Bengaluru - 560097, India
(+91) 9051614370
pinak.mandal@icts.res.in

# PINAK MANDAL

## Some Academic Highlights

- 2nd place at national level mathematics exam IIT-JAM(2014)
- 9-th place at national level mathematics exam (for my current employment) TIFR-GS(2016)
- 15-th place at national level math exam (for lecturership/professorship in India) - NET(2016)
- Selected for Future Research Talent program hosted by Australian National University (2021)

## Education

**International Centre for Theoretical Sciences (ICTS) - Tata Institute of Fundamental Research, Bengaluru** — ***Research Scholar***

2017 - Present

I work under professor Amit Apte on data assimilation and machine learning approaches for solving PDEs.

**Jadavpur University, Kolkata** — ***Msc (Mathematics)***

2014 - 2016

**Jadavpur University, Kolkata** — ***Bsc (Mathematics)***

2011 - 2014

## Some Past Projects

**Data Analytics and other projects, Indian Institute of Science (2018)**

At the Indian Institute of Science I have worked on several projects. Some of them are

- analyzing Prof Ramesh Hariharan's chromosome data and determining the most likely gene configurations that cause color blindness
- finding social structures in a group of dolphins that reside in Doubtful sound, a fjord in New Zealand
- music genre classification with machine learning
- approximately solving computationally challenging problems with genetic algorithms eg the travelling salesman problem

**Atmospheric plume modelling, ICTS (2019)**

Under Prof Vishal Vasan I have worked on atmospheric plume modelling which included solving a PDE model and integrating the solution on the road network obtained from OpenStreetMap data to estimate air pollution caused by traffic around Peenya, Bengaluru.

### Predicting images from fMRI data, Neuromatch Academy (2021)

I worked with several other international students with varied backgrounds (ranging from neuroscience to chemistry) and we showed that fMRI data can be used to predict images seen by a subject quite well.

## Current Projects

### Data Assimilation, ICTS

I have written my own module (available at https://github.com/pinakm9/filters) for simulating generic stochastic processes, Markov chains and implementing popular filtering algorithms eg Particle and Kalman filters with many different variations.

### Non-linear filter stability, ICTS

- Under Prof Amit Apte I devised an efficient way to compute stability of non-linear filters which I presented at the 7th Indian control conference, 2021 https://ieeexplore.ieee.org/document/9703185.
- In a separate paper, we showed that filter stability is related to filter convergence https://arxiv.org/abs/2208.10810.

### Solving Fokker-Planck equations with machine learning, ICTS

I have written my own module for solving Fokker-Planck equations (https://github.com/pinakm9/fp-solvers) (in preparation) which is applicable to dimensions traditionally thought of as challenging (tested in 10 dimensions).

### Solving variational problems with machine learning, ICTS

I, in collaboration with the plasma physics group at Australian National University, am currently exploring the possibility of solving magnetohydrodynamics equations written in variational form using the augmented Lagrangian method with physics informed neural nets.

### A gallery of examples from my current projects

A gallery of examples from my current projects is available at my Github page https://pinakm9.github.io/gallery22/.

## Skills

- A very competent Python coder. Most of the projects mentioned here can be found at my Github https://github.com/pinakm9 .
- Fluent in English, Bengali, Hindi.
- A decent chess player. Winner of the annual chess tournament at ICTS (2022).
- A decent long-distance runner.