



Tristan Laidlow

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Summary

I am a Senior Staff Research Scientist on the Atlas project at Boston Dynamics, where I take state-of-the-art perception algorithms and use them to enable new robot behaviors. In particular, my work is focused on combining semantic and geometric information so robots can understand and perform tasks in their environments. I am involved in the entire Atlas perception stack, from calibration and camera drivers to developing and maintaining cutting-edge machine learning models.

Experience

Senior Staff Research Scientist, Boston Dynamics – Waltham, MA USA Apr 2024 – Present

- Led the development of a dynamic, real-time object pose estimation system using learning-based keypoint models to enable Atlas to reliably perform precise pick-and-place behaviors in non-static environments.
- Wrote a kalibr-based calibration pipeline and updated camera drivers to use Nvidia's VPI library, resulting in much higher image quality and a doubling of the achievable FPS on Atlas' head cameras.
- Designed a series of hardware-safe experiments to introduce perception-based behaviors on the new robot.
- Worked with the reinforcement learning team to develop perception-based abstractions that would allow for policies to be trained in simulation and deployed on the robot with a minimal sim-to-real gap to overcome.

Staff Research Scientist, Boston Dynamics – Waltham, MA USA Oct 2022 – Mar 2024

- Created a localization and mapping system based on the COLMAP structure-from-motion pipeline, allowing Atlas to robustly execute pick-and-place behaviors with cm-level accuracy using only a single RGB camera.
- Co-led an investigation on the impact of moving from lidar-based to vision-based navigation in feature-poor environments, presenting the results to senior leadership and informing future robot designs.
- Designed experiments and conducted failure analysis of the on-board perception system under tight timelines and limited hardware access to ensure the success of high-profile demonstrations to Hyundai Motor Group.
- Prototyped a system for automatically annotating object masks using Segment Anything and DINOv2 features.

Dyson Research Fellow, Imperial College London – London, UK Oct 2019 – Aug 2022

- Supervised research projects of PhD students that focused on fusing semantic segmentations into 3D reconstructions using neural rendering pipelines.

Education

Imperial College London – PhD in Computer Science Apr 2020

- Thesis: *Robust Multimodal Dense SLAM*, supervised by Dr. Stefan Leutenegger and Prof. Andrew Davison

University of Toronto – BAsC in Engineering Science June 2015

- Major: Aerospace Engineering, Minor: Robotics & Mechatronics
- Thesis: *Real-Time Motion Generation for Aerial Vehicles*, supervised by Prof. Angela Schoellig

Skills

Programming: Python (numpy, opencv), PyTorch, C++, \LaTeX

DevOps: Git, CI/CD, Unit/Integration Testing, Docker, VS Code

Communication: I have experience speaking at international conferences and workshops, and I frequently present ideas and results to peers, senior leadership, and other stakeholders.

Publications

1. Hidenobu Matsuki, Edgar Sucar, **Tristan Laidlow**, Kentaro Wada, Raluca Scona, and Andrew J. Davison, “iMODE: Real-Time Incremental Monocular Dense Mapping using Neural Fields”, *ICRA 2023* (Best Navigation Paper Award Finalist).
2. Dorian Henning, **Tristan Laidlow**, and Stefan Leutenegger, “BodySLAM: Joint Camera Localisation, Mapping, and Human Motion Tracking”, *ECCV 2022*.
3. **Tristan Laidlow** and Andrew J. Davison, “Simultaneous Localisation and Mapping with Quadric Surfaces”, *3DV 2022*.
4. Stephen James, Kentaro Wada, **Tristan Laidlow**, and Andrew J. Davison, “Coarse-to-Fine Q-Attention: Efficient Learning for Visual Robotic Manipulation via Discretisation”, *CVPR 2022* (Oral).
5. Shuaifeng Zhi, Edgar Sucar, Andre Mouton, Iain Haughton, **Tristan Laidlow**, and Andrew J. Davison, “iLabel: Interactive Neural Scene Labelling”, *RA-L 2022*.
6. Shuaifeng Zhi, **Tristan Laidlow**, Stefan Leutenegger, and Andrew J. Davison, “In-Place Scene Labelling and Understanding with Implicit Scene Representation”, *ICCV 2021* (Oral).
7. Zoe Landgraf, Raluca Scona, **Tristan Laidlow**, Stephen James, Stefan Leutenegger, and Andrew J. Davison, “SIMstack: A Generative Shape and Instance Model for Unordered Object Stacks”, *ICCV 2021*.
8. **Tristan Laidlow**, Jan Czarnowski, Andrea Nicastro, Ronald Clark, and Stefan Leutenegger, “Towards the Probabilistic Fusion of Learned Priors into Standard Pipelines for 3D Reconstruction”, *ICRA 2020*.
9. Jan Czarnowski, **Tristan Laidlow**, Ronald Clark, and Andrew J. Davison, “DeepFactors: Real-Time Probabilistic Dense Monocular SLAM”, *RA-L 2020*.
10. **Tristan Laidlow**, Jan Czarnowski, and Stefan Leutenegger, “DeepFusion: Real-Time Dense 3D Reconstruction for Monocular SLAM using Single-View Depth and Gradient Predictions”, *ICRA 2019*.
11. Michael Bloesch, **Tristan Laidlow**, Ronald Clark, Stefan Leutenegger, and Andrew J. Davison, “Learning Meshes for Dense Visual SLAM”, *ICCV 2019*.
12. **Tristan Laidlow**, Michael Bloesch, Wenbin Li, and Stefan Leutenegger, “Dense RGB-D-Inertial SLAM with Map Deformations”, *IROS 2017*.
13. Michael Bloesch, Hannes Sommer, **Tristan Laidlow**, Michael Burri, Gabriel Nuetzi, Peter Fankhauser, Dario Bellicoso, Christian Gehring, Stefan Leutenegger, Marco Hutter, and Roland Siegwart, “A Primer on the Differential Calculus of 3D Orientations”, *arXiv preprint 2016*.

Patents

1. Michael Bloesch, **Tristan Laidlow**, Ronald Clark, Andrew J. Davison, and Stefan Leutenegger, “Scene Representation using Image Processing”, US Patent 12 118 668, Oct. 15, 2024.
2. **Tristan Laidlow**, Jan Czarnowski, and Stefan Leutenegger, “Depth Estimation”, US Patent 11 941 831, Mar. 26, 2024.

Community Service

Research Fellow Rep. , Equality, Diversity & Culture Committee – Imperial College London, UK	2020 – 2022
Dept. of Computing Rep. , Postdoc & Fellows Development Centre – Imperial College London, UK	2020 – 2022
Session Chair , Dataset Generation and Benchmarking of SLAM Algorithms (ICRA Workshop)	2019
Reviewer , Major Conferences/Journals on Robotics and Computer Vision	2018 – Present