Tharindu Warnakula, PhD

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A computational physics and machine learning scientist with an excellent record of peer-reviewed publications; math olympian and amateur baritone, with an insatiable appetite for tackling hard problems. 7 years of experience working in statistical modelling and computational physics, 4+ years experience in machine learning and data science.

PROFICIENCIES - TECHNOLOGIES/TECHNIQUES

Languages	Python, C++, Java, R, SQL, LaTeX, Matlab, Mathematica.
Tools/Libraries	Linux, PyTorch, Tensorflow, scikit-learn, pandas, Spark, Tableau.
Cloud Services	AWS Sagemaker, QuickSight, Athena, S3, Redshift, EC2 etc.
Probabilistic models	Bayesian Hierarchical models, Fokker-Planck equations, Monte Carlo methods.
Machine Learning	Clustering, gradient boosting, random forest, NLP techniques, logistic regression.
Deep Learning	RNN, CNN, Transformers, GAN.
Time Series Analysis	ARMA, ARIMA, GARCH, RNN.

WORK EXPERIENCE

Research Fellow ▶   2020-Present
Monash University

- Built a full-suite of **analytical**, **computational** and **machine-learning models** to further our understanding of opto-electrical properties of materials in thin-film solar cell technologies.
- **Wrangled** and **visualised large datasets**. Used **domain-knowledge** to **engineer features**. **Trained**, **validated** and **interpreted** models.
- Supported experimental efforts by **interpreting and explaining measurement results** theoretically.
- Designed and solved models using **multi-core** and **multi-gpu supercomputing clusters**.
- **Managed multiple simultaneous independent and collaborative projects**, delivering outcomes on strict deadlines and supporting doctoral students.

Teaching Associate   2017- 2020
Faculty of Information Technology and Faculty of Engineering, Monash University

Tutored masters and undergraduate students in Advanced Engineering Data Analysis (ENG5001/6001), Advanced Algorithms and Data Structures (FIT3155), Theory of Computation (FIT2014).

HIGHLIGHTED PROJECTS

Symmetry-optimised quantum solver for the many emitter-resonator model

- Reduced the hitherto best-known **computational complexity** of the solution method for an important quantum system from quintic to quartic, by discovering an **analytical symmetry** in the system of equations.
- Coded in **C++**, parallelised using **OpenMP** and run on the **NCI supercomputing cluster**.

Broken axial symmetry and poloidal plasmonic modes on a torus

- Brought new insight into surface plasmon modes on a torus by explaining the plasmon modes as originating from the **breaking of axial symmetry** on a cylinder.
- Analytical expression for the symmetry breaking dynamics was derived.

in Linkedin Profile   ▶ Solar cell device simulation project

📃 Google Scholar Publication Profile

Water pipeline failure prediction using Random Survival Forest

- Built a machine learning model to predict water pipeline failures across 3 Australian states using data from multiple water suppliers(in **collaboration with Data61 of CSIRO**).
- Developed in **Python** using **scikit-learn** and **pandas**.

Energy demand forecasting using Recurrent Neural Network

- Proposed a novel **recurrent neural network** architecture with a **two-phase attention** mechanism for predicting energy demand peaks successfully for energy suppliers in New South Wales(in **collaboration with Data61 of CSIRO**).
- Developed in **Python** using **Tensorflow**, **Pytorch** and **Google Colab**.

Predicting optics at rough interfaces with Convolutional Neural Network

- Independently developed a **convolutional neural network** model to predict optical effects of nano-scale features, to be used in solar cell simulations, bypassing the need for expensive 3D finite element simulations.
- Coded using **Python** and **Pytorch**, trained on **multi-gpu** environments in the Monash University **supercomputing cluster**.

End-to-end machine learning pipeline for text classification on the AWS cloud

- Constructed an **end-to-end ML pipeline** to classify review texts based upon **word2vec** and **BERT** embedding schemes.
- Coded on **AWS Sagemaker Studio** using other built-in tools including Autopilot, Feature Store, Debugger, Ground Truth and Pipelines. Also utilised related AWS services such as **S3, Athena** and **EC2**.

EDUCATION

Ph.D. (Computational Quantum Optics)   2016-2020
Monash University

- Made several key research contributions in **computational physics** and **theoretical quantum optics**, with thesis titled "Computational modelling of nano-resonators and coupled gain media".
- Developed sophisticated quantum physics solvers for **supercomputing environments**, with outcomes **published in highly ranked physics journals**.

B.Sc.(Hons) Electronic and Telecommunication Engineering - First Class (GPA 3.84)   2010-2015
University of Moratuwa, Sri Lanka

GCE Advanced Level Examination - National rank of 31 out of over 40,000   2009
St. Sebastian's College, Sri Lanka

AWARDS AND GRANTS

- Monash University Graduate Research Scholarship (2016-2019)
- Monash Faculty of Engineering International Postgraduate Research Scholarship (2016-2019)
- Monash University Postgraduate Publication Award grant (2019)
- People's Choice Award at Monash University Faculty of Engineering 3-minute thesis competition (2019)
- National Computational Merit Allocation Scheme grant(275,000 hours) (2018)
- Monash Strategic Partner Allocation computational grants(500,000 hours) (2017-2021)
- Team ranked 15th at IEEEXtreme Programming Competition 8.0(out of over 1800 teams globally) (2014)
- Honourable Mention at the 50th International Mathematical Olympiad (2009)
- Silver medal at the Sri Lankan Mathematical Olympiad among over 10,000 high school students (2009)