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Education

Nanyang Technological University Singapore
B.S. (Hons) in Physics (GPA 4.91/5.00), CN Yang Scholars Programme *Class of 2024*

Hwa Chong Institution Singapore
A Levels (UAP 88.75/90.00), Integrated Programme *Class of 2017*

Honours

Dean's List, NTU *AY20/21*
Princeton University Physics Challenge - Top 10 / Hon. Mention *2017*
Best Science Student Award, Hwa Chong Institution (College) *2016*
Singapore Chemistry Olympiad - Silver *2016*
Singapore Physics Olympiad - Silver *2016*

Experiences

Topologically Active Polymers Lab University of Edinburgh, UK
Research Assistant *May 2023 - Present*

- Designed and performed 3D molecular dynamics simulations in LAMMPS, using a python pipeline and a supercomputing cluster in order to elucidate the temporal and spatial dynamics of Structural Maintenance of Chromosome (SMC)-proteins moving on linear DNA.
- Performed statistical analysis with the goal of connecting simulation results to *in vitro* and *in vivo* observations in collaboration with an experimental lab.

Astignes Capital Asia Singapore
Quantitative Development Intern *May 2022 - Aug 2022*

- Developed a risk regime indicator in python, tracking volatility co-movements through a novel use of Principal Component Analysis, using the distribution of eigenvalues as a proxy for correlation across time-series. Experimented with methods such as Hidden Markov Models and Gaussian Mixture Models to investigate regime changes and transition probabilities for different data sources.
- Translated regime transition information into a toy strategy by writing a Genetic Algorithm, exploring a parameter space of $\sim 10^{12}$. Quantified strategy P&L and volatility, providing heuristic value for trading operations.
- Designed, deployed, and maintained an in-house dashboard in Plotly Dash for data visualisation with automatic updates, enhancing user interactivity for data discovery.

Making and Tinkering, NTU Singapore
Summer Project *May 2021 - Aug 2021*

- Developed and built a remote cell-counting optical microscope, capable of resolving single-cells at the micron level. Automated mechanical motion and focusing, allowing for 3-D motion with sub-millimetre precision.
- Experimented with applying a deep CNN for image classification (cell-counting), along with hyper-parameter tuning and validation using synthetic data.
- Implemented and refined a machine vision pipeline, attaining over 90% accuracy in synthetic and real-life tests with less than 1 second run-time.
- Developed a Flask web front-end, interfacing with a Python back-end, deployed on a Raspberry Pi.

Earth Observatory of Singapore, NTU Singapore
Research Assistant *Dec 2020 - May 2022*

- Applied Monte Carlo methods to quantify accuracy of a pre-trained Convolutional Neural Network (CNN), developing a processing pipeline to improve signal detection accuracy at least 95%.
- Automated the processing of $\sim$ 100 TB raw data using a super-computing cluster, detecting over 6000 robust micro-earthquake candidates over a 1.5 year period.
- Implemented a novel gridsearch method, validating with bootstrap methods, in order to associate and relocate low-magnitude (M<3) earthquakes in the Aceh region, for future use in finite element modelling.
- GitHub repo and wiki at github.com/zhengyang-c/cy1400-eqt

Skills

Programming: Competent in python (pandas, numpy, matplotlib). Experience with machine learning in Tensorflow (model construction, feature engineering, hyperparameter tuning, synthetic data generation). Daily drives Linux, experience with bash and supercomputer workflows. Experience with Excel VBA scripting, web crawling, gnuplot and LaTeX.

Notable Courses: Financial Mathematics, Computational Physics, Introduction to Data Science and Artificial Intelligence, Linear Algebra, Vector Calculus, Differential Equations, Introduction to Complex Analysis, Classical Electrodynamics, Quantum Mechanics, Analytical Mechanics