Pinak Mandal

Glebe - 2037, NSW
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Academic Highlights

- 2nd place at national level mathematics exam IIT-JAM   2014
- 9th place at national level mathematics exam TIFR-GS   2016
- 15th place at national level math exam (for lecturership in India) NET   2016
- Future Research Talent Fellow (Australian National University)   2021

Education and Work

- **University of Sydney, Sydney**   2023 - 2025
  Postdoc (Machine Learning and Dynamical Systems)

- **International Centre for Theoretical Sciences, Bengaluru**   2017 - 2023
  PhD (Applied Mathematics and Deep Learning)
  Thesis: Numerical Filter Stability, Fokker-Planck Equations and
  Infinite Dimensional Optimization with Deep Learning

- **Jadavpur University, Kolkata** - MSc (Mathematics)   2014 - 2016

- **Jadavpur University, Kolkata** - BSc (Mathematics)   2011 - 2014

Projects

I have worked on a broad range of applied problems with a recent focus in fundamental
machine learning.

- **Unlearning in generative models, USyd**   2025
  Currently developing methods for forgetting sensitive training data in trained
  generative models.

- **Learning dynamical systems from data with Random Feature Maps, USyd**   2024
  Developed a data-driven mathod for sampling the non-trainable parameters of tanh
  random feature maps. Conceptualized and implemented deep and local variants of
  the random feature map to achieve state-of-the-art forecast times for chaotic
  dynamical systems.

- **Solving partial differential equations and constrained optimization problems
  with deep learning, ICTS**   2021-2023
  Developed deep learning based algorithms for solving high-dimensional Fokker-Planck
  equations and problems in calculus of variations.

- **Data Assimilation, ICTS**   2020-2021
  Developed and applied a method for computationally assessing the stability of
  numerical filters such as EnKF and particle filters.

- **Predicting Visual Stimuli from fMRI Data, Neuromatch Academy** 2021
  Used fMRI data to predict images seen by human subjects (in collaboration with an international group of graduate students).

- **Atmospheric Plume Modelling, ICTS** 2019
  Developed a PDE-based model for air pollution estimation using OpenStreetMap data.

- **Data Analytics, Computational Geometry and Topology, and Genetic Algorithms IISc** 2018
  These short projects include, but are not limited to, analyzing chromosome data to determine gene configurations that cause color blindness, finding social structures in a groups of dolphins in Doubtful Sound (NZ), music genre classification with machine learning, designing approximate solvers for NP-hard problems with genetic algorithms, and exploring the structure of the telecom data of Trentino using topological data analysis.

Conferences

I have presented my work at several conferences. Some of them are listed below.

- Numerical methods for complex high dimensional systems - Jervis Bay 2024

- 6th workshop on sequential Monte Carlo methods - ICMS, Edinburgh 2024

- Variational principles of plasma confinement in 3D magnetic fields - ANU, Canberra 2023

- 7th Indian control conference - IIT Bombay, Mumbai 2021

In 2025 I helped organize a minisymposium titled "Data-driven reconstruction and forecasting of dynamical systems" at SIAM DS25 in Denver.

Publications and Visualizations

- A list of my research articles can be found at **Google Scholar**.

- A gallery of visualizations from some of my projects is available at my **Github page**.

Software

I am primarily a Python coder with some experience in MATLAB and C. I have written several Python modules for various tasks such as implementation of hit-and-run random feature maps, solving high dimensional partial differential equations, and simulation of generic random variables and stochastic processes. I have several years of experience with Python's standard scientific libraries as well as ML libraries such as tensorflow and Pytorch. Most of my software projects are publicly availble on **Github**.

Referees

Vishal Vasan - ICTS , **Amit Apte - IISER Pune**, **Sreekar Vadlamni - TIFR CAM**, **Georg Gottwald - USyd**