



Faculty Development Program



Title : Data to Discovery: A Mathematical Perspective

Date : 2026-03-30 - 2026-03-30

Time : 10:00 - 11:30

Venue : TT728

Event Outcome

- Participants will gain a structured understanding of how mathematical principles transform data into meaningful insights. They will be able to formulate learning problems



Resource Person 1 - Details

Name : Prakash M

Designation : Assistant Professor Sr. Grade 1, School of Advanced Sciences

University/ Company : VIT, Vellore

Address : India, 632014.

Resource Person's Profile :

1. Profile of Prakash M

Mani Prakash is faculty of Mathematics, at Vellore Institute of Technology, India. His work focuses on data-driven modeling, machine learning, and control systems, with applications in computational science. He is particularly interested in bridging mathematical theory with real-world problems, including bioimage analysis and intelligent systems.

Modern science is increasingly driven by large, complex, and high-dimensional data arising from domains such as computational biology, bioimage analysis, and microscopy. However, transforming raw data into meaningful scientific discovery remains a fundamental challenge. This talk presents a unified mathematical perspective on the journey from data to discovery, emphasizing how mathematical structures underpin modern data-driven methodologies. We begin by framing data as mathematical objects and discuss the role of representation through feature engineering and embedding techniques. The talk then explores how learning models ranging from classical statistical methods to modern machine learning algorithms can be formulated as optimization problems, where the goal is to infer underlying patterns from observed data. Key concepts such as loss functions, decision boundaries, and generalization are introduced to highlight the theoretical foundations that govern model behavior. Building on this, we examine how mathematical tools from probability, linear algebra, and optimization enable robust inference and prediction, particularly in noisy and high-dimensional settings common in biological data. Through illustrative examples, including real-world datasets, we demonstrate how the integration of mathematical modeling and data-driven approaches leads to actionable insights and scientific discovery. Finally, the talk discusses emerging directions, including automated feature learning and the role of interpretable models in bridging theory and application. By connecting mathematical principles with practical workflows, this presentation aims to provide a structured understanding of how data can be systematically transformed into knowledge.

Python (NumPy, SciPy, scikit-learn), Jupyter Notebooks, and basic visualization tools will be used to demonstrate data representation, feature engineering, and model building. Simple real-world datasets will be employed to illustrate mathematical concepts such as optimization, classification, and inference in a practical, hands-on manner.

Coordinator's: Prof. PRAKASH M 17008 - Assistant Professor Sr. Grade 1 - SAS
Prof. BALAJI S 14779 - Assistant Professor Grade 2 - SAS