# Curriculum Vitae

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## Education

**Lancaster University (October 2018 - Present)**

- Statistics and Operational Research PhD (2022-2026) "Bi-Objective Strategic and Operational Decision-Making in Redundancy Allocation Problems with Dynamic Maintenance"
- Statistics and Operational Research MRes (2021-2022), Distinction
- Mathematics BSc with Hons (2018-2021), First Class, 80% average

**Neston High School (September 2011 - July 2018)**

- A-Levels (2016-2018): Mathematics, Physics, Computer Science, A*A*A*.
- EPQ (2017-2018): "How can machine learning be used to recognise the gender of a person from a digital image?", A* at 49/50.
- GCSEs (2014-2016): 6 A*s and 4 As, A*s include Mathematics, English Language, Triple Science, and Computer Science.

## Research Employment

- **ECO-AI** (March 2024) - For one month, I worked for a lecturer in Management Science at Lancaster University, helping to develop a grant proposal for a project called ECO-AI. The project aims to develop hyper-heuristics to solve vehicle routing problems for vehicles that use green energy sources, such as electric- or hydrogen-powered vehicles. I worked on the many aspects of the proposal, including an in-depth literature review of multiple areas outside my primary area of expertise, such as variations of vehicle routing problems, explainability in AI and optimisation, and interactive multi-objective optimisation. I also helped to design the Work Projects (WPs), focusing on how outputs from each WP would be used in other WPs.
- **Smith Institute - Internship** (February 2024) - I worked alongside three other interns on a multi-disciplinary literature review on network resilience, completing this project in an accelerated four-week period. The final product investigated statistical and operational research perspectives on network resilience with applications to: infrastructure (physical networks), software (dependency networks), the spread of disinformation (social networks), and biological networks.

## Technical Skills

- **Mathematical Rigour** - Using skills learned during my bachelor's degree, I can construct rigourous mathematical proof where it is required. An example of this is the theoretical work in my paper *Decomposable Impulsive Markov Decision Processes with Multiple Objectives: Theory and Application*, where I developed the necessary theory to better understand the models I proposed, and to ensure that the solution methodologies had a rigourous foundation.
- **LaTeX** - I use LaTeX to write all of my papers, as well as making all of my conference presentations and posters using Beamer.
- **Computation** - I do all of the computational work for my research in Julia, and have recent experience in teaching Python to undergraduates. I have previous experience programming in Java, MySQL, R, C, and C++.

## Awards

- **Alan Talbot Memorial Prize** - Best performance in first year Mathematics at Lancaster University.
- **Bevington Prize** - Outstanding academic performance in first year at Bowland College, Lancaster University.

## Published and Submitted Works

- **Fairley, L.**, Shone, R., Jacko, P., Huang, J. (2025). A Bi-Objective MDP Design approach to redundancy allocation with dynamic maintenance for a parallel system. Accepted (to appear) in *European Journal of Operational Research.*
- **Fairley, L.**, Shone, R., Jacko, P., Huang, J. (2025). Decomposable Impulsive Markov Decision Processes with Multiple Objectives: Theory and Application. Submitted (under review) to *Mathematics of Operations Research.*

## Conferences

- 4th IMA and OR Society Conference on Mathematics of Operational Research – April 2023 (Talk: "Approximate Dynamic Programming for the Maintenance of Controlled Network Infrastructure")
- 8th Stochastic Modelling Meeting (STOCHMOD 2024) – June 2024 (Talk: "A Bi-Objective Integrated Design and Dynamic Maintenance Approach to the Redundancy Allocation Problem")
- 5th IMA and OR Society Conference on Mathematics of Operational Research – April 2025 (Talk: "Decomposable Impulsive Markov Decision Processes with application to series-parallel systems in logistics")
- 34th European Conference on Operational Research (EURO 2025) - June 2025 (Talk: "An MDP Design approach to redundancy allocation with dynamic maintenance)

## Teaching and Outreach Experience

- **Graduate Teaching Assistant** (Lancaster University Management School, 2022-Present) - I have been a teaching assistant of the first-year module "Tools and Techniques for Business Analytics" across three consecutive cohorts, which introduces a range of topics in operational research such as probability, decision trees, linear programming, simulation, and queuing theory. I am involved in the tutorials, which focus on pen-and-paper exercises, as well as computer workshops, in which the students work on OR problems in Excel, as well as learning Python. Across both, I help students on a one-to-one basis and present solutions to the whole class. Additionally, I've marked written courseworks, making sure to always provide specific feedback.
- **STOR-i Schools Programme** - I've run three hour-long sessions across Lancaster Royal Grammar School and Neston High School, where I gave A-level students a taste of my research as an example of what can be done with a mathematics education. I found that the students were very engaged with the sessions and enjoyed the tasks I developed that introduced ideas of sequential decision-making under uncertainty and balancing between multiple objectives.