

A Report on
One-week online Faculty Development Program (FDP) on
"Mathematical Foundations for Computational Intelligence (MFCI)"
Organized by Department of Mathematics
from 25.11.2024 to 30.11.2024.



Report Submitted by: Dr. P. Ramesh Reddy, Assistant Professor and Head, Department of Mathematics.
Mode of Conduct: Online
Report Received on 03.12.2024.
Total Participants: 153 registered, 110 actively participated
Brochure:

<p>About MITS</p> <p>Madanapalle Institute of Technology & Science is established under the auspices of Subbaraja Rangayya Educational Academy, in the year 1998, under the visionary presiding leadership of Dr. B. Vijaya Prasad Choudary, Ph.D., Secretary & Correspondent. This is the most sought after premier institution, situated in the charismatic city of Tirupur, in the belly region of Madanapalle, Bangalore district of Andhra Pradesh. MITS is approved by AICTE, New Delhi and affiliated to JNTUA, Anaparthi, MITS is a NAAC accredited Institute with B+ Grade with autonomous status from UGC since 2014. MITS is an ISO 20000:2018 Institution. MITS ranked in the band 200-300 - NIRF 2024 under Engineering Discipline. National Board of Accreditation (NBA) accredited & UG Programs (C.E, CSE, EEE, ECE, ME, ME and PG programs (MBA and MCA).</p> <p>Institute Vision</p> <p>To become a globally recognized research and academic institution and sharing expertise in technological and socio-economic development of the nation.</p> <p>Institute Mission</p> <p>To foster a culture of excellence in research, innovation, entrepreneurship, national thinking and ability by providing necessary resources for generation, dissemination and utilization of knowledge and in the process create an ambience for professional learning to the youth for success in their careers.</p> <p>About Department</p> <p>The Department of Mathematics, since its inception, has been under dynamic programs and is able to attract quality students in undergraduate and post graduate programs in various disciplines. The department is funded with UGC, DST, SERB etc. worth of Rs. 74.71 Lakhs. The department faculty has published 620 research articles in reputed national and international journals. The major research areas are Algebra, Theoretical and Computational Fluid Dynamics, Graph Theory, Statistics, modelling, Control Theory, Fuzzy Logic, Multivariate Analysis and nonlinear Functional integral Equations. The department is committed to foster mathematical computational skills of students for success in their careers.</p>	<p>Chief Patron Dr. N. Vijaya Bhaskar Choudary, Secretary & Correspondent</p> <p>Patron Mrs. Keerthi Nadella</p> <p>Executive Director Program Chair Dr. C. Yuvaraj Principal, MITS</p> <p>Co-Chair Dr. Vadim Azhmyakov, Ph.D Professor Department of Mathematics, MITS</p> <p>Convener Dr. P. Ramesh Reddy, Ph.D HoD-Mathematics, MITS</p> <p>Coordinator Dr. A. Subba Rao, Ph.D Asst. Professor, Dept. of Mathematics, MITS</p> <p>Co-coordinator Dr. R. Saravana, Ph.D Assoc. Professor, Dept. of Mathematics, MITS</p> <p>Certificate E-Certificate will be provided on the completion of Faculty Development Program.</p>	<p>One Week Online Faculty Development Programme on "Mathematical Foundations for Computational Intelligence"</p> <p>NAAC A+ 3 NBA ACCREDITED MBA & MCA</p> <p>MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE (UGC-AUTONOMOUS INSTITUTION) Madanapalle-517325, Anaparthi Dist., Andhra Pradesh</p> <p>Date: 25/11/2024 to 30/11/2024</p> <p>Organized by Department of Mathematics www.mits.ac.in</p>	<p>Resource Persons:</p> <p>Session : 1 Day 01: (25-11-2024) Session : 2</p> <p>Dr. K.V. Narasimha Murthy Associate Professor, Department of Mathematics, MITS Topic: Probability Modelling</p> <p>Dr. Om Prakash Professor, Department of Mathematics, IT Patna Topic: Linear Algebra for Machine Learning</p> <p>Session : 3 Day 02: (26-11-2024) Session : 4</p> <p>Dr. R. Vishnu Vardhan Professor, Department of Statistics, Ramajun School of Mathematical Sciences, Pondicherry University Topic: Predictive Analytics Using R</p> <p>Dr. D. Pradeep Kumar Professor, Department of Management Studies MITS Topic: Dimensionality Reduction Technique</p> <p>Session : 5 Day 03: (27-11-2024) Session : 6</p> <p>Dr. A. Prashant Assistant Professor, Department of Mathematics MITS Topic: An Introduction to Graph Algorithms: Finding Shortest Paths and Spanning Trees</p> <p>Dr. Y.V.K. Ravi Kumar Professor, BITS Pilani, Hyderabad Department of Computer Science & Information Systems Topic: Optimization in machine Learning</p>
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<p>Resource Persons:</p> <p>Session : 7 Day 04: (28-11-2024) Session : 8</p> <p>Dr. Subramanian Kuppasamy Research Fellow, Deakin University, School of Engineering, Australia Topic: Memory Sampled-data Control for T-S Fuzzy Systems</p> <p>Dr. R. Nidhya Professor, Department of Computer Science and Engineering, MITS Topic: Building Neural network from Scratch</p> <p>Session : 9 Day 05: (29-11-2024) Session : 10</p> <p>Dr. J. Indhumathi Professor, Department of Information Science and Technology, Anna University, Chennai Topic: The Role of Mathematics in Emerging Technologies</p> <p>Dr. Basabi Chakraborty Ph.D. (Tohoku University, Japan) Professor & Dean Department of Computer Science and Engineering, MITS Topic: Some Proposals of Similarity Measures for Efficient Analysis of Time Series Data</p> <p>Session : 11 Day 06: (30-11-2024) Session : 12</p> <p>Dr. S. Kusuma Assistant Professor & HoD Department of CSE- Data Science, MITS Topic: Advanced AI for Health: Personalized Application with google gemini</p> <p>Dr. Goutam Chakraborty Ph.D. (Tohoku University, Japan) Distinguished Professor and Dean Department of Computer Science and Engineering, MITS Topic: Graph clustering and Matrix Rank Reduction - Two Sides of the Same Coin</p>	<p>About FDP</p> <p>A Faculty Development Program (FDP) on "Mathematical Foundations for Computational Intelligence" is designed to provide faculty members with a solid understanding of the mathematical principles that underlie key methods in Computational Intelligence (CI). The goal of the program is to bridge the gap between theory and practice, helping participants grasp the mathematical tools and techniques essential for fields like machine learning, artificial intelligence, data analysis, and optimization.</p> <p>This one-week FDP will cover several core areas of Mathematics that are foundational for Computational Intelligence, with a focus on both the theoretical concepts and their practical applications in real-world problems.</p> <p>Eligibility to Participate</p> <p>The faculty members of the UGC / AICTE recognized Universities and Engineering College, Research scholars, Industry (Bureau/consultants/Technicians/Participants from Industry etc.).</p> <p>Registration Fees</p> <p>Rs. 200/- for faculty members. Rs. 150/- for PG students & Research Scholars.</p>	<p>Organizing Committee Members</p> <p>Dr. K.V. Narasimha Murthy Assoc. Prof Dr. Ramaamy Subramanian Asst. Prof Dr. Kata Sreelakshmi Asst. prof Dr. Nazeer Ansari Asst. Prof Dr. P. Ramesh Asst. Prof Dr. Pujari Bharath Kumar Asst. Prof Dr. T. Thambirasan Asst. Prof Dr. G. Leena Rosalind Mary Asst. Prof</p> <p>Dr. T. Chalapati Asst. Prof Dr. K. Padmaja. Asst. Prof Dr. A. Divya Asst. Prof Dr. P. Murugan Asst. Prof Dr. Durga Bhavani Asst. Prof Dr. Athmakoori Prashant Asst. Prof Dr. Sarode Rekha Asst. Prof Dr. Kezla Saini Asst. Prof</p> <p>Registration Link: https://forms.gle/9He6nepRcCIjMaI019 Last Date for Registration: 24/11/2024</p> <p>Contact Details : Dr. A. Subba Rao, Ph.D Mobile : 91-9160020473 Email: subbarao@mits.ac.in</p> <p>Follow Us on : </p>
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Introduction:

The Faculty Development Program (FDP) titled "Mathematical Foundations for Computational Intelligence" was organized by the Department of Mathematics, Madanapalle Institute of Technology & Science (MITS), from 25th November 2024 to 30th November 2024. The program aimed to introduce faculty members, researchers, and participants to the Mathematical principles that form the foundation of Computational Intelligence (CI) and its applications in Machine Learning (ML), Artificial Intelligence (AI), Data Science, and Optimization.



With 153 participants registered, the program saw 110 active participants attending the sessions, indicating strong interest and engagement throughout the week. The FDP offered a platform for participants to learn from experts, discuss advanced mathematical concepts, and explore their applications in various technological domains.

Objectives of the FDP:

The primary objectives of the FDP were:

- To provide a comprehensive understanding of **Mathematical Foundations** in Computational Intelligence, covering areas such as **Probability, Statistics, Optimization, Graph theory, and Linear Algebra**.
- To enhance the participants' knowledge in advanced topics like **Neural Networks, Machine Learning Algorithms, and Predictive Analytics**.
- To demonstrate the applications of these mathematical techniques in real-world scenarios, such as in **AI, ML, and Data-driven Decision-making**.
- To foster academic growth and professional development by integrating **Theoretical Mathematics** with **Practical Computational Techniques**.

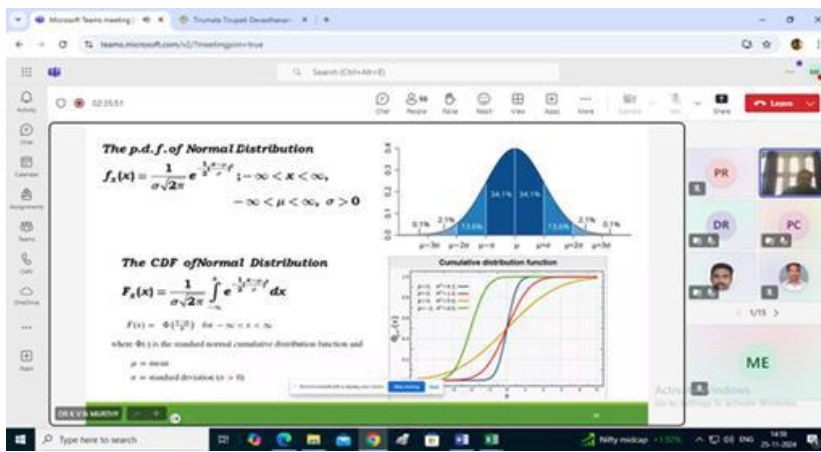
Structure of the FDP:

The FDP was spread over **six days**, comprising **12 sessions** led by distinguished resource persons from leading academic and research institutions across India and abroad. The sessions provided participants with both theoretical insights and hands-on applications of the mathematical tools used in computational intelligence.

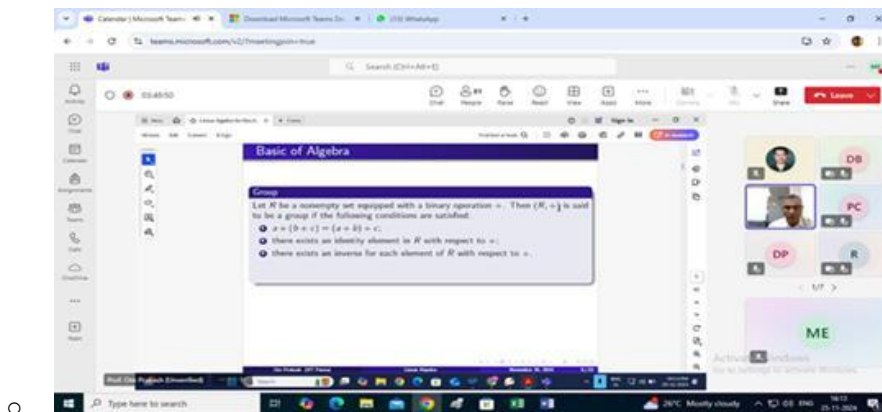
Detailed Session Report:

Day 1: 25th November 2024 (Monday) Session 1: Probability Modelling

- **Time:** 2:00 PM to 3:30 PM
- **Resource Person:** Dr. K.V. Narasimha Murthy, Associate Professor, Department of Mathematics, MITS
- **Overview:** Dr. Murthy introduced **Probability Modelling** and its significance in CI. He discussed various **probability distributions** and how they are applied in modelling real-world systems where uncertainty and randomness are present.



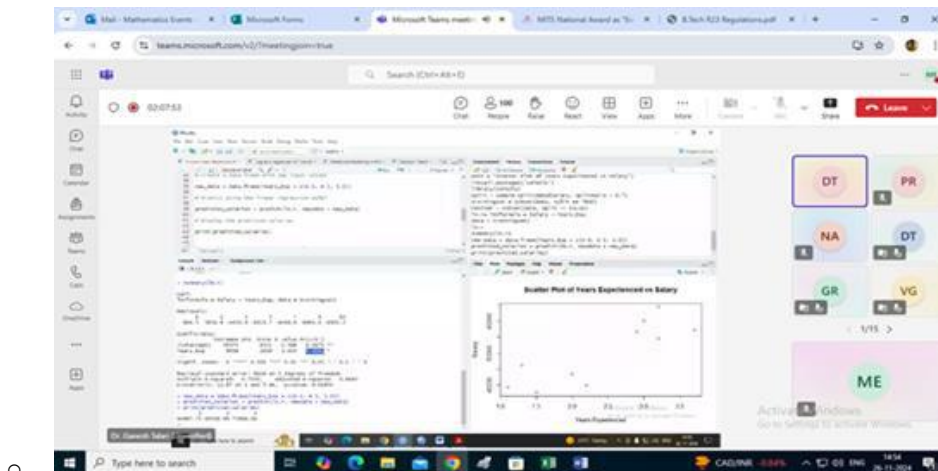
- **Session 2: Linear Algebra for Machine Learning**
- **Time:** 3:30 PM to 5:00 PM
- **Resource Person:** Dr. Om Prakash, Professor, Department of Mathematics, IIT Patna
- **Overview:** Dr. Prakash explained the role of **Linear Algebra** in **Machine Learning**, focusing on matrix operations, eigenvalues, and singular value decomposition (SVD) for **dimensionality reduction** and **feature extraction** in machine learning models.



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Day 2: 26th November 2024 (Tuesday) Session 3: Predictive Analytics Using R

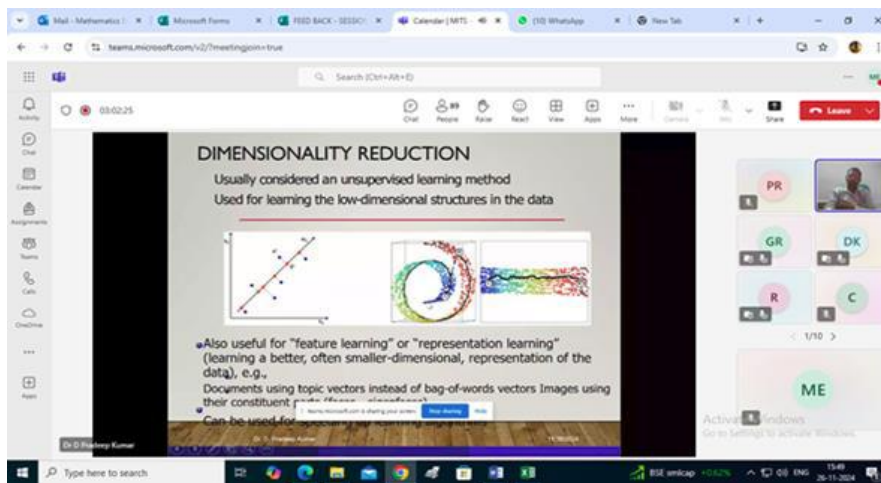
- **Time:** 2:00 PM to 3:30 PM
- **Resource Person:** Dr. Ganesh Talari, Assistant Professor of Mathematics & Scientific Computing, NIT Hamirpur (HP)
- **Overview:** Dr. Talari focused on the use of **R programming** for **predictive analytics**. He demonstrated various statistical techniques, including **regression analysis** and **forecasting models**, highlighting their application in data-driven decision-making.



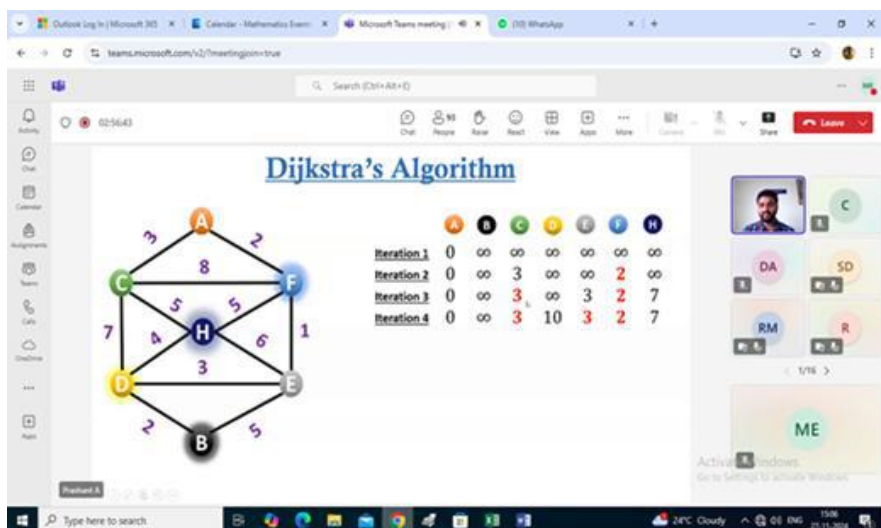
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Session 4: Dimensionality Reduction Technique

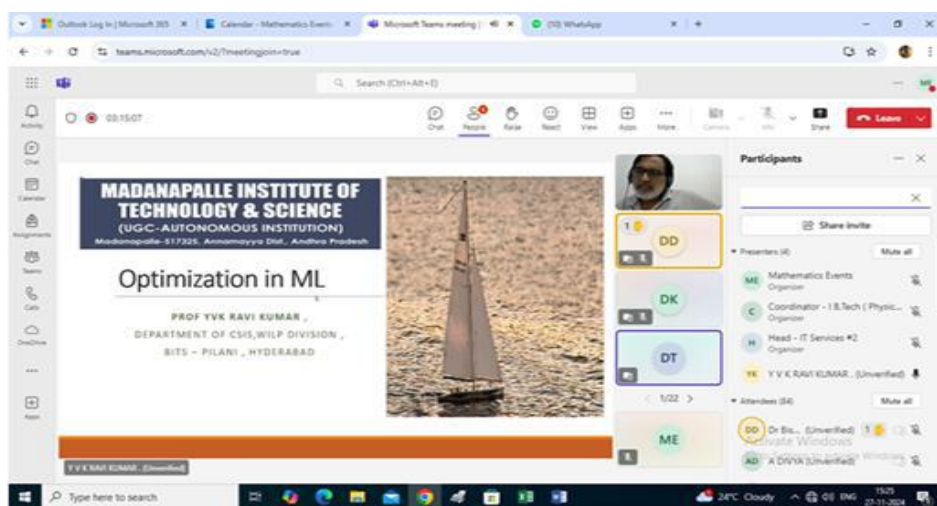
- **Time:** 3:30 PM to 5:00 PM
- **Resource Person:** Dr. D. Pradeep Kumar, Professor, Department of Management Studies, MITs
- **Overview:** Dr. Kumar covered **dimensionality reduction techniques** like **Principal Component Analysis (PCA)** and **Linear Discriminant Analysis (LDA)**, explaining their importance in reducing the complexity of large datasets while preserving relevant information.



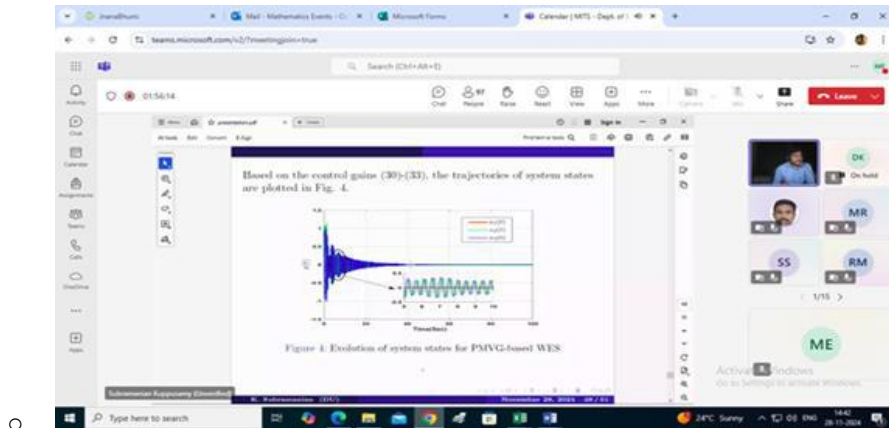
- Day 3: 27th November 2024 (Wednesday) Session 5: An Introduction to Graph Algorithms: Finding Shortest Paths and Spanning Trees. Session 5: An Introduction to Graph Algorithms: Finding Shortest Paths and Spanning Trees
- Time: 2:00 PM to 3:30 PM
- Resource Person: Dr. A. Prashant, Assistant Professor, Department of Mathematics, MITS
- Overview: Dr. Prashant introduced **graph algorithms**, specifically **Dijkstra's algorithm** for finding **shortest paths** and **Kruskal's** and **Prim's** algorithms for **spanning trees**, which are critical in **network optimization** and **AI-based decision-making**.



- Session 6: Optimization Theory and Machine Learning
- Time: 3:30 PM to 5:00 PM
- Resource Person: Dr. Y V K Ravi Kumar, Professor, [BITS - Pilani](#), Hyderabad
- Overview: Dr. Y V K Ravi Kumar discussed **optimization theory** and its applications in **machine learning**. Topics included **gradient descent** and **convex optimization**, which are foundational for training deep learning models.



- **Day 4: 28th November 2024 (Thursday) Session 7: Memory Sampled-Data Control for T-S Fuzzy Systems**
- **Time:** 2:00 PM to 3:30 PM
- **Resource Person:** Dr.Subramanian Kuppusamy, Research Fellow, Deakin University, School of Engineering, Australia.
- **Overview:** Mr. Kuppusamy discussed **memory sampled-data control** for **Takagi-Sugeno fuzzy systems** used in **control theory** and engineering. He highlighted their relevance in modelling and controlling systems with uncertainties.

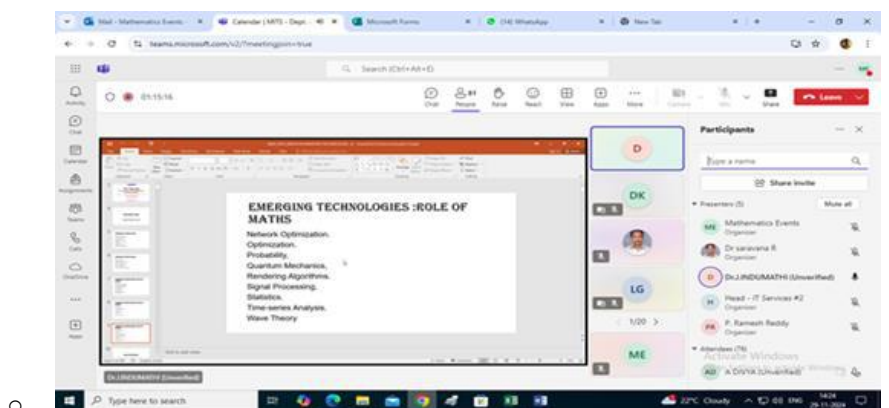


- **Session 8: Building Neural Networks from Scratch**
- **Time:** 3:30 PM to 5:00 PM
- **Resource Person:** Dr. R. Nidhya, Professor, Department of Computer Science and Engineering, MITS
- **Overview:** Dr. Nidhya provided an in-depth tutorial on **building neural networks** from the ground up. She explained the basics of **backpropagation**, **activation functions**, and how neural networks are trained for AI applications.



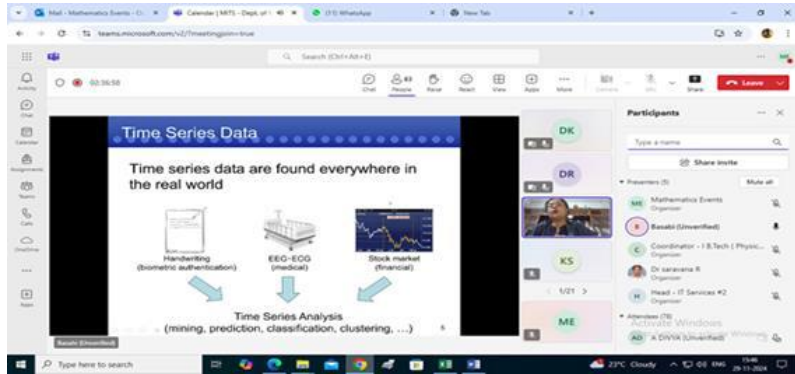
Day 5: 29th November 2024 (Friday) Session 9: The Role of Mathematics in Emerging Technologies

- **Time:** 2:00 PM to 3:30 PM
- **Resource Person:** Dr. J. Indhumathi, Professor, Department of Information Science and Technology, Anna University, Chennai
- **Overview:** Dr. Indhumathi discussed the role of **mathematics in emerging technologies**, focusing on **AI**, **blockchain**, and **quantum computing**. She illustrated how mathematical models and algorithms underpin these advanced technologies.



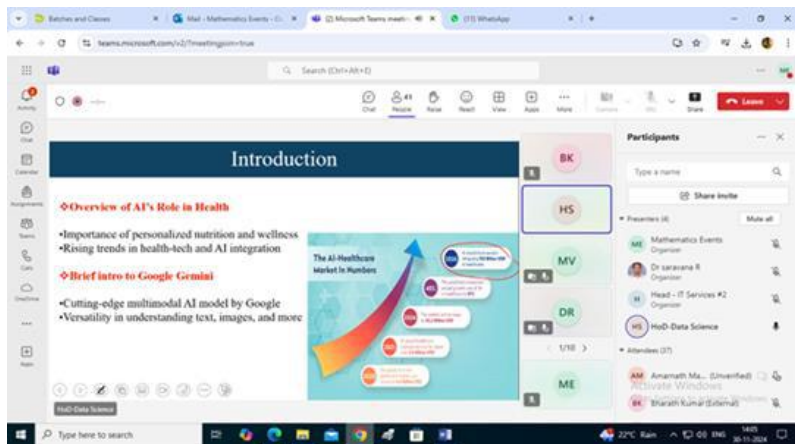
Session 10: Some Proposals of Similarity Measures for Efficient Analysis of Time Series Data

- **Time:** 3:30 PM to 5:00 PM
- **Resource Person:** Dr. Basabi Chakraborty, Ph.D., (Tohoku University, Japan), Professor & Dean, Department of Computer Science and Engineering, MITS
- **Overview:** Dr. Chakraborty discussed various **similarity measures** used for **time series analysis**, such as **dynamic time warping (DTW)**, and their importance in analyzing temporal data in fields like finance and healthcare.

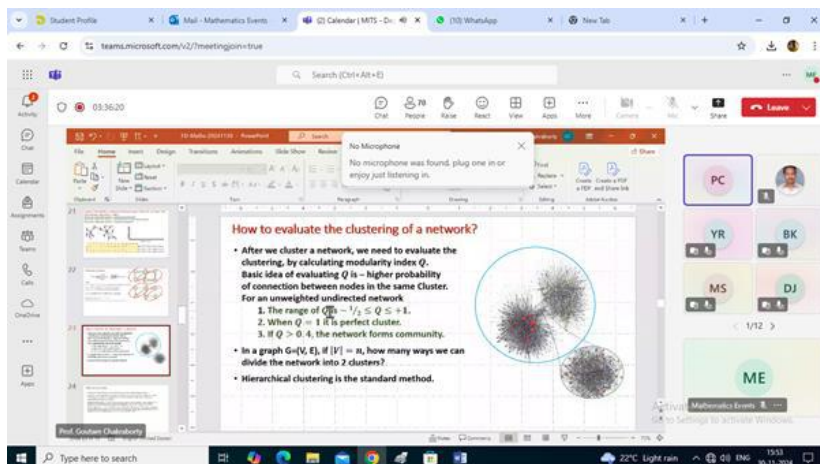


Day 6: 30th November 2024 (Saturday) Session 11: Advanced AI for Health: Personalized Application with Google Gemini

- **Time:** 2:00 PM to 3:30 PM
- **Resource Person:** Dr. S. Kusuma, Assistant Professor & HoD, Department of CSE- Data Science, MITS
- **Overview:** Dr. Kusuma presented the use of **AI in healthcare**, particularly in building **personalized health applications** using platform **Google Gemini**. She showcased the role of AI in **disease prediction** and **patient-specific treatment planning**.



- **Session 12: Graph Clustering and Matrix Rank Reduction - Two Sides of the Same Coin**
- **Time:** 3:30 PM to 5:00 PM
- **Resource Person:** Dr. Goutam Chakraborty, Ph.D., (Tohoku University, Japan), Distinguished Professor and Dean, Department of Computer Science and Engineering, MITS
- **Overview:** Dr. Chakraborty concluded the FDP with a session on **graph clustering** and **matrix rank reduction**, discussing how these mathematical methods are used for data analysis and optimization in computational intelligence tasks.



Conclusion:

The FDP on "**Mathematical Foundations for Computational Intelligence**" was a highly successful event, with **110 active participants** engaging in sessions over the course of the week. The program offered valuable insights into how mathematical principles are applied in modern computational intelligence techniques, particularly in AI, Machine Learning, and Data Science.

Participants expressed their satisfaction with the content and structure of the FDP, and the sessions were well-received for their blend of theoretical knowledge and practical application. This FDP has significantly contributed in enhancing the participants' understanding of the mathematical tools crucial for computational intelligence and their application in real-world problems.

Feedback from Participants:

The program received positive feedback for its comprehensive coverage of topics, expert speakers, and practical applications. Participants appreciated the interactive sessions and the opportunity to learn from renowned resource persons in the field. Many expressed interests in applying the knowledge gained in their research and teaching.

This FDP successfully bridged the gap between **mathematical theory** and **computational applications**, benefiting faculty members, researchers, and students looking to explore the rapidly advancing field of computational intelligence.

Vote of Thanks:

I would like to express my sincere gratitude to the Management and the Principal for providing us with the opportunity to conduct the one-week Faculty Development Program (FDP) on "**Mathematical Foundations for Computational Intelligence**." It was a privilege to share knowledge and engage with participants on such an insightful topic. The support and encouragement we received made this event a success, and we are thankful for the opportunity to contribute to the academic & research development of the faculty members.