

Jack Collins

POSTDOCTORAL RESEARCHER

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Education

Queensland University of Technology / Commonwealth Scientific and Industrial Research Organisation

Brisbane, Queensland

DOCTORATE OF PHILOSOPHY

2018 - 2022

- Thesis: Simulation to reality and back: A robot's guide to crossing the reality gap
- Supervisors: Dr. Juxi Leitner, Dr. David Howard and Dr. Ross Brown

Queensland University of Technology

Brisbane, Queensland

BACHELOR OF ENGINEERING(MECHATRONICS)(HON)

2014 - 2017

- Major in Robotics
- 1st Class Honours
- GPA - 6.25/7.0
- Thesis Title: Automated Artificial Evolution of 3D Hexapod Legs

Professional Experience

University of Oxford

Oxford, United Kingdom

POSTDOCTORAL RESEARCHER

Dec. 2021 - Current

- Postdoctoral researcher at the Oxford Robotics Institute in the Applied AI lab (A2I).
- Researcher of model-based learning, manipulation and learning from demonstration.
- Supervision of DPhil students and other lab responsibilities.

Holovision 3D

Brisbane, Australia

R&D ENGINEER

Sept. 2019 - Nov. 2021

- Lead developer of cobot welding cell. Deployed in 4 months for steel fabricator, Watkins Steel.
- Research into Mixed Reality for industrial construction through visualisation and annotation within Microsoft HoloLens 1 and 2, Oculus Quest and Rift headsets.
- Application of 3D printing technology to the construction industry.

Commonwealth Scientific and Industrial Research Organisation

Brisbane, Australia

INTERNSHIP

Aug. 2016 - Oct. 2017

- Research into the computational evolution of 3D morphologies informed by a multi-physics engine.
- Implementation of an automated, parallelised C++ environment capable of running on a High Performance Cluster.
- Work resulted in the publication of undergraduate thesis in a top-tier evolutionary conference.

Teaching Experience

King Abdullah University of Science and Technology (KAUST) Academy

Jeddah, Saudi Arabia

LECTURER

Feb. 2024 - Mar. 2024

- Lecturer of KAUST Academy Advanced AI Course covering the foundations of convolutional neural networks and their application to computer vision, including image classification, segmentation, and object detection.

University of Oxford

Oxford, United Kingdom

TUTOR

Oct. 2022 - Jan. 2023

- Tutor of C19 - Machine Learning, a 4th year subject within the Masters in Engineering Science degree.

University of Oxford - Lady Margaret Hall

Oxford, United Kingdom

LECTURER AND TUTOR

Aug. 2022 - Current

- Lecturer of topics within the machine learning course.
- Tutor of introductory and advanced machine learning courses. Tutoring included running seminars and tutorials on machine learning concepts and marking assessable items.

- Mechatronics Design 2 - Research, Design, and Implementation of an advanced mechatronics product.
- Mechatronics Design 1 - Culmination of a product requiring mechanical design, electrical design, and embedded software.
- Building IT Systems - Foundation unit taught in Python with topics including APIs, Databases, search patterns and GUIs.

Publications

Yamada, J., Zhong, S., Collins, J., & Posner, I. (Under Preparation). D-Cubed: Latent diffusion trajectory optimisation for dexterous deformable manipulation.

Newbury, R., Collins, J., He, K., Pan, J., Posner, I., Howard, D., & Cosgun, A. (Under Review). A review of differentiable simulators.

Yamada, J., Rigter, M., Collins, J., & Posner, I. (2023). TWIST: Teacher-student world model distillation for efficient sim-to-real transfer. *arXiv preprint arXiv:2311.03622*. (Accepted to 2024 ICRA)

Collins, J., Robson, M., Yamada, J., Sridharan, M., Janik, K., & Posner, I. (2024). RAMP: A benchmark for evaluating robotic assembly manipulation and planning. *IEEE Robotics and Automation Letters*, 9(1), 9-16. <https://doi.org/10.1109/LRA.2023.3330611>

Wu, Y., de O. Borde, H.S., Collins, J., Jones, O.P., & Posner, I. (2024). DreamUp3D: Object-centric generative models for single-view 3D scene understanding and real-to-sim transfer. *IEEE Robotics and Automation Letters*, 9(4), 3291-3298. <https://doi.org/10.1109/LRA.2024.3362678>

Yamada, J., Hung, C., Collins, J., Havoutis, I., & Posner, I. (2023). Leveraging scene embeddings for gradient-based motion planning in latent space. In *2023 International Conference on Robotics and Automation (ICRA)*.

Yamada, J., Collins, J., & Posner, I. (Under Review). Efficient skill acquisition for industrial insertion tasks in obstructed environments.

Howard, D., Collins, J., & Robinson, N. (2023). Taking shape: A perspective on the future of embodied cognition and a new generation of evolutionary robotics. *IOP Conference Series: Materials Science and Engineering*, 1261(1), 012018. <https://doi.org/10.1088/1757-899X/1261/1/012018>

Collins, J., Chand, S., Vanderkop, A., & Howard, D. (2021). A review of physics simulators for robotic applications. *IEEE Access*, 9, 51416-51431. <https://doi.org/10.1109/ACCESS.2021.3068769>

Collins, J., Brown, R., Leitner, J., & Howard, D. (2021). Follow the gradient: Crossing the reality gap using differentiable physics (RealityGrad). *arXiv*. <https://doi.org/10.48550/arXiv.2103.11244>

Collins, J., Brown, R., Leitner, J., & Howard, D. (2021). Traversing the reality gap via simulator tuning. In *Australasian Conference on Robotics and Automation (ACRA)*.

Collins, J., McVicar, J., Wedlock, D., Brown, R., Howard, D., & Leitner, J. (2020). Benchmarking simulated robotic manipulation through a real world dataset. *IEEE Robotics and Automation Letters*, 5(1), 250-257. <https://doi.org/10.1109/LRA.2019.2956758>

Collins, J., Cottier, B., & Howard, D. (2019). Comparing direct and indirect representations for environment-specific robot component design. In *2019 IEEE Congress on Evolutionary Computation (CEC)* (pp. 2705-2712). <https://doi.org/10.1109/CEC.2019.8790093>

Collins, J., Howard, D., & Leitner, J. (2019). Quantifying the reality gap in robotic manipulation tasks. In *2019 International Conference on Robotics and Automation (ICRA)* (pp. 6706-6712). <https://doi.org/10.1109/ICRA.2019.8793757>

Collins, J., Howard, D., Geles, W., & Maire, F. (2018). Towards the targeted environment-specific evolution of robot components. In *GECCO 2018 - Proceedings of the 2018 Genetic and Evolutionary Computation Conference*.

Honours

2023 -
Current **Research Member**, Oxford Kellogg College research member and student advisor

2022 **Fellow**, DAAD Alnet
Reviewer, International Journal of Robotics Research, Robotics and Autonomous Letters, Robotics and Autonomous Systems Journal, Conference on Robot Learning, International Conference on Intelligent Robots and Systems, International Conference on Robotics and Automation

Skills

Robot Technologies

EXPERIENCE WITH:

- Robot Operating System (ROS) and accompanying packages
- Rigid and Soft Body Simulation - Nvidia Isaac, Pybullet, MuJoCo, CoppeliaSim, Project Chrono.
- Motion Capture
- CAD Tools: Solidworks, OnShape
- 3D Printing

Programming Languages and other relevant technologies

EXPERIENCE WITH:

- Python - PyTorch, OpenCV, etc.
- C/C++
- Latex
- Git
- High Performance Clusters (HPC)
- Software Containers (Singularity and Docker)

Community Activities

Community Engagement

Brisbane

INVITED TALKS AND DEMONSTRATIONS

2019-2021

- Promotion of robotics, science and technology at secondary schools:
 - Queensland Academy for Science Mathematics and Technology
 - Holland Park State High
 - Mt Gravatt State High
- Demonstration at public robotics and technology festival for public education and outreach.

FIRST Lego League Challenge

Brisbane

JUDGE

Nov. 2020

- Feedback on robot design, innovation and team values