

Charlie Street

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Research

I am a research fellow in the School of Computer Science at the University of Birmingham. My research goal is to develop robotic systems with a guaranteed quality of service under uncertainty. To achieve this, I apply planning and model checking techniques to formal data-driven models of robot behaviour. A core achievement of my research has been multi-robot planning solutions which use model checking techniques to reason over the temporal behaviour of robots and other processes in the environment. These results are presented in my DPhil thesis titled ‘Multi-Robot Coordination Under Temporal Uncertainty’.

Research Interests

- Formal Verification for Robotics
- Robot Planning Under Uncertainty
- Multi-Robot Coordination
- Continuous-Time and Non-Stationary Planning Models

Research Positions

- **University of Birmingham** **Jan 2023 - Present**
 - Research Fellow in Computer Science
- **Oxford Robotics Institute, University of Oxford** **July 2022 - Dec 2022**
 - Postdoctoral Research Assistant in AI for Autonomous Systems

Education

- **DPhil in Engineering Science at the University of Oxford** **2018-2022**
 - Thesis: *Multi-Robot Coordination Under Temporal Uncertainty*
 - Supervisors: Nick Hawes, Bruno Lacerda, and Manuel Mühlig
- **MSci in Computer Science at the University of Birmingham** **2014-2018**
 - Thesis: *IntelliJam: An Intelligent Agent for Musical Improvisation*
 - Supervisor: Peter Tino
 - First class with honours (average: 92%)

Projects

- **CONVINCE** **2023-Present**
 - Context-Aware Verifiable and Adaptive Dynamic Deliberation (UKRI grant number 10042096)
 - Technical lead on work package titled ‘Task and Motion Planning in Dynamic Environments’
- **External Collaboration with Accenture Labs** **2021-2022**
 - Developed a congestion-aware simulation for warehouses
 - Led technical development and paper writing
- **First Fleet** **2020-2021**
 - Deploying multi-robot systems in agriculture
 - Implemented a multi-robot planning system
- **Team ORIon (RoboCup Competition Team)** **2019-2021**
 - Deploying service robots in domestic environments
 - Led team ORIon and task-level planning sub-team

Supervision

PhD Students

- **Stefano Bernagozzi (with M. Mansouri and L. Natale)** **2023-Present**
 - Topic: *Behaviour Trees for Robotics*
- **Weijian Zhang (with M. Mansouri)** **2023-Present**
 - Topic: *Human-Aware Formation Control for Multi-Robot Systems*

Final Year Projects/MSc Dissertations

- **Rushikesh Bagul (with M. Mansouri)** **2023**
 - Topic: *Statistical Model Checking for Behaviour Trees*
 - Designed idea for dissertation project
- **Alex Rutherford (with B. Lacerda and N. Hawes)** **2021-2022**
 - Topic: *Multi-Agent Reinforcement Learning with a Model-Based Simulator*
- **Yifeng Wei (with B. Lacerda)** **2020-2021**
 - Topic: *Trial-Based Search for Generalised Stochastic Petri Nets*
- **James Wheadon (with N. Hawes)** **2019-2020**
 - Topic: *Multi-Agent Path Finding in Continuous Time*
- **Han Zhou (with B. Lacerda)** **2018-2019**
 - Topic: *Auctioning for Multi-Robot Coordination*

Internships

- **Tom Liu (with N. Hawes)** **2021**
 - Topic: *Generalising Duration Distributions Across Topological Maps*
- **Clarissa Costen (with N. Hawes)** **2019**
 - Topic: *Continuous-Time Markov Chains for Shared Autonomy*

Outreach/Demonstrations

- **Led robot demonstrations at Goodwood Festival of Speed** **2021**
- **Led robot demonstration at Oxford University open day** **2019**
- **Prepared robot demonstration for opening of college building** **2019**
- **Assisted with robot demonstration at Blenheim Palace** **2019**

Service

- **Journal Reviewing:** IEEE Transactions on Robotics (T-RO); IEEE Robotics and Automation Letters (RA-L); Frontiers in Robotics and AI.
- **Conference Programme Committee:** AAAI Conference on Artificial Intelligence (AAAI) - 2023, 2024; International Conference on Autonomous Agents and Multiagent Systems (AAMAS) - 2023; AAMAS Demo Track - 2024; European Conference on Artificial Intelligence (ECAI) Demo Track - 2024; International Conference on Principles of Knowledge Representation and Reasoning (KR) Special Track on Reasoning, Learning, & Decision Making - 2024.
- **Conference Reviewing:** AAAI - 2020; AAMAS - 2020, 2021; KR - 2021; ECAI - 2024; International Joint Conference on Artificial Intelligence (IJCAI) - 2019; International Conference on Automated Planning and Scheduling (ICAPS) - 2020-2022; Conference on Neural Information Processing Systems (NeurIPS) - 2020, 2021; IEEE International Conference on Robotics and Automation (ICRA) - 2020, 2024; IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) - 2021-2024; European Conference on Mobile Robots (ECMR) - 2019; Advances in Cognitive Systems - 2020; Robotics: Science and Systems (RSS) - 2023, 2024.
- **Workshop Programme Committee:** ICAPS 2023 Workshop on Planning and Robotics (PlanRob).

Teaching

- **Lecturer for Advanced Robotics, University of Birmingham** **2023, 2024**
 - Taught lecture on Multi-Robot Planning Under Uncertainty
 - Helped write 2024 exam paper
- **Teaching Assistant for CDT Robotics Course, University of Oxford** **2020**
 - Designed a localisation exercise, assisted students, and prepared robot software

Talks

- **Tutorial at AAMAS, London** **2023**
 - Title: Multi-Robot Planning Under Uncertainty
- **ICAPS Journal Presentation Track, Virtual** **2022**
 - Title: Congestion-Aware Policy Synthesis for Multi-Robot Systems
- **Conference Presentation at AAMAS, Virtual** **2022**
 - Title: Context-Aware Modelling for Multi-Robot Systems Under Uncertainty
- **Highlight Talk at Lorentz Workshop, Leiden** **2022**
 - Title: Multi-Robot Coordination Under Temporal Uncertainty
- **ARMS Workshop Presentation at AAMAS, Virtual** **2022**
 - Title: Proactive Multi-Robot Task Allocation Under Spatiotemporal Uncertainty
- **Conference Presentation at AAMAS, Virtual** **2020**
 - Title: Multi-Robot Planning Under Uncertainty with Congestion-Aware Models
- **Doctoral Consortium Presentation at AAMAS, Virtual** **2020**
 - Title: Towards Multi-Robot Coordination Under Temporal Uncertainty
- **Short Presentation at Multi-Robot Systems Summer School, Prague 2019**
 - Title: Congestion-Aware Planning for Multi-Robot Systems

Selected Publications

- [1] Charlie Street, Bruno Lacerda, Manuel Mühlig, and Nick Hawes. “Right Place, Right Time: Proactive Multi-Robot Task Allocation Under Spatiotemporal Uncertainty”. In: *Journal of Artificial Intelligence Research* 79 (2024), pp. 137–171. URL: <https://jair.org/index.php/jair/article/view/15057>.
- [2] Charlie Street, Sebastian Pütz, Manuel Mühlig, Nick Hawes, and Bruno Lacerda. “Congestion-Aware Policy Synthesis for Multirobot Systems”. In: *IEEE Transactions on Robotics* 38.1 (2022), pp. 262–280. URL: <https://ieeexplore.ieee.org/document/9477767>.
- [3] Charlie Street, Masoumeh Mansouri, and Bruno Lacerda. “Formal Modelling for Multi-Robot Systems Under Uncertainty”. In: *Current Robotics Reports* 4.3 (2023), pp. 55–64. URL: <https://link.springer.com/article/10.1007/s43154-023-00104-0>.
- [4] Charlie Street, Bruno Lacerda, Michal Staniaszek, Manuel Mühlig, and Nick Hawes. “Context-Aware Modelling for Multi-Robot Systems Under Uncertainty”. In: *Proceedings of the 21st International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*. 2022. URL: <https://www.ifaamas.org/Proceedings/aamas2022/pdfs/p1228.pdf>.

A complete publication list can be found at <https://scholar.google.com/citations?user=Qyzuo6IAAAAJ>.

References

- Masoumeh (Iran) Mansouri (University of Birmingham) - `m.mansouri@bham.ac.uk`
- Nick Hawes (University of Oxford) - `nickh@robots.ox.ac.uk`
- Lorenzo Natale (Italian Institute of Technology) - `lorenzo.natale@iit.it`