Pinak Mandal

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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

Some 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

Projects

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

- **Unlearning via orthogonalization in generative models, USyd** 2025
  Developed fast algorithms for forgetting sensitive data in 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

- I have several first-author articles accepted in leading journals, including **Nature Communications, Foundations of Data Science, Physica D,** and **IEEE**. A list of my research articles can be found **here.**
- 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 my projects, and 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, such as **DeepRFM** and **forget**, are publicly availble on **GitHub**.

Referees

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