

# Research Fellow - School of Computer Science

Charlie Street

I am applying for this position to take the next step in my academic career, and to contribute towards an exciting project with real-world outcomes. The aims of the CONVINCe project align well with my existing research. My DPhil focused on multi-robot coordination under temporal uncertainty. Within this, I explored models which capture robot behaviour more accurately than common formalisms such as Markov decision processes, which consider limited forms of uncertainty. For example, I used Markov automata to model asynchronous multi-robot execution, extended Markov automata for non-stationary environments, and captured robot policy execution with continuous-time Markov chains. With these models, I have applied sequential decision making techniques, such as labelled real-time dynamic programming, to synthesise robust and efficient robot behaviour under uncertainty. Moreover, I have used these models to develop a scalable discrete-event simulator which accurately captures task-level robot behaviour. This simulator could be used within CONVINCe for rapid contingency planning during execution. Formal model checking techniques can be utilised within CONVINCe to analyse why a robot has failed, and for execution monitoring. Previously, I have utilised model checking techniques for continuous-time Markov chains, such as transient analysis, to reason over robot locations in continuous time, and the appearance of tasks in the environment. If accepted for the role, I hope to translate some of these ideas to CONVINCe.

I have a strong publication record in high impact venues such as IEEE T-RO and AAMAS. Further, I have presented my work at IEEE MRS and AAMAS, as well as through outreach events. For example, at the 2021 Goodwood Festival of Speed, I led demonstrations of a Toyota Human Support Robot and UR10 Robotic Manipulator, and engaged with the public about robotics. Moreover, I have supervised four undergraduate dissertations and two internships, preparing me for the increased responsibilities as a research fellow. I have also led work on multi-robot warehouse logistics with industrial collaborators at Accenture Labs.

In addition to research, I have integrated my work onto robotic systems using ROS. In First Fleet, I integrated a planner developed during my DPhil onto agricultural robots supporting fruit pickers, which required modifications for online deployments. My work with Team ORIon focused on deploying service robots in domestic environments. This requires fundamental robot behaviours such as manipulation, perception, navigation, and speech to build an integrated robotic system.

In summary, my research interests align well with the advertised role. If accepted I look forward to furthering my research as part of the CONVINCe project.