Ethan Canzini

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Research Interests

My interests lie in the application of physics-informed machine learning, non-linear control & optimization, and dynamics modelling in fields such as the control of mobile manipulation, space robotics and autonomous systems. My research seeks to combine the flexibility of machine learning methods with a grounding in engineering, mathematics and physics to develop solutions to complex real-world problems in the manufacturing, agriculture and space sectors. This has led directed my research path to combining control, metamaterials and robotics for autonomous solutions.

Current Role(s)

- **Post-Doctoral Research Associate** — Sheffield, UK
  School of Mechanical, Aerospace & Civil Engineering, University of Sheffield — *Oct 2024 - Present*
  - **Research Projects**: Working as a research associate in systems & control on the ESPRC COATIN and STAMAN projects and in the EPSRC RESCu-M2 hub
  - **Challenge Area Co-Lead, Space & Aviation**: Co-lead of the Space & Aviation Challenge Area for the UK Metamaterials Network
  - **Leadership**: Co-lead of the RAMS Lab, leading the space systems and robotics themes. Co-lead of the Applied & Theoretical Metamaterials Lab (ATM Lab)
- **Teaching Associate** — Sheffield, UK
  School of Electrical & Electronic Engineering, University of Sheffield — *Aug 2025 - Present*
  - **Lecturing**: Module leader for teaching undergraduate and graduate students in robotics and control.
  - **Supervision**: Supervising undergraduate, graduate and postgraduate students in their research.
  - **FHEA**: Awarded Fellow of the Higher Education Academy (FHEA) for teaching and supervision.

Grants & Awards

- **Airbus UK**: Robotics Research Scholarship - £16,000 — *Sept 2020, Aug 2021*
- **EPSRC**: ICASE Research Scholarship - £6,000 — *Aug 2021*
- **RS Online**: Grassroots Student Project Award - £1,000 — *Mar 2021*

Education

- **Doctorate of Philosophy (Ph.D.), Systems & Control** — Sheffield, UK
  School of Mechanical, Aerospace & Civil Engineering, University of Sheffield — *Aug 2021 - Aug 2025*
  - **Research**: Undertook a PhD in the School of Mechanical, Aerospace & Civil Engineering, supervised by Prof. Ashutosh Tiwari and Dr. Simon Pope. Research is centred around learning-based methods for decision-making, planning and control for autonomous robotic systems.
  - **Thesis Title**: *Learning-Based Methods for Decision-Making, Planning & Control* working in partnership with Airbus UK.
  - **Assessors:**: Dr. Jonathan Aitken (internal) & Prof. Jeremy Watson (external, UCL)
- **Masters of Engineering (M.Eng.), Aerospace Engineering w/ Year in Industry** — Sheffield, UK
  School of Mechanical, Aerospace & Civil Engineering, University of Sheffield — *Sept 2016 - Jul 2021*
  - **Studies**: Graduated with 1st Class (4.0 GPA) degree in aerospace engineering, studies in avionics, robotics & control theory.
  - **Graduate Thesis**: *Metrology-Assisted Assembly Process to Improve Landing Gear Installation Accuracy*, in partnership with Aribus UK.

Publications

- **JOURNAL**: **Ethan Canzini**, David Miller, Divya Tiwari, Windo Hutabarat, Allan Matthews, Ashutosh Tiwari, "Analysis of Sensing Modalities for Electrode-Induction Gas Atomization of Metal Powders", July 2025. *Under Review at Surface & Coating Technologies.*
- **JOURNAL**: **Ethan Canzini**, Simon Pope, Ashutosh Tiwari, "Geometric Visual Servo via Optimal Transport", June 2025. *Under Review at Control Engineering Practice.*
- **JOURNAL**: Néstor Sanchez-Arriaga, **Ethan Canzini (Joint first author)**, Nathan Plumb, Michael Farnsworth, Adrian Leyland, Ashutosh Tiwari, "Enhancing Robotic Wafer Inspection with Sensor Fusion and Learned Manifolds", in *Nature Scientific Reports.*
- **CONFERENCE**: **Ethan Canzini**, Simon Pope, Ashutosh Tiwari, "Generating Continuous Paths On Learned Constraint Manifolds Using Policy Search", *IEEE/RSJ International Conference on Intelligent Robots & Systems (IROS)*, Abu Dhabi, UAE, October 2024.
- **JOURNAL**: **Ethan Canzini**, Marc Auledas-Noguera, Simon Pope, Ashutosh Tiwari, "Decision Making For Multi-Robot Fixture Planning Using Multi Agent Reinforcement Learning", in *IEEE Transactions on Automation Science & Engineering.*
- **CONFERENCE**: **Ethan Canzini**, Marc Auledas-Noguera, Dominique Chasteau and Ashutosh Tiwari, "A Novel Sensing Template Using Data Fusion for Large Volume Assembly", *14th IFAC Workshop on Intelligent Manufacturing Systems*, Tel Aviv-Yafo (Israel), March 2022.

Employment History

Industrial Experience

- **Teaching Assistant** — Sheffield, UK
  University of Sheffield — *Sept 2021 - Jul 2024*
  - **Role**: Working as a Graduate Teaching assistant (GTA) for a variety of modules within the faculty for undergraduate, graduate and postgraduate students.
  - **Modules**: Embedded systems, optimal control, hardware-in-the-loop control, aerospace automation, control theory & robotics.
- **Research Scientist** — Broughton, UK
  Airbus Operations Ltd. — *Sept 2021 - Jul 2024*
  - **Role**: Research scientist working on developing autonomous robot solutions for manufacturing operations.
  - **Contribution**: Assisted on the development and deployment of robotic fixtures system for wing assembly.
  - **Dissemination**: Presented work package as part of the *Made Smarter Centre for Connected Factories.*
- **Automation & Robotics Engineer** — Weymouth, UK
  ASM Assembly Systems Ltd. — *Jul 2019 - Jul 2020*
  - **Role**: Worked on developing and deploying robotic systems for semiconductor manufacturing.
  - **Autonomous AGV**: Developed a SLAM-guided AGV for the transportation of large parts and machines.
  - **ML Fault Detection System**: Maintained the SQL server used to store all machine test data and wrote the machine learning back-end to predict faults in manufacturing processes.

Internships

- **Research Intern** — Didcot, UK
  Growbotics Ltd. — *Jul 2024 - Sept 2024*
  - **Role**: Research intern in the field of autonomous satellites & robotics for sustainable space exploration
  - **Collaboration**: Liaised with 3rd party companies and launch providers with producing space-suitable hardware and control interfaces
  - **Satellite State Estimation**: Developed low-cost sensor-based state estimators for full 6-DOF satellites using microcontrollers.
- **Visiting Researcher** — Zürich, Switzerland
  ETH Zürich — *Jul 2022*
  - **Role**: Invited to be a visiting researcher at ETH Zurich as part of the Robotics Summer School.
  - **Topics**: Trajectory optimisation, multi-sensor fusion, SLAM, navigation, full-stack ROS and open source software for deployable robots.

Teaching Experience

Module Teaching (at UoS)

- **Hardware-in-the-Loop & Rapid Control Prototyping (ELE308)**: 2025-Present
  Module leader and lecturer for undergraduate control systems module focusing on deploying real-time controllers to hardware using LabVIEW and MATLAB. Developed the lecture & assessment content.
- **Rapid Control Prototyping (ELE438)**: 2025-Present
  Module leader and lecturer for graduate control systems module focusing on developing optimal control algorithms on embedded hardware. Developed the lecture & assessment content.
- **Industrial Training Programme, Avionics (ACS402)**: 2021-2023
  Module leader and lecturer for graduate avionics module in partnership with Airbus UK. Developed the lecture & assessment content and planned the Airbus interaction.
- **Real-Time Embedded Systems (ACS6127)**: 2021-2024
  Teaching Assistant and Module Leader for graduate control systems module for developing real-time embedded systems. Led labs and tutorial sessions, and delivered lecture content.

Supervision (at UoS)

- **Postgraduate**:
  Nathan Espley-Plumb, *Bottom-up Connector-based Assembly for Flexible Assembly Systems*, Ph.D., Feb 2023 - Present. In partnership with Siemens Plc.
- **Graduate**:
  Dhiraj Jandu, *Using Force-Torque Sensing to aid Peg-in-Hole Assembly*, M.Eng. thesis, 2026. In partnership with Airbus UK
  Joaquin Barawed, *Accurate Feature Detection and Tracking for Relative Pose Estimation in Assembly*, M.Eng. thesis, 2025
  Jake O'Neill, *Intelligent Inspection System for Adaptive Robotic Scanning*, M.Sc. thesis, 2025
  Elena Manoli, *Towards Industry 5.0: Dynamic Robot Behaviour Manipulation Based on Human Proximity and Movement*, M.Sc. thesis, 2024
- **Undergraduate**:
  William Santoso, *Geometric Control of Robot Manipulators*, B.Eng. dissertation, 2026
  Maxwell Bird, *Relative Dynamics Estimation of Orbiting Spacecraft*, B.Eng. dissertation, 2025

Achievements

Invited Talks

- **"Decision Making for Multi-Robot Fixture Planning Using Multi-Agent Reinforcement Learning"**: May 2025
  Presented at the 2025 IEEE International Conference on Robotics & Automation (ICRA), Georgia Institute of Technology
- **"Geometry-Informed Systems for Robotic Manipulation: Methods in Planning & Control"**: May 2025
  Presented to the Dynamics Research Group, School of Mechanical, Aerospace & Civil Engineering, University of Sheffield
- **"Scaling Robotic Capability In Industry Using Multi-Agent Systems - Applications in Agriculture, Construction & Manufacturing"**: June 2023
  Presented at the National Polytechnic Institute of Mexico, Ciudad de México, Mexico

Professional Activities

- **HEA**: Fellow of the Higher Education Academy (FHEA) 2024 - Present
- **IEEE**: Member of the Institute of Electrical & Electronic Engineers (MIEEE) 2020 - Present