

Humphrey Munn

PhD Candidate in Robotics & Machine Learning

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Education

- Feb 2023–June 2026 **(Expected), Doctor of Philosophy (PhD)**, The University of Queensland & CSIRO Data61, Brisbane
- **Topic:** Multi-objective reinforcement learning for whole-body robot controllers.
 - **Principal Advisors:** Marcus Gallagher, David Howard.
 - **Associate Supervisors:** Brendan Tidd, Peter Böhm.
- 2019–2022 **Bachelor of Computer Science (Honours)**, The University of Queensland, Brisbane
- **Major:** Machine Learning.
 - **GPA:** 6.875 / 7.0 (High Distinction Average).
 - **Thesis:** *Does Structural Modularity in Neural Networks Lead to Compositional Functionality?*
 - **Award:** First Class Honours.

Publications

- Under Review **RAPT: Model-Predictive Out-of-Distribution Detection and Failure Diagnosis for Sim-to-Real Humanoid Robots**
H. Munn, B. Tidd, P. Böhm, M. Gallagher, D. Howard.
- Introduced RAPT, a lightweight, self-supervised deployment-time monitor for 50 Hz humanoid control.
 - Enables reliable online OOD detection and post-hoc root-cause diagnosis via gradient-based temporal saliency and zero-shot LLM reasoning.
- May 2026 **Scalable Multi-Objective Robot Reinforcement Learning through Gradient Conflict Resolution**, *ICRA 2026*, Accepted
H. Munn, B. Tidd, P. Böhm, M. Gallagher, D. Howard. *IEEE International Conference on Robotics and Automation*.
- Proposed GCR-PPO, a scalable multi-objective extension to actor-critic RL that explicitly resolves conflicts between objective-wise gradients.
 - Achieved average performance gains of 9.5% across IsaacLab manipulation and locomotion benchmarks.
- Nov 2025 **Whole-Body Dynamic Throwing with Legged Manipulators**, *ACRA 2025*
H. Munn, B. Tidd, P. Böhm, M. Gallagher, D. Howard. *Australasian Conference on Robotics and Automation*.
- Optimized full-body RL policies to exploit momentum and coordinated dynamics for throwing tasks.
 - Demonstrated successful sim-to-real transfer to a physical humanoid platform.

2023 **Towards Understanding the Link Between Modularity and Performance in Neural Networks for Reinforcement Learning, IJCNN 2023**

H. Munn, M. Gallagher. *International Joint Conference on Neural Networks*, pp. 1–7.

- Investigated the relationship between network modularity and performance in RL using MAP-Elites.
- Shown that optimal modularity depends on complex interactions between structure, task, and optimisation dynamics.

2022 **Assessing Evolutionary Terrain Generation Methods for Curriculum Reinforcement Learning, GECCO 2022**

D. Howard, H. Munn, D. Dolcetti, J. Kannemeyer, N. Robinson. *Proceedings of the Genetic and Evolutionary Computation Conference*, pp. 377–384.

- Analyzed how terrain generation methods (CPPNs vs GANs) influence curriculum learning for humanoid locomotion.

Research & Teaching Experience

- Mar **Research Assistant, CSIRO's Data61, Brisbane, Supervisor: Dr. David Howard**
- 2022–Aug
2022
 - Extended a custom robotics framework developed during previous internship.
 - Implemented novel curriculum learning methods for legged locomotion.
 - Contributed to the publication of findings in GECCO '22.
- Feb **Academic Tutor, The University of Queensland, Brisbane**
- 2022–Nov
2024
 - Taught *Machine Learning (COMP4702)*, *Compilers & Interpreters (COMP4403)*, and *Machine Learning for Data Scientists (DATA7703)*.
 - Responsible for lesson planning, assessment marking, and facilitating advanced technical tutorials.
- Summers **Summer Research Intern, CSIRO's Data61, Brisbane**
- 2020–2022
 - Developed a research project enabling simulated robot curriculum learning on non-parameterisable environments.
 - Achieved a >56% improvement in robot locomotion performance through a novel curriculum learning variant.
 - Tasks included Python programming, statistical testing, and data visualization.