

SAM YU

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EXPERIENCE

Graduate Researcher

University of Alberta - Group of Prof. Massimo Boninsegni

Sept 2022 - April 2024

Edmonton, Alberta, Canada

- Researched the low-temperature physics of superfluid helium-4 adsorbed onto graphene substrate, advancing current theoretical understanding of quantum fluids
- Designed and executed large-scale C++ quantum Monte Carlo (QMC) simulations on computing clusters
- Estimated statistical errors in averages of correlated QMC data through renormalization group method
- Developed parallelized bootstrap & Markov chain methods to model the superfluid response from QMC data, published results

Undergraduate Researcher

University of Waterloo - Group of Prof. Andrea Scott

May - Aug 2021

Waterloo, Ontario, Canada

- Research and development of deep learning models for predicting ice conditions in Arctic Canada
- Unified model's forecast domain to entire Canadian Arctic by optimizing training memory usage of deep learning model
- Developed a new parameter-free MATLAB algorithm for determining freezing/melting dates from remote sensing data
- Trained and dockerized new machine learning models for integration and deployment to forecasting webpage hosted on AWS

Undergraduate Researcher

University of Waterloo - Group of Prof. Vasudevan Lakshminarayanan

Sept - Dec 2020

Waterloo, Ontario, Canada

- Researched the relationship between retinal disorders and fractal dimension of the retinal vasculature, and published the results
- Derived confidence intervals on effect size for different disease categories by applying statistical models to data pooled from all available studies

Numerical Environmental Modeller

Environment and Climate Change Canada

Jan - April 2020

Dorval, Quebec, Canada

- Built Django Python web interface for retrieving and visualizing information from tidal gauges across Atlantic Canada
- Integrated postprocessing framework with numerical storm surge solver for detiding and computing power spectra/statistics

Software Analyst Intern

Thales Rail Signaling Solutions

Jan - April, Sept - Dec 2019

Toronto, Ontario, Canada

- Created Python application for monitoring vehicle controller variables during real-time train operation
- Developed Python scripts to automate fixing of errors in automatic documentation generation spanning multiple train projects, reducing completion time by weeks
- Analyzed test coverage of C/C++ codebase using Gcov profiling tool

PROJECTS

Identifying Phase Transitions of Confined 2D Liquid Crystals

2022

- Rewrote Monte Carlo simulation package from scratch in C++, achieving a 200% simulation speedup
- Combined large scale parameter-sweeps with unsupervised learning (PCA, DBSCAN, etc..) to successfully identify critical points
- Developed computational geometry algorithms for detecting extended-object collisions, aided by calculations in Mathematica

Quantum State Tomography with Recurrent Neural Networks

2021

- Reconstructed the ground state of a quantum XY spin chain with up to 30 spin sites using an RNN in PyTorch
- Incorporated physical symmetries into recurrent neural network, demonstrating significant speedup during training

EDUCATION

University of Alberta

MSc. in Physics - grade: 4.0/4.0

Sept 2022 - April 2024

University of Waterloo

BSc. in Honours Mathematical Physics, Co-op program - grade: 84/100

Sep 2017 - Sept 2022

SKILLS

Programming: Python, C++, MATLAB, SQL, Mathematica

Software tools: Linux, HPC, Git, Jupyter, PyTorch, Docker, scikit-learn, pandas

Statistical methods: Machine learning, Monte Carlo methods