

Joshua Knights

Post-Doctoral Research Associate in Robotic Perception at the Australian Centre for Robotics

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EDUCATION

2020–25

PhD: Bridging Domain Gaps in 3D Scene Understanding

QUEENSLAND UNIVERSITY OF TECHNOLOGY • Brisbane, Australia 📍



Thesis Supervisors: Peyman Moghadam, Clinton Fookes, Sridha Sridharan

Joint PhD with CSIRO performing research into state-of-the-art deep learning algorithms for 3D Robotic Vision, with a particular focus on how to bridge domain gaps between pre-trained models and novel test domains.



- Programming in Python and C++, as well as expertise in machine learning and data science libraries including PyTorch and OpenCV
- Lead multiple research projects from inception to publication, designing and implementing end-to-end machine learning pipelines including novel network architectures and loss functions
- Lead a data collection campaign over three years to record, clean, annotate and publicly release a multi-modal dataset for LiDAR and camera perception in unstructured natural environments
- Provided mentorship and project management to early career students, leading to multiple conference submissions and publications

2014–19

Bachelor of Mechanical Engineering (Hons.) (GPA of 6.1)

UNIVERSITY OF QUEENSLAND • Brisbane, Australia 📍



Foundational mathematical, problem solving and methodological skills for working as a professional engineer and researcher

2014–19

Bachelor of Arts (Extended Major: Philosophy) (GPA of 6.4)

UNIVERSITY OF QUEENSLAND • Brisbane, Australia 📍



Enhanced a base of critical thinking and problem solving skills, providing strong deconstructive analytical tools and the ability to approach problems from oblique angles

WORK EXPERIENCE

2026–

Post-Doctoral Research Associate

AUSTRALIAN CENTRE FOR ROBOTICS, USYD • Sydney, Australia 📍



- Assisted in the development of a novel 3D reconstruction benchmark for asset inspection and management.
- Developed a method for adapting learning-based algorithms for regressing key tree parameters from sparse aerial 3D scans to novel environments in a few-shot manner. This work resulted in the submission of a first-author paper to the ISPRS Journal of Photogrammetry and Remote Sensing.

2024–24

Research Engineer

SMART ROBOTICS LAB, TUM • Munich, Germany 📍



- Developed computer vision pipelines for autonomous drones deployed into unstructured natural environments as part of a deliverable for the EU Horizons project [DigiForest](#)
- Proposed and developed an image-to-LiDAR 6-Dof Metric Localisation pipeline for the localisation of drones with lightweight stereo camera sensors into pre-built dense 3D maps. This work resulted in a [publication accepted to ICRA2025](#).
- Worked as part of a team to integrate deep perception models trained using the PyTorch machine learning library into a SLAM & autonomous exploration pipeline with Libtorch for deployment on aerial drones
- Provided supervision for masters and undergraduate students undergoing research placements

2019–20

Research Engineer

DATA61, CSIRO • Brisbane, Australia 📍



- Researched and implemented state-of-the-art computer vision algorithms and deep learning pipelines for a variety of tasks including semantic segmentation, object detection, action recognition and image classification
- Leveraged the principle of temporal consistency to achieve state-of-the-art performance for self-supervised action recognition on several commonly used benchmark datasets. This work resulted in a [publication accepted to ICPR2021](#).

FIRST AUTHOR PUBLICATIONS

2026	J. Knights et al., "Few-Shot Adaptation for Robust Deep Regression of Tree Parameters from ULS Forest Data Using Meta-Learning". Under review with the ISPRS Journal of Photogrammetry and Remote Sensing. J. Knights et al., "WildCross: A Cross-Modal Large Scale Benchmark for Place Recognition and Metric Depth Estimation in Natural Environments". In IEEE International Conference on Robotics and Automation (ICRA), 2026.
2025	J. Knights et al., "SOLVR: Submap Oriented LiDAR-Visual Re-Localisation". In IEEE International Conference on Robotics and Automation (ICRA), 2025.
2024	K. Vidanapatharina*, J. Knights*, S. Hausler* et al., "WildScenes: A Benchmark for 2D and 3D Semantic Segmentation in Large-scale Natural Environments". In the International Journal of Robotics Research (IJRR), 2024. J. Knights et al. "GeoAdapt: Self-Supervised Test-Time Adaptation in LiDAR Place Recognition Using Geometric Priors". In IEEE Robotics and Automation Letters, 2024.
2023	J. Knights*, K. Vidanapatharina* et al., "Wild-Places: A Large-Scale Dataset for Lidar Place Recognition in Unstructured Natural Environments". In IEEE International Conference on Robotics and Automation (ICRA), 2023.
2022	J. Knights et al., "Incloud: Incremental learning for point cloud place recognition". In IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2022
2021	J. Knights et al., "Temporally Coherent Embeddings for Self-Supervised Video Representation Learning". In IEEE International Conference on Pattern Recognition (ICPR), 2021

CONTRIBUTING AUTHOR PUBLICATIONS

2025	D.N.P. Oliveira, J. Knights et al., "REGRACE: A Robust and Efficient Graph-based Re-localization Algorithm using Consistency Evaluation". Accepted to IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2025.
2023	K. Mason, J. Knights et al., "Uncertainty-aware lidar place recognition in novel environments". In IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2023. M. Ramezani, J. Knights et al. "Pose-graph attentional graph neural network for lidar place recognition ". In IEEE Robotics and Automation Letters, 2023.

AWARDS AND HONOURS

2018	The University of Queensland Student Exchange Scholarship , University of Queensland, Brisbane
2019	The University of Queensland Employability Award , University of Queensland, Brisbane Outstanding Honours Thesis Presentation for the 36th Year of the Engineering Student Conference , University of Queensland, Brisbane
2020	CSIRO Data61 Top-Up Scholarship , Commonwealth Scientific and Industrial Research Organisation, Brisbane
2025	2025 QUT Outstanding Doctoral Thesis Award , Queensland University of Technology, Brisbane

STUDENTS MENTORED

2022	Keita Mason . Provided supervision and assistance for her Honours research placement at DATA61 CSIRO, which culminated in a publication at IROS2023.
2024	Débora Oliveira Makowski . Provided supervision for the research component of her Masters of Engineering degree at the Technical University of Munich, which culminated in a publication at ICRA2025.
2025	Joseph Reid . Provided supervision for the research component of his Masters of Engineering degree at the University of Queensland.