

Research Statement

Robotic Systems with a Guaranteed Quality of Service

As robots became prevalent in society, there is a growing need for safe, reliable autonomy. An end goal for this is to develop performant robots which achieve a *guaranteed quality of service*, e.g. the robot successfully achieves its task 99% of the time. Existing robotic deployments are often limited to controlled environments. Real-world environments are often much more unpredictable and *uncertain*, and the stochastic dynamics in these environments have a significant effect on robots acting within them. To be performant in these environments, robots require accurate models of the environment and efficient decision-making techniques. However, a model is never truly accurate, and so robots should be embodied with knowledge of how accurate their models are to improve performance. Developing techniques for efficient robot decision-making with a guaranteed quality of service requires a cross-disciplinary approach, combining techniques from AI, robotics, and formal verification.

My goal is to develop robotic systems with quality of service guarantees, i.e. robots which learn accurate environment models which are improved over their deployment; use these models to support efficient decision-making; and provide formal guarantees over this behaviour to demonstrate the reliability of the system.