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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**

**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 human subjects.**

**Current Projects**

**Data Assimilation, ICTS**

**I have written my own module (available at** [**https://github.com/pinakm9/filters**](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**](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**](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**](https://github.com/pinakm9/fp-solvers)**) which is applicable to dimensions traditionally thought of as challenging (tested in 10 dimensions) (in preparation).**

**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 am exploring the possibility of solving magnetohydrodynamics equations written in an augmented Lagrangian form.**

**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/**](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**](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.**

**Papers and drafts**

* **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.**
* **P. Mandal, S. K. Roy, and A. Apte, “Probing robustness of nonlinear filter stability numerically using sinkhorn divergence,” arXiv preprint arXiv:2208.10810, under review at Physica D, 2022.**
* **P. Mandal and A. Apte, “Solving high dimemsional Fokker-Planck equations,” in preparation, 2022.**

**Referees**

* [Vishal Vasan](https://www.icts.res.in/people/vishal-vasan) (email: vishal.vasan@icts.res.in)
* [Amit Apte](https://www.iiserpune.ac.in/research/department/data-science/people/faculty/regular-faculty/amit-apte/359) (email: apte@iiserpune.ac.in)
* [Sreekar Vadlamni](http://math.tifrbng.res.in/~sreekar/Site/Home.html) (email: sreekar@tifrbng.res.in)