

Surya T. Sathujoda

CONTACT INFORMATION

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EDUCATION

University of Cambridge

M.A.St., Mathematics (Part III of Mathematical Tripos) Sept. 2022 - Jun. 2023
• Dissertation Topic: “Deep Learning for Partial Differential Equations”

University of Southampton

B.Sc., Physics Sept. 2019 - June 2022
• Dissertation Topic: “In Anticipation of Dark Matter Discovery - A Phenomenological study”

University of Manchester

B.Sc., Computer Science Sept. 2015 - June 2018
• Dissertation Topic: “Pattern Recognition of Stock Price Movement”

AWARDS AND GRANTS

University of Southampton: Best Performance of BSc (Hons) Physics Degree Award, 2022
University of Southampton: Best Bachelor of Science Thesis Award, 2022
CDT in Machine Intelligence for Nano-Devices: UKRI Research Grant, 2021
Royal Astronomical Society: Summer Undergraduate Research Bursary, 2021
University of Southampton: Dept of Physics and Astronomy Research Assistantship, 2021

PUBLICATIONS

- [1] **Sathujoda, S.T.** and S.M. Sheth. Physics-informed Localized Learning for Advection-Diffusion-Reaction Systems. *International Conference on Machine Learning (ICML) Frontiers4LCD Workshop* 2023.

PROFESSIONAL EXPERIENCE

Schlumberger, Abingdon, UK

Data Scientist Intern - Physics Team June 2022 - September 2022

Conducted research on simulating fluid dynamics using **Physics-informed Deep Learning** and implemented a novel TensorFlow model to predict future state variables in subsurface fluid simulations for optimizing carbon capture and storage. Achieved a significant reduction in training time from 45 hours to 3 hours on an NVIDIA Tesla V100 GPU, by introducing a new model comprising a localized auto-encoder, residual networks, and physics-informed losses. Work to be published at ICML 2023 Workshop.

Machine Intelligence CDT, University of Southampton, UK

Machine Learning Research Intern June 2021 - August 2021

Conducted research funded by UKRI EPSRC on **Graph Neural Networks** at MINDS CDT, implementing GNN models using PyTorch and PyTorch-Geometric for classification tasks such as Protein-Protein Interaction and Citation Networks. Analyzed the performance of Graph Attention Networks and quantified the effect of thresholded attention dropout on attention weights distribution.

Astrophysics Group, University of Southampton, UK

Astrophysics Research Assistant August 2021 - October 2021

Conducted research on machine learning inference for Accretion Disks of Active Galactic Nuclei, jointly funded by the Royal Astronomical Society and University of Southampton. Developed expertise in training **Gaussian Processes** using Python package Starfish for characterizing exoplanet spectral properties and building parameter inference models using GPs for Monte-Carlo radiative transfer simulations of SS Cygni.

Fidessa, London, UK

Software Development Intern

June 2017 – September 2017

Worked in an Agile Scrum Development team on a Post-Trade FinTech product for financial order management. Responsible for implementing live **low-latency C++** code and utilising TCL to build and run the test framework. Collaborated with team using Perforce version control, Jenkins Continuous Integration and Jira for project management

ACADEMIC THESES **Deep Learning for Partial Differential Equations**

Cambridge Image Analysis Group - University of Cambridge

Jan 2023 - May 2023

Literature survey of Neural Operators to approximate PDEs and studied possibilities for the extension for current models, such as Fourier Neural Operators (FNO) and Physics-informed Neural Operators (PINO), to be applied to unstructured grids and meshes.

In Anticipation of Dark Matter Discovery

Theoretical Particle Physics Group - University of Southampton

Oct 2021 - Jan 2022

Predicted, visualised and studied particle interactions beyond the Standard Model. Analysed the Inert Two Higgs Doublet and Minimal Fermion Dark Matter models by calculating cross-sections, relic densities and branching ratios to search for Dark Matter candidates using CalcHEP and micrOMEGAs C packages.

Pattern Recognition of Stock Price Movement

Machine Learning and Optimization Group - University of Manchester

Sept 2017 - June 2018

Conducted research on Unsupervised methods, clustering Financial Time-Series data using K-Means and evaluating performance using metrics such as the DB Index. Performed feature extraction and calculated technicals like Moving Averages and Bollinger Bands using MATLAB.

OTHER

EXPERIENCE

Teaching Assistant for Programming and Data Analysis Module

Department of Physics and Astronomy - University of Southampton

Oct 2021 - Jan 2022

In charge of running weekly programming workshops with 20+ undergraduates and marking module assessments. Required to be able to explain programming concepts in Python and demonstrate examples introduced in lecture set. Responsible for thoroughly explaining Statistical/Data analysis concepts such as Statistical Distributions, Hypothesis Testing, Uncertainty, Model fitting and Parameter estimation via Least-squares and Chi-squared.

Institute of Physics (IOP) Student Representative

Campus Ambassador & SE England National Student Committee Rep.

Mar 2021 - June 2022

Chair of coding workshops on 'Introduction to Julia' and 'Introduction to R for Data Analysis' with 100+ participants. Part of organising committee of coding workshops on 'Introduction to C++ for Physicists' and 'C++ libraries for Physical Simulations' with speakers from CERN. Part of IOP Limit Less campaign to encourage and support young students, from diverse backgrounds, to follow their passion for Physics to Higher Education.

COMPUTER SKILLS

- *Languages:* Python, Java, C++, C, HTML, CSS, PHP, JavaScript
- *Statistical Computing & Toolkits:* R, MATLAB, NumPy, SciPy, Matplotlib, Pandas, Origin
- *Machine Learning Libraries:* Tensorflow, Keras, PyTorch, PyTorch-Geometric, Scikit-Learn
- *Data Technologies:* Relational Database Management Systems, SQL
- *Development Tools:* Git, Perforce, Jenkins, Jira, HP Quality Centre

References available on request.