

Freddie Bullard

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PERSONAL PROFILE

A motivated individual interested in applying computational and numerical methods to solve scientific problems across fields. Current physics undergraduate and previous Software Engineering intern with strong mathematical and computational skills, ranked 3rd out of 227 in Year 2 and received the Module Prize for best performance in Stars and Galaxies. A keen learner, and interested in many areas of science, completed several projects and online courses related to Computer Science and Biology.

EDUCATION

Durham University, Durham, UK

Summer 2024

BSc Physics

- **Grade:**

- **Year 2:** First class, 87% - ranked 3/227

- **Year 1:** First class, 82% - ranked 25/241

- **Relevant Topics:** Linear Algebra, Calculus, Electromagnetism, Quantum Mechanics, Thermodynamics, Condensed Matter Physics, Stars and Galaxies, Classical Mechanics, ODEs, PDEs, Nuclear Physics, Statistical Physics, Complex Analysis, Computational Physics

- **Awards:** Durham Physics Award for Outstanding Achievement (Year 1, Year 2), Stars and Galaxies Module Prize (Year 2), Computing Project Poster Prize Runner Up (Year 3)

RESEARCH EXPERIENCE

Classical and Quantum Monte Carlo Optimisation 

October 2023 – March 2024

Department of Physics, Durham University

- Conducted a comparative study of simulated and quantum annealing as heuristics, using the Travelling Salesman Problem as a test example
- Employed Monte Carlo techniques to implement simulated and quantum annealing in Python

Complex Structure Stress Analysis with Machine Learning 

Autumn 2023

Department of Physics, Durham University

- Investigated the use of stress-induced birefringence in studying the stresses and strains in complex structures under load
- Implemented a CNN based on Unet to extract stress information from photoelasticity images
- Added a physical constraint layer to allow training over fewer epochs and improve generalisation on experimentally obtained data

Investigating the Dark Matter Content of Spiral Galaxy M82 

Spring 2023

Department of Physics, Durham University

- Investigated the dark matter content of the spiral galaxy M82 through analysis of its rotation curve from HI and CO emission lines, and its luminosity as a function of distance from the galactic centre
- Applied image processing techniques, including dark and bias subtraction and flat-field corrections, to reduce uncertainty in our data

PROFESSIONAL EXPERIENCE

Software Development Engineer Intern

Summer 2023

Expedia Group, London

- Worked in a team of 10, developing and maintaining the ad delivery and tracking services

- Enhanced and extended a RESTful API service to track events related to ad impressions, utilised Kotlin and Spring to implement new tracking functionalities

Software Engineer Intern

Summer 2022

Spectrum Logic, London

- Designed and implemented an image segmentation algorithm in Python to automate region-of-interest detection in low contrast, 16-bit greyscale images for their Western Blot CMOS 1:1 image scanner

PERSONAL PROJECTS

Brain MRI Segmentation with Deep Learning 🧠 | Python (PyTorch)

Summer 2023 – Present

- Applying Deep Learning to automate identification of tumour shape features in brain MRI scans
- Leveraging hypothesis testing to analyse the relationship between imaging features and genomic clusters

Noise Reduction Web App 🌐 | Python (Flask, NumPy)

Summer 2022

- Implemented Gaussian, Median and Bilateral filters from scratch in Python with NumPy
- Improved code efficiency through vectorisation, concurrency and filter-separation
- Developed a full-stack web application using Python with Flask, hosted on Google Cloud Platform

ONLINE COURSES

Finding Hidden Messages in DNA (Bioinformatics I)

Summer 2023

UC San Diego via Coursera

Neural Networks and Deep Learning

Summer 2023

DeepLearning.AI via Coursera

6.006 Introduction to Algorithms

Summer 2022

MIT OCW

6.0001 Introduction to Computer Science and Programming in Python

Summer 2022

MIT OCW

TECHNICAL SKILLS

Languages: Python, Kotlin, HTML/CSS, L^AT_EX, SQL

Libraries and Frameworks: NumPy, SciPy, Matplotlib, Flask

Other: VS Code, IntelliJ, Git, Linux, MacOS, Windows, ImageJ

REFERENCES

Available upon request