Emma Allen

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I am a technically diligent student driven by a passion for continuous learning and a desire to gain a deeper understanding of our world. Through post-graduate studies I am seeking to improve my mathematical and computational skills with the ultimate aim of pursuing a career in computational methods and scientific research.

I have a strong interest in scientific modelling and have pursued this by working under the guidance of Professor Gang Chen at UCLA. I focused on utilising machine learning techniques to conduct Empirical Orthogonal Function (EOF) analysis and identify the dominant modes of variability . I am keen to learn more and gain further experience in a research.

Education

University of Edinburgh 2021 to 2025
BSc Honours in Computational Physics

- Expected first; pre-honours average 78%
- Awarded pre-honours certificate of achievement for excellent grades in first and second year
- Awarded Margaret Campbell Scott scholarship for achieving excellent entrance qualifications

University of California, Los Angeles (UCLA) 2023 to 2024
Academic Exchange

- 10% acceptance rate
- Completed courses in quantum mechanics (A), machine learning (A) and differential equations (A)
- Attended Conference for Undergraduate Women and Non-Binary Physicists (CUWiP) in San Diego

Research Experience

Research Intern June - August 2024
Applied Science and Technology Research Institute, Hong Kong

- Project based on compressing weights and KV cache data that will be used to develop a large language model. Using C++, I implemented several algorithms with limited success due to the large dataset size and lack of element-wise repetition. these problems by looking at entropy-based methods and applying my knowledge of entropy from thermodynamics to information theory. Ultimately, achieved a compression ratio of 92.4% compared to the theoretical limit of 92.1% for this dataset.
- Detailed my findings and methodology in a report and presented to my colleagues
- *Tools utilised: C++, Python, Latex*

Undergraduate Researcher Jan 2024 - August 2024
UCLA, Los Angeles

- Looked at surface temperature variability from 1980 to 2020. Began by detrending the data and plotting contour plots of variance, mean temperature and skewness to gain a baseline for what results to expect.
- Conducted an EOF analysis to identify the dominant modes of variability using singular value decomposition. The Results demonstrated that the first two EOFs captured distinct temperature variability patterns primarily in North America and Eurasia, which aligns with existing literature.
- *Tools utilised: Python (NumPy, sckit-learn, PyTorch), Latex*

Industry Experience

Safety Case Engineer Nov 2020 - Sept 2021
EDF, Gloucestershire

- Collaborated with members of the defueling team to author essential safety case documentation that provides comprehensive visibility of the defueling safety case for two nuclear stations

- Completed an independent research project consolidating over 30 years of research detailing the impact climate change will have on the entire nuclear fleet.
- Reviewed chemistry standards across the nuclear fleet, made a series of recommendations, which I recorded in a report and internally published and I presented my findings to colleagues and members of the UK Office for Nuclear Regulation
- Maintained the internal Wikipedia to showcase organisation changes and share operational experience. I designed the website to ensure easy access to consolidated key information
- Achieved the Industrial Cadets Platinum Leaders Award by the Engineering Development Trust (EDT) for completing a comprehensive 14000-word logbook that detailed my volunteering, mentoring and project accomplishments
- *Tools utilised: HTML / CSS, Microsoft Office*

Optiver Spring Intern April 2023 (1 week)
Optiver, Amsterdam

- Learnt about trading and market making from interactive lectures on fundamentals of profitable trading, trading systems introduction, and panel discussions
- Applied newly acquired knowledge to complete Optibook challenge. Collaboratively we engineered a dual-listing algorithm and competed against other teams, finishing fourth out of ten teams
- *Tools utilised: Python*

Mathematics and Physics Tutor Jan 2018 - Sept 2023
Various Locations

- Crafted innovative lesson plans and delivered them with an empathetic approach that enabled student to progress, such that three of my students achieved As in National 5 mathematics
- Adapted instructional strategies to effectively address individual challenges and improve their range of problem-solving techniques.

Projects

Astronomy Project, 2023 to present

- I led the Python sub-team to design and implement code object orientated code that reconstructed the analytical analysis supporting Hubble's universe expansion conclusion. Poster available *here*

Students As Change Agents, 2022

- Our team produced a concise 5-minute video and report that outlined short-, medium- and long-term solutions to address the problem "How can Scotland save vacant buildings to save the planet?". Presented these to our client, a start-up company called Grand Bequest
- Completed the Edinburgh award, exemplifying personal development and adaptability in a professional setting, public speaking and multifaceted communication

Additional Experience and Awards

Engineering Development Trust (EDT) Ambassador, 2021 to present: Deliver panel sessions to provide insights to my industry placement at EDF

Society Positions: Head of socials for Hoppers (gender minorities in CS). Head of media and marketing for hot chocolate society

Grade 8 Piano, 2023: Achieved grade 8 piano after playing piano for five years

First Place - Cambridge, Newnham College Essay Competition, 2019: Thoroughly researched the future of autonomous vehicles and reported my findings in a 2500 word essay

Technologies

Programming Languages: C++, C, Python, Java, Haskell, HTML / CSS, Latex