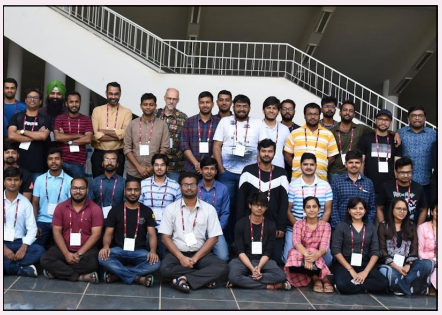
SEPTEMBER - OCTOBER 2023

Volume 1 Issue 2

Aganit

Department of Mathematics, BITS-Pilani, Hyderabad Campus



AWARDS AND ACHIEVEMENTS

Prof. P.K. Sahoo receiving *S. Venkateswaran Faculty Excellence Award,* from Prof. Sundar, Director BITS Pilani, Hyderabad Campus

Prof. Manish Kumar received a project on *Uncertainty Principles in Generalized Function Spaces: Theory and Applications* by NBHM, DAE, Mumbai, Government of India

Prof. Manish Kumar

He also filed an Indian Patent on the title *A DEVICE AND METHOD FOR LIGHTWEIGHT STREAM CIPHER* along with the inventors: Mr. Kalra Divye & Dr.Yadav Ramakant

Prof. P.K. Sahoo was appointed as *Editor of International Journal of Geometric Methods in Modern Physics*

&

He received a project as Co-PI, titled "*A Fundamental Study on Cosmic Acceleration in Modified Gravity Approach*", funded by Ministry of Higher Education, Govt. of Malaysia, (2023-2026)

International Travel Grants Recipients

Santosh V. Lohakare

Tapaswini Patro

Lokesh K Duchaniya

UPCOMING EVENT

89th Annual Conference of the **Indian Mathematical Society (IMS-2023)**

Join us for the conference hosted by our department from 22nd to 25th December 2023.

Plenary Speakers:

1. Manjul Bhargava, Princeton University, USA.
2. Helen M. Byrne, University of Oxford, UK.

Symposia Topics: Commutative Algebra, Controllability and Differential Equations, Harmonic Analysis, Hyperbolic PDEs and Shock Waves, Recent Trends in Graph Theory, Theoretical Astrophysics & Cosmology

Registration Deadline: 15th December 2023

For more details and registration, visit: https://www.bits-pilani.ac.in/ims-2023/

ACADEMIC VISITS

Prof. P.K. Sahoo interacting with students at ***Sambalpur University, Odisha***

during an invited talk on *"Wormholes"*

Simran Arora, Prof. P.K. Sahoo, Raja Solanki and Gaurav Gadbail

at *Inter-University Centre for Astronomy and Astrophysics (IUCAA) Pune*,

during 21st-29th October, 2023

Prof. Sharan Gopal delivered an invited talk

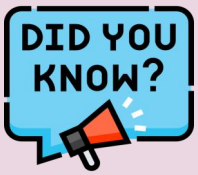
at ***School of Mathematics and Statistics, University of Hyderabad,***

titled *"Periodic Points of Solenoidal Automorphisms"* on 11th September, 2023

Prof. P.K. Sahoo delivered a talk

at *Department of Mathematics, Pune University, Pune*

on 28th October,2023



In a room of 23 people, there's a **50% chance** that two of them have the same birthday.

In a room of 75 people, the probability increases to **99%**.

PRESENTATIONS AND TALKS

Workshop on Tension in Cosmology at Corfu Summer Institute, Corfu, Greece during 6th September - 13th September 2023

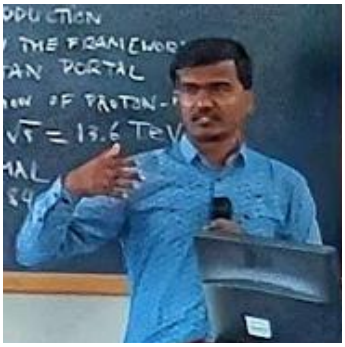
Lokesh Kumar Duchaniya presented a paper on "Cosmology Implication of f(T) gravity models through phase space analysis" at this workshop.

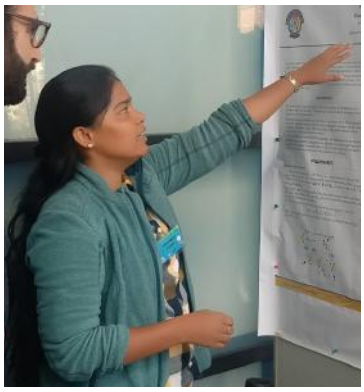
He received ***SERB ITS Grant*** for attending the workshop.

International Conference on Particle Physics and Cosmology (Rubakov 23) at Yerevan State University, Yerevan, Armenia during 2nd October - 7th October 2023

Santosh V. Lohakare presented a paper on "Observational constrained F(R,G) gravity cosmological model and the dynamical system analysis" at Rubakov 23.

He received ***SERB ITS Grant & CSIR Foreign Travel Grant*** for the conference.





International Network in Space Quantum Technologies (INSQT) Workshop on Space Quantum Internet at Humboldt-Universität zu Berlin, Erwin Schrödinger Zentrum, Berlin, Germany

Tapaswini Patro presented a poster titled "Hidden non-n-locality in linear networks" at this workshop conducted during 30th August - 1st September 2023.

She secured **$2066 funding** from the ***University of Strathclyde, Glasgow, U.K.*** for the same.

PRE SUBMISSION SEMINARS

(left to right) **Kshma Trivedi, Agrawal Amarkumar Shyamsunder, Ghale Vinodkumar Rajlingappa, Simran Arora & Sri Sakti Swarup Anupindi** delivered pre-submission seminars for their Ph.D. Theses

Sayantan Ghosh attended **IAGRG School on Gravitation and Cosmology**

During 9th October - 21st October 2023 at ICTS Bengaluru

Sayantan Ghosh with other participants

Debismita Nayak attended *National workshop on finite element method simulation using COSMOL multiphysics software* at **VIT Chennai** during 2nd September - 3rd September 2023

Debismita Nayak

Sangeeta Dhawan

Sangeeta Dhawan and **Debismita Nayak** attended a *5-Day Online Workshop on Recent Advances in Differential Equations and Applications* conducted by **VIT-AP University,** during 27th October - 31st October 2023

Pankaj Patel and **Vinodkumar Ghale** participated in "**Rational points on modular curves**" workshop at ICTS Bengaluru during 11th September - 22nd September 2023

Pankaj Patel and **Vinodkumar Ghale** with other participants

A Journey Through Cosmos: Professor Mishra's Impact on General Relativity and Beyond

Einstein's General Relativity defines our understanding of gravity. Unlike Newtonian physics, which perceives gravity as a force between masses, Einstein conceptualized gravity as the curvature of space-time influenced by mass and energy. Massive objects, like planets and stars, bend the fabric of space-time, altering the paths of objects and even light itself. Einstein's field equations express these relationships mathematically, linking space-time curvature to the distribution of energy and matter. This profound shift in perspective has allowed for a more accurate explanation of various phenomena, such as the bending of light around massive objects. Gravity, according to Einstein, is not a force acting at a distance but a dynamic interaction between matter and the geometry of space-time. The late time cosmic acceleration issue has become a challenge to understand among theoretical cosmologist and the geometry of space time. So, the modification of Einstein General Relativity has become inevitable.

Professor Bivudutta Mishra (Ph.D. from Sambalpur University in 2003) has dedicated his career to exploring the geometric intricacies of Einstein's General Relativity and its modification. His research, spanning over 150 impactful papers in national and international journals, focuses on the study of Theoretical Dark Energy and the Modified Theories of Gravity. Some of them have been figured in advance science news. His continuous research not only contributes significantly to theoretical physics and cosmology but also marks a continuous effort to refine our understanding of the fundamental aspects of the cosmos.

He has completed two sponsored projects, one sanctioned by the University Grants Commission (UGC) and the other by the Science and Engineering Research Board, Department of Science and Technology (SERB-DST). At present, he is handling one project from Council of Scientific and Industrial Research (CSIR). From 2012 to 2016, he served as the Head of the Mathematics Department on our campus. Since 2018, he is holding the position of Associate Dean of the International Programmes and Collaboration. Additionally, he has played pivotal roles as a convener, organizing committee member, and coordinator for numerous esteemed conferences, webinars, and workshops. Based on his research credentials, he has been selected as the Visiting

Prof. Bivudutta Mishra

Associate of Inter University Centre for Astronomy and Astrophysics, Foreign member of Russian Gravitational Society, Fellow of Royal Astronomical Society and Fellow of Institute of Mathematics and Applications. He has been invited by several foreign universities to share his findings in important scientific events. One can find more about him here.

Under his mentorship, Dr. Sankarsan Tarai and Dr. Pratik Premdarshi Ray have successfully earned their Ph.D. degrees. He has also served as a co-guide for Dr. Parbati Sahoo. Presently, Agrawal Amarkumar Shyamsunder, Siddheshwar Atmaram Kadam, Santosh Vijay Lohakare, Lokesh Kumar Duchaniya, Shubham Atmaram Narawade, Rahul Vijay Bhagat and Yengkhom Kalpana Devi are actively engaged in their research under his guidance.

Harmonic Analysis and Computational Complexity: Professor Alphonse's Academic Journey

Prof. Michael Alphonse

Harmonic analysis studies functions and signals by breaking them into constituent frequencies. It explores how complex functions can be represented as combinations of simpler sinusoidal functions, providing valuable insights into their behaviors. Crucial in solving partial differential equations and understanding functions defined on various mathematical spaces, harmonic analysis extends its significance to quantum physics and control theory. Also, it finds applications in signal processing, audio compression, image analysis, communication systems, etc.

Graph theory focuses on the relationships and connections between discrete objects, forming structures known as graphs. These graphs, composed of vertices or nodes connected by edges, offer a versatile framework for modeling and analyzing diverse systems. Key applications are studying networks, optimizing network routing, identifying connected components, finding the shortest paths, database systems for query optimization, etc.

With over two decades of teaching and research experience at BITS Pilani, Prof. Michael Alphonse has significantly impacted these two distinct disciplines: Mathematics (Harmonic Analysis and Operator Theory) and Computer Science (Graph Theory). In Mathematics, his work focuses on the discrete versions of operators like the Hardy-Littlewood maximal operator and Singular Integral operators on variable Lebesgue spaces using methodologies such as the Calderon-Zygmund decomposition, transference principle, and interpolation theorem. In Computer Science, his research focuses on the NP-completeness of the Domination on Graphs problem, exploring it within specific graph classes and contributing to the theoretical understanding of computational complexity through kernelization techniques.

Prof. Alphonse earned his Ph.D. in Mathematics from IIT Kanpur in 1993. He further diversified his academic background by obtaining an ME in Software Systems from BITS Pilani in 2002. He explored advanced mathematics as a Visiting Scientist at ISI Calcutta for a year and further honed his skills through a two-year Post-Doctoral Fellowship at IIT Kanpur. Prof. Alphonse is a Fellow of the Institute of Mathematics and its Applications, UK, underscoring his standing in the international mathematical community. For three years, he held the role of the faculty in charge of the Instruction Division at our campus, which has since been restructured along with few other divisions into AUGSD.

He seamlessly blended academic and industry expertise from the start of his career. By working in the industry at Satyam Computers for two years, he applied academic rigor to practical applications, gaining valuable insights into real-world challenges and enriching his perspective on the intersection of theoretical knowledge with practical solutions. You can find more about him here.

Dr. Tushar Kanta Pradhan completed his Ph.D. under Prof. Alphonse's co-guidance, and currently, Sri Sakti Swarup Anupindi is pursuing a Ph.D. under his mentorship.

- K. Mukherjee, S. Mandal, **T. Patro**, and **N. Ganguly,** 2023. "Hidden non–***n*** *-locality in linear networks*", *Physical Review A* -108, pp. 032416.*

- **Lohakare, Santosh V.**, S. K. Maurya, Ksh Newton Singh, **B. Mishra**, and Abdelghani Errehymy, 2023. "Influence of three parameters on maximum mass and stability of strange star under linear f (Q)− action", *Monthly Notices of the Royal Astronomical Society,* 526(3), pp.3796-3814.*

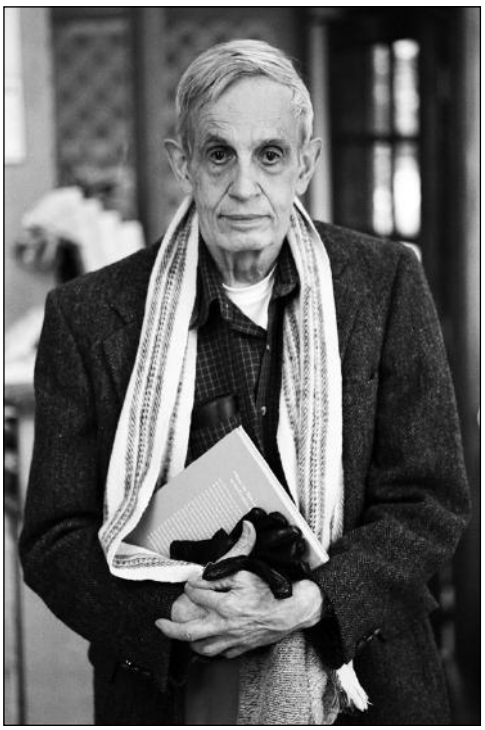
- **Gupta, R.** and **Rai, A.,** 2023. "*A class of permutation quadrinomials over finite fields*", *Communications in Algebra*, pp. 1-7.

- **Lohakare, S.V.**, Rathore, K. and **Mishra, B.**, 2023. "Observational constrained F (R, **G**) gravity cosmological model and the dynamical system analysis", *Classical and Quantum Gravity, **40** 215009 .**

- **Kadam, S.A.**, Thakkar, N.P. and **Mishra, B.**, 2023. "Dynamical system analysis in teleparallel gravity with boundary term", *The European Physical Journal C **83**, Article number: 809.**

* indicates Q1 journal

KNOW A MATHEMATICIAN



John Forbes Nash Jr.

John Nash (1928-2015), an American mathematician, made significant contributions to game theory, real algebraic geometry, and differential equations. He received the 1994 Nobel Prize in Economics. As a Princeton graduate, Nash introduced key concepts like Nash equilibrium and the Nash bargaining solution, pivotal in game theory. In the 1950s, he solved nonlinear PDEs in Riemannian geometry, leading to the Nash embedding theorems. Nash and Ennio De Giorgi independently advanced our understanding of elliptic and parabolic PDEs, resolving Hilbert's nineteenth problem on regularity, which had eluded solutions for nearly six decades.

To delve deeper into his life, read his biography "A Beautiful Mind" by Sylvia Nasar (1998).

> **I would not dare to say that there is a direct relation between mathematics and madness, but there is no doubt that great mathematicians suffer from maniacal characteristics, delirium and symptoms of schizophrenia.**
>
> — John Nash

Dr. Sankarsan Tarai

Assistant Professor (Grade II), Division of Mathematics,

School of Advanced Sciences, VIT Chennai, India

His research primarily focuses on General Relativity, Cosmology, and Modified Gravity theories. His active research involves the exploration of dynamics of various cosmological models within the extended theory of gravity. Also, he has an impressive publication record of more than fifteen research papers in esteemed journals, underscoring his significant contributions to the academic and scientific community. After his doctoral studies at BITS Pilani Hyderabad campus, he served as a Rashtriya Uchchatar Shiksha Abhiyan Post Doctoral Fellow (RUSA PDF) at Utkal University, Bhubaneswar, Odisha, from 2020 to 2023.

PhD Thesis: Study on the Dynamics of Anisotropic Cosmological Models in a Modified Theory of Gravity.

Supervisors: Prof. B. Mishra / Prof. P.K. Sahoo

Year of completion: 2019

Dr. Pratik P. Ray

Assistant Professor, Department of Mathematics,

School of Advanced Sciences, VIT-AP University

His research expertise revolves around the fields of Cosmology, Relativity, Modified Gravity theories, and Astrophysics. He is actively engaged in research, with a publication record of seven research papers in highly reputable SCI journals. He has presented his research at various national and international conferences, with notable participation in events held in Japan and Armenia. In recognition of his academic contributions, he has received a DST international travel grant. Additionally, he has gained valuable teaching experience as an ad-hoc faculty member at VSSUT, Burla, for 1.5 years and at NIT Andhra Pradesh for one year.

PhD Thesis: Study on Late Time Cosmic Dynamics and some Anisotropic Dark Energy Models

Supervisors: Prof. B. Mishra / Prof. P.K. Sahoo

Year of completion: 2019

BITS Pilani
Hyderabad Campus
Department of Mathematics

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