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 theoretical physics undergraduate and previous Software Engineer Intern with strong mathematical and computational skills, ranked 3rd out of 227 in Year 2 and received the Module Prize for best performance in the module Stars and Galaxies II. A keen learner, and interested in many areas of science, completed several projects and online courses related to machine learning, algorithms and bioinformatics.

Education

Durham University, Durham, UK — Summer 2025

MPhys Theoretical Physics

- **Grade**:
  - **Year 2**: First class, 87% - ranked 3/227
  - **Year 1**: First class, 82% - ranked 25/241
- **Relevant Topics**: Linear Algebra, Calculus, Complex Analysis, Infinite Dimensional Vector Spaces, Computational Physics, ODEs, PDEs, Statistical Physics, Thermodynamics, Quantum Theory
- **Awards**: Durham Physics Award for Outstanding Achievement (Year 1, Year 2), Module Prize (Year 2)

Research Experience

Protein Folding with Quantum Optimisation — Autumn 2023 – Present

Department of Physics, Durham University

- Investigating solutions to NP-hard mathematical optimisation problems with Adiabatic Quantum Computing
- Applying quantum Monte Carlo simulation of quantum annealing to protein folding problems

Optical Stress Analysis of Complex Shapes with Deep Learning — Autumn 2023 – Present

Department of Physics, Durham University

- Investigated the use of stress-induced birefringence in studying the stresses and strains in complex structures under load
- Applied a UNET-based convolutional neural network with added physics-inspired constraints for instantaneous stress-information extraction.

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

- Applied U-Net convolutional neural network with ResNet backbone to automate the identification of tumour shape features in brain MRI scans
- Leveraged 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, LaTeX, SQL
Libraries and Frameworks: NumPy, SciPy, Matplotlib, Flask
Other: VS Code, IntelliJ, Git, Linux, MacOS, Windows, ImageJ

References

Available upon request

University of Durham
Academic Transcript

Name: Frederick Solomon Bullard

Student Information:

Date of Birth: 1 October 2002
College: John Snow College
University ID Number: 000933478
HESA ID Number: 2111169334784
Date of Admission: 27 September 2021
Date of Leaving:
Mode of Study: Full Time

Programme Information:

Award: Master of Physics
Programme Title: Physics
Programme Code: F301
Programme Outcome:
Date of Award:
Min. Full-Time Duration: 4 year(s)

Module Code	Module Title	Module Level	Mark (%)	University Credits
Academic Year 2021-2022				
PHYS 1081	Introduction to Astronomy	1	87	20
PHYS 1101	Discovery Skills in Physics	1	74	20
PHYS 1122	Foundations of Physics 1	1	83	40
MATH 1061	Calculus I	1	78	20
MATH 1071	Linear Algebra I	1	84	20
Academic Year 2022-2023				
PHYS 2581	Foundations of Physics 2A	2	93	20
PHYS 2591	Foundations of Physics 2B	2	88	20
PHYS 2611	Mathematical Methods in Physics	2	95	20
PHYS 2621	Stars and Galaxies	2	84	20
PHYS 2631	Theoretical Physics 2	2	80	20
PHYS 2641	Laboratory Skills and Electronics	2	82	20
Academic Year 2023-2024				
PHYS 3631	Foundations of Physics 3B	3	In Progress	20
PHYS 3561	Computing Project	3	In Progress	20
PHYS 3621	Foundations of Physics 3A	3	In Progress	20
PHYS 3661	Theoretical Physics 3	3	In Progress	20
PHYS 3591	Mathematics Workshop	3	In Progress	20
PHYS 3601	Advanced Laboratory	3	In Progress	20

Prizes and Distinctions: Outstanding Achievement L1, Outstanding Achievement L2, Physics Module Prize L2

Comments:

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For Registrar and Secretary

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This transcript does not show the outcomes of decisions made by Boards of Examiners about any mitigating circumstances or medical evidence, which may exist for the student named. The overall academic performance of the student, as judged by the Board of Examiners, is reflected in the degree classification awarded by the University.