

# David Lewis Fairbairn

MATHEMATICIAN · SOFTWARE ENGINEER

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## Education

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### Durham University

Oct 2021 - Present

Doctor of Philosophy in the Department of Mathematical Sciences

Completion expected 2028

- Research Topic: *Multi-Agent Path-Finding and Algorithmic Graph Theory*
- Supervisors: Prof. Norbert Peryimhoff, Prof. Matthew Johnson, Dr. George Mertzios
- Sponsor: Tharsus Limited
- Additional Courses Complete: Advanced Algorithms (COMP4087), Spectra and Geometry of Graphs and Networks (MAGIC096)

### Durham University

Oct 2016 - July 2019

Bachelor of Science in Mathematical Sciences

1:1 (First Class Honours)

- Awarded: 3H Project Prize (Department of Mathematical Sciences) for the highest mark in the final year project

### Bede Academy

Oct 2014 - Sep 2016

A-Levels

- Mathematics A\*, Further Mathematics A\*, Physics A

## Work Experience

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### Tharsus

Blyth, United Kingdom

Mathematician - Engineer

Oct 2022 - present

- Led the development of novel algorithms for simulation of multi-agent systems and performed foundational software development in C++, Python, and CUDA to support the design and implementation of advanced robotics and automation systems.
- Collaborated with cross-functional teams to develop customized solutions that met the unique needs of each client.
- Conducted company wide data analytics using PowerBI, Python, Excel, SQL, and Cosmos DB to support business decision-making and process improvements.
- Integrated collaborative research projects with multiple universities into production code to drive innovation and create value for Tharsus and its clients.
- Lead for part of a grant funded project to develop a novel algorithm for multi-agent systems.
- Provided technical guidance, mentorship and developed workshops for team members.
- Managed year in industry placement student.
- Led the recruitment of mathematicians and data scientists and assisted in recruitment of software developers.
- Responsible for planning and organisation of work experience placements and outreach events.
- **Advanced Technical Skills:** C++, Python, CUDA, Docker, PowerBI, Excel, SQL, Cosmos DB, Mathematical Modelling, Algorithm Design, Data Analysis, Data Visualisation, Robotics, Automation, Agile, Scrum.
- **Soft Skills:** Cross-functional collaboration, communication, leadership, mentorship, project management, recruitment, outreach.

### Tharsus

Blyth, United Kingdom

Graduate Data Engineer

Mar 2020 - Oct 2022

- Developed algorithms and simulations of multi-agent systems to optimize system performance and inform system design.
- Applied mathematical modelling techniques and data analysis techniques to support the optimization of multi-agent systems.
- Designed and implemented data analysis processes using Excel and SQL to support business decision-making and process improvements.
- Contributed to the development of a product called Bump, including software applications for Android devices and Bluetooth communication.
- Worked with Bluetooth low energy (BLE) to develop accurate and high frequency ranging of multiple devices for social distancing applications.
- Participated in code reviews, testing, and debugging to ensure high-quality software development practices.
- Developed CI/CD pipelines using Azure DevOps to automate the build, test, and deployment of distributed software systems.
- Full stack development of web applications using React, Node.js, Azure, Azure Functions, Cypress, and Jest.
- Wrote embedded software for testing and debugging of hardware.
- Wrote Factory Acceptance Test (FAT) software in electron for commissioning of hardware.
- **Technical Skills:** C++, Python, Excel, SQL, Android development, Bluetooth communication, Bluetooth Low Energy, React, Node.js, Azure, Azure Functions, Cypress, Jest, Embedded software, Electron.
- **Soft Skills:** Cross-functional collaboration, communication, project management, problem solving, teamwork, leadership.

### Simba Sleep

London, United Kingdom

Operations Coordinator

July 2018 - Oct 2018

- Developed and implemented a new warehouse management system to streamline the order processing and fulfillment process.
- Collaborated with warehouse personnel to identify areas of improvement and ensure smooth communication channels between teams.
- Managed the transition to the new system and provided ongoing support to ensure its success.
- Led cross-functional teams to execute on projects and achieve business objectives.
- Contributed to the development of processes and procedures to improve overall customer experience.
- **Technical Skills:** Warehouse management systems, Excel VBA, Automatic PDF Parsing, Python, 3PL integration.
- **Soft Skills:** Cross-functional collaboration, communication, leadership, project management.

## Skills and Interests

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<b>Programming Skills</b>	<b>Expert:</b> C++, Python, $\LaTeX$ ,
	<b>Proficient:</b> CUDA, Docker, PowerBI (Power Query), SQL, Power Automate,
	<b>Familiar:</b> Azure Functions, Android development, C, JavaScript, Azure Pipelines, Cosmos DB
	<b>Basic:</b> React, Node.js, Cypress, Jest, Excel VBA, Haskell, Prolog, R, Azure IOT, OpenCV, Arduino,
	<b>Worked with:</b> Electron, Firebase, Hugo, Tensor Flow, Unity.
<b>Miscellaneous Skills</b>	Mathematical Modelling, Algorithm Design, Data Analysis, Data Visualisation, Robotics, Automation, Agile, Scrum.
	Multi-Agent Path-Finding (MAPF), Multi-Agent Systems, Artificial Intelligence, Algorithmic Graph Theory, Geometry, Swarm Intelligence, Game Theory, Spectral Graph Theory, Complexity Theory, Data Science, Machine Learning.
<b>Languages</b>	English (Native), Mandarin Chinese (Introductory).

## Achievements

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2021	<b>Finalist (Rising Star Award)</b> , The North East's IT and Technology Awards (Dynamites 2021)	Newcastle-upon-Tyne
2019	<b>Presenter</b> , Rising Star Research Symposium	Durham University
2019	<b>3H Project Prize</b> , Department of Mathematical Sciences	Durham University
2018	<b>President's Vote of Thanks</b> , St Mary's College	Durham University
2017	<b>Bronze Award</b> , Duke of Edinburgh's Award	Bede Academy

## Publications

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### CONFERENCE PROCEEDINGS

Exploiting Geometric Constraints in Multi-Agent Pathfinding  
Dor Atzmon, Sara Bernardini, Fabio Fagnani, David Fairbairn  
*Proceedings of the International Conference on Automated Planning and Scheduling (ICAPS), 2023*

### MISCELLANEOUS

Computational Methods in Graph Connectivity  
David Fairbairn  
The Durham Institute of Research, Development, and Invention (Website), 2019

## Volunteering

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### TechUp Women

Mentor *Nov 2021 - Nov 2022*

- I mentored an individual looking to change careers into tech and helped them with their CV, foundational programming skills and interview preparation.
- I held a talk to the 2021/2022 cohort about my experiences in tech and how to get started as well as how to get into the industry.

### International Mathematical Olympiad

*Bath, UK*

Team Guide - Slovenia

*Jul 2019*

- I was a team guide for the Slovenian team at the International Mathematical Olympiad.
- I was responsible for the team's welfare and ensuring they were able to enjoy the experience.
- I also helped with their preparation for the competition.

## Organisations

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### Durham Institute of Research, Development, and Invention (DIRDI)

*Durham*

Member

*Mar 2023 - Present*

- I have published an article on the DIRDI website.

### Algorithms and Complexity in Durham (ACiD)

*Durham*

Research Student

*Oct 2021 - Present*

**References available upon request.**