Steven Carr Ph.D.

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Autonomy and Robotics Engineer at Icon Technology working to automate and modernize construction. My work focuses on providing assurances for autonomous systems that deploy the state-of-the-art in machine learning and reinforcement learning. Looking for opportunities to apply artificial intelligence that improves decision-making at every level in the stack.

Professional Experience

ICON Technology - *Autonomy and Robotics Engineer*   2023-Current
◇ Designed software stack and custom ROS2 packages for a 6 DOF, multi-tool robot working on 3D printed construction.
◇ Developed planning algorithms for optimal area coverage for a non-holonomic agent in the presence of dynamic obstacles.

Oden Institute for Computational Engineering and Sciences - *Postdoctoral Fellow*   2022-2023
◇ Lead an 8-person research team, collaborating across 4 universities and institutes, exploring applications in autonomy with an emphasis on assured reinforcement learning (RL) and the implications of generative artificial intelligence for RL.
◇ Improved state-of-the-art model-based approaches, ensuring safety while learning in policy gradient methods (PPO, SAC).

Multi AI - *Artificial Intelligence Research Consultant*   2022-2023
◇ Designed models and algorithms (using constrained MCTS) for high-level autonomous decision-making with adversaries.

The University of Texas at Austin - *Graduate Research Assistant*   2016-2022
◇ Published and presented numerous academic research papers on topics in machine learning, controls and robotics.
◇ Modified machine learning libraries (Tensorflow and PyTorch) to formally verify an agent controlled by an RNN.

Skygrid - *Applied Research Intern*   2018
◇ Designed and implemented an information sharing algorithm for a team of UAV agents to provably converge to a consensus.
◇ Modified a D* algorithm to build a scalable multi-agent path planning solution for air traffic management.

The University of Texas at Austin - *Teaching Assistant for ASE 361K/361L Aircraft Design I/II*   2016-2018
◇ Taught a systems engineering-based approach for designing, building, flight testing a UAV to meet mission requirements.
◇ Lectured 200 undergraduate students on UAV control systems and implementing an extended Kalman filter (EKF) using Ardupilot Mission Planner with specific instruction on tuning for hardware-in-the-loop controllers.

Department of Defence (Australia) - *Technology Analyst*   2015-2016
◇ Utilized engineering, physics and mathematical skills to create technical assessments for government decision-makers.
◇ Collaborated with Five Eyes Defense partners to produce concept documents for future defense capabilities.

Australian Centre for Field Robotics (ACFR) - *Optimization Researcher*   2014-2015
◇ Explored high-level path planning for trajectory generation on multiple robotic agents in an environment with both uncertainty and imperfect information, using tree-based optimization.
◇ Participated in a team environment to develop a simulation process for UAVs using Python and C++.

Silicon Controls - *Systems Engineer (2013-2014) and Hardware Tester (2011-2013)*   2011-2014
◇ Applied Bayesian statistics principles to detect faulty units information from large data sets using SQL.

Education

The University of Texas at Austin   2016 – 2022
Doctor of Philosophy (Aerospace Engineering) - Task-Aware Planning and Learning in Partially Observable Environments
Subject Areas: Autonomous Systems, Artificial Intelligence, Robotics, Probability Theory, Reinforcement Learning
Master of Science Engineering (Aerospace Engineering) | Coursework: Machine Learning, State Estimation, Optimal Control

The University of Sydney   2010 – 2014
Bachelor of Engineering (Aeronautical Space)/ Bachelor of Science (Advanced Mathematics/Physics) Honours I
Coursework: Aircraft Systems, Aircraft Design, Astrophysics, Mathematics (Advanced) | Graduated with Distinction

Recent Academic Papers

Fine-Tuning Language Models Using Formal Methods Feedback. Conference on Machine Learning and Systems	2024
Safe Reinforcement Learning via Shielding for POMDPs. AAAI 2023 Conference	2023
Quantifying Faulty Assumptions in Heterogeneous Multi-Agent Systems. IEEE Control Technology and Applications	2023
Dynamic Certification for Autonomous Systems. Communications of the ACM	2023

Skills & Interests

Technical Skills   Python, C++, Tensorflow, PyTorch, ROS, ROS2, Gazebo, Unity, NVIDIA Isaac, TensorRT, CUDA
Software Libraries   Learning (OpenAI Gym, Gymnasium, JAX, scikit-learn) | Robotics (Nav2, MoveIt2, Foxglove)