Emil Haines

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A PhD student at UCL with over three years experience working for international particle physics experiments. Proficient in software development and data analysis using Python and C++, with experience using modern deep learning techniques and frameworks in multiple research projects. Hoping to transfer the flexible range of skills I have acquired in research to a machine learning role within industry, and work on projects with meaningful real life applications.

Experience

ATLAS Experiment, CERN — Apr. 2021 – Present
Postgraduate Researcher — *London, UK/Geneva, CH*

- Qualified author for ATLAS, a leading, international particle physics experiment based at CERN
- Developed and maintained an analysis framework (`C++` and `Python`), version controlled with `git`, incorporating signal selection algorithms for the study of decays of the Higgs Boson to long-lived particles
- Analysed petabyte-scale datasets produced via particle collisions at the Large Hadron Collider, using grid computing facilities, and interpreted results with advanced statistical techniques (hypothesis testing, confidence intervals)
- Graph neural networks for jet classification; algorithm development and performance optimisation (`PyTorch`); led implementation of conditioning mechanisms in GNN framework, allowing the model to make smoothly interpolating inferences over a range of possible conditioning parameters, improving background rejection up to 75% for signal masses not used in training, compared to baseline methods
- Completed a one year attachment at CERN (Oct. 2021 - Sep. 2022); undertook shifts as an on-call expert, ensuring daily operations at ATLAS ran smoothly; regularly presented research to fellow students and academics
- Gained skills in scientific writing (`LaTeX`) through thesis writing and internal document notes
- Contributions due to be published in high impact physics journals

Graphcore — July 2019 – Sep. 2019
Silicon Engineer Intern — *Bristol, UK*

- Selected for 10 week internship in the Silicon Verification team on data analytics; processing and visualising validation test data and producing interactive tools for the dashboard
- Presented outcome to the CEO, CTO and VPs of the company, as well as fellow interns

UCL — Oct. 2020 – May 2021, Jan. 2024 – present
Post-Graduate Teaching Assistant — *London, UK*

- Organised problem classes for ∼20 students; guided students during demonstration sessions, communicated complex topics clearly; marked and provided feedback on coursework
- Courses: (3^{rd} year) Practical Machine Learning for Physicists, Nuclear and Particle Physics, (1^{st} year) Practical Physics and Computing

Education

UCL — 2020 – present
PhD Particle Physics — *London, UK*

- STFC funded research project working on the detection of new particles as a member of the ATLAS experiment
- Completed postgraduate courses in Machine Learning for Big Data, furthering practical understanding of modern machine learning techniques and database technologies, and Statistical Analysis, gaining knowledge of core concepts in probability and statistics

University of Bristol — 2016 – 2020
MSci Physics — *Bristol, UK*

- Graduated with first class honours, with an overall mark of 77%
- Awarded commendation for master's project entitled 'Deep Learning for event classification at LUX-ZEPLIN'; developed a novel convolutional autoencoder for detecting waveforms in time-series data (`Tensorflow, scikit-learn`), and demonstrated its efficacy when applied to searches for dark matter candidates
- Achieved high marks in computational and mathematical units, including: 91 in Methods of Theoretical Physics, 84 in Advanced Quantum Physics, and 83 in Quantum Information Theory and Computational Physics; covered topics including linear algebra, calculus, and probability