Glebe - 2037, NSW
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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

The University of Sydney - Sydney — ***Postdoc (Machine learning and dynamical systems)***
2023 - Present

International Centre for Theoretical Sciences (ICTS) - Tata Institute of Fundamental Research, Bengaluru — ***PhD (Mathematics)***
2017 - 2023

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 human subjects.

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://www.sciencedirect.com/science/article/pii/S0167278923001197.

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) which is applicable to dimensions traditionally thought of as challenging (tested in 10 dimensions).

Solving variational problems with machine learning, ICTS

In 2022 I was selected as a part of the Future research talent program hosted by Australian National University. In collaboration with them I explored the possibility of solving constrained optimization problem in Hilbert spaces.

A gallery of examples from my projects

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

Publications

1. P. Mandal, S. K. Roy, and A. Apte, “Stability of nonlinear filters-numerical explorations of particle and ensemble kalman filters,” in 2021 Seventh Indian Control Conference (ICC), pp. 307-312, IEEE, 2021.

2. Pinak Mandal, Shashank Kumar Roy, and Amit Apte. Probing robustness of nonlinear filter stability numerically using sinkhorn divergence. Physica D: Non- linear Phenomena, 451:133765, 2023.

3. Pinak Mandal and Amit Apte. “Learning zeros of Fokker-Planck operators”. In: arXiv preprint arXiv:2306.07068 (2023).

4. Pinak Mandal and Amit Apte. “Solving Fokker-Planck equations using the zeros of Fokker-Planck operators and the Feynman-Kac formula”. In: arXiv preprint arXiv:2401.01292 (2024).

5. Pinak Mandal. “Learning solutions to some toy constrained optimization problems in infinite dimensional Hilbert spaces”. In: arXiv preprint arXiv:2401.01306 (2024).

Referees

- Vishal Vasan (email: vishal.vasan@icts.res.in)
- Amit Apte (email: apte@iiserpune.ac.in)
- Sreekar Vadlamni (email: sreekar@tifrbng.res.in)
- Georg Gottwald (email: georg.gottwald@sydney.edu.au)

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.