Tristan Laidlow

linkedin.com/in/tristan-laidlow | https://scholar.google.com/citations?user=bmOi48IAAAAJ

Summary

I am the Research Lead for SpatialAI on the Atlas project at Boston Dynamics, where I take state-of-the-art perception algorithms and use them to enable new autonomous robot behaviors. In particular, my work is focused on combining semantic and geometric information (from both model-based and data-driven sources) 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

Research Lead (SpatialAI), Boston Dynamics – Waltham, MA USA June 2025 – Present

- Provide high-level research direction and individual contributions towards the development of learning-based vision systems that combine 3D geometry and scene understanding to be used online during robot behaviors.

Senior Staff Research Scientist, Boston Dynamics – Waltham, MA USA Apr 2024 – May 2025

- Spearheaded the design and implementation of a robust, real-time object pose estimation system, using learning-based keypoint models to enable precise pick-and-place behaviors in dynamic environments, significantly enhancing autonomous locomotion and manipulation capabilities on Atlas.
- Collaborated with the reinforcement learning team to develop perception-based abstractions that would allow grasping policies to be trained in simulation and deployed on the robot with a minimal sim-to-real gap.
- Engineered and deployed 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.

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 Languages: Python (Pytorch, Numpy, OpenCV), C++, LaTeX
Tools & Platforms: Git, CI/CD, Unit/Integration Testing, Docker, Linux
Soft Skills: Technical Leadership, Cross-Functional Collaboration, Stakeholder Communication, Failure Analysis

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