

Joshua Knights

Learning and Perception Scientist and Engineer

CONTACT



+61 432 183 292



joshuab.knights@gmail.com

ABOUT ME

I am a learning and perception scientist and engineer, with extensive experience in developing and applying a mixture of classical and learning-based solutions to a wide variety of challenging tasks. I am adaptable, proactive and highly self-motivated, with the ability to switch between autonomous and team work as required. I am excited by new challenges and eager to acquire new skills to address problems from novel and effective angles.

KEY SKILLS

Computer Vision: 2D & 3D Perception, Depth Prediction, Segmentation, Place Recognition, Registration, Odometry

Machine Learning: Self-Supervised Learning, Dataset Management & Curation, Lifelong Learning, Multi-Modal Learning

Python: Numpy, Pytorch, TensorRT, Scipy, Scikit-learn, Pandas, Matplotlib, Open3D

Programming: Python, Git, Docker, C++

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, pandas, scikit-learn 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
- Worked with distributed computing clusters to efficiently train large-scale ML / AI models
- Provided mentorship and project management to early career students, leading to multiple conference submissions and publications
- Thesis submitted and currently under examination

2014–18

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

- Awarded: Outstanding Honors Thesis Presentation for the 36th year of the Engineering Student Conference
- Awarded: University of Queensland Employability Award

2014–18

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

FIRST AUTHOR PUBLICATIONS

2025

J. Knights et al., "SOLVR: Submap Oriented LiDAR-Visual Re-Localisation". Accepted to 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.

FIRST AUTHOR PUBLICATIONS

- 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, S.B. Laina, S. Boche, W. Burgard, S. Leutenegger, "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.

WORK EXPERIENCE

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](#).

REFERENCES

Dr. Peyman Moghadam

Embodied AI Cluster Lead, DATA61 CSIRO

Phone: +61 3327 4444

Email: Peyman.Moghadam@data61.csiro.au

Prof. Dr. Stefan Leutenegger

Associate Professor, ETH Zurich

Phone: +41 44 632 4807

Email: lestefan@ethz.ch