

curriculum vitæ of

# LEWIS DEAN

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## EDUCATION

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<b>Dean Trust Wigan</b>	2014 – 2019
• GCSEs: 9 grade 9s, 1 grade 8	
<b>Winstanley College</b>	2019 – 2021
• A-Levels: Mathematics (A*), Further Mathematics (A*), Physics (A*), Chemistry (A*)	
<b>University of Manchester</b> , MPhys in Physics with Theoretical Physics	2021 – 2025
• Cumulative Year 3 GPA: 83%	

## TECHNICAL SKILLS

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### Physics Expertise

- My four-year programme culminated in advanced courses that elucidated the cornerstones of modern physics. The modules I completed include (but are not limited to): quantum field theory, general relativity, nuclear physics, electromagnetism, thermodynamics and the frontiers of solid state physics. I ranked top of my cohort in the latter course.
- *Lab experience* - over the course of ten experiments, I've developed both my practical skills and my ability to devise comprehensive risk assessments. Each experiment's data analysis was comprised of careful error propagation, and often a least squares regression analysis that compared the measurements made to theoretical predictions. The execution of these experiments was accompanied by interview assessments, which helped advance my presentation skills, as well as the writing of lab reports, that were typeset using  $\text{\LaTeX}$ .

### Mathematical Proficiency

- Along my academic journey, I have worked with,
  - Methods of solving differential/integral equations, including complex analysis techniques
  - Probability theory and statistics
  - Linear and tensor algebra
  - Calculus of variations
  - Stochastic calculus
  - Nonlinear system analysis

### Coding Experience

- *Python* - facilitated the data analysis necessary in lab. Examples of my commonly used libraries are SciPy, NumPy, Matplotlib, and Pandas. Moreover, in my third year lab, I used machine learning, namely XGBoost Random Forests, to classify types of interaction events observed within a detector through the kinematic features of any secondary charged particles produced.
- *Limited C++ experience* - I spent one semester undertaking the introductory course "Object-Orientated Programming in C++". The final project involved building a hierarchical catalogue of elementary particles, which tested my understanding of encapsulation, polymorphism, the rule of fives, exception handling, RAII practices, etc.
- Accustomed to Git version control and Bash.

## WORK EXPERIENCE

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<b>Mitacs Globalink Research Intern</b> , Simon Fraser University, Canada	Jun – Sept 2023
• As an intern under the Sivak group, I was introduced to the idea of information engines, and how they can extract useful energy from fluctuations. My project involved writing Python computer simulations to quantify how the amount of extractable energy varied for fluctuations with different auto-correlations.	
• <i>High performance computing experience</i> - simulations were ran on Supercomputer Cedar, where I used the Slurm Workload Manager to execute jobs in parallel.	

- To boost simulation speed, I used Cython to compile the original Python scripts to C.
- The internship ended with a presentation, summarising the results of my simulations and further areas of study.

## PROJECTS

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Project reports available at: [lewismdean.uk](http://lewismdean.uk)

### Master's Project: Proton Beam Monitoring System

- I am building a piece of online software which will be used to interface with a proton beam imaging system, as well as for analysing the images taken. Protons interact within a scintillator to produce scintillation light, which will then be imaged by the camera modules of several Raspberry Pis.
- The system is to be tested at the Proton Beam Therapy Centre of The Christie NHS Foundation Trust.
- This project will provide me experience with both frontend and backend web development, in addition to some visual computing.

### Phase Transition Simulation

- My lab partner and I simulated an Ising model ferromagnet to determine how its heat capacity and magnetic susceptibility varied with temperature. To do this, we implemented Markov chain Monte Carlo methods that updated the spins of sites in the lattice; we then extracted the lattice's magnetic properties by ensemble averaging over different evolutions of the magnet.
- Our simulation earned us the highest marked theoretical computing project in our cohort.

## POSITIONS OF RESPONSIBILITY

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### Dean Trust Wigan Hall Captain

2018 - 2019

- Assisted the teaching of younger year groups during form time.
- Coordinated lunchtime events to raise hall points.

### Winstanley College Physics Ambassador

2019 - 2021

- Supported the department on 2 open evenings by describing the course to aspiring students and parents.
- Represented my year group in senior leadership meetings.