

Amartya (Marty) Mukherjee

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Education

- 2022 – 2027 **University of Waterloo** – Waterloo, Ontario
PhD in Applied Mathematics
- 2017 – 2022 **University of Waterloo** – Waterloo, Ontario
BMath in Scientific Computation/Applied Mathematics, minor in Statistics
GPA: 86.7/100
Selected coursework: Ordinary Differential Equations 2 (93%), Partial Differential Equations 1 (98%), Computational Linear Algebra (96%), Computational Methods for Partial Differential Equations (90%), Statistical Learning - Classification (94%), Control Theory (95%)
Selected course report:
- *Insider Trading Roles Classification*, Statistical Learning - Classification [[Link](#)]

Honors and scholarships

- 2021 Term Dean's Honours List in Fall 2017, Fall 2019 and Winter 2021 (University of Waterloo)
- 2021 3rd place at CodeML Hackathon 2021 - Challenge 6
- 2018 President's Scholarship (University of Waterloo)
- 2017 Founder's Scholarship (K. International School Tokyo)

Technical Skills

Programming languages

Python, Matlab, C++, SQL, C, Java, R

Software

L^AT_EX, Git, Flask, TensorFlow, Keras, PyTorch, OpenCV, PySindy, PySpark, ONNX

Languages

English (fluent), Japanese (fluent), Mandarin (basic)

Research Experience

- May 2021 – December 2021 **Computer Vision, Noah's Ark Lab at Huawei Technologies Canada**
Mentor: Dr. Wentao Liu
Worked on motion vector extraction for accelerated video AI tasks on smartphones. Integrated modified H.264 and HEVC video decoders into the Android Media framework that output motion vector information into the OpenMAX buffer. Reduced the computation times of optical flow and action recognition models by 55% and 34% respectively. Filed a patent, that has been approved by the United States Patent and Trademark Office.

May 2020 – **Fields CQAM Laboratory for Inference and Prediction**
April 2021 Mentor: Professor Navaratnam Sri Namachchivaya
Worked on data-driven dimensionality reduction methods in two-time-scaled dynamical systems. Replaced regression with a combination of sparse optimization and data assimilation in modelling dynamical systems. Reduced the mean squared prediction error of Rossby waves by 21% using Compressed Sensing and further by 64% using Ensemble Kalman Filter. Lead author of the paper [1].

Publications and Preprints

April 2022 Mukherjee, A., Aydogdu, Y., Ravichandran, T. and Namachchivaya, N.S., 2022. **Stochastic Parameterization Using Compressed Sensing: Application to the Lorenz-96 Atmospheric Model.** Tellus A: Dynamic Meteorology and Oceanography, 74(2022), pp.300–317. DOI: <http://doi.org/10.16993/tellusa.42>
May 2021 Mukherjee, A., 2021. **A Comparison of Reward Functions in Q-Learning Applied to a Cart Position Problem.** Preprint [arXiv:2105.11617](https://arxiv.org/abs/2105.11617)

Patents

November 2021 S. Kumar, A. Mukherjee, S. Patel, R. X. Chai, W. Liu, Y. Yu, Y. Wang, J. Tang. **Methods and Devices for Extracting Motion Vector Data from Compressed Video Data.** United States Patent Application 92007962, filed November 26, 2021.

Industry Experience

January 2020 – **Zeitspace (Software Engineer)** – Waterloo, ON
April 2020 Automated the sorting of riders onto races according to their skill level with unsupervised learning. Utilized the TrueSkill algorithm to determine ranks of riders given prior race results. Sorted riders with similar ranks and experience to the same race using K Means Clustering. Deployed this algorithm to the backend: Python with Flask
May 2019 – **TELUS Health (Software Developer)** – Cambridge, ON
August 2019 Test Automation - PS Suite: An application used by doctors to access patient records and write prescriptions
Wrote and debugged 120 test cases in Python that test the user interface of the PS Suite. Enhanced the TELUS automation framework by updating the Jenkinsfile to include a pipeline that tests incremental upgrades. Approved and detected bugs of latest releases of the PS Suite using regression tests
May 2018 – **FirstQA Systems K. K. (Blockchain Developer)** – Yokohama, Japan
August 2018 Establishing an ecosystem where consumers can access production process for each food product in the market
Developed the SakuraFresh cryptocurrency through the NEM Blockchain. Built a platform that allows companies to perform transactions through the blockchain: Angular and Express

Other Projects

August 2021 –
Ongoing

TorchTS

Mentor: Professor Rose Yu (University of California, San Diego)

[\[Link to GitHub Repository\]](#)

Contributed to the TorchTS open-source project. Worked on parameter estimations in Ordinary Differential Equations using Optimization for Data Science. Improved the learning methodology of the ODENet model using single-step observations. Developed the ODE-DNN-Net model, which combines ODEs with Deep Neural Networks, to improve the prediction of oscillating data. Reduced the mean squared prediction error of three ODEs by a factor of 10^2 .

November 2021

Petals to the Metal - Flower Classification on TPU

[\[Link to Kaggle Notebook\]](#)

Trained the EfficientNet-v2-XL model on TensorFlow with TPUs to classify 104 different types of flowers. Achieved a macro F1 score of 0.96259.

December 2020

Pokemon GAN

[\[Link to Colab Notebook\]](#)

Used PyTorch to train a GAN with images from Kaggle [\[Link\]](#) to create a realistic Pokemon Generator

December 2020

Shallow Water Waves Animation

Amath 442: Computational Methods for Partial Differential Equations

[\[Link to Colab Notebook\]](#)

Created an animation of the damping problem in shallow water waves in 2D space. Used finite volume method with Lax-Friedrichs flux to solve the PDE numerically.