, we were asked to search for manufacturers with capabilities to manufacture what we designed at a small to medium scale.

Objectives of the project: The EMILI project by Embedos Engineering LLP is centered on developing an advanced I/O Link system for industrial automation. The enclosure is a critical sub-project, designed in-house to securely house both the EMILI I/O Link Master and an onboard computer.

Tool used: Autocad Fusion 360

Details of Papers/patents: N/A

Brief description of the working environment: Working environment was pleasant, our project leader Brieuc was very pleasant and accomodating. The expectations were reasonable and not

overly difficult. I have learnt how to work in a team, communicate effectively with those working alongside me.

Academic courses relevant to the project: Engineering Graphics

Learning Outcome: Industrial Design. Learning how to contact vendors, manufacturers. Project Management

PS-I station: Embedos Engineering LLP, Mumbai

Student

Name: DHRUVKUMAR ASHOKBHAI GANGANI(2023B5A81124P)

Student Write-up:

PS-I Project Title: Device Management Utility

Short Summary of work done: This project involved the development of a web-based Device Management Utility (DMU) designed to simplify the onboarding, configuration, and remote management of IoT devices. Built using React.js, Node.js with Express.js, and PostgreSQL, the system provides a responsive user interface, secure RESTful APIs, and reliable data storage. Key features include seamless device registration, over-the-air (OTA) firmware updates, and version control, all integrated into a modular and scalable three-tier architecture. The DMU enables efficient device lifecycle management and lays the groundwork for real-time monitoring and enterprise-level integration. It also presents a practical solution that can be further adapted by organizations like Embedos to support internal and client-facing IoT deployments.

Objectives of the project: 1. Design a user-friendly UI for managing IoT devices. | 2. Implement secure and scalable backend APIs. | 3. Ensure real-time firmware updates with rollbacks and robust database integration.

Tool used: 1. React 2. Figma 3. Github

Details of Papers/patents: -

Brief description of the working environment: Working Environment, Expectations from company, and Learning during PS-1

The project was carried out in an online, remote setup with flexible working hours. All development and collaboration activities were conducted from home, allowing for independent task management and self-paced progress. Regular updates were shared through short team meetings, while weekly review sessions were held to track overall progress, address challenges, and align on upcoming goals. This environment encouraged a balance of autonomy and accountability, fostering both technical and communication skills.

Through this project, key skills in full-stack web development were gained, particularly in using React.js for frontend interfaces, Node.js and Express.js for backend API development, and PostgreSQL for relational database management. In addition to technical proficiency, the project enhanced understanding of IoT system architecture, API integration, and version control practices. The experience also strengthened project planning, remote collaboration, and problem-solving abilities—crucial competencies for real-world engineering and software development roles.

Academic courses relevant to the project: 1. Computer Programming (CP)

Learning Outcome: 1. Frontend Development 2. UI/UX Designing

PS-I station: ETDC - Electronic Test & Development Centre- Hyderabad, Hyderabad

Student

Name: JITEN SINGH NEGI .(2023B5AA0788H)

Student Write-up:

PS-I Project Title: Development of Calibration Modular App

Short Summary of work done: During my PS-I internship at ETDC Hyderabad, I developed a comprehensive modular calibration application to automate the uncertainty calculation process in electrical measurements. The project began with a deep dive into lab processes and GUM standards. I structured the application using Python and Tkinter to build an intuitive GUI, enabling users to input measured data, select predefined procedures, and generate reports seamlessly. Key milestones included creating modules to handle job cards, job reports, and

standard mapping, integrating bulk CSV/Excel file ingestion, implementing unit conversion and mapping logic, and producing professionally formatted bilingual (English-Hindi) reports in PDF. I also created features like single-point uncertainty calculators, dynamic coverage factor estimation, and real-time GUI error handling. The app was rigorously tested using real lab data and validated by lab experts. By the end of the internship, the application supported full-cycle calibration workflows across multiple parameters like DC/AC Voltage, Current, and Resistance, including traceability and statistical validation.

Objectives of the project: The primary objective of this project was to design and implement a modular desktop application to automate the calculation of measurement uncertainty in electrical calibration workflows. This was to reduce human error, improve efficiency, and provide a standardized method to generate calibration reports compliant with GUM (Guide to the Expression of Uncertainty in Measurement) guidelines. The software aimed to provide support for various calibration procedures and test conditions while producing professionally formatted reports with integrated job cards and result summaries.

Tool used: Software (S/w): Python 3.12 Tkinter (GUI) Pandas, NumPy, SciPy ReportLab (PDF Generation) PyInstaller (Packaging to .exe) MS Excel/CSV for standards and measured data Git (Version control) Hardware (H/w): Lab PCs at ETDC Standard calibration dev

Details of Papers/patents: No papers or patents were published as part of this PS-I project.

Brief description of the working environment: As a part of the Electro-Technical division, I was given access to calibration instruments, procedure manuals, and practical datasets. The working hours were structured yet flexible enough to accommodate iterative development, testing, and debugging of the application.

Mentors and lab staff at ETDC were welcoming and highly knowledgeable, providing continuous guidance on domain-specific challenges, especially around measurement uncertainty, standard specifications, and lab traceability. The expectation was to develop a reliable, extensible solution that could streamline and digitize existing manual workflows.

Academic courses relevant to the project: Probability & Statistics, CS F111, DSA, Python Programming

Learning Outcome: This project provided hands-on exposure to the intersection of software engineering and electrical instrumentation. I gained a comprehensive understanding of measurement uncertainty principles, particularly following GUM guidelines, and learned to implement both Type A (statistical) and Type B (non-statistical) uncertainty models within a software system. Developing the application enhanced my proficiency in Python programming, including GUI design, file handling, PDF generation, and modular architecture. I learned how to integrate diverse data sources—like procedure files, standards, and measured values—and map them efficiently to derive meaningful calibration outcomes.

PS-I station: Goa Shipyard Ltd., Goa

Student

Name: RAJ SHUKLA .(2023A4PS0409P)

Student Write-up:

PS-I Project Title: Assembly Techniques in Modern Shipbuilding

Short Summary of work done: The work assigned to me at Goa Shipyard was both challenging and exciting. I had the opportunity to go onboard several government-classified ships and study their internal systems. I explored various mechanical components and learned about different assembly techniques used in modern shipbuilding. The exposure helped me understand practical engineering problems and the scale at which shipyard operations are executed. I also interacted with professionals who explained how theoretical concepts are applied in real-life shipbuilding.

Objectives of the project: Understanding Mechanical Systems and Assembly Techniques in Modern Shipbuilding

Tool used: Primarily field study and documentation tools; no specific software or hardware tools used.

Details of Papers/patents: None

Brief description of the working environment: The working environment at Goa Shipyard Ltd. was professional yet welcoming. Employees were cooperative and guided us throughout the duration of the internship. We were expected to observe, learn, and ask relevant questions. I was exposed to the real-world challenges of shipbuilding, including project management, material handling, and system integration. The company maintained high standards of confidentiality and safety, especially when dealing with classified vessels. I learned to analyze systems, document observations effectively, and understand the complexities involved in large-scale mechanical assembly.

Academic courses relevant to the project: Mechanics of Solids
Advanced Mechanics of Solids
Material Science

Learning Outcome: Learnt how ships work and are assembled from the inside.

PS-I station: Goa Shipyard Ltd., Goa

Student

Name: SOHAM DESHPANDE .(2023B3A80959P)

Student Write-up:

PS-I Project Title: Maritime Electronics

Short Summary of work done: Work with industry specialists.

Objectives of the project: Study and implement the maritime electronics onboard coast guard and Indian Navy ships

Tool used: Electronic Layouts

Details of Papers/patents: None

Brief description of the working environment: Professional government facility

Academic courses relevant to the project: Electronic

Learning Outcome: Understand the complex intricate circuits and ship layouts while learning how electronics are fitted

PS-I station: IDS Infotech Ltd, Chandigarh

Student

Name: SOHAM .(2023A7PS0488P)

Student Write-up:

PS-I Project Title: SmartInterviewer AI-Powered Interview Simulation Platform

Short Summary of work done: Firstly they assign us the tasks to see our compatibility and on the basis of our submission they assigns us the roles which we have to work on for the project. My role was DB, I was supposed to make a database according to the needs of the backend team then I have to interconnect the tables with the help of JOINS in the database. After completing this task, i was assigned with the new task which was to create marketing material like google Ads or linkedIn ads for the project.

Objectives of the project: Develop a web application that: 1) Analyzes a candidate's resume 2) Takes optional HR inputs (job role, preferred traits, red flags) •3) Generates tailored interview questions 4) Conducts AI-based mock interviews (text/chat or voice) 5) Scores and provides feedback on candidate performance.

Tool used: MySQL WORKBENCH, Canva

Details of Papers/patents: -

Brief description of the working environment: As my PS was in online mode so I would say the working environment is excellent.

I learned about the database development skill at the level of a company, I was feeling that I am working in that company, also learned about the communication skills as my communication skills were needed to be improved.

Academic courses relevant to the project: Database Systems

Learning Outcome: Communication skills, making and maintaining Database.

PS-I station: IDS Infotech Ltd, Chandigarh

Student

Name: SAKSHAM ARYAN .(2023A8PS0474H)

Student Write-up:

PS-I Project Title: SmartInterviewer: AI based interviewing platform

Short Summary of work done: Developed a machine learning pipeline that parses a resume, generates questions based on it, record response then transcribes them with sentiment analysis.

Objectives of the project: Build an ai automated interviewing platform

Tool used: S/w - jupyter notebook, Python modules: whisper, spacy, transformers

Details of Papers/patents: none

Brief description of the working environment: The team worked well under deadlines with the proper supervision of the mentors. Overall assessment of mentors was credible and the workflow went smoothly.

Academic courses relevant to the project: None

Learning Outcome: Learnt about LLMs , workflow pipeline formation, NLP and teamwork

PS-I station: IDS Infotech Ltd, Chandigarh

Student

Name: VANSHIKA SINGH .(2023AAPS0214H)

Student Write-up:

PS-I Project Title: AI-powered interview simulator

Short Summary of work done: During my Practice School-I at IDS Infotech, I worked as a Frontend Developer on an AI-powered Interview Simulator platform. The project aimed to provide users with a realistic and interactive environment to practice job interviews using artificial intelligence. Over the course of four weeks, I was responsible for designing and developing key user interface components using React.js and TailwindCSS. My primary contributions included building the landing page, login page, registration page, forgot password page, interview history page, user profile interface and a resume submission form with a resume preview card. These components formed the foundation of the user onboarding process and were designed to be responsive, accessible, and scalable. I focused on writing modular and reusable code, ensuring that each component was ready for future backend integration. I also applied real-world UI/UX principles to enhance usability and followed best practices in form validation, layout structuring, and responsive design. This internship gave me valuable exposure to software development in a professional environment, improved my technical and problem-solving skills, and deepened my understanding of frontend architecture within an AI-based product.

Objectives of the project: Simulate real-world interview experiences using AI to help users practice and improve, provide personalized feedback through voice analysis, response quality, and behaviour tracking, make interview preparation accessible, repeatable, and stress-free, reduce bias and improve candidate readiness using intelligent automation.

Tool used: Hardware: Laptop with Intel i5 processor, 8GB RAM Software/Development Tools: React.js (Frontend Framework) TailwindCSS (Styling) Formik, React Hook Form (Form handling) Git & GitHub (Version control) VS Code (Code editor) Figma (UI design & protot

Details of Papers/patents: -

Brief description of the working environment: During my Practice School-I at IDS Infotech, I worked in a collaborative and learning-focused environment. Despite being a short-term intern, I was treated as a contributing member of the development team. Communication was clear and structured, with regular check-ins to review progress and resolve issues. The team was approachable, and feedback was constructive and timely.

The company expected interns to be proactive, disciplined, and open to learning. I was given the autonomy to manage my tasks while also being supported through technical guidance when needed. Expectations included writing clean, modular code, meeting design requirements, and staying aligned with project timelines.

The internship offered a valuable opportunity to apply classroom knowledge in a professional setting. I gained practical experience in frontend development, including React.js, TailwindCSS, and form handling libraries. I also learned to work with design prototypes, handle responsive layouts, and follow code management workflows using Git.

More importantly, I developed a deeper understanding of how frontend interfaces contribute to the functionality and user experience of AI-driven applications. This exposure enhanced not

only my technical skills but also my ability to collaborate in a real-world software development team.

Academic courses relevant to the project: Computer programming, technical report writing

Learning Outcome: Built real-world UI components using React.js and TailwindCSS
Gained experience in responsive and accessible design
Learned form handling, validation, and modular coding
Improved understanding of UI/UX principles and teamwork in a tech environment.

PS-I station: IDS Infotech Ltd, Chandigarh

Student

Name: KASHVI KHANDELWAL(2023B3A31112G)

Student Write-up:

PS-I Project Title: Smartinterviewer

Short Summary of work done: I personally did project management so i had to manage the project and a lot of other people.

Objectives of the project: To make an ai operated interviewer

Tool used: Clickup

Details of Papers/patents: -

Brief description of the working environment: Good only, supportive mentors with daily checkups.

Academic courses relevant to the project: AI/ML

Learning Outcome: Project management role

PS-I station: IMD, Pune, Pune

Student

Name: SUNAY YALLURE(2023A3PS0516G)

Student Write-up:

PS-I Project Title: Assessment of Pune's Heat Stress using MERRA2/ERA5 data and development of its Forecasting Model using Machine Learning
Assessment of Pune's Heat Stress using MERRA2/ERA5 data and development of its Forecasting Model using Machine Learning

Short Summary of work done: We had to analyze the heat stress for Pune region using publicly available datasets and then compare it with various standard thermal comfort indices. Datasets were downloaded from Giovanni and Copernicus, and Python libraries were used to clean, extract, tabulate and plot the heat stress using 2 methods (Mean Radiant Temperature and Universal Thermal Comfort Index). The obtained results were then analyzed and compared with the standard instrument readings and other thermal comfort indices. A small Machine Learning model was also developed to predict heat stress events in the future.

Objectives of the project: To assess historical heat stress trends in Pune region using reanalysis datasets, perform a comparative analysis of thermal comfort indices and instrument readings, and develop a simple machine learning model for heat stress forecasting

Tool used: Python libraries: pandas, matplotlib, xarray, GeoPandas, cartopy

Details of Papers/patents: NA

Brief description of the working environment: All the scientists were really helpful. Our guide was also very knowledgeable in his field and helped us whenever we faced any obstacles in our project

Academic courses relevant to the project: Computer Programming

Learning Outcome: This project taught about the applications of data analysis and visualization in the climate and environment sector.

PS-I station: IMD, Pune

Student

Name: KRISHNA KISHOR AGRAWAL(2023A3PS0809G)

Student Write-up:

PS-I Project Title: Weather Data Management System

Short Summary of work done: I helped IMD , Pune to make a full stack website and deploy them in there server which helps them to catalogue the daily inference sheets data they get , and easily view records by using dynamic filters.Also added an export function which help them to export all the filtered data as CSV files

Objectives of the project: “The objective of this project is to develop a website which is designed to streamline the entry, storage, and retrieval of meteorological data”

Tool used: Phpmyadmin, MySQL

Details of Papers/patents: Not such

Brief description of the working environment: Good

Academic courses relevant to the project: yes

Learning Outcome: Learned to develop a Full stack website and work with Corporate and Governmental Departments.

PS-I station: IMD, Pune, Pune

Student

Name: LAKSHMINIDHISH JAVVADI(2023A4PS1084G)

Student Write-up:

PS-I Project Title: Heat stress analysis

Short Summary of work done: Develop a machine learning forecasting model

Objectives of the project: Develop a machine learning forecasting model

Tool used: Python , cds,google colab , NN

Details of Papers/patents: None

Brief description of the working environment: Very good

Academic courses relevant to the project: Yes

Learning Outcome: Machine learning

PS-I station: IMD, Pune, Pune

Student

Name: KARTHIKEYA RAGHU .(2023A8PS0294H)

Student Write-up:

PS-I Project Title: Data Preprocessing and Comparative Analysis of Forecasting Models Using AWS Data.

Short Summary of work done: We were given CSV files which contained the column names(Parameter), the date and time the observation was taken and the various parameters. We had to develop various ways to impute the missing values and identify and address outliers. Before that we had to bring all the column names, and the format of the date and time representation to a common standard as they varied from file to file. After that we developed an LSTM forecasting model that would consume this preprocessed dataset.

Objectives of the project: Develop a tool to preprocess raw data collected from IMD's sensors used by their Automatic Weather Stations (AWS).

Tool used: Software - Python, Tensorflow package, Statsmodels Package.

Details of Papers/patents: NA

Brief description of the working environment: I was assigned to the Pashan office. Our mentor was very considerate. We had ample place to sit, but had to bring our own lunch as the canteen was very far. Our mentor would guide us through the various steps of the project.

Academic courses relevant to the project: NA, CS F111 (If you use C, C++ but we worked purely in Python)

Learning Outcome: Understood various methods of imputation, outlier detection and forecasting models.

PS-I station: IMD, Pune

Student

Name: AADITYA RAJPUT .(2023A8PS0384H)

Student Write-up:

PS-I Project Title: The impact of Land Cover Land Use and Air Quality Parameters on Urban Heat Island (UHI) in Bengaluru

Short Summary of work done: The Urban Heat Island (UHI) project focuses on analyzing the impact of Land Use/Land Cover (LULC) changes and air quality parameters on the UHI effect in urban Bengaluru. Using multi-year geospatial data (2019–2024) in the form of classified .tif LULC files and six years of hourly air quality data from five monitoring stations, the project quantifies temperature anomalies across the city. The study integrates remote sensing, GIS, and statistical techniques to assess how different land cover types — such as vegetation, built-up areas, and water bodies — influence urban thermal patterns. Air quality parameters such as NO, NO₂, and PM concentrations are correlated with temperature data to identify their role in intensifying the UHI effect. Bounding boxes are created around each station and around the combined study area to extract localized LULC compositions and track yearly changes. These spatial features, along with temporal AQI data, are used to develop a machine learning model that predicts UHI intensity based on land cover type and pollution levels. The project includes spatial visualizations, statistical summaries, and a predictive framework to understand the dynamic interactions between anthropogenic activities, air quality, and land transformation. Ultimately, the findings offer valuable insights for sustainable urban planning, helping policymakers mitigate heat stress and improve livability in fast-growing urban centers like Bengaluru.

Objectives of the project: To process Geo-Spatial data and Data analysis along with Basic ML Modeling

Tool used: Python libraries like Pandas , Numpy , Matplotlib , Scikit-learn , GeoPandas,Shapely,Rasterio,Xarray

Details of Papers/patents: Submitted a hard copy of PS 1 final report

Brief description of the working environment: During my Practice School-I (PS-I), I was placed in a research-driven academic setting in collaboration with IMD Pune (India Meteorological Department). The environment was highly interdisciplinary, combining environmental science, geospatial data analysis, and machine learning. The working atmosphere encouraged independent thinking, collaborative problem-solving, and a strong emphasis on scientific rigor and data integrity. I was given the autonomy to explore methodologies while also receiving structured feedback from mentors.

The primary expectation from the company and IMD Pune was to contribute meaningfully to a real-world problem: analyzing the Urban Heat Island (UHI) effect in Bengaluru. I was expected to process multi-year air quality and meteorological data provided by IMD, integrate it with satellite-based Land Use/Land Cover (LULC) datasets, and develop models to assess and predict UHI intensities. There was a clear emphasis on accuracy, technical depth, and reproducibility of results.

Through this experience, I became proficient with tools like Python, GeoPandas, Rasterio, and QGIS. I learned to handle geospatial raster and vector data, apply statistical analysis on temporal trends, and implement machine learning models to study environmental patterns. Working with IMD Pune data significantly enhanced my understanding of real-world meteorological datasets and their application in urban climate studies. Additionally, I improved

my skills in scientific documentation, data visualization, and interpreting research outcomes. Overall, this internship bridged the gap between theoretical knowledge and applied research, offering a deep dive into the integration of climate science and data analytics for sustainable urban development.

Academic courses relevant to the project: EVS

Learning Outcome: Data Analysis , Pyhon Libraries for GeoSpatial Data Analysis , ML modeling

PS-I station: IMD, Pune

Student

Name: YASH KAMAT(2023A8PS0547G)

Student Write-up:

PS-I Project Title: Battery Powered Temperature Logger

Short Summary of work done: I manipulated peripheral configuration registers in the STM32L031K6 microcontroller and achieved least power consumption and transmission via UART, however the temperature sensor used I2C which had a very difficult configuration and wasn't completed.

Objectives of the project: 1) Record temperature every 5 seconds. 2) Transmit minimum and maximum temperature every 24 hours via appropriate protocols. 3) Achieve everything in least power.

Tool used: Nucleo-L031K6 board, STS35 temperature sensor, STM32CubeIDE, linux terminal.

Details of Papers/patents: I extensively read the STM32L031K6 user and reference manuals to implement bare metal code.

Brief description of the working environment: The organisation was flexible and I was allowed to work from home since I had all the required components with me, and visit them once a while after achieving small goals throughout the week.

Academic courses relevant to the project: C Programming, Digital Design, Microprocessors and Interfacing, Embedded System Design

Learning Outcome: Embedded Systems, Embedded C Programming, STM32 microcontrollers, I2C, UART protocols, STM32CubeIDE, debugging tools.

PS-I station: IMD, Pune

Student

Name: AADITYA JOSHI .(2023A8PS0695P)

Student Write-up:

PS-I Project Title: Web based weather data management system

Short Summary of work done: web dev

Objectives of the project: to create a portal

Tool used: code editors

Details of Papers/patents: nil

Brief description of the working environment: To make the given project

Academic courses relevant to the project: yes

Learning Outcome: web dev

PS-I station: IMD, Pune, Pune

Student

Name: KAJAL AGARWAL(2023A8PS1150G)

Student Write-up:

PS-I Project Title: Assessing Climatic Influences on Energy Demand in Maharashtra

Short Summary of work done: Using daily temperature and energy demand dataset of 35 districts in Maharashtra, the objective was to understand the relationship between temperature variations and energy demand. We were given three temperature sets. Tmax(maximum temperature), Tmin(minimum temperature) and DTR(Tmax-Tmin).To understand temperature variations, we used the concepts of climatology, trends and anomalies and generated plots for the same for all the three types of temperatures.After we had analysed the patterns and identified vulnerable districts, (5 hottest and 5 coldest along the years), we used energy demand data and generated scatter plots to determine if patterns in temperature variations were consistent with patterns in energy demand variations. We then determined which of the temperature types' variations was most consistent with the energy demand variations.

Objectives of the project: To understand the impact of temperature variations and climate change on energy demand in Maharashtra

Tool used: Jupyter Lab, Python libraries(pandas, matplotlib,numpy)

Details of Papers/patents: None

Brief description of the working environment: The working environment is great. All interns working in the CAUI division would sit in the same room and days were coordinated to ensure there is enough seating space for everyone. All scientists are friendly and helpful. My mentor was pretty understanding and great too. I was called only three days per week where we would evaluate the work done over WFH days and future work. Work culture is not very hectic but largely depends on the project, I was given enough time to complete each task. Some projects (hardware-oriented) may require you to go everyday.

Academic courses relevant to the project: yes

Learning Outcome: Learning to use python libraries like pandas, matplotlib,numpy to generate plots

PS-I station: IMD, Pune

Student

Name: KOMAL PUSHKAR APTE(2023AAPS0028G)

Student Write-up:

PS-I Project Title: Automated Processing and Visualization of Radiation Data Using Python

Short Summary of work done: wrote python scripts to automate data analysis, for data stored in excel sheets.

Objectives of the project: writing python scripts to automate data analysis

Tool used: S/W: python, excel, pandas, numpy, openpyxl

Details of Papers/patents: -

Brief description of the working environment: relaxed environment, work is not rushed

Academic courses relevant to the project: NA

Learning Outcome: python, excel

PS-I station: IMD, Pune

Student

Name: ADITYA ANIKET VAIDYA(2023AAPS0619G)

Student Write-up:

PS-I Project Title: Assessment of Climate Models for Health Risk Management

Short Summary of work done: The project aimed to evaluate the accuracy of two climate models—GFS (Global Forecasting System) and ERFS (Extended Range Forecast System)—for health risk management in India during 2024. Weekly minimum and maximum temperature predictions from both models were compared against observed data using statistical metrics such as MAE, RMSE, NSE, and KGE. A Python-based pipeline was developed to automate the analysis, generate comparative visualizations, and map state- and district-wise accuracies using shapefiles. A custom accuracy metric was created by weighting multiple performance factors, offering a holistic model comparison. Results showed that ERFS consistently outperformed GFS, especially in predicting minimum temperatures, with higher correlation and lower error values. ERFS achieved an overall accuracy of 83.2%, compared to GFS's 71.8%. Disease-prone regions were identified using WHO-recommended temperature thresholds for malaria and dengue. ERFS demonstrated stronger alignment with actual conditions, accurately capturing high-risk zones, especially in the 16–19°C range for minimum temperatures. The findings highlight ERFS as a more reliable model for issuing weekly health bulletins. The study presents a scalable, automated approach to integrate climate forecasts into public health planning and suggests further enhancements, including the incorporation of humidity, rainfall, and real-time health data.

Objectives of the project: Create a comprehensive report of the accuracies of two climate models namely GFS and ERFS so that better predictions can be made with regard to the potential outbreak of a disease in a particular region.

Tool used: Python, VS Code, Excel

Details of Papers/patents: None

Brief description of the working environment: Good environment, helpful staff, air conditioned student lab to work in.

Academic courses relevant to the project: Probability and Statistics, Technical Report Writing

Learning Outcome:

Learnt how to handle data in csv file formats, learnt various statistical measures essential for proper analysis of varied data, learnt about how climate models work, learnt how to use shape files to show the data corresponding to a particular state or district.

PS-I station: IMD, Pune

Student

Name: SAMARTH SHREEPAD DIXIT .(2023B1AA1324H)

Student Write-up:

PS-I Project Title: Crop Yield Prediction using Weather and Soil Data through Machine Learning

Short Summary of work done: We tried a new method of stacking ML models to predict the yield

Objectives of the project: We had to create an ML model to predict the yield of crops based on Soil and Weather parameters

Tool used: Canva, VScode, Django, Gradio, Python, Jupyter, Many ML models including CNN KNN RNN ANN Transformer etc.

Details of Papers/patents: N/A

Brief description of the working environment: IMD is an excellent PS Station to do hands on work, which is reflected and affected throughout the nation.

My expectations were not too much, a good project, helpful members from the IMD, and overall a good learning experience. All of these were fulfilled and I was very happy with staff and mentors present there.

Working environment was not stressful at all. Apart from the restricted activities everything was light and overall a positive friendly environment, which gave the motivation to work.

Academic courses relevant to the project: Programming languages, Software Development, Machine Learning and Data Analytics etc.

Learning Outcome: Machine Learning, Team Coordination, Software Development

PS-I station: IMD, Pune, Pune

Student

Name: AMAN PATEL(2023B5A31004G)

Student Write-up:

PS-I Project Title: An Automated ML-Based Quality-Controlled IoT Weather Station

Short Summary of work done: During my internship at IMD Pune, I worked on developing and testing a quality-controlled IoT weather monitoring system integrated with machine learning models for weather parameter prediction. I trained and evaluated five ML models on meteorological datasets including temperature, humidity, pressure, and visibility, and implemented data quality control mechanisms such as sensor and station limits, rate-of-change checks, missing data detection, and LSTM-based deviation flagging. Additionally, I contributed to the deployment pipeline using ESP8266 nodes, Raspberry Pi servers, InfluxDB for data storage, and Grafana for real-time visualization, validating the system's robustness in field conditions. This work helped enhance automated weather data acquisition, anomaly detection, and predictive capabilities for localized weather monitoring at IMD.

Objectives of the project: to build an Automated ML-Based Quality-Controlled IoT Weather Station.

Tool used: Used Python, TensorFlow, ESP8266, Raspberry Pi, InfluxDB, Grafana for IoT weather data collection, ML prediction, anomaly detection, visualization.

Details of Papers/patents: -

Brief description of the working environment: During my PS-I at IMD Pune, I worked in a collaborative and research-focused environment under the guidance of scientists and engineers dedicated to improving weather monitoring systems. The environment encouraged independent problem-solving while maintaining structured reporting, with weekly discussions on progress and challenges. I had access to lab facilities for sensor interfacing and embedded system testing, along with the computational resources required for data processing and ML model training.

I expected the company to provide exposure to real-world weather monitoring challenges, ML integration in operational workflows, and practical deployment constraints in meteorological instrumentation. IMD met these expectations by involving me in live projects requiring both hardware-software integration and data analysis skills, ensuring alignment with industry and research standards.

During PS-I, I learned end-to-end system development for IoT-based weather monitoring, including sensor calibration, ESP8266 and Raspberry Pi programming, MQTT communication, and time-series data storage using InfluxDB. I gained practical experience in building dashboards using Grafana for live visualization and understood the role of quality control pipelines in operational weather monitoring. Implementing ML models like LSTM for weather parameter prediction and developing anomaly detection mechanisms improved my understanding of real-world ML deployment challenges. This internship also strengthened my skills in Python, Docker, Git, and data analysis, and gave me insights into professional communication, documentation, and interdisciplinary teamwork essential for delivering reliable technology solutions in meteorology.

Academic courses relevant to the project: -

Learning Outcome: I learnt IoT, Machine Learning, Embedded systems and corporate skills

PS-I station: Indian Semiconductor Mission (ISM), Delhi

Student

Name: ARSHIKA SHARMA(2023AAPS0607G)

Student Write-up:

PS-I Project Title: Semiconductor manufacturing

Short Summary of work done: A comprehensive report and study of the topic

Objectives of the project: Learning about utilities, facilities, chemical gases and global supply chain

Tool used: Google/excel

Details of Papers/patents: None

Brief description of the working environment: Very good and considerate

Academic courses relevant to the project: ECE courses (semiconductor fabrication)

Learning Outcome: Trends of the global semiconductor supply chain market

PS-I station: Institute of Seismological Research, Gandhinagar

Student

Name: SAYAN PAUL(2023A1PS0120G)

Student Write-up:

PS-I Project Title: Earth Structure Using Receiver Function Analysis

Short Summary of work done: Extracting data from FSDN website and IRISDMC and then using that data to plot rf graphs and extract data for analysis

Objectives of the project: To plot receiver functions using seismographic data from different seismological stations and then analyze them for analysis of Earth structure

Tool used: Python, Unix, Jupyter, VS Code, Linux

Details of Papers/patents: 1 paper to be published

Brief description of the working environment: It was online PS

Academic courses relevant to the project: None

Learning Outcome: Learnt UNIX, Linux, Python, SAC codes and a very firm grasp on how seismological research is performed.

PS-I station: Institute of Seismological Research, Gandhinagar

Student

Name: ANISH SAI NIMMAGADDA .(2023A7PS0027P)

Student Write-up:

PS-I Project Title: Machine Learning-Based Detection of Radon Anomalies for Earthquake Prediction

Short Summary of work done: During my Practice School-I (PS-I), I worked on the development of a machine learning-based framework for detecting radon anomalies as potential earthquake precursors. The primary goal was to explore whether radon emissions, when analyzed using advanced computational techniques, could provide early warning signs for seismic activity. I began by collecting and preprocessing environmental time series data, including radon concentration and associated meteorological parameters such as temperature, pressure, and humidity. This phase helped me gain a strong understanding of the characteristics of time series data, including trends, seasonality, and noise. I applied signal preprocessing techniques like Fast Fourier Transform (FFT) and Empirical Mode Decomposition (EMD) to extract meaningful features from the raw radon data. These features were used to train a feedforward neural network (FFNN) to detect anomalies that could be linked to historical earthquake events. Throughout the project, I experimented with various parameters—such as input window sizes, activation functions, and training epochs—to optimize the model's performance. I also correlated the model's outputs with earthquake catalogs to evaluate its reliability in identifying precursors. This project significantly enhanced my understanding of applied machine learning, time series processing, and domain-specific feature extraction. It also improved my ability to handle noisy real-world datasets and interpret model results in a geophysical context.

Objectives of the project: To collect and preprocess radon concentration data from ground-based sensors or stations, ensuring quality and consistency for analysis. To analyze the temporal behavior of radon signals and identify patterns or anomalies that may correlate with seismic activity.

Tool used: Hardware (H/W): Cloud-based computing resources via Google Colab Software (S/W): Google Colab – for coding, model training, and visualization in a collaborative environment ChatGPT – for guidance, code assistance, and conceptual clarification Python

Details of Papers/patents: N/A

Brief description of the working environment: The working environment during my PS-I was highly research-oriented and self-driven, conducted in a remote setting under the guidance of faculty and with access to online resources. I was encouraged to take ownership of the project from the initial problem formulation to the final implementation. The flexible, independent structure promoted critical thinking and allowed for deep exploration of the intersection between environmental science and machine learning.

Although the setup was academic rather than corporate, the expectations were similar to those in a real-world research environment—requiring consistent progress, scientific rigor, and the ability to troubleshoot technical challenges independently. Regular check-ins and feedback from mentors helped align the work with research standards.

My learning during PS-I was substantial. I gained hands-on experience with time series data, signal preprocessing techniques like FFT and EMD, and implemented a Feedforward Neural Network (FFNN) for anomaly detection. I explored correlations between radon levels and seismic events while accounting for meteorological noise. The use of tools like Google Colab, Python libraries, and ChatGPT enabled efficient development and conceptual clarity.

Overall, PS-I significantly enhanced my understanding of machine learning, environmental data modeling, and scientific reporting. It also instilled a strong foundation in autonomous learning and problem-solving—skills crucial for research and industry alike.

Academic courses relevant to the project: ML 3-part specialization on Coursera

Learning Outcome: Understanding of Geophysical and Environmental Indicators:

Gained insights into how radon gas emissions from the Earth's crust can serve as potential precursors to seismic activity.

PS-I station: Institute of Seismological Research, Gandhinagar

Student

Name: MRIDUL SINHA .(2023B2A10910P)

Student Write-up:

PS-I Project Title: Moonquake Detection and Classification using Apollo Seismic Data

Short Summary of work done: During PS-I, our team worked on the project “Understanding Moonquakes through Machine Learning using Apollo Seismic Data.” The objective was to analyze Apollo Passive Seismic Experiment (PSE) data and apply modern data-driven methods to detect and classify lunar seismic events. We began by exploring the fundamentals of lunar seismology and reviewing relevant literature, including Onodera (2023) and Nunn (2022). Using Python and ObsPy, we developed scripts to systematically download Apollo seismic waveform data in .mseed format and corresponding metadata. The preprocessing pipeline was designed to handle raw waveforms, involving trimming, detrending, tapering, bandpass filtering, and instrument response correction. Both waveform and spectrogram visualizations were generated to study patterns of different event types. Next, we used event catalogs to extract and label moonquakes, dividing them into shallow, deep, thermal, impact, and artificial categories. Features such as energy, frequency content, FFT slices, and amplitude were extracted for machine learning applications. We implemented clustering (K-Means, DBSCAN) to observe natural groupings and applied supervised classification techniques, including KNN and Keras-based models, to distinguish between impact and non-impact events. Additionally, a coherence-based method was tested to improve the detection of weak high-frequency events. Through this project, we gained hands-on experience with planetary seismic data, advanced signal processing, and the integration of machine learning into scientific workflows. Our work highlights the potential of reanalyzing Apollo datasets to prepare for upcoming missions like Artemis, contributing towards lunar safety and planetary exploration.

Objectives of the project: Study different types of lunar seismic events and their characteristics. Retrieve, preprocess, and visualize Apollo Passive Seismic Experiment (PSE) waveform data. Apply signal processing and feature extraction for event analysis. Develop and test machine learning models for automated moonquake classification and detection.

Tool used: Software: Python, ObsPy, Pandas, NumPy, Matplotlib, Scikit-learn, Keras, Google Colab
Data Sources: Apollo Passive Seismic Experiment

Details of Papers/patents: None

Brief description of the working environment: The working environment during PS-I was collaborative, research-driven, and well-structured. Our mentor created an academic yet professional atmosphere, where we were guided through both the scientific background of lunar seismology and the technical aspects of handling Apollo seismic data. Weekly discussions, review sessions, and feedback on coding practices and presentations ensured steady progress while also fostering teamwork. The environment encouraged self-learning, literature review, and constructive peer discussions, which helped us grow both technically and academically. Our expectations from this program were to gain exposure to large-scale scientific datasets, apply classroom knowledge to real-world problems, and develop interdisciplinary skills by integrating planetary science concepts with modern data analysis and machine learning techniques. These expectations were met successfully as we learned to process raw Apollo Passive Seismic Experiment data, implement preprocessing pipelines, and apply machine learning methods for classification and event detection.

The learning outcomes were both technical and professional. Technically, we developed skills in Python, ObsPy, Pandas, and Keras, while gaining experience in advanced signal processing and feature extraction. Professionally, we improved our teamwork, presentation, and scientific communication abilities. By the end of PS-I, we were able to present our findings in a seminar, compile them into a report, and reflect on the broader relevance of our project to future planetary missions.

Overall, the PS-I experience was enriching, bridging theoretical knowledge with practical application, and preparing us for further research and professional challenges.

Academic courses relevant to the project: Electrical Sciences

M1

M2

Signals and Systems

Computer Programming

Learning Outcome: Understood fundamentals of lunar seismology and moonquake classifications.

Gained hands-on experience in preprocessing seismic waveform data using Python and ObsPy.

Learned to visualize events through waveforms and spectrograms.

Extracted features (energy, frequency, amplitude) relevant to seismic event analysis.

Built and evaluated machine learning models (Keras, clustering, classification) for event detection.

Improved research, teamwork, and scientific communication skills through report and seminar presentation.

PS-I station: Institute of Seismological Research, Gandhinagar

Student

Name: NISHA LAXMAN GAWADE .(2023B3A40462H)

Student Write-up:

PS-I Project Title: Earth Structure Using Receiver Function Analysis

Short Summary of work done: The PS-I project focused on estimating the lithospheric structure beneath parts of Northeast India and Myanmar using receiver function analysis. We collected teleseismic waveform data from nine broadband seismic stations and processed them using Python libraries such as ObsPy. After verifying SAC headers and rotating the components from ZNE to LQT, we applied Gaussian filtering and deconvolution techniques to isolate receiver functions. Our team was divided into three focus areas: sedimentary layer analysis, crustal thickness estimation via H- κ stacking, and anisotropy detection. Sedimentary layers were identified by analyzing early Ps arrivals, while crustal thickness and Vp/Vs ratios were computed using stacked radial RFs. Anisotropic patterns were investigated through azimuthal variations in RF amplitudes. The results were validated against geological maps and previous regional studies. The project provided meaningful insights into regional tectonics and earthquake hazard zones and helped us gain significant exposure to real-world geophysical analysis.

Objectives of the project: 1.To analyze teleseismic waveform data and compute receiver functions (RFs) 2.To estimate crustal thickness and Vp/Vs ratios using H- κ stacking 3.To identify sedimentary layers and assess seismic anisotropy beneath broadband stations 4.To interpret the lithospheric structure in tectonically active regions using Python-based seismic tools

Tool used: Software: Python, ObsPy, SAC Tools, Matplotlib, NumPy Hardware: Ubuntu/Linux system (dual boot), seismic data servers (IRIS)

Details of Papers/patents: None during the PS-I period.

Brief description of the working environment: The working environment at ISR was collaborative and research oriented. Under the guidance of Dr. Sowrav Saikia, we were encouraged to independently explore advanced seismological methods and tools. Although the project was research-intensive, our mentor provided regular check-ins and technical direction. We had access to waveform databases, technical manuals, and experienced researchers. The expectations from ISR were aligned with academic goals—understanding crustal processes through computational methods. We were expected to perform quality checks on data, apply signal processing techniques, and interpret the outcomes scientifically. The experience enriched our understanding of real-world research workflows, team collaboration, and scientific communication. It bridged theoretical concepts from classroom learning with practical seismic analysis, enhancing both our technical and analytical skills.

Academic courses relevant to the project: Seismology and Earth Structure
Geophysics
Applied Mathematics
Signal Processing
Python Programming

Learning Outcome: Understood seismic wave behavior and the concept of converted phases (Ps, PpPs, etc.)

Gained hands-on experience in waveform preprocessing, rotation, filtering, and RF deconvolution

Learned to estimate crustal parameters (H and κ) and identify sedimentary features

Developed skills in scientific analysis, data visualization, and collaborative report writing

PS-I station: INTEL Solutions & Services India Pvt Ltd, Bengaluru

Student

Name: SHARUNDHATHYA C .(2023A3PS0255H)

Student Write-up:

PS-I Project Title: Design and FPGA implementation of fast and slow division algorithms

Short Summary of work done: After a survey of different division algorithms, we decided to study and implement the SRT radix 4 algorithm. We obtained the block diagram and FSM for the algorithm after understanding its flow. These were then translated to Verilog code and simulated to verify the outputs on the Modelsim software. Using Intel Quartus Prime software we compiled our design, that involved analysis, elaboration, synthesis, fitting and pin assignment. Through timing analysis we identified and resolved setup and hold time violations. We also analyzed the generated compilation reports and did power and area analysis. Finally, we implemented our design on the FPGA via LabsLand which allowed us to verify the functionality of our divider on real hardware.

Objectives of the project: Review design specifications of divider algorithms and arrive at the block diagram with proper inputs and outputs for a specific algorithm. Develop a Finite State machine (Mealy / Moore) based on the design specifications and the Verilog HDL code for the developed FSM. Simulate and verify the design for its functionality with proper test cases using ModelSim/ Questa simulator. Synthesize the design and perform timing analysis. Implement the design on the targeted FPGA using LabsLand virtual FPGA lab.

Tool used: Intel Quartus Prime software, Verilog HDL coding, Modelsim simulator, LabsLand FPGA virtual lab.

Details of Papers/patents: None

Brief description of the working environment: We were enrolled as part of the Unnati training program by Intel and not as interns in the company. However we received very minimal support from the industry mentor, considering it a training program. We had to work on the given project in teams of 2/3. Though the project was good it did not fulfill the industry experience that was expected and seemed to be almost a self-guided personal project. The project did help learn the Intel Quartus software and the flow of how a design is developed and implemented on an FPGA but better mentorship and guidance would have helped understand and learn it to a greater extent.

Academic courses relevant to the project: Until 2nd year - Digital Design. 3rd year courses such as FPGA lab would be relevant.

Learning Outcome: Understanding division algorithms and developing a block diagram and FSM for the same.

Creating the Verilog code for the algorithm and testbench for its simulation.

Using Modelsim to simulate the written code.

Implementing design on Intel Quartus, analyzing generated reports, fixing timing violations and doing pin assignment.

Using LabsLand to program the Altera DE1-SoC FPGA and testing the functionality of our design virtually.

PS-I station: INTEL Solutions & Services India Pvt Ltd, Bengaluru

Student

Name: AARUSH SUMIT MATHUR .(2023A3PS0698P)

Student Write-up:

PS-I Project Title: Implementation of Division Algorithms in FPGA

Short Summary of work done: I first learnt non restoring algorithm, then wrote it in verilog then got a file from intel quartus then implemented in labsland fpga

Objectives of the project: To implement non-restoring algorithm in verilog and fpga

Tool used: Intel Quartus, Labsland, Verilog editor

Details of Papers/patents: NA

Brief description of the working environment: good learning

Academic courses relevant to the project: Digital Design

Learning Outcome: I learnt how to use verilog, labsland, intel quartus etc

PS-I station: INTEL Solutions & Services India Pvt Ltd, Bengaluru

Student

Name: PRITHAM KUMAR JENA .(2023A8PS1308H)

Student Write-up:

PS-I Project Title: FPGA Implementation of Goldschmidt Division Algorithm

Short Summary of work done: During our PS-I, we worked as a team of three on the FPGA implementation of the Goldschmidt division algorithm using Verilog HDL. The objective was to design an efficient hardware-based divider suitable for fixed-point arithmetic. We developed Verilog modules for core arithmetic operations and integrated them into a complete division datapath. Both signed and unsigned versions were implemented using Q4.4 and Q4.12 fixed-point formats. To improve performance, we pipelined the design to enhance throughput while maintaining computational accuracy. We verified the functionality of our modules through simulations using ModelSim and synthesized the designs using Intel Quartus Prime. We also deployed and tested the final implementations on an Cyclone V FPGA board using LabsLand to ensure correctness on real hardware. Throughout the project, we encountered several challenges related to precision handling, synchronization, and hardware timing, but resolving them helped us better understand digital design and FPGA workflows. It was a great hands-on experience where we learned a lot, especially about translating algorithms into working hardware.

Objectives of the project: The objective of this project is to implement the Goldschmidt division algorithm on an FPGA using Verilog HDL. The project focuses on designing fixed-point arithmetic modules, optimizing them through pipelining, and validating their correctness and efficiency through simulation in ModelSim and deployment on FPGA hardware using Intel Quartus Prime and LabsLand.

Tool used: Intel Quartus Prime, ModelSim, LabsLand

Details of Papers/patents: NA

Brief description of the working environment: This was a remote training program under the Intel Unnati program, where we worked on FPGA-based digital design projects. We were expected to understand the core concepts of digital logic and apply them to real-world problems using Verilog HDL. The experience gave us a solid foundation in hardware description languages, simulation workflows, and FPGA deployment, while also improving our problem-solving and debugging skills.

Academic courses relevant to the project: Digital Design, Microprocessors & Interfacing

Learning Outcome: Through this project, I gained hands-on experience in digital design using Verilog HDL, particularly in implementing arithmetic algorithms like Goldschmidt division. I learned how to develop and simulate hardware modules using ModelSim, synthesize and test designs with Intel Quartus Prime, and perform hardware validation using remote FPGA access via LabsLand. Additionally, I understood the importance of pipelining for performance optimization and deepened my knowledge of fixed-point arithmetic and FPGA-based system design.

PS-I station: INTEL Solutions & Services India Pvt Ltd, Bengaluru

Student

Name: URJIT KHATUA(2023AAPS0495G)

Student Write-up:

PS-I Project Title: Implementation of Newton-Raphson Division on FPGAs

Short Summary of work done: Researched division algorithms, designed circuits in Verilog implementing the same, simulated their functioning, optimized the designs, performed timing analysis, ran the code on a real FPGA using LabsLand

Objectives of the project: Designing and optimizing division using the Newton-Raphson algorithm for a Cyclone-V FPGA

Tool used: Intel Quartus Prime, LabsLand, Questa Simulator

Details of Papers/patents: None

Brief description of the working environment: This station is NOT an internship, but instead part of the "Intel Unnati Industrial Training Program". This means that it is entirely online with less interaction from the representative from the company. You are expected to learn things yourself using online resources. The participants at this station formed groups of three dedicated to different division algorithms.

Academic courses relevant to the project: Digital Design (marginally), any DELs related to FPGAs

Learning Outcome: Verilog, FPGAs, Algorithms for division

PS-I station: KeenSemi (Keenheads Technologies pvt Ltd), Noida

Student

Name: ARYAN KUMAR SINGH(2023A7PS0362G)

Student Write-up:

PS-I Project Title: Improving LLM Accuracy through Structured Data Extraction from IP Specifications

Short Summary of work done: During my PS-I internship, I developed a Visual Retrieval Augmented Generation (RAG) system designed to process and extract information from

complex IP specification PDF documents. The core of the project involved building a pipeline to convert unstructured PDF content, including images, tables, and diagrams, into a structured format suitable for Large Language Models (LLMs). My work encompassed: PDF to Image Conversion: Implementing robust PDF parsing using PyMuPDF and OpenCV for page extraction and smart cropping to focus on relevant content. Hybrid Embedding Strategy: Developing a unique approach to generate embeddings; visual pages (containing diagrams or tables) were processed by a specialized visual language model (ColQwen2) for visual embeddings, while text-heavy pages utilized a sentence transformer (MiniLM-L12-v1) for textual embeddings. This ensured comprehensive content understanding. FAISS Indexing: Storing these diverse embeddings in a FAISS vector database for efficient semantic search and retrieval. Cross-Attention Reranking: Integrating a cross-encoder (ms-marco-MiniLM-L-6-v2) to rerank retrieval results, significantly improving the relevance and accuracy of retrieved documents for a given query. LLM Integration: Utilizing a Qwen2.5-VL-3B-Instruct model to generate detailed answers based on the retrieved visual and textual context from the documents. This project successfully demonstrated how to bridge the gap between complex, visual-rich technical documents and LLM comprehension, enhancing the accuracy of information extraction and reducing the likelihood of hallucinations in generated responses.

Objectives of the project: The objective of this project is to accurately transform unstructured IP specification PDF documents (including text, images, tables, and diagrams) into a structured, LLM-ready data format to enhance LLM comprehension and reduce hallucination.

Tool used: Development Tools: Software: PyCharm: Integrated Development Environment (IDE) for writing and debugging Python code. VNC Viewer: Software used for remote access to your company's CPU in a Linux environment. Hardware: Company CPU (Linux Environment):

Details of Papers/patents: No we just worked on the project we didn't publish any papers.

Brief description of the working environment: I conducted my PS-I internship at KeenSemi, a semiconductor design company located in Noida. My working environment involved remote access to a Linux-based company CPU via VNC Viewer, with development primarily done in PyCharm. This setup provided a robust platform for handling computationally intensive tasks, essential for AI/ML development.

KeenSemi expected me to contribute to improving the efficiency of processing complex technical documentation, specifically IP specifications, to make them digestible for advanced AI models. This involved a strong emphasis on accuracy in data extraction, a deep understanding of LLM capabilities, and the ability to integrate cutting-edge RAG methodologies. The goal was to reduce manual efforts in data preparation and enhance the precision of AI-driven insights from these critical design documents.

During PS-I, I gained invaluable practical experience in several key areas. I mastered advanced PDF parsing and data extraction techniques, including handling challenging visual elements like diagrams and tables. I learned to design structured data schemas optimized for LLM consumption, ensuring semantic fidelity. Critically, I developed a hands-on understanding of hybrid embedding strategies, FAISS indexing, and cross-attention reranking for effective

information retrieval. Furthermore, I learned to integrate and fine-tune LLMs for specific tasks, ultimately improving their ability to comprehend and respond to queries based on highly technical, multi-modal input. This internship significantly enhanced my Python programming skills within an AI/ML context and provided real-world exposure to semiconductor design documentation challenges.

Academic courses relevant to the project: Natural Language Processing (NLP), Machine Learning (ML) & Deep Learning (DL), Computer Vision (CV) & Image Processing, Information Retrieval (IR), Data Structures and Algorithms, Programming (Python specific).

Learning Outcome:

1. Expert Data Extraction: Master techniques for accurately extracting diverse information (text, tables, images, diagrams) from complex PDF documents.
2. Structured Data Design: Learn to model and create effective data schemas optimized for LLM consumption, ensuring semantic integrity.
3. LLM Integration & Optimization: Understand how to prepare data for LLMs, evaluate RAG/RAG-less strategies, and enhance LLM comprehension and performance.
4. Accuracy & Error Management: Develop skills in measuring extraction accuracy, identifying LLM hallucinations, and implementing strategies for continuous improvement.
5. Practical Python for AI: Gain hands-on experience building end-to-end data pipelines in Python for AI/ML applications.

PS-I station: KeenSemi (Keenheads Technologies pvt Ltd), Noida

Student

Name: DWITI SUCHAK .(2023B3A30958P)

Student Write-up:

PS-I Project Title: Digital Circuit Design and Static Timing Analysis using VLSI Design Methodology: A Comprehensive Study

Short Summary of work done: During my internship, I gained a comprehensive understanding of Very Large Scale Integration (VLSI) design, with a primary focus on ensuring the reliable and high-speed operation of digital circuits. My work began with solidifying foundational knowledge in Digital Electronics, including the principles of logic gates, combinational circuits like

multiplexers, and sequential elements such as latches and Flip-Flops. I also explored CMOS technology, understanding the roles of PMOS and NMOS transistors and the application of Transmission Gates in circuit design. A significant portion of the internship was dedicated to Static Timing Analysis (STA), which is critical for verifying chip performance. I learned about clock characteristics, the importance of Setup Time and Hold Time for data integrity, and how to calculate Slack to identify timing margins or Timing Violations. This included understanding Clock Skew, Jitter, and other Uncertainties. My study extended to various Timing Paths and special cases like false and multicycle paths. Further, I delved into advanced STA concepts, including Physically and Logically Exclusive Clocks, the use of Timing Models (ETM, QTM), and the impact of Unequal Rise and Fall delays. Crucially, I learned about Derate and On-Chip Variations (OCV), which are vital for designing robust chips against manufacturing imperfections. The concept of a Virtual Clock for external interface timing was also covered. I gained insight into the full ASIC Design Flow, from initial specification to final signoff, and applied practical SDC commands to define timing constraints for a sample design, reinforcing theoretical knowledge. Additionally, I utilized Linux scripting tools like find, sed, and awk for efficient data management. This internship provided a holistic view of modern chip design, emphasizing the indispensable role of precise timing analysis.

Objectives of the project: Gain a comprehensive understanding of fundamental digital electronics concepts: Including logic gates, combinational circuits, and sequential elements (latches and flip-flops). Master the theoretical and practical aspects of Static Timing Analysis (STA): Focusing on clock characteristics, setup/hold times, slack calculation, and clock uncertainty. Develop proficiency in identifying and resolving timing violations: Understanding causes and mitigation methods. Explore and analyze different types of timing paths: Including standard and special paths like false and multicycle paths. Understand the basics of CMOS technology and transmission gates: Comprehending their working principles and applications in building digital blocks. Learn to define and apply timing constraints: Utilizing industry-standard commands for accurate timing analysis. Acquire knowledge of the essential stages in the Physical Design (PD) Flow: Understanding the sequence and purpose of design planning, floorplanning, placement, Clock Tree Synthesis (CTS), and routing. Familiarize with advanced timing concepts: Including exclusive clocks, timing models, minimum pulse width, unequal rise/fall, derate, and On-Chip Variations (OCV). Understand the overall ASIC design flow: From specification to signoff. Familiarize with basic Linux scripting commands: Utilizing find, sed, and awk for processing and analyzing data.

Tool used: vnc, linux, very less cadence not directly used but saw, EDA Playground to stimulate the verilog

Details of Papers/patents: -

Brief description of the working environment: During my Practice School – I (PS-I) internship, I was immersed in a dynamic and technically demanding environment focused on VLSI design. The workspace fostered an atmosphere that encouraged independent problem-solving and

self-reliance, particularly as the project progressed. This setup allowed for significant individual contribution and a strong emphasis on managing tasks autonomously.

The company's expectations were clear: to achieve high standards of technical output, ensure the timely completion of assigned tasks, and proactively engage in continuous learning within the challenging field of semiconductor design. There was an implicit expectation to rapidly assimilate complex information and apply it directly to practical design scenarios, pushing boundaries in performance and reliability.

My learning experience during PS-I was transformative. I significantly deepened my understanding of fundamental Digital Electronics and CMOS principles, which form the bedrock of chip design. The core of my learning revolved around Static Timing Analysis (STA), where I mastered concepts like setup/hold times, slack calculation, and the intricacies of clocking, including skew and on-chip variations (OCV). I gained practical exposure to applying industry-standard SDC commands for timing constraints and explored the complete ASIC design flow. This experience not only honed my technical skills but also cultivated strong self-management and problem-solving abilities in a rigorous engineering setting.

Academic courses relevant to the project: Digital Design

Learning Outcome: SDC Commands in STA and basic Verilog and instantiation of verilog

PS-I station: MCEME, Secunderabad

Student

Name: SRUTI GUDURU .(2023AAPS0285H)

Student Write-up:

PS-I Project Title: Mathematical Modelling For Path Navigation

Short Summary of work done: Modifying code, adding new files and plugins and testing it

Objectives of the project: to improve the functioning of the robot and to speed it up and resolve issues

Tool used: ROS2, Gazebo

Details of Papers/patents: N/A

Brief description of the working environment: working environment actually depends on day to day basis, most of the time you work in either robotics lab or ai lab or cyber sml range lab, however on few days you work in classrooms or in library, a clean nice place. Expectations of MCEME for us to improve their UAV.

Academic courses relevant to the project: yes

Learning Outcome: patience, ros2, gazebo, iterative testing

PS-I station: MCEME, Secunderabad

Student

Name: BANDLA HIMA NAGA SRI HARSHITHA .(2023B4A80803H)

Student Write-up:

PS-I Project Title: BFSR Target Identification Using AI

Short Summary of work done: During my Practice School-I at MCEME, Secunderabad, I worked on a project involving the Battlefield Surveillance Radar (BFSR) used by the Indian Army. The primary objective was to develop an AI-integrated system capable of classifying moving targets based on the unique audio signals captured by the radar. The project began with understanding the fundamentals of BFSR operation, including its ability to detect and track human and vehicular movement. I then moved on to collect audio data from radar sources and study their signal patterns. Using this data, I implemented various preprocessing techniques such as noise reduction, normalization, and spectrogram conversion to prepare the signals for analysis. I developed a Python-based machine learning model that extracted features from these spectrograms and classified the target types (human, light vehicle, or heavy vehicle). Several models were tested to evaluate performance, and the best-performing model was used for live testing with real-time audio inputs from the radar. Throughout the project, I encountered practical challenges such as audio input compatibility, signal inconsistency, and prediction errors, which were resolved through continuous testing and debugging. The final system demonstrated the potential to enhance the efficiency and automation of radar-based

surveillance using AI techniques. This project improved my understanding of radar systems, signal processing, machine learning, and real-world application development while enhancing my problem-solving and teamwork skills.

Objectives of the project: 1.To study the working principles of the Battlefield Surveillance Radar (BFSR) used by the Indian Army for detecting and tracking moving targets across a wide range of terrains and environments. To understand and analyze the audio signals generated by the BFSR system, and explore their unique patterns based on different types of moving targets such as humans, light vehicles, and heavy vehicles. To preprocess and classify real-time audio signals from the radar using suitable machine learning techniques, with the goal of accurately identifying the class of moving targets. To design and implement a Python-based machine learning model capable of processing radar audio inputs, extracting relevant features, and predicting the type of target. To evaluate the performance of the developed model through live testing, ensuring the accuracy and reliability of predictions in real-time conditions. To explore the potential of AI integration with BFSR systems, providing a cost-effective and efficient solution for enhanced target classification in defense applications.

Tool used: Hardware : Battlefield Surveillance Radar (BFSR),Radar Headset with Audio Output,USB Audio Adapter ,Laptop/PC ; Software : Jupyter Notebook ,Python ,Librosa ,NumPy & Pandas,Matplotlib & Seaborn ,Scikit-learn , Sounddevice / PyAudio , Windows OS

Details of Papers/patents: No papers or patents were published or filed as part of this project during the Practice School-I period.

However, the project demonstrates potential for further research and development in the field of AI-assisted radar systems, and may lead to publication.

Brief description of the working environment: During my Practice School-I at Military College of Electronics and Mechanical Engineering (MCEME), Secunderabad, I had the opportunity to work in a disciplined and technically stimulating environment. The team at MCEME provided valuable guidance and encouraged independent exploration, which created a balance between mentorship and hands-on learning. The environment promoted collaboration, critical thinking, and problem-solving, all of which were essential for the successful completion of the project.

At the beginning of the internship, I expected to gain exposure to real-world defense technologies, specifically the functioning and application of the Battlefield Surveillance Radar (BFSR). These expectations were not only met but exceeded, as I was given the opportunity to work with actual radar hardware, understand military surveillance systems, and integrate them with machine learning tools.

Throughout the internship, I acquired technical skills such as audio signal processing, Python programming, feature extraction, and machine learning model development. Additionally, I improved my ability to troubleshoot real-time system issues and gained practical experience in working with hardware-software integration.

This experience also enhanced my communication, documentation, and teamwork skills, which are crucial in any professional setting. Overall, the PS-I program provided a strong foundation in

applied research, innovation, and interdisciplinary learning, aligning well with both my academic background and career aspirations.

Academic courses relevant to the project: NA

Learning Outcome: 1.Understanding of BFSR Technology

Gained in-depth knowledge about the working principles, components, and operational use of the Battlefield Surveillance Radar (BFSR) used by the Indian Army.

2.Audio Signal Analysis

Learned how to collect, interpret, and differentiate audio signals generated by radar when detecting various moving targets such as humans, light vehicles, and heavy vehicles.

3.Preprocessing Techniques

Applied audio preprocessing methods such as noise removal, normalization, and spectrogram generation to prepare raw radar signals for analysis.

4.Feature Extraction and Classification

Understood how to extract meaningful features from radar audio data and use them to train machine learning models for target classification.

5.Python Programming & Machine Learning

Enhanced programming skills in Python and gained hands-on experience in implementing machine learning models using libraries such as scikit-learn, Librosa, and Matplotlib.

6.Live Testing and Evaluation

Conducted live testing with real-time audio inputs, identified practical challenges in signal classification, and assessed model performance based on accuracy and reliability.

7.Problem-Solving and Adaptability

Developed the ability to troubleshoot hardware-software integration issues, such as audio input recognition and prediction mismatches during real-time implementation.

8.Team Collaboration and Communication

Improved collaboration and technical communication skills while working in a team environment, documenting findings, and presenting the project outcomes effectively.

PS-I station: MCEME, Secunderabad

Student

Name: ROHIT KUMAR PATEL .(2023B5A30814P)

Student Write-up:

PS-I Project Title: Mathematical modelling for path navigation

Short Summary of work done: We made a navigation module using dijkstra and Astar algorithm for a UAV

Objectives of the project: Model the graph based algorithms, develop and simulate the algorithms.

Tool used: ROS2, tortoise bot, vscode, wsl ubuntu

Details of Papers/patents: N/A

Brief description of the working environment: Very good working environment and a good place to learn skills with discipline

Academic courses relevant to the project: N/A

Learning Outcome: ROS2, PATH PLANNING ALGORITHMS

PS-I station: MCEME, Secunderabad

Student

Name: KANDLA JHA(2023B5A30954G)

Student Write-up:

PS-I Project Title: Design a large antenna array for a chosen frequency

Short Summary of work done: We basically deisgned a single antenna first using HFSS. We decided to go with micropatch antenna. We did literature review first and found out about fractal antennas. We then designed a array of 8×8 using the signle antenna we designed.

Objectives of the project: To learn how to design antennas and use various softwares related to it. Also learn antenna array theory

Tool used: Hfss, matlab and cst.

Details of Papers/patents: We are planning to write a paper and submit it to IEEE. Paper has been written. We will now submit it.

Brief description of the working environment: Pretty good. Very flexible. The people there are helpful and good. I got more than I expected. Did not expect a paper as an outcome. I learnt 3 new softwares which is good.

Academic courses relevant to the project: Emt 1, Emt2 , Es

Learning Outcome: Learnt antenna theory. Learnt Matlab and HFSS. Learnt how different antennas are useful in different places.

PS-I station: MeitY Startup Hub(MSH), New Delhi

Student

Name: ABHIGYAN PRAKASH SRIVASTAVA .(2023AAPS0233H)

Student Write-up:

PS-I Project Title: Data Curation and Analysis of MeitY Startup Hub schemes in boosting India's Startup Ecosystem

Short Summary of work done: Under MSH, I monitored and prepared reports on how startups were performing, how accelerators are helping particular startups, etc. I also attended collaboration meetings of MSH with Google, Microsoft, Maruti, L&T Semiconductors, etc and prepared documents for these collaborations.

Objectives of the project: The project focused on startup ecosystem data curation under the SAMRIDH scheme and strategic collaboration analysis with corporates like Google, Maruti Suzuki, and L&T Semiconductors. The first phase dealt with evaluating startup performance

data, while the second focused on insights from partnership programs aimed at AI skilling, mobility innovation, and semiconductor enablement.

Tool used: MS Excel

Details of Papers/patents: Nil

Brief description of the working environment: MSH inaugurated a new office in Noida which was very spacious and has all necessary facilities. MSH is great for getting exposure to corporate companies and startups. We got to see how startups are monitored, how they are funded, how big corporates like Google, microsoft, etc collaborate with government bodies to create schemes.

Academic courses relevant to the project: NA

Learning Outcome: Understood how public-private collaborations in innovation ecosystems are evaluated and executed.

Learned how government schemes are implemented, monitored, and documented in real-time.

PS-I station: Mitsubishi Electric India Private Limited - R&D, Pune

Student

Name: YASH AGRAWAL .(2023A3PS0306P)

Student Write-up:

PS-I Project Title: Function Block Debugging and Data Communication Validation in Mitsubishi iQ-F Series DB Setting Tool Using Wireshark and Cross-Platform Monitoring with iQ-R Series

Short Summary of work done: Investigated a critical data truncation issue in Mitsubishi iQ-F PLC modules where database select operations retrieved only 32 characters instead of the full 50-character data, despite successful insertion and updates. Conducted comparative analysis with iQ-R modules using Wireshark for network packet analysis, implemented ladder logic programming with various instruction sets, developed custom function blocks for database operations, and configured hardware setups including ADC conversion systems. The analysis

identified the issue within the OPEN function block implementation and provided recommendations for resolution through custom function block development and alternative implementation strategies.

Objectives of the project: Investigate data communication inconsistencies between Mitsubishi iQ-F and iQ-R PLC modules in database operations Analyze function block operations (open, close, insert, update, select, status) for SQL database integration Identify and resolve the data truncation issue where iQ-F retrieves only 32 characters instead of 50 during select operations Compare network traffic between iQ-R and iQ-F using Wireshark for detailed packet analysis

Tool used: SW - GXWorks3, Codesys, MES Interface Tool, DB Setting Tool; HW - MES iQ-R module and iQ-F CPU

Details of Papers/patents: NA

Brief description of the working environment: Working environment was encouraging and was very friendly, everyone is happy to help you with your doubts, no matter how silly they, there is also some flexibility in working hours. When I started my internship, orientation was upto to my expectation and also the project I was assigned to was very helpful to me from learning perspective, I was able to learn new languages (ST and Ladder programming) and many more things.

Academic courses relevant to the project: Microprocessor Interfacing (MuP)
Computer Programming (CP)

Learning Outcome: Hands-on experience with PLC programming using ladder logic and ST programming
Proficiency in various instructions (MOV, FMOV, BMOV, PLS, SET, RESET)
Custom function block development and implementation
Hardware setup and configuration of iQ-R and iQ-F modules
Network protocol analysis using Wireshark
Database connectivity through ODBC and SQL integration
ADC conversion system implementation with barometric pressure sensors
Industrial automation system integration and troubleshooting

PS-I station: Mitsubishi Electric India Private Limited - R&D, Pune

Student

Name: SRIJAN MUKHOPADHYAY .(2023A3PS0334P)

Student Write-up:

PS-I Project Title: Mitsubishi iQ-R PLC Client Communication With WS Series Safety PLC via Custom Protocol & SDCL Library Development for iQ- R series PLC.

Short Summary of work done: This project focuses on establishing ethernet communication between iQ-R PLC and Mitsubishi WS Series Safety PLC using custom protocol, with comprehensive network analysis performed through Wireshark. The initial phase involved systematic study of PLC fundamentals and iQ-R architecture, followed by extensive hands-on experience in ladder programming using critical instructions including MOV, PLF, PLS, SET, RESET, etc. Hardware configuration encompassed CPU modules, Ethernet communication interfaces, input/output modules and analog-to-digital conversion modules, culminating in successful implementation of an analog barometric pressure measurement system with precise scaling algorithms. The Modbus TCP protocol was carefully applied between the iQ-R and iQ-F PLCs in order to understand the concept of communication between two PLCs. This involved a thorough examination of frame structures, function codes, and register mapping descriptions. Comprehensive testing of read coil, discrete input, and input register operations was part of the communication validation process. Wireshark packet analysis and protocol validation were used to thoroughly verify query-response. This methodical approach using Modbus TCP as a preparatory protocol provides crucial practical experience and technical foundation necessary for successfully implementing the target custom protocol communication system. During the latter half of the 8-week period, comprehensive study was conducted on WSO GETH and WSO CPU0 module manuals to understand hardware specifications and protocol development potential. This study resulted in the identification and documentation of 21 distinct protocols suitable for implementation. An Estimated Specification Document (ESD) was subsequently prepared and released to MELCO Japan for further evaluation and development planning.

Objectives of the project: This project focuses on establishing ethernet communication between iQ-R PLC and Mitsubishi WS Series Safety PLC using custom protocol, with comprehensive network analysis performed through Wireshark. The initial phase involved systematic study of PLC fundamentals and iQ-R architecture, followed by extensive hands-on experience in ladder programming using critical instructions including MOV, PLF, PLS, SET, RESET, etc. Hardware configuration encompassed CPU modules, Ethernet communication interfaces, input/output modules and analog-to-digital conversion modules, culminating in successful implementation of an analog barometric pressure measurement system with precise scaling algorithms. The Modbus TCP protocol was carefully applied between the iQ-R and iQ-F PLCs in order to understand the concept of communication between two PLCs. This involved a thorough examination of frame structures, function codes, and register mapping descriptions.

Comprehensive testing of read coil, discrete input, and input register operations was part of the communication validation process. Wireshark packet analysis and protocol validation were used to thoroughly verify query-response. This methodical approach using Modbus TCP as a preparatory protocol provides crucial practical experience and technical foundation necessary for successfully implementing the target custom protocol communication system. During the latter half of the 8-week period, comprehensive study was conducted on WS0 GETH and WS0CPU0 module manuals to understand hardware specifications and protocol development potential. This study resulted in the identification and documentation of 21 distinct protocols suitable for implementation. An Estimated Specification Document (ESD) was subsequently prepared and released to MELCO Japan for further evaluation and development planning.

Tool used: Mitsubishi GXWorks3, WireShark, Setting and Monitoring tool- S/W ;H/W- iQ-R PLC R08CPU ,RJ71EN71,R61P,I/O modules, WS0 GETH Module, WS0CPU0 Module, iQF (FX5CPU)

Details of Papers/patents: Made the Estimated Specification Document (ESD) for WS0-GETH Ethernet Interfacing Module along with Protocol List which was sent to Mitsubishi Electric Corporation (MELCO), Japan.

Brief description of the working environment: PS-I Experience Description

Working Environment

The working environment embodied authentic Japanese work culture characterized by meticulous attention to detail, collaborative teamwork, and continuous improvement principles. The workplace fostered a culture of respect, punctuality, and systematic approach to problem-solving. Colleagues demonstrated exceptional dedication to quality and precision, creating an atmosphere conducive to learning and professional growth. The hierarchical yet supportive structure enabled effective knowledge transfer while maintaining clear communication channels.

Company Expectations

My expectations from the company were fully met and exceeded in several aspects. I anticipated gaining hands-on experience with industrial automation systems, which was comprehensively fulfilled through direct involvement in PLC programming and communication protocol implementation. The company provided structured learning opportunities, access to advanced software tools like GX Works3, and exposure to cutting-edge automation technologies. The balance between guided mentorship and independent project work aligned perfectly with my learning objectives.

Learning Outcomes

The learning experience encompassed comprehensive technical and professional development. I mastered Mitsubishi PLC programming using GX Works3, gained proficiency in ladder logic programming, and developed expertise in hardware configuration including ROXCPU processors, I/O modules, and Ethernet communication systems. Understanding Modbus TCP protocols and utilizing Wireshark for network analysis significantly enhanced my troubleshooting capabilities. The project culminated in successfully implementing inter-PLC communication between iQ-R and WS series safety PLCs using WS communication protocols. Beyond technical skills, I developed crucial professional competencies including systematic

documentation, project management, and effective communication within a multicultural corporate environment that included communicating with Japanese counterparts

Academic courses relevant to the project: Microprocessor & Interfacing, Communication Networks

Learning Outcome: This report demonstrates the successful establishment of a comprehensive foundation for industrial PLC communication through systematic implementation of hardware configuration, programming proficiency, and protocol development. The methodical approach encompassing iQ-R PLC architecture mastery, ladder programming expertise, and practical analog device integration provided essential hands-on experience with industrial automation systems. The strategic implementation of Modbus TCP protocol between iQ-R and iQ-F PLCs, coupled with thorough network analysis using Wireshark, demonstrated effective data transfer utilizing multiple function codes while validating communication reliability and error handling mechanisms. The development of an SDCL library using the MELCO Japan template facilitated structured organization of communication parameters, packet classification, and response handling, establishing a robust foundation for advanced protocol development.

The comprehensive analysis of the WSO-GETH Ethernet Interface Module revealed sophisticated communication capabilities through structured telegram-based protocols supporting both polling and auto-update modes. The module's systematic data organization, with clearly defined byte-level mapping for operational parameters and diagnostic information, ensures reliable and deterministic behavior essential for industrial automation applications. The creation of a detailed Protocol List encompassing 21 distinct protocols and the subsequent Estimated Specification Document (ESD) for the WS Series PLC provides a complete framework for implementing secure and efficient communication between iQ-R and WS Series Safety PLCs. This systematic progression from fundamental PLC concepts to complex safety protocol implementations, supported by rigorous validation methodologies and comprehensive documentation, establishes the necessary technical competence and practical experience required for successfully deploying custom communication protocols in safety-critical industrial environments.

Softwares used were Mitsubishi GXWorks3, WireShark, Setting and Monitoring tool.

PS-I station: Mitsubishi Electric India Private Limited - Service Gurgaon, Gurgaon

Student

Name: SANKALP TATTWADARSHI SWAIN .(2023AAPS0769P)

Student Write-up:

PS-I Project Title: Revamping MEI's CRM, AI And Analytics

Short Summary of work done: built an AI diagnostic tool, analysed call volume data, reviewed service workflows

Objectives of the project: To review service workflows and improvise CRM systems

Tool used: ollama and mistral for AI dev, Excel for data analytics

Details of Papers/patents: None

Brief description of the working environment: proper corporate working environment, mentor gives adequate amount of time and guidance

Academic courses relevant to the project: NA

Learning Outcome: On ground implementation visualisation

PS-I station: National Centre for Polar and Ocean Research (NCPOR) - Deciphering the Dynamics, Goa

Student

Name: HARSHIL DEVANG SALVI(2023A3PS0177G)

Student Write-up:

PS-I Project Title: deciphering of dynamics

Short Summary of work done: we collected the data from the satellites for chl-a in the regions near antarctic ocean and found the missing data points using various methodologies as some data is not seen because of the clouds and different parameters.

Objectives of the project: -

Tool used: python, grads

Details of Papers/patents: -

Brief description of the working environment: the working environment was nice and had good space to work . Expectation was that they would give us an electronics project instead of an ML.

Academic courses relevant to the project: yes

Learning Outcome: AI/ML and python and grads

PS-I station: National Centre for Polar and Ocean Research (NCPOR) - Deciphering the Dynamics, Goa

Student

Name: ADITYA SRIVASTAVA(2023AAPS0620G)

Student Write-up:

PS-I Project Title: Gap-filling method for chlorophyll-a and sea surface temperature satellite data in the southern ocean and EOF analysis

Short Summary of work done: We basically had to download chlorophyll-a satellite data and fill gaps in the dataset, which was caused by cloud cover. After trying multiple algorithms, Data Interpolating Empirical Orthogonal Functions (DINEOF) worked best in this case. After that, we downloaded sea surface temperature (SST) datasets from NASA and evaluated the correlation matrix between the principal components of both the datasets.

Objectives of the project: To fill gaps in chlorophyll-a satellite data and carry out empirical orthogonal function (EOF) analysis between sea surface temperature (SST) and chlorophyll-a data in order to determine the spatial and temporal correlations between the datasets.

Tool used: OpenGrADS, Python, Matplotlib, Numpy

Details of Papers/patents: None

Brief description of the working environment: The working environment was flexible, there were no strict reporting or leaving times. We were required to regularly update our mentor on the progress we made. The project was strictly data analysis and we learnt the techniques and methods for analysing geospatial data and calculating correlations between different natural parameters.

Academic courses relevant to the project: Computer Programming

Learning Outcome: How to fill gaps in geospatial datasets, interpretation of EOF analysis results, analysis and plotting via Python

PS-I station: National Centre for Polar and Ocean Research (NCPOR) - Deciphering the Dynamics, Goa

Student

Name: YUGANDHAR SANDIP PATIL(2023AAPS1064G)

Student Write-up:

PS-I Project Title: Chlorophyll-A and SST data filling techniques and EOF analysis.

Short Summary of work done: Download large dataset from NASA and ISRO website for daily chlorophyll-A and SST in Aghulas region . Lot of missing data due to cloud cover and ice. Analyze best interpolating algorithm for both dataset. (random Forest, Linear regression, DINEOF etc), after finding most suitable method by comparing deviations and graph clarity, find correlation between different parameters to predict chlorophyll-A concentration.

Objectives of the project: To interpolate missing data in satellite images and then find their correlations.

Tool used: OpenGrads, MATLAB, Python , .nc environment apps

Details of Papers/patents: NA

Brief description of the working environment: For such important research institute the workstations and other hardware are old. Campus of NCPOR is really good. It has mess , where you can have lunch. Our project scientist was really cool, helped us a lot throughout the project. But the staff is little non cooperative specially IT staff, took us more than 10 days to get 3 workstations running.

Scientist expect proper research work, projects are not that challenging but require lot of time due to huge dataset.

But the project is completely relevant for IT and CS, they had mentioned Electrical domain at top on PSMS , all of my team(BITS) was from electrical background, but it was made clear to us on 1st day that they do not have any electrical project.

Academic courses relevant to the project: NA

Learning Outcome: Machine learning algorithms, Large dataset handling in python and OpenGrads

PS-I station: National Institute of Electronics and Information Technology [NIELIT], Patna

Student

Name: SUPRIYA PRIYADARSHNI(2023A7PS0477G)

Student Write-up:

PS-I Project Title: Anomaly Detection using Artificial Intelligence

Short Summary of work done: During my PS-I at NIELIT, I worked on a project related to anomaly detection using deep learning. My main tasks included understanding the dataset and converting it into YOLO format for training object detection models. I also attended Python

classes, where I learned about functions, loops, Pandas, and Matplotlib. I got basic exposure to PyTorch and how it is used to train models. Overall, I gained hands-on experience with data handling, simple coding, and the initial steps of working with AI models.

Objectives of the project: To detect anomalies using deep learning techniques. To prepare and convert the dataset into a suitable format for training object detection models. To explore and understand modern AI models like YOLO for real-time detection tasks.

Tool used: Python, YOLO model, Pytorch

Details of Papers/patents: NA

Brief description of the working environment: During my PS-I at NIELIT, I had a great learning experience in a supportive environment. Our station mentor Ankit Sir was very helpful and guided us throughout the project with patience and clarity. Sunil Sir also provided valuable insights and made the sessions more interactive and engaging. We attended regular classes on AI and Python, which helped us understand the basics and apply them in our project. Overall, the mentors were approachable, and the learning atmosphere was very encouraging.

Academic courses relevant to the project: yes

Learning Outcome: Learned how to handle and convert datasets for training deep learning models. Gained basic knowledge of Python, including Pandas, Matplotlib, and PyTorch. Understood the basics of object detection.

PS-I station: National Institute of Electronics and Information Technology [NIELIT], Patna

Student

Name: ANUBHAV JHA .(2023B2A10916P)

Student Write-up:

PS-I Project Title: Audio Fingerprinting

Short Summary of work done: I have worked on audio processing using deep learning models. I have used dejavu fingerprinting for fingerprint library. I used torchaudio for modelling specifically CNNs and used some preprocessing tools.

Objectives of the project: To create robust fingerprints for audio chunks for the identification of original audio.

Tool used: Nvidia GPU, Pytorch, Google ADK, HuggingFace, Dejavu fingerprint,

Details of Papers/patents:

https://dspace.lib.ntua.gr/xmlui/bitstream/handle/123456789/59099/Nikou_DSML_Thesis.pdf?sequence=1&isAllowed=y

Brief description of the working environment: Working environment was decent, officials were supportive in the learning process. Hardware and software prerequisites were mostly available to use. Very enthusiastic mentor for working on diverse projects. Environment was more like an educational institution rather than a corporate which was good for technical exploration. I explored in audio processing using deep learning methods which was very new for me. Regular project discussions were conducted which helped in faster and early debugging.

Academic courses relevant to the project: BITS F464(Just for intro of machine learning)

Learning Outcome: Deep Learning concepts , learnt concepts of pytorch specifically torchaudio and signal analysis.

PS-I station: NRLDC-National Regional Load Despatch Center, Grid-India, Delhi

Student

Name: YASHANSHI SAJWAN .(2023B4A71029P)

Student Write-up:

PS-I Project Title: EXPERIMENTING WITH DEEP LEARNING MODELS FOR TIME-SERIES BASED ELECTRICITY DEMAND FORECASTING IN THE NORTHERN REGION

Short Summary of work done: The core objective of my project was to predict future electricity demand based on historical time series data. I began by developing an understanding of the fundamentals of machine learning and neural networks, with a focus on Long Short-Term Memory (LSTM) networks, which are particularly effective for sequential data. Alongside LSTMs, I also explored traditional forecasting models such as ARIMA and Prophet to compare their performance and understand their appropriate use cases. Through extensive experimentation, I learned how different models handle seasonality, trends, and temporal dependencies in electricity demand data. I performed feature engineering—using techniques like Fourier transforms and lag features—to capture important patterns and improve forecast accuracy. I trained and evaluated these models using performance metrics such as RMSE and MAPE. As a final step, I developed an interactive dashboard that displays forecasted electricity demand for all nine states, allowing for easy visualization and comparison.

Objectives of the project: The goal was to make a deep learning or statistical model to predict the electricity demand values across 9 states and Union Territories.

Tool used : Python, PyTorch, NumPy, Pandas, Scikit-learn, Matplotlib, Jupyter Notebook

Details of Papers/patents: None

Brief description of the working environment: The working environment during PS-I was relaxed. Most of the learning was self-paced, and I mostly had to explore things on my own. However, the mentors would clear our doubts if we had any.

Academic courses relevant to the project: None

Learning Outcome: I gained a strong foundation in machine learning and neural networks, understanding how models learn from data; explored time series prediction in depth, learning how to handle sequential data and build forecasting models. Additionally, I developed skills in feature engineering, applying techniques to enhance model performance.

PS-I station: Rajasthan Solar Association, Jaipur

Student

Name: VEDANT GOYAL .(2023AAPS0232H)

Student Write-up:

PS-I Project Title: Emerging trends in Electric Vehicles and Battery Energy Storage Systems

Short Summary of work done: At the start of my PS, I was instructed to prepare a study on the differences between Electric Vehicles (EVs) and Internal Combustion Engine Vehicles (ICEVs), with a specific focus on the factors that contribute to EV adoption. This formed the core of my work throughout the PS period. Alongside this research, I also engaged in some technical learning related to EV mechanisms and basic electrical circuits to strengthen my understanding of the underlying technologies. However, I was not taken on any field visits during this period.

Objectives of the project: Creating a Comparison between the automobile market of Electric Vehicles and Internal combustion engine vehicles

Tool used: Microsoft Word, Microsoft PowerPoint, Adobe Acrobat, Google

Details of Papers/patents: None

Brief description of the working environment: The working environment during my PS was very friendly and inclusive. Everyone at the company made me and my peers feel welcome, and at no point did we feel out of place. I truly enjoyed the supportive and professional atmosphere they created and provided throughout the duration of my PS.

Academic courses relevant to the project: Signals and Systems, Communication Systems

Learning Outcome: Automobile market, Innovation in Battery Technology, Market factors leading to increased EV adoption

PS-I station: Rajasthan Solar Association, Jaipur

Student

Name: SNEHA DALAL(2023B5TS1241P)

Student Write-up:

PS-I Project Title: Renewable Energy Finance and Public Relations

Short Summary of work done: At first I studied about the basics of solar panels and solar energy so that I could relate it to my main project later. Then I studied some important government schemes like PM- KUSUM , PM Surya Ghar Muft Bijli Yojana and Rajasthan Renewable energy policy 2023. Then I studied about the Rajasthan's potential in solar and wind energy area and installed capacity. After that I moved onto studying some costing systems like cost of different components of solar panel. Then I did a comparative study of Rajasthan , Andhra Pradesh, Gujarat, Maharashtra , Tamil Nadu. And then I studied where does Rajasthan stand in National Framework. And at last I studied where does India and Rajasthan stand internationally.

Objectives of the project: Objective of the project was to see how much work is being done in Rajasthan and other states of India. And how much potential does India have in terms of solar and wind energy and where does India stand globally.

Tool used: This was a Research based project so I mostly used sites like MNRE and IRENA and used google sheets for making graphs.

Details of Papers/patents: I didn't use many research papers or patents . I used sites like MNRE, IRENA for data and google sheets for making graphs.

Brief description of the working environment: The working environment was very nice, healthy and supportive. Specially company mentor and CEO of the company were very supportive, they guided us very nicely.

Academic courses relevant to the project: This was Finance project. But as such no specific course was needed.

Learning Outcome: Major learning outcomes are that Rajasthan is the leading state in India in the area of Renewable energy and India is also doing a commendable job in this sector. But still China is the leading country but take away is that India has the potential and if India takes the right steps then it will become leader in renewable energy sector.

PS-I station: Raman Research Institute, Bengaluru

Student

Name: GIRIDHAR A N(2023A8PS0522G)

Student Write-up:

PS-I Project Title: Simulation of ADC and FFT-based correlator in Python/MATLAB

Short Summary of work done: One of three projects I had, we started off by learning up most of the things I mentioned above and then went on to simulating our ideal model, once we were done with that we plotted and calculated some of the parameters from existing data of an on-board ADC, alongside which we implemented the whole digital signal processing pipeline on an FPGA board (Red Pitaya)

Objectives of the project: Modelling of Flash ADC Architecture, Split FFT algorithm and Auto/Cross Correlation with finite word effects as would be implemented on Hardware (RFSoc)

Tool used: Python/MATLAB for simulation

Details of Papers/patents: We wrote reports for each individual project

Brief description of the working environment: Work environment is very welcoming and research staff are always open to any doubts and questions. Project is little demanding in terms of learning curve for a 2nd year student so it is a bit difficult to find time for other work, they expect discipline and constant learning mindset. Overall fantastic place to learn and gain exposure to electronics for research.

Academic courses relevant to the project: Digital Design, Computer Programming, Signals and Systems

Learning Outcome: Python/MATLAB (numpy, matplotlib, scipy/Signal Processing toolbox), Working of Flash ADC and its parameters (SNR, SINAD, ENOB etc), Split M*N FFT algorithms, Auto and Cross correlation of signals, effects of quantization errors and finite word implications when using hardware for real-time signal processing.

PS-I station: Regional Remote Sensing Centre, Jodhpur, Jodhpur

Student

Name: JAYESH SANJAY PAREEK(2023A3PS0191G)

Student Write-up:

PS-I Project Title: SPATIO TEMPORAL ASSESSMENT OF DESERTIFICATION USING SPECTRAL FEATURE SPACE MODEL

Short Summary of work done: In this project, I worked on analyzing vegetation and surface reflectance characteristics using satellite data through the Google Earth Engine (GEE) platform. The main objective was to explore the relationship between Normalized Difference Vegetation Index (NDVI) and Albedo to compute a derived index known as the Drought Detection Index (DDI). I began by importing NDVI and Albedo raster images and scaling them appropriately. A mask was applied to filter out invalid pixels (e.g., $NDVI \leq 0$). To ensure representative sampling, I implemented both random and stratified sampling techniques, selecting approximately 5.1 million pixels across the area of interest. Stratified sampling was done by dividing NDVI into 10 classes to achieve better spatial distribution. I then created scatter plots of NDVI versus Albedo to visually inspect the relationship. A linear regression model was fitted using the sampled data to derive the DDI formula, where DDI was calculated as a function of NDVI and Albedo. Using this formula, I generated a pixel-wise DDI raster image across the study region. Throughout the project, I learned to handle large datasets efficiently in GEE, perform statistical sampling, visualize patterns through scatter plots, and export results for further analysis. The project demonstrates a successful integration of remote sensing, cloud-based geospatial analysis, and machine learning principles to monitor drought-related indicators at a large scale.

Objectives of the project: to identify the desertification patterns in 12 districts of Rajasthan

Tool used: Google Earth Engine, JavaScript API, MODIS Satellite Data, Google Drive, Python, Matplotlib, Scikit-learn, GDAL.

Details of Papers/patents: none

Brief description of the working environment: My work environment was highly supportive, collaborative, and focused on learning and skill development. I worked primarily on the Google Earth Engine (GEE) platform, which provided a powerful cloud-based environment for processing and analyzing large geospatial datasets. The tasks were research-driven, encouraging me to explore remote sensing concepts such as NDVI, Albedo, and drought monitoring through real satellite data.

I had the opportunity to write JavaScript code in GEE to perform image stacking, masking, sampling, and visualization, which deepened my understanding of satellite data processing. I was also encouraged to analyze data outside GEE using Python, enabling me to learn tools like Matplotlib and Scikit-learn for visualization and regression modeling.

The guidance I received was constructive, and problem-solving was highly encouraged. I was able to ask questions freely, experiment with different approaches (e.g., stratified vs. random sampling), and explore how changes in data handling impacted outcomes. This hands-on environment enhanced both my theoretical knowledge and technical capabilities.

Overall, the environment was conducive to learning, provided access to modern tools, and offered practical exposure to remote sensing and geospatial analysis workflows, making the experience both educational and professionally enriching.

Academic courses relevant to the project: Digital Signal Processing, Image Processing, Control Systems, Probability and Statistics, Linear Algebra, Electromagnetic Theory, Microprocessors and Embedded Systems, Computer Programming, Data Structures and Algorithms, Machine Learning.

Learning Outcome: Gained expertise in using Google Earth Engine for satellite image analysis, stratified sampling, NDVI-Albedo modelling, and applying regression techniques for large-scale spatial data interpretation.

PS-I station: Regional Remote Sensing Centre, Jodhpur, Jodhpur

Student

Name: PALAK SADAWAT(2023B2A31242G)

Student Write-up:

PS-I Project Title: Semantic Segmentation of VHRS Data for Horticultural plantation type extraction Using Deep Learning techniques

Short Summary of work done: During my PS-I internship at RRSC Jodhpur, I worked on the semantic segmentation of very high-resolution satellite imagery for identifying horticultural plantations. The core objective was to develop and compare deep learning models capable of accurately segmenting crops such as date palms and pomegranate. I began by implementing a baseline U-Net model for both binary and multiclass segmentation tasks. To address the prevalent issue of class imbalance—where pomegranate and background pixels were underrepresented compared to date palm pixels—I introduced class-weighted loss functions into the U-Net architecture. Building on this, I explored transformer-based architectures by implementing SegFormer-B0, a modern model known for its efficiency and performance on segmentation tasks. Model training and experimentation were carried out using Python, PyTorch, and supporting libraries like HuggingFace Transformers. I utilized GPU-enabled systems for accelerated processing. High-resolution .tif satellite imagery provided by RRSC was preprocessed using geospatial libraries such as GDAL. The models were evaluated using metrics like accuracy, mean Intersection over Union (mIoU), and loss. A detailed comparative analysis was conducted to assess the strengths and weaknesses of each approach. In addition to technical development, I improved my coding, presentation, and communication skills, and gained insights into organizational workflows, servers, datasets, and tools such as NAViG. This project not only enhanced my technical proficiency but also deepened my understanding of how remote sensing and AI can support precision agriculture in India.

Objectives of the project: The objective of this project was to develop and compare deep learning models for semantic segmentation of VHRS imagery to identify horticultural crops like pomegranate and date palm

Tool used: Hardware (H/w): GPU-enabled workstation with NVIDIA GPUs for faster model training High-resolution .tif satellite imagery from RRSC Jodhpur Software (S/w): Languages/Frameworks: Python 3.9, PyTorch 2.6, HuggingFace Transformers, Torchvision, Geospati

Details of Papers/patents: None

Brief description of the working environment: The working environment at RRSC Jodhpur was professional, collaborative, and intellectually stimulating. As interns, we were given the freedom to explore, ask questions, and experiment with ideas, while also being guided by experienced mentors. The atmosphere encouraged both independent learning and teamwork, creating a healthy balance of structure and flexibility. Regular check-ins and group discussions fostered a sense of accountability and motivation, while also helping us refine our communication and presentation skills.

The organization expected us to be proactive, self-motivated, and open to learning new technologies and concepts. Emphasis was placed on research-oriented thinking, maintaining discipline, and producing meaningful outputs in alignment with real-world applications. We were encouraged to deep-dive into unfamiliar domains such as remote sensing, AI/ML, and geospatial data processing, and to apply these to practical challenges like horticultural crop segmentation.

Throughout PS-I, I gained hands-on experience with deep learning models, geospatial tools, and high-resolution satellite data. I also improved my coding proficiency, learned to use AI-based development tools, and developed an understanding of data augmentation, model evaluation, and infrastructure like servers and firewalls. Exposure to NAViG and insights into India's space-tech ecosystem enriched my perspective. Beyond technical skills, I learned the importance of professionalism, time management, collaboration, and adaptability in a research-driven organizational setup. Overall, the experience was transformative, laying a solid foundation for both academic and career growth.

Academic courses relevant to the project: Computer Programming(CS-F111)

Learning Outcome: The PS-I program has been a truly enriching experience. As someone new to the domains of remote sensing, image segmentation, and AI/ML/DL, I gained a strong foundational understanding of these fields, including model training and testing processes. I improved my coding skills, explored AI-assisted development tools, and learned to create impactful presentations using Canva. The program also helped me grow personally—enhancing my communication, confidence, and time management, while also teaching me the importance of work-life balance. I gained valuable exposure to the technical infrastructure at RRSC, including insights into firewalls, servers, and platforms like NAViG. Engaging in discussions on space and technology broadened my perspective on India's future in these fields and gave me a deeper understanding of how large scientific organizations operate.

PS-I station: Regional Remote Sensing Centre, Jodhpur, Jodhpur

Student

Name: GARV JINDAL .(2023B3A70995P)

Student Write-up:

PS-I Project Title: Semantic Segmentation of Horticulture Plantation using VHRS satellite data.

Short Summary of work done: During my Practice School at RRSC Jodhpur (ISRO), I worked on semantic segmentation of high-resolution RGB satellite imagery to map pomegranate and date palm plantations for precision agriculture. I developed a custom PyTorch pipeline with data preprocessing (GDAL), label remapping, and augmentations, and trained U-Net and SegFormer-

B0 models using Focal + CrossEntropy loss and multi-GPU setups. Comparative analysis showed SegFormer-B0 provided superior boundary detection and generalization over U-Net. The project demonstrated the potential of transformer-based models for accurate, scalable crop mapping, supporting ISRO's efforts in AI-driven agricultural monitoring.

Objectives of the project: To learn and apply Machine Learning.

Tool used: hardware- Nvidia p400 GPU software- ArcGIS, QGIS, Jupyter Notebook.

Details of Papers/patents: No

Brief description of the working environment: Good.

Academic courses relevant to the project: ML

Learning Outcome: Machine Learning

PS-I station: Semi-Conductor Laboratory (SCL), Mohali, Punjab, Mohali

Student

Name: ARIN SAMANT .(2023A3PS0325P)

Student Write-up:

PS-I Project Title: DEVELOPMENT OF AN AUTOMATED LABVIEW-BASED TEST FRAMEWORK FOR GAN-FET AND PVM STRUCTURES' CHARACTERIZATION

Short Summary of work done: During my Practice School-I at the Semi-Conductor Laboratory (SCL) Mohali, I developed a comprehensive automated LabVIEW-based test framework for the electrical characterization of Gallium Nitride (GaN) FET and PVM structures. The project involved integrating the Cascade Summit 12K wafer prober with Keysight B2902A Source Measure Units (SMUs) via VISA/TCP-IP protocols to execute semi-automated parametric tests, including resistance measurement (2-wire and 4-wire modes), transfer characteristics, output characteristics, and forward characteristics. In addition to core test automation, I designed and implemented advanced features such as precise SMU synchronization for time-aligned

measurements, hysteresis analysis for charge trapping effects, pulsed testing to study dynamic device behavior, selective data logging for efficient analysis, automatic file header generation for traceability, and real-time custom graph plotting. These developments improved measurement accuracy, reduced manual intervention, and enhanced flexibility in semiconductor testing workflows.

Objectives of the project: Designing LabVIEW test patterns for resistance, transfer, output, and forward characteristics. Implementing new features like SMU syncing, hysteresis measurement, pulse testing, selective logging, automatic file headers, and custom real-time plotting. Using VISA/TCP-IP protocols to control instruments programmatically.

Tool used: LABVIEW, Cascade Summit 12K wafer prober , Keysight B2902A SMUs

Details of Papers/patents: can't share

Brief description of the working environment: The Semi-Conductor Laboratory (SCL) Mohali provided a highly technical, research-oriented environment focused on semiconductor fabrication and testing. Collaboration with experienced scientists and engineers fostered a culture of learning, innovation, and precision, where adherence to standard operating procedures, safety protocols, and accuracy in measurement was paramount.

Academic courses relevant to the project: Electronic devices, Microelectronic circuits

Learning Outcome: GaN HEMT, LABVIEW, handling SMUs and prober

PS-I station: Shalaka Connected Devices LLP, Pune

Student

Name: SHUBH MISHRA(2023A3PS0208G)

Student Write-up:

PS-I Project Title: IoT Based Livestock Monitoring System

Short Summary of work done: Initially they gave us a week for training wherein we learnt how to use ESP32 and STM32 microcontrollers along with different sensors. Then we started with the project which was divided into 2 phases. The first phase included interfacing the sensors with ESP32 and the second dealt with making it industry ready by managing power, integrating battery and testing. The work was done on the software and hardware used in the industry.

Objectives of the project: Our goal was to make a device that can monitor the health of cattle in real time using an industry level microcontroller(ESP32) and sensors. The device was supposed to be completely made by us from scratch and was made for a real client.

Tool used: EspressifIDE, ESP32, STM32, STM32CubeIDE, temperature sensor, pulse monitor, timer and accelerometer

Details of Papers/patents: NA

Brief description of the working environment: The work environment is excellent. Our superiors were very friendly and treated us very well. They took us seriously and trained us well. They were very considerate and we enjoyed coming to work.

Academic courses relevant to the project: Microprocessor Programming and Interfacing, Digital Design, and CP

Learning Outcome: We learnt a lot about programming in Embedded Systems and Internet of Things in the industry. Integrating sensors and understanding the working behind each sensor was very critical for the development of the device.

PS-I station: Shalaka Connected Devices LLP, Pune

Student

Name: AADI DESHMUKH .(2023A7PS0094H)

Student Write-up:

PS-I Project Title: Cloud-Based IoT Data Analytics Dashboard and Factory Display System

Short Summary of work done: During my internship at Shalaka Connected Devices LLP, I developed two end-to-end software systems. First, I built a full-stack IoT data analytics dashboard. It simulates sensor data (temperature, humidity, BPM, SPO2, accelerometer), publishes it via MQTT to an EMQX broker, and stores it in MongoDB Atlas via a Flask-based backend. A REST API exposed this data to a dynamic React.js dashboard that offers time-series visualizations, pagination, and filtering. Second, I developed a Factory Display System—a Raspberry Pi-compatible, fullscreen dashboard for displaying production metrics and announcements in real time. It includes an admin portal for configuring multiple display pages without developer input. I integrated an SQLite backend, implemented local state management, and optimized the UI for industrial readability. Both projects were modular, scalable, and deployed using cloud platforms. This experience improved my practical skills in data communication, API design, and production-grade software deployment.

Objectives of the project: To design and implement a real-time IoT data pipeline from simulated sensor devices to a scalable cloud backend. To develop a web-based dashboard that visualizes historical and live sensor data. To create a factory-ready display system with admin-controlled metric and image pages for industrial usage. To ensure deployment readiness, modular architecture, and maintainability.

Tool used: Software: Python, Flask, MongoDB Atlas, Paho MQTT, React.js, Chart.js, Tailwind CSS, SQLite, Netlify, Render

Details of Papers/patents: N/A

Brief description of the working environment: Shalaka Connected Devices LLP provided a technically enriching, self-driven working environment. I was given the autonomy to design and develop project components end-to-end while maintaining regular updates with my mentor, Hrishikesh Kamat. The company expected us to contribute practical, scalable software solutions aligned with their hardware and firmware systems.

This pushed me to follow clean coding practices, document my work professionally, and ensure production-level deployment readiness. I collaborated remotely and was supported with real-time feedback and guidance when needed. Through this internship, I learned how to design modular architectures, integrate cloud-based technologies with embedded systems, and build maintainable UIs tailored for industrial stakeholders. The experience bridged my academic foundation with real-world applications in IoT and embedded systems.

Academic courses relevant to the project: Database Systems,

Learning Outcome: Understood MQTT protocols and cloud integration for real-time IoT data flows. Learned modular system design, RESTful API development, and database schema planning.

PS-I station: Shalaka Connected Devices LLP, Pune

Student

Name: ADITYA NITIN GULLANAVAR(2023A8PS0523G)

Student Write-up:

PS-I Project Title: IoT in Livestock Monitoring system

Short Summary of work done: In this project, I designed and implemented an IoT-based Livestock Health Monitoring Device using the ESP32-WROOM-32D microcontroller. The system integrates multiple sensors — MAX30102 for heart rate and SpO₂, MAX30205 for body temperature, ADXL345 for movement detection, and DS3231 for real-time clock functionality. Sensor readings were taken periodically and stored in RTC memory or NVS to retain data across deep sleep cycles, significantly reducing power consumption. I also implemented a logic to collect multiple readings over 5 boots (each boot lasting ~15 seconds with deep sleep in between), and transmit all data in bulk via MQTT only after the 5th boot, ensuring efficient power and data usage. The project included custom ESP-IDF driver modifications for better power efficiency and reliable data collection, especially for the MAX30102. I also handled Wi-Fi reconnection logic, ensuring that the device reliably connected to the network only when necessary to publish data. Additional logic was added to track boot counts and reset cycles, ensuring the system remained stable and self-correcting over time. The project concludes with a reliable, low-power health monitoring device capable of capturing and transmitting vital livestock data, making it ideal for remote, real-time animal health tracking in agricultural settings.

Objectives of the project: Designing a health monitoring system for cattle.

Tool used: Espressif-IDE, STM32-IDE

Details of Papers/patents: none

Brief description of the working environment: The working environment during my internship was dynamic, tech-focused, and highly collaborative. I worked independently on most tasks but also received guidance when needed, which helped me grow both technically and professionally. The team encouraged innovation, problem-solving, and ownership of tasks — I was trusted to handle real project responsibilities like sensor integration, low-power design,

and data transmission logic using the ESP32 platform. Regular check-ins and feedback sessions kept the workflow structured and goal-oriented.

From the company, I expected hands-on experience in embedded systems, exposure to real-world IoT applications, and mentorship to improve my technical capabilities. These expectations were fully met. I got to work on a complete project lifecycle — from hardware-level sensor communication to implementing power optimization, deep sleep management, and MQTT-based data transfer. The company also provided flexibility in trying out different approaches, which boosted my confidence in debugging and refining embedded code.

Throughout the internship, I gained deep insights into embedded development using ESP-IDF, I2C/SPI communication protocols, sensor driver customization, and power-efficient IoT system design. I also learned practical skills in memory management, persistent storage using NVS, and structuring data for efficient cloud communication. Beyond technical growth, I improved my time management, project planning, and problem-solving mindset — all crucial skills for a career in embedded systems or IoT development. Overall, it was a highly enriching and practical experience that significantly bridged the gap between academic knowledge and real-world applications.

Academic courses relevant to the project: Learnt industrial standards on designing an embedded system.

Learning Outcome: Learnt how to code in esp32 and stm32 boards and integrate multiple sensors.

PS-I station: Shalaka Connected Devices LLP, Pune

Student

Name: SWAPNIL YADAV(2023A8PS1067G)

Student Write-up:

PS-I Project Title: IoT-based Pipeline Monitoring System

Short Summary of work done: We designed and implemented a Wi-Fi and MQTT-based pipeline monitoring system that continuously collects data from sensors such as pressure, temperature, and vibration. The sensor data is transmitted to an MQTT broker and visualized

on a dashboard for real-time monitoring. Fault detection logic was added to identify anomalies and provide timely alerts, ensuring safe and reliable pipeline operation.

Objectives of the project: The project aims to design and implement a Wi-Fi and MQTT-based pipeline monitoring system that collects real-time data from sensors (such as pressure, temperature, and vibration) and transmits it to a central server or dashboard. This enables early detection of anomalies, reduces downtime, and ensures safe and efficient pipeline operation through continuous monitoring and timely alerts.

Tool used: Hardware: ESP32 microcontroller, timestamp sensor, temperature sensor, motion sensor, power supply. Software/Platforms: ESP IDE (for coding), MQTT Broker . Protocols: Wi-Fi for connectivity, MQTT for publish/subscribe communication.

Details of Papers/patents: N/A

Brief description of the working environment: The working environment during the internship was collaborative and supportive, providing ample opportunities for learning and skill development. I had access to necessary resources and guidance from mentors, which helped me understand both technical and practical aspects of project execution. Regular discussions and feedback sessions encouraged problem-solving and innovation, while the overall environment promoted teamwork, discipline, and professional growth.

Academic courses relevant to the project: Microprocessors and Interfacing, Digital Design

Learning Outcome: Through this project, we gained hands-on experience in designing a complete IoT-based monitoring system, starting from sensor interfacing and real-time data acquisition to transmitting information over Wi-Fi using the MQTT protocol. We learned how to integrate multiple sensors, visualize data on a dashboard, and implement basic fault detection for preventive maintenance. Additionally, the project enhanced our understanding of embedded system design, communication protocols, and cloud connectivity, while also improving our skills in problem-solving, teamwork, and project execution.

PS-I station: Shalaka Connected Devices LLP, Pune

Student

Name: VINIT VINOD VIBHUTE(2023AAPS0616G)

Student Write-up:

PS-I Project Title: IoT based Pipeline Monitoring System

Short Summary of work done: I developed an IoT-based pipeline monitoring system using ESP32, AHT10 (temperature/humidity sensor), MPU6500 (vibration sensor), and DS3231 (RTC). The system collects sensor data periodically, formats it into JSON, and transmits it wirelessly using MQTT and LoRa. I implemented power-saving features using deep sleep modes and synchronized time using NTP. The data is monitored on a cloud dashboard for real-time analysis. I also worked on hardware integration, sensor interfacing, power analysis, and optimized embedded code for reliable performance.

Objectives of the project: To develop an IoT-based system for real-time monitoring of pipelines using sensors (AHT10, MPU6500, and DS3231) with an ESP32 microcontroller. The system detects temperature, humidity, and vibration, transmits data wirelessly via MQTT/LoRa, and optimizes power usage through sleep-wake cycles for efficient, remote pipeline health monitoring.

Tool used: Hardware: ESP32-WROOM-32D, AHT10, MPU6500, DS3231 RTC, SX1278 LoRa, Battery Backup, Nordic Power Profiler Kit. Software- Espressif IDE, MQTTX,

Details of Papers/patents: NA

Brief description of the working environment: Through this project, I learned to design and implement a complete IoT system, integrating sensors like AHT10, MPU6500, and DS3231 with the ESP32 microcontroller. I gained practical experience in wireless communication using MQTT and LoRa, formatting sensor data in JSON, and transmitting it to cloud platforms for real-time monitoring. I explored power optimization techniques using deep sleep modes and interrupt-based wake-ups, as well as time synchronization via NTP. Additionally, I strengthened my skills in embedded C programming, hardware prototyping, current consumption analysis using tools like the Nordic Power Profiler, and technical documentation and presentation.

Academic courses relevant to the project: C programming, Microprocessor Interfacing, Digital design

Learning Outcome: Through this project, I learned to design and implement a complete IoT system, integrating sensors like AHT10, MPU6500, and DS3231 with the ESP32 microcontroller. I gained practical experience in wireless communication using MQTT and LoRa, formatting sensor data in JSON, and transmitting it to cloud platforms for real-time monitoring. I explored power optimization techniques using deep sleep modes and interrupt-based wake-ups, as well as time synchronization via NTP. Additionally, I strengthened my skills in embedded C

programming, hardware prototyping, current consumption analysis using tools like the Nordic Power Profiler, and technical documentation and presentation.

PS-I station: Society for Applied Microwave Electronics Engineering and Research (SAMEER), Mumbai

Student

Name: KESHAV JOSHI(2023AAPS0592G)

Student Write-up:

PS-I Project Title: Optical System Simulation of a Micro Pulse LiDAR

Short Summary of work done: During my PS-1, I worked on the design, simulation, and experimental validation of a Micro-Pulse LiDAR system for atmospheric sensing. I developed system-level models of pulsed laser transmission through free space, incorporating effects such as atmospheric attenuation, beam divergence, and scattering to predict performance under realistic conditions. Experimental validation of some of the performance aspects were performed using bench and field tests. This involved the generation and modulation of pulsed laser beams, optimization of optical alignment over long paths, and detection of received signals using photodetectors and digital oscilloscopes. Techniques such as FFT analysis, signal averaging, and timing analysis were used to acquire and analyse experimental data. The experiments involved working with commercial and research-grade hardware including high-power lasers, modulators, collimators, etc. I also explored various signal acquisition solutions, ultimately implementing a high-speed data capture system using an NI USB-6351 DAQ and LabVIEW. I got to learn, in depth, about the various components of a LiDAR system and help the scientists select and design the necessary components for the core project.

Objectives of the project: To simulate and experimentally validate a Micro-Pulse LiDAR system by modeling pulsed laser free-space propagation and verifying Time-of-Flight ranging.

Tool used: OptiSystem, MATLAB, NI LabVIEW, Lasers, Photodetectors, DAQs, FPGAs

Details of Papers/patents: We have drafted a conference publication for the simulation of the LiDAR. Further reports may include progress reports sent to MeitY.

Brief description of the working environment: SAMEER is an autonomous R & D Lab under MeitY, Govt of India, and has a lot of state-of-the-art equipment. The scientists are very approachable and the project allotment is entirely based on the interests of students. The scientists allow you to work on the domain of your choice, giving reasonable deadlines. The scientists can help you when needed but expect you to be proactive in studying about or working on the project.

. My mentor at SAMEER, on the other hand, actually provided a lot of valuable guidance, including helping with the report, presentations as well as pushing for a conference publication. Since the work is primarily based on contributing to ongoing projects, there might be a lack of readily available resources to study from, so be ready to research on your own and often encounter hurdles. If possible, the scientists will allow you to work on experiments which, in my opinion, is a great opportunity to apply your fundamentals.

We had to maintain documentation on the experiments performed and any proprietary software or hardware used, for future reference, and present our reports at the end of the PS. We were questioned on our presentation as well as the project domain, so know what you are working on.

SAMEER provides a great opportunity to gain a lot of exposure to current technology and gain hands-on work experience on ongoing projects under MeitY.

Academic courses relevant to the project: Depends on the project domain you choose.

Learning Outcome: Gained hands-on experience in simulating and experimentally validating a Micro-Pulse LiDAR system, including pulsed laser propagation, free-space transmission effects, and Time-of-Flight delay measurements. Developed practical skills in optical alignment, data acquisition using NI LabVIEW, and analyzing real-world performance of LiDAR systems.

PS-I station: SRLDC -Southern Regional Load Despatch Center,Grid-India, Bengaluru

Student

Name: ADIT KAPUR(2023A3PS0170G)

Student Write-up:

PS-I Project Title: INTEGRATION OF CAPABILITY CURVES IN A SOUTH-INDIA GRID CASE

Short Summary of work done: We started by learning the fundamentals—simulating a simple five-bus system and performing load flow analysis under different scenarios. This helped us understand how real and reactive power behave in a network. As we progressed, we explored ways to automate the process using Python. Writing scripts to connect Excel data with PSS/E made the simulations much more efficient and scalable. A final part of the project involved handling raw data from the Southern Grid. Since the data wasn't in the required format, we created a Python script to clean and restructure it. This involved organizing the information into Pgen, Qmax, and Qmin columns, filling in missing values using interpolation, and generating individual Excel sheets for each unit. This made it easy to feed accurate capability data into PSS/E.

Objectives of the project: This project focuses on simulation the Indian power grid using the Power System Simulator for Engineering (PSS/E) through a Python interface and injecting it's capability curves to evaluate its limits of operation.

Tool used: PSS/E (Power System Simulator for Engineering), Python and Excel

Details of Papers/patents: none

Brief description of the working environment: My internship was a great chance to see how a real company works. My work hours were from 9:30 AM to 5:00 PM on weekdays, which helped me get into a good routine. Over time, the company became more flexible with the schedule, which was a nice change.

The company expected me to be eager to learn, to solve problems on my own, and to work well with others. They wanted me to use what I learned in my classes to tackle real-life projects.

During my internship, I got hands-on experience with things like simulating power systems and automating tasks with Python. The most important things I learned were how to handle real-world data, make processes more efficient, and write scripts to connect different software programs like Excel and PSS/E. The internship ended with me giving a presentation to all the managers about my project, which I needed to do to get my certificate. It was an important lesson in how to present my work to company higher-ups.

Academic courses relevant to the project: Electrical Machines

Learning Outcome: Learnt to use the PSS/E (Power System Simulator for Engineering) tool to simulate power grids and used the Python libraries Pandas and Psspy to interface PSS/E with Excel.

PS-I station: SRLDC -Southern Regional Load Despatch Center,Grid-India, Bengaluru

Student

Name: PARIN KUMAR SUSIL .(2023B5AA1130P)

Student Write-up:

PS-I Project Title: Power demand prediction using historical weather data

Short Summary of work done: We had predicted day in advance demand forecast using past demand trends and future weather forecast

Objectives of the project: To forecast day in advance power using historical weather

Tool used: Python, XGBoost, PostgreSQL, Grafana

Details of Papers/patents: NIL

Brief description of the working environment: It was general office environment, with very helpful employees.

Academic courses relevant to the project: Machine learning

Learning Outcome: Machine Learning, Python, Data analysis

PS-I station: Standardisation, Testing & Quality Certification Directorate (STQC), Delhi, Delhi

Student

Name: PANA V DEWAN .(2023B5A31089H)

Student Write-up:

PS-I Project Title: Development of an IoT based SOS Transmitter using LPWAN

Short Summary of work done: Designed and implemented an IoT-based SOS transmitter using Arduino Nano and LoRa communication. Integrated GPS and Bluetooth modules for location tracking and remote triggering, along with an LCD display for message and coordinate output. Added push-button functionality and LED indicators for signal status and ACK confirmation. Worked on extending device range through antenna design and improving portability. Also explored PCB design using CAD tools to move from breadboard prototyping to a compact hardware solution.

Objectives of the project: To design and implement a reliable IoT-based SOS transmitter system using LPWAN (LoRa) technology that enables long-range, low-power emergency communication without reliance on internet connectivity, ensuring timely alerts and accurate location tracking during critical situations.

Tool used: 1. KiCad & Proteus for PCB design 2. Fritzing for circuit diagrams 3. Datasheets & Manufacturer Resources for ICs and modules

Details of Papers/patents: No patent as of now yet.

Brief description of the working environment: During my Practice School at Electronics Regional Test Laboratory (ERTL), North, I had the opportunity to work in a professional electronics testing and certification environment. The lab provided exposure to industry-grade equipment and procedures, where accuracy, safety, and adherence to standards were highly emphasized. The working atmosphere was collaborative, with guidance from experienced engineers and technical staff, while also encouraging self-learning and independent problem-solving.

My expectations from the company were to gain practical insights into electronics testing, component interfacing, and exposure to real-world challenges in ensuring device reliability and compliance. ERTL met these expectations by allowing me to work on modules involving power supplies, voltage regulators, comparators, and communication systems, while also emphasizing proper documentation and the importance of datasheets and standards in design validation.

During the course of my PS-I, I learned how to interpret and apply datasheet information effectively, interface multiple electronic components, and understand the working of SMPS, linear regulators, and Op-Amps in practical circuits. I also gained experience in extending the communication range of devices, basics of antenna design, and the use of CAD software for PCB designing. Overall, the PS-I experience provided me with a balance of theoretical knowledge and hands-on exposure, which strengthened my foundation in core electronics and prepared me for future academic and professional challenges.

Academic courses relevant to the project: Digital Design, Electrical Sciences, Microprocessor Interfacing.

Learning Outcome: - Understanding and application of LPWAN (LoRa) communication protocols for long-distance data transmission.

- Integration of microcontrollers, GPS, Bluetooth, and LoRa modules in a real-time embedded system.

- Hands-on experience in circuit design, prototyping, and hardware-software interfacing for IoT applications.

- Development of skills in low-power system design and optimizing devices for portable use. Exposure to reliability testing, range extension techniques, and antenna design for IoT communication.

- Practical knowledge of creating an end-to-end IoT emergency alert system with acknowledgment and location tracking features.

PS-I station: UST Bengaluru, Bengaluru

Student

Name: KUMAR YASH(2023A3PS1134H)

Student Write-up:

PS-I Project Title: Using AI/ML for Data Processing and Journey Mapping

Short Summary of work done: In PS1, I worked on enabling an ML-based anomaly detection dashboard by focusing on process-level data understanding and feature design. After journey mapping three core HR processes—Termination, Contract End, and No Show—I identified key data events and milestones to define expected timelines and outcomes. These were then converted into regex-style event patterns used to flag normal sequences. Any deviation from these patterns was considered a candidate anomaly. I also explored the use of Isolation Forest, a tree-based unsupervised model suited for detecting anomalies in temporal and categorical data. I tested and evaluated preliminary features such as event delay, sequence mismatch, and missing approvals, preparing the foundation for model training. These steps were aimed at feeding both the regex-based and ML-based logic into a unified anomaly detection dashboard. Future interns can build on this by refining features, tuning models, and enhancing the dashboard's UI to display flagged cases with traceable reasoning.

Objectives of the project: To create an ML based dashboard to detect anomalies in employee data for UST and provide actionable insights as well as map out the flow of business processes involved in employee onboarding to offboarding

Tool used: Company servers, Office laptop, Python, ML libraries like sklearn, Microsoft Fabric, Power BI, VSCode

Details of Papers/patents: -

Brief description of the working environment: Relaxed working environment but weekly progress updates.

Academic courses relevant to the project: NA

Learning Outcome: Machine learning, Microsoft fabric pipelines, data analysis

PS-I station: UST Bengaluru, Bengaluru

Student

Name: SREEHARI V S(2023A8PS1068G)

Student Write-up:

PS-I Project Title: Product design of dashboards

Short Summary of work done: Got into meetings, understood user needs, desinged

Objectives of the project: To design dashboard

Tool used: Figma

Details of Papers/patents: None

Brief description of the working environment: Very flexible work culture, no strict timings as long as you get the work done. If you want a certain type of project you will have to ask your industry mentors to give you such a project.

Academic courses relevant to the project: Human computer interaction, Business communication, Principles of management

Learning Outcome: Team communication, user centric design

PS-I station: UST Trivandrum, Thiruvananthapuram

Student

Name: JUAN ANTONY AJAY(2022A4PS0901G)

Student Write-up:

PS-I Project Title: Journey Mapping of Hire Business Process

Short Summary of work done: Map the entire Hire BP and point out pain points and come up with possible solutions

Objectives of the project: Map the entire Hire BP and point out pain points and come up with possible solutions

Tool used: Workday, Miro board

Details of Papers/patents: None

Brief description of the working environment: Friendly environment with flexible work times. Very supportive staff

Academic courses relevant to the project: Computer Programming

Learning Outcome: Learnt to use Workday and Miro board and learnt about the Hire BP of UST
