

# Humphrey Munn

*PhD Candidate in Robotics & Machine Learning*

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## Education

- Feb (Expected), Doctor of Philosophy (PhD), The University of Queensland & CSIRO  
2023–June Data61, Brisbane
- 2026
- **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.
- Developed 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.
  - Demonstrated improved scalability and robustness across high-dimensional 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.
  - Achieved successful sim-to-real transfer to physical humanoid and quadruped platforms.

- 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.  
 ○ Demonstrated that optimal modularity depends on complex interactions between structure, task, and optimization 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.  
 ○ Evaluated the impact of terrain generation methods (CPPNs vs GANs) on curriculum learning for humanoid locomotion.

## Robotic Systems Experience

- Platforms Sim-to-real deployment on physical humanoids (Unitree G1, In-house systems) and quadrupeds (Spot, ANYmal C, Spot Arm).
- Simulation IsaacLab, MuJoCo (RL training for locomotion and manipulation).
- Control Whole-body RL policies, momentum-exploiting dynamic behaviours.
- Deployment Real-time control (50 Hz), domain shift identification, failure monitoring, diagnosis, and recovery.

## Research & Teaching Experience

- Mar **Research Assistant**, *CSIRO's Data61*, Brisbane, Supervisor: Dr. David Howard
- 2022–Aug  
2022 ○ Extended custom robotics frameworks and 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-parameterizable environments.  
 ○ Achieved a >56% improvement in robot locomotion performance through a novel curriculum learning variant.  
 ○ Tasks included Python programming, statistical testing, and data visualization.

## Technical Skills

- Programming Python, PyTorch, C++, C, MATLAB, Bash.
- RL & Control PPO, TD3, Actor–Critic, Multi-Objective RL, Sim-to-Real Transfer.
- Robotics Legged Locomotion, Whole-Body Control, Humanoid Systems.
- Simulation IsaacLab, MuJoCo.
- Tools Linux, Git, ROS 2, Apptainer, HPC.