

# Pinak Mandal

Glebe - 2037, NSW

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## Education and Employment

- **University of Sydney, Sydney** 2023 - 2025  
Postdoc (Machine Learning and Dynamical Systems)  
Supervisor: [Georg Gottwald](#)
- **International Centre for Theoretical Sciences, Bengaluru** 2017 - 2023  
PhD (Applied Mathematics and Deep Learning)  
Supervisors: [Amit Apte](#), [Vishal Vasan](#)  
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 via orthogonalization in generative models, USyd** 2025  
Developed new algorithms for forgetting sensitive data in generative models that are orders of magnitude faster than gradient surgery. Gained expertise in generative architectures such as VAE, GAN, WGAN and WGAN-GP as well as low rank adaptations, and gradient surgery.
- **Learning dynamical systems from data with Random Feature Maps, USyd** 2024  
Developed a data-driven method for sampling the non-trainable parameters of tanh random feature maps. Conceptualized and implemented deep and local variants of random feature maps to achieve state-of-the-art forecast times for chaotic dynamical systems. Developed expertise in writing GPU-optimized PyTorch code using boolean tensors and efficient matrix-tensor operations.
- **Solving partial differential equations and constrained optimization problems with deep learning, ICTS** 2021-2023  
Developed deep learning algorithms for solving high-dimensional Fokker-Planck equations and problems in calculus of variations and identified a special failure mode of physics-informed neural networks for parabolic equations. Gained in-depth understanding of TensorFlow's automatic differentiation pipeline.
- **Data Assimilation, ICTS** 2020-2021  
Developed a method for assessing the stability of numerical filters, including EnKF and particle filters, and demonstrated exponential stability in both cases.
- **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 atmospheric plume, and combining with it open-source data from OpenStreetMap, estimated air pollution levels in [Peenya](#).

## Conferences and Seminars

- Co-organized the minisymposium: Data-driven reconstruction and forecasting of dynamical systems - **SIAM DS25, Denver** 2025
- Machine learning seminar - **USyd** | **Talk:** Learning dynamical systems with hit-and-run random feature maps 2025
- Applied math seminar - **USyd** | **Talk:** Unlearning via orthogonalization in generative models 2025
- Numerical methods for complex high dimensional systems - **Jervis Bay** | **Talk:** From Random to Reliable: Good sampling for random features in ML 2024
- 6th workshop on sequential Monte Carlo methods - **ICMS, Edinburgh** | **Poster:** Numerical explorations of nonlinear filter stability using Sinkhorn divergence 2024
- New directions for stochastic differential equations and machine learning - **ICMS, Edinburgh** | **Poster:** Success and failure of PINNs and solving Fokker-Planck equations 2024
- Variational principles of plasma confinement in 3D magnetic fields - **ANU** | **Talk:** Deep learning for stellarator design (with Zhisong Qu) 2023
- In-house symposium - **ICTS, Bengaluru** | **Talk:** Grid-free solutions of Fokker-Planck equations 2022
- 7th Indian Control Conference - **IIT Bombay** | **Talk:** Stability of nonlinear filters - numerical explorations of particle and ensemble Kalman filters 2021

## Awards

- 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
- Recipient of Infosys-TIFR Leading Edge travel grant 2023

## 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 illustrating some of my projects is available on my [GitHub page](#).

## Software Development

I have authored multiple software packages in Python, and bring several years of experience with Python's scientific computing and machine learning stack, including expertise in TensorFlow and PyTorch. My projects focus on building scalable systems that perform reliably across platforms. Most of my software projects, such as [DeepRFM](#) and [forget](#), are publicly available on [GitHub](#).