



**INDIAN INSTITUTE
OF TECHNOLOGY**
(INDIAN SCHOOL OF MINES)
DHANBAD

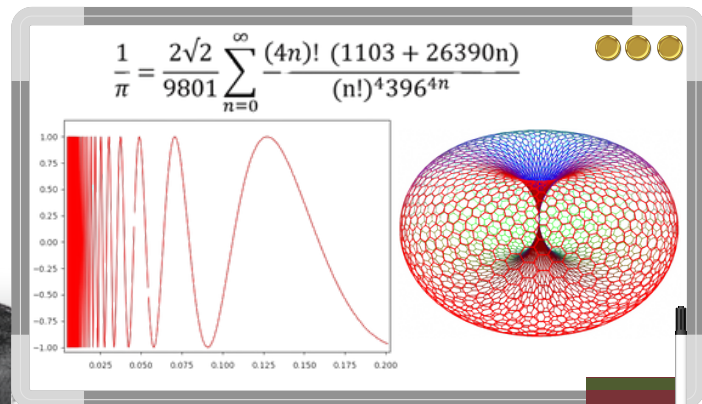
Legacy that inspires the future

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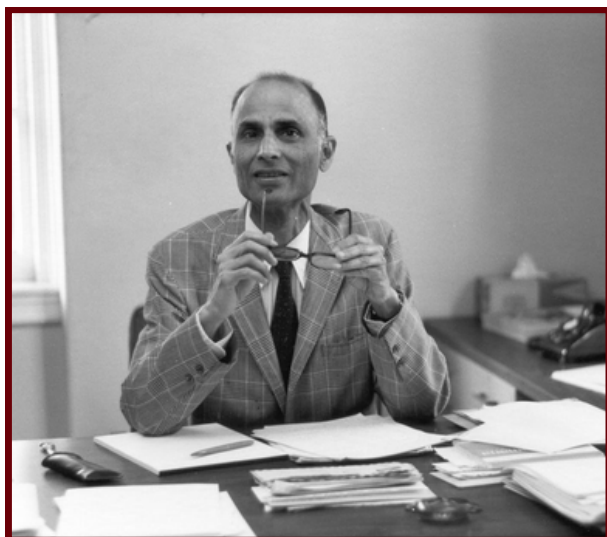


GANANAM

*A Monthly Newsletter of
Department of Mathematics and Computing*



KNOW INDIAN MATHEMATICIAN BORN IN OCTOBER



Harish-Chandra trained to be a physicist and became one of the greatest mathematicians of his age. He did fundamental work in representation theory, especially on Lie groups. His work linked algebra, analysis, geometry, and group theory in a basic and epoch-making manner that subsequently became the foundation on which modern work in a variety of fields, ranging from differential geometry and mathematical physics to number theory, is being carried out.

Harish-Chandra was born on 11 October 1923 in Kanpur; he was awarded a B.Sc. in 1941, then a master's degree in 1943 from the University of Allahabad. He worked as a postgraduate research fellow on problems in theoretical physics under Homi Bhabha, at the Indian Institute of Science, Bangalore. After a short while, he went to Cambridge, where he studied for his Ph.D. under Dirac's supervision. While at Cambridge, he moved away from physics and became more interested in mathematics. At Cambridge, he attended a lecture by Pauli, and pointed out a mistake in Pauli's work. Harish-Chandra obtained his degree in 1947 for his thesis Infinite irreducible representations of the Lorentz group, and in the same year, he went to the USA. He worked at the Institute of Advanced Study at Princeton from 1963 and was appointed IBM-von Neumann Professor in 1968.

Harish-Chandra received many awards in his career. He was a Fellow of the Royal Society of London and a Fellow of the National Academy of Sciences. He won the Cole prize from the American Mathematical Society in 1954 for his papers on representations of semisimple Lie algebras and groups. In 1974, he received the Srinivasa Ramanujan Medal from the Indian National Science Academy.

In India, we have Harish-Chandra Research Institute in Prayagraj, named after the mathematician Harish-Chandra, funded by the Department of Atomic Energy, Government of India. In honoring Harish-Chandra, we recognize a mathematician who bridged the gap between the abstract world of mathematics and the tangible world of physics. His legacy will continue to inspire generations of thinkers in both fields.

WELCOME



Dr. Hemant K. Mishra joined IIT (ISM) Dhanbad as an Assistant Professor in the Department of Mathematics and Computing in Oct 2024. Previously, he was a Postdoctoral Associate at Cornell University during Feb 2022–Sep 2024, and a Research Associate at Louisiana State University during Feb 2022–Jun 2022. He serves as an appointed reviewer for the American Mathematical Society and for the American Journal of Applied Mathematics.

He earned a Ph.D. degree from Indian Statistical Institute Delhi in Oct 2021. His Ph.D. thesis is an exposition of differential and subdifferential properties of symplectic eigenvalues, along with a symplectic analog of the well-known Lidskii's theorem for eigenvalues. He received an M.Sc. in Mathematics and Computing in May 2016 from the Indian Institute of Technology Guwahati. His primary research interests lie in matrix analysis and continuous-variable quantum information—the mathematical framework to understand and characterize quantum states of light—with a special focus on quantum systems with bosonic particles exhibiting Gaussian characteristics in their quantum states.

PUBLICATIONS

- **R. K. Upadhyay**, D. Pradhan, R. D. Parshad, P. Roy, Existence of global attractor in reaction–diffusion model of obesity-induced Alzheimer's disease and its control strategies, 140(2025) 1–38.
- E. Bindal, **A. K. Singh**, and M. K Singh, "A Novel PQ-KEM based on Coding Theory", Indocrypt, Oct. 2024.
- C. Azevedo, S. Santra, **S. Kumawat**, H. Nagahara, and K. Morooka, "Deep Volume Reconstruction from Multi-focus Microscopic Images", in Medical Image Computing and Computer Assisted Intervention (MICCAI), Morocco, Oct. 2024
- C. Amala, B. Subbarao, **T. Ojha**, B. B. Das. S. K. Ram, and S. P. Mohanty, "An Off-chip Based PUF for Robust Security in FPGA Based IoT Systems", in IEEE Proceeding on 22nd OITS International Conference on Information Technology, Guntur, India, Dec. 2024.

SPONSORED PROJECTS

- Special Grant of INR 27,50,000 to establish a Computer Vision Lab in the Department of Mathematics and Computing, IIT (ISM) Dhanbad, awarded to **Dr. Sudhakar Kumawat**.
- Special Grant of INR 12,30,000 to establish an IoT Testbed for Advanced Research in Computer Networks and AI-Enabled IoT Systems, awarded to **Dr. Alakesh Kalita**.
- Faculty Research Scheme of INR 14,89,000 awarded to **Dr. Alakesh Kalita**.

MATHEMATICS & COMPUTING NEWS

- Professor Pham Tiep, the Joshua Barlaz Distinguished Professor of Mathematics in the Department of Mathematics at Rutgers School of Arts and Sciences, has provided a proof for two major, longstanding mathematical problems. One of these is the 1955 Height Zero Conjecture, proposed by the influential German-American mathematician Richard Brauer, who passed away in 1977. The conjecture, considered one of the most significant challenges in the area of representation theory of finite groups.

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- Researchers, PhD students Nicholas Crispino, Kyle Montgomery, and research analyst Fankun Zeng, at Washington university have devised an agent **to help large language models 'think'**. The large language models that have increasingly taken over the tech world are not "cheap" in many ways. The most prominent LLMs, GPT-4 for instance, took some \$100 million to build in the form of legal costs of accessing training data, computational power costs for what could be billions or trillions of parameters, the energy and water needed to fuel computation, and the many coders developing the training algorithms that must run cycle after cycle so the machine will "learn".

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ALUMNI SPARK



Mr. Sanchit Agarwal, an alumnus of integrated M.Tech in Mathematics & Computing 2013, currently works as a Senior Applied Scientist at Amazon, USA. He also has a Master's in Machine Learning from Carnegie Mellon University (CMU), USA and worked in Samsung Electronics, Noida, India. With AGI team at Amazon, he worked on dialogue modeling and query processing for intelligent assistants like Alexa, and to fine-tune the large language models (LLMs) associated with applications across Amazon including shopping and Alexa.

He emphasizes that the Mathematics & Computing program provided a solid grounding in Linear Algebra, Statistics, and Computer Science, essential for his Machine Learning studies at CMU. He appreciated the program's flexibility for research internships and external opportunities, which were challenging to secure then. As AI evolves rapidly, he believes a strong foundation in core subjects is vital, alongside staying updated with ongoing advancements in AI and LLM research, for future success.

THESIS DEFENSE

Sampling and interpolation in shift-invariant spaces and error estimates covering discontinuous signals - **Kumari Priyanka** on October 22, 2024 (Supervisor: **Prof. A. Antony Selvan**)

UPCOMING EVENTS

- National Conference on Data Predictive Analytics and Numerical Simulation during January 23-25, 2025.
- National Mathematics Day- December 22, 2024.

ADDITIONAL RESPONSIBILITY

- **Prof. M. K. Singh** appointed as Nodal Officer
 1. *Monitoring & Outreach* - Implementation of NEP 2020, Program, Dhanbad, Jharkhand through which four State Universities mapped with IIT(ISM) Dhanbad by the Ministry of Education, Government of India.
 2. For *Training of STEM Teachers* of PM SHRI Schools by the Centrally Funded Technical Institutions (CFTIs) i.e., IIT(ISM) Dhanbad.
- **Prof. A. K. Singh** served as a Program Committee member for Indocrypt 2024, to be held at Chennai, India, Dec. 18-21, 2024.

INVITED TALKS

- Delivered an invited talk on Contaminant Transport Modelling for Aquifer at CUSB Gaya on Oct. 16, 2024 by **Prof. M. K. Singh**.
- Delivered a guest lecture on Personal Leadership Styles and Traits With or Without Stress under Nurturing Future Leadership Programme on Oct. 23, 2024 at IIT(ISM) Dhanbad by **Prof. M. K. Singh**.
- Delivered an invited talk on Data Simulations based on Testing of Hypothesis: Parametric and Non-parametric at VIT-AP on Oct. 24, 2024 by **Prof. P. S. Rao**.

EDITORIAL TEAM

Prof. S P Tiwari (HOD), Prof. P S Rao, Prof. Atul Kumar Verma, Prof. Tamoghna Ojha, Naman Shankar Srivastava, Hima Chowdary Tanikonda.

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