Jeffrey Suen

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github.com/jeffrunningit

Professional Summary

MSc Physics background with a strong foundation in data manipulation and analysis, mathematics, statistics, and computational modeling. Proficient in Python, C/C++, and MATLAB, with hands-on experience in solving data-driven problems and conducting independent research. Adept at translating complex datasets into useful information and insights.

Technical Skills

- **Programming:** Main: Python (NumPy, SciPy, pandas, matplotlib, scikit-learn)
  Previous Experience: C/C++, Java, JavaScript, MATLAB
- **Data Analysis & Visualization:** Matplotlib, Scikit-learn, Mathematica, SQL
- **Tools & Platforms:** Git, Windows, Mac, Linux, Microsoft Excel, LaTeX

Projects

Coding projects available at github.com/jeffrunningit

SIR model Pandemic Simulation

Interactive app available at https://sir-model-pendemic-prediction-production.up.railway.app

- Developed a particle simulation as a social interaction analogy in **C++** and **python** implementing the SIR model to visualize and analyze pandemic spread dynamics
- Implemented **object-oriented** programming principles using custom classes to represent and manage a population and the infection statuses of each agent
- Designed and implemented the **Monte Carlo** step integration scheme for infectious disease dynamics
- Utilizing the k-d tree data structure to optimize nearest neighbor searching which reduced simulation time by over 50%
- Performed data analysis by tracking and outputting the number of Susceptible, Infected, and Recovered individuals over time, facilitating subsequent analysis and visualization of pandemic curves
- Designed a web app interface for interactive simulation and visualization with **Flask**

Photoacoustics Data Analysis

- Developed a data processing pipeline in **Python** for **time-series** photoacoustic spectroscopy data from proprietary experimental instruments, significantly reducing manual analysis time
- Implemented signal processing techniques including averaging, smoothing, interpolation, FFT, etc. using **SciPy** and **NumPy**
- Created informative visualizations (time-series plots and spectrograms using **Matplotlib**) to analyze signal characteristics and frequency content, for scientific interpretation and presentation

Gravitational Wave Data Polarization Mode Classification

- Analysed detection data through LIGO's API with packages such as **scipy**, **matplotlib**, **PyCBC** etc.
- Implemented noise modeling, whitening, and time-frequency analysis
- Applied **machine learning** algorithms using the **scikit-learn** library to probe for non-tensorial g-wave polarization modes
- Visualized signal spectrograms and model performance with **confusion matrices**
- Obtained a model of 76% accuracy with random forest training

Education

MSc Physics and Astronomy, *Advanced Matter and Energy Physics* 2022 – 2024
University of Amsterdam

BSc Physics, *Enrichment Stream in Theoretical Physics* 2018 - 2022
Chinese University of Hong Kong

Relevant coursework: Data Structures, Statistical Mechanics, Advanced Calculus, Computational Physics, Statistics and Probability, Complex Systems-Dynamics and Chaos

Scholarships: Undergraduate Research Experience Grant, S.H.Ho College Scholarship

Research Experience

Research Intern, Advanced Research Center for Nanolithography 2023 – 2024

- Studied laser-induced acoustics with plasmonic gratings, motivated by the improvement of nanolithography technology in microchip manufacturing processes
- Analysed experimental data with **python** code using techniques such as fourier transform to observe surface plasmon polariton resonances and ultrasonic echoes
- Identified the *acoustic impedence mismatch* as a key factor affecting acoustic wave signals, rarely mentioned in existing literature

Research Intern, Chinese University of Hong Kong 2021 - 2022

- Studied ZnS as an alternative buffer for CZTS solar cell with DFT computational simulations using **bash** and **python** scripts
- Investigated the electronic structures from the DFT result data
- Illustrated electrical conductivity enhancement in ZnS buffer by doping of Sn
- Demonstrated possibility of stabilizing dopant Sn with the co-doping of oxygen

Gravitational Wave Researcher, Chinese University of Hong Kong 2020

- Implemented Null-Stream formulation to probe for alternative gravitational-wave polarization with LIGO data analysis
- Demonstrated feasibility to apply **machine learning** to probe for non-tensorial g-wave modes
- Obtained model of 85% accuracy with random forest training