# Amartya (Marty) Mukherjee

a29mukhe@uwaterloo.ca      Waterloo, Ontario, Canada

+1 226-505-7700      [LinkedIn]

## Education

| | |
|---|---|
| 2022 – 2027 | **University of Waterloo** – Waterloo, Ontario<br>PhD in Applied Mathematics under Jun Liu's supervision |
| 2017 – 2022 | **University of Waterloo** – Waterloo, Ontario<br>BMath in Scientific Computation/Applied Mathematics, minor in Statistics<br>*GPA: 86.7/100* |

## 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**

LaTeX, Git, Flask, TensorFlow, Keras, PyTorch, OpenCV, PySindy, PySpark, ONNX

**Languages**

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

## Research Experience

| | |
|---|---|
| May 2021 –<br>December 2021 | **Computer Vision, Noah's Ark Lab at Huawei Technologies Canada**<br>Mentor: Dr. Wentao Liu<br>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 – April 2021 | **Fields CQAM Laboratory for Inference and Prediction**<br>Mentor: Professor Navaratnam Sri Namachchivaya<br>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 |

## 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 – April 2020 | **Zeitspace (Software Engineer)** – Waterloo, ON<br>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 – August 2019 | **TELUS Health (Software Developer)** – Cambridge, ON<br>Test Automation - PS Suite: An application used by doctors to access patient records and write prescriptions<br>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 – August 2018 | **FirstQA Systems K. K. (Blockchain Developer)** – Yokohama, Japan<br>Establishing an ecosystem where consumers can access production process for each food product in the market<br>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 –
April 2022

**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 $10^2$.

September 2020
– December
2020

**Insider Trading Roles Classification**

[Link to Report]

Trained classification models (Support Vector Machine, K-Nearest Neighbors, Neural Network, Decision Tree) on United States conventional stock or non-derivative transactions datasets from over 2000 constituents. Divided role codes of each trader into four levels of hierarchy as the prediction variable. Achieved a 70.2% test accuracy using Bagged Tree.