



INDIAN INSTITUTE
OF TECHNOLOGY
(INDIAN SCHOOL OF MINES)
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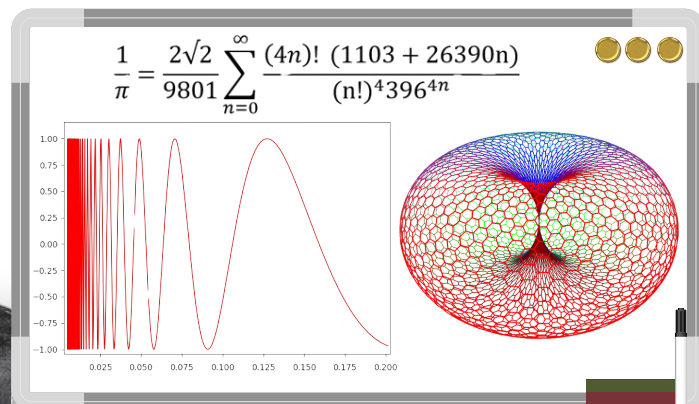
Legacy that inspires the future

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GANANAM

*A Monthly Newsletter of
Department of Mathematics and Computing*



EVENTS ORGANIZED

Short Term Training Program on Six Sigma Green-Belts during June 30–July 4, 2025 organized by **Prof. Subhashis Chatterjee** (coordinator) and **Prof. Santimoy Kundu** (co-coordinator).

Six Sigma is a fact-based data driven structured methodology that is used to create breakthrough improvements in business processes. It is used to solve organizational problems where the solution is not known. The program augments the participants existing domain knowledge and expertise with statistical thinking and application. This aims to help them to channelize their efforts and knowledge in the right direction and achieve groundbreaking results in their field.



The program hosted sessions on deployment of Six Sigma in organization, organization hierarchy for Six Sigma, project hopper, project charter, voice of customer, critical to quality, tree diagram, pareto, SIPOC; measurement system analysis, capability analysis; process analysis, problem analysis, control charts, test of hypothesis, regression analysis; solution prioritization matrix, solution matrix, RICI – chart, before after tests, solution implementation; control Plan, control charts for online analysis, mistake proofing, Kaizen philosophy.

INVITED TALKS

- **Prof. Scindhiya Laxmi** delivered an invited talk on "Physics-Informed Neural Networks and their Applications in Biomedical Imaging" at the workshop on Numerical and Machine Learning Techniques for Applied Mathematics (NMAM 2025) at Department of Mathematics, NIT Jamshedpur during 10-14 July, 2025.
- **Prof. Tamoghna Ojha** delivered an Invited talk on "On the Edge of Future IoT Networks: Sensing, Communication and Computation" in the FDP "From Data to Decisions: Machine Learning and IoT Applications in Healthcare and Agri-Tech" organized by NIT Delhi along with EICT Academy NIT Warangal on 12 July 2025.
- **Prof. Tamoghna Ojha** delivered two expert lectures on "Energy Aspects of Future IoT Networks" and "Communication and Computing in Future IoT networks" at MMTTC, IIT Patna organized short term program on "Preparedness for Industry 4.0: Demands and Prospects" at BIT Mesra on 15 July 2025.
- **Prof. Alakesh Kalita** delivered an invited talk on "How to Set Up Resource-Constrained IoT Networks and Conduct Experiments" at BIT Mesra, Ranchi and "How to use Advanced ML Algorithms in Resource-Constrained IoT Networks" at MMTTC, IIT Patna organized short term program on "Preparedness for Industry 4.0: Demands and Prospects" at BIT Mesra on 15 July 2025.
- **Prof. Tamoghna Ojha** delivered two expert lectures on "Introduction to Deep Learning" in the summer school courses "Interpretability in Deep Learning" and "Generative AI for Health and Life Science" organized jointly by UiT Norway and IIT (ISM) Dhanbad on 22-23 July 2025.

SPONSORED PROJECTS

- "Applications of various machine learning (ML) techniques for predicting, detecting, and analyzing rare earth elements (REEs) in different geological and environmental contexts, TEXMiN Foundation", **Prof. Subhashis Chatterjee (PI), Prof. Santimoy Kundu (Co-PI)**, 16.618 Lakhs, July 2025.

PHD AWARDED



Miss. Shanya Baghel, research scholar under **Prof. Shuvashree Mondal**, successfully defended her PhD thesis entitled "ROBUST DIVERGENCE BASED INFERENCE FOR ONE-SHOT DEVICES" on 10th July, 2025.

The primary focus of this thesis is to develop robust inferential analysis of one-shot device testing data addressing several key challenges associated with its reliability prognosis. A one-shot device is a component or unit designed to be utilized only once, resulting in its destruction or extensive rebuilding after performing its intended function. The reliability inference of one-shot device

testing units is vital, especially when the stakes are high, such as in the military, aerospace and medical applications. The reliability analysis incorporating typical lifetime testing is challenging as the exact failure times of such devices cannot be identified accurately in most instances. As a result, observations are limited to recording whether a failure occurs before or after a specified inspection time, resulting in failure count data only.

Moreover, when failure mechanisms of some of one-shot device testing units slightly deviate from model assumptions, conventional methods like maximum likelihood estimation may produce significantly biased estimates. Since purely uncontaminated data is rare in practice, it is crucial to develop robust estimation methods immune to a small proportion of outliers in the dataset. In this thesis, robust estimators and test statistics have been developed based on failure count data leveraging density power divergence and exponential-polynomial divergence measures. This study is carried out both in classical and Bayesian frame-work. Along with the study of large sample properties of the estimators, their robustness is analytically examined through the derivation of the influence function. Further, this thesis focuses on developing several techniques in order to bring a trade-off between robustness and efficiency of the estimation making a substantial contribution towards the reliability analysis of one-shot device testing data.

FACULTY ACHIEVEMENT

- **Prof. Akhilesh Prasad** has been selected for the National Academy of Sciences (NASI), India membership - 2025.

VISITING STUDENT

- **Ms. Arshee Naz**, a PhD student from NIT Delhi, visited the Department of Mathematics and Computing supported, from 11 June 2025 to 04 July 2025, supported by the **ACM Anveshan Setu Fellowship**. During this period, she focused on “Satellite IoT Networks”, a part of her PhD thesis work, mentored by **Prof. Tamoghna Ojha** at COSINE Lab of the department.

MATHEMATICS AND COMPUTING NEWS

- **Dijkstra’s Algorithm Finally Surpassed!:** Chinese scientists from Tsinghua University have made history – developing the fastest shortest-path algorithm since 1984! They broke Dijkstra’s “sorting barrier”, achieving $O(m \cdot \log^{(2/3)} n)$ runtime. [[Read More](#)]
- **Tiny quantum dots unlock the future of unbreakable encryption:** By using quantum dots and smart encryption protocols, researchers overcame a 40-year barrier in quantum communication, showing that secure networks don’t need perfect hardware to outperform today’s best systems. [[Read More](#)]
- **Scientists uncover a surprising connection between number theory and evolutionary genetics:** An interdisciplinary team of mathematicians, engineers, physicists, and medical scientists has uncovered an unexpected link between pure mathematics and genetics, that reveals key insights into the structure of neutral mutations and the evolution of organisms. [[Read More](#)]

EDITORIAL TEAM

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