Ethan Alexander Canzini

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PRINCIPAL INTERESTS

Machine learning, optimal control, robotics & automation, multi-agent systems, artificial intelligence, reinforcement learning; applications of multi-agent systems in robotics, space systems and aerospace design, traditional optimal control methods alongside machine learning and reinforcement learning, game and decision theoretic approaches to multi-agent systems.

ACADEMIC BACKGROUND

PhD in Automatic Control   2021 - Present
University of Sheffield, Sheffield, UK

- Undertaking a PhD in Control in the Department of Automatic Control & Systems Engineering, supervised by Prof. Ashutosh Tiwari and Dr. Simon Pope. Research is centered around multi-agent optimal control for robotics.
- Thesis titled: *Learning-Based Control For Multi-Robot Systems*
- Specializing in game theory, decision theory, multi-agent systems, reinforcement learning and optimal control

MEng Aerospace Engineering w/ Year In Industry   2016 - 2021
University of Sheffield, Sheffield, UK

- Graduated with 1st Class (4.0 GPA) degree in aerospace engineering with double minor in control systems and robotics
- Undertook studies in aerospace, space systems and robotics with an emphasis on control theory
- Undergraduate project: Design of a UAV for completing hazardous search and rescue operations
- Graduate thesis: *Metrology-Assisted Assembly Process to Improve Landing Gear Installation Accuracy*

EMPLOYMENT HISTORY

Research Scientist in Robotics   2021 - Present
Airbus UK, Broughton, UK

- Academic consultant for manufacturing robotics as part of the requirements for the scholarship from Airbus UK
- Assisting on the development and deployment of an intelligent jigless fixturing system for wing assembly
- Working as part of the *Made Smarter Centre for Connected Factories*
- Research was conducted in partnership with Airbus to ensure that research aligned with their manufacturing aims

Graduate Teaching Assistant   2021 - Present
University of Sheffield, Sheffield, UK

- Working as a Graduate Teaching assistant (GTA) for a variety of modules within the department, both under- and postgraduate
- Topics of the modules include embedded systems, optimal control, hardware-in-the-loop control, aerospace automation, control theory

Visiting Researcher July 2022

ETHZ Robotics Summer School ETH Zürich, Zürich, Switzerland

- One of 30 candidates selected from over 400 to take part in an intensive robotics course for hazardous environments

- Focused on learning to deploy real-world robotics when facing non-permissive enviroments

- Topics covered include: *trajectory optimisation, multi-sensor fusion, SLAM, navigation, full-stack ROS and open source robotics*

Automation Engineer 2019 - 2020

ASM Assembly Systems Ltd. Weymouth, UK

- Developed a SLAM-guided AGV for the transportation of large parts and machines

- Maintained the SQL server used to store all machine test data and wrote the Python back-end that was used to insert data into the server for data analysis

- Started production of an anomaly detection algorithm for machine failure prediction

- Deployed multiple autonomous solutions for manufacturing processes

SPECIAL ACHIEVEMENTS

Awards & Scholarships

- RS Grassroots Student Project Fund, March 2021

- EPSRC ICASE Award for Outstanding Research, University of Sheffield, 2021

- Airbus UK Scholarship for Industrial Robotics, Airbus UK/University of Sheffield, 2021

Professional Activities

- Member of Institute of Electrical & Electronic Engineers (IEEE), 2020 - present

- Preparing documentation and sponsorship for becoming a Chartered Enginerr (CEng) of the Institute of Engineering & Technology

- Preparing documentation following sponsorship for becoming an Associate Fellow of the Higher Education Academy (AFHEA)

- Reviewer for conference papers at the 14th IFAC Workshop on Intelligent Manufacturing Systems 2022 and at the 56th CIRP Conference on Manufacturing Systems 2023

- Reviewer for the Journal of Artificial Intelligence for Engineering Design, Analysis and Manufacturing, 2021 - present

RESEARCH FUNDING

Research at UoS focuses on multi-agent systems using reinforcement learning and optimal control within industrial robotics applications

- (2021 - Present) ICASE Award for Research - £16,000

- (2021 - Present) EPSRC Research Scholarship - £6,000

- (2021 - Present) Airbus UK Scholarship for Robotics Research

- (March 2021) RS Online Grassroots Research Grant - £1,000

TEACHING AND GTA WORK

- *Introduction to Control Systems (ACS219)*   *2021-2022*
  Delivered a second year module focusing on control theory tutorials aimed at creating a foundation for future control systems design

- *Mechatronics Group Design Project (AC330)*   *2021-Present*
  Provided assistance to third year robotics and mechatronics students working on a group design project. Topics included reinforcement learning, robotics, trajectory optimization and MATLAB programming

- *Industrial Training Programme for Avionics (ACS402)*   *2021-Present*
  Led the lab-based section of the module and prepared content regarding industrial deployments of mechatronics and artificial intelligence for automation. Additionally, provided lecturing capabilities for topics including control theory, industrial design and machine vision

- *Real-Time Embedded Systems (ACS6127)*   *2021-Present*
  Assisted in lab sessions and moderated assessment tasks. Additionally, helped deliver the module and presented the lectures during the academic year and provided demonstrations

- *Hardware-In-The-Loop & Rapid Control Prototyping (ACS336)*   *2022-Present*
  Worked in the lab sessions as a GTA and helped teach content related to programming optimal control algorithms on real hardware using simulation and testing methods

- *Physical Systems (ACS133)*   *2023-Present*
  Worked in the lab sessions as a GTA helping students with MATLAB and Simulink projects to model and control real-world physical systems

PAPERS, POSTERS, LECTURES

POSTER   Néstor Sanchez-Arriaga, Ethan Canzini, Nathan Plumb, Michael Farnsworth, Adrian Leyland, Ashutosh Tiwari, "Enhancing Robotic Wafer Inspection with Sensor Fusion and Learned Manifolds", *IEEE Robotics & Automation Society Chapter Conference 2024*, Sheffield, UK, February 2024

PREPRINT   Ethan Canzini, Marc Auledas-Noguera, Simon Pope, Ashutosh Tiwari, "Decision Making For Multi-Robot Fixture Planning Using Multi Agent Reinforcement Learning", Sheffield, UK, doi: 10.36227/techrxiv.24171534

LECTURE   Ethan Canzini, "Scaling Robotic Capability In Industry Using Multi-Agent Systems - Applications in Agriculture, Construction & Manufacturing", *National Polytechnic Institute of Mexico*, Mexico City, Mexico, June 2023

POSTER   Ethan Canzini, Marc Auledas-Noguera, Simon Pope, Ashutosh Tiwari, "Decision Making For Multi-Robot Fixtures: A Reinforcement Learning Approach", *Sustainable Manufacturing Presentation for the Engineering Research Symposium 2023*, Sheffield (UK), 2023

PAPER   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, doi: 10.1016/j.ifacol.2022.04.207

SKILLS & PROFICIENCY

- Proficient in robotics and ML orientated programming languages (C/C++, Python, Java, C#, MATLAB, Lua, Julia, Rust) including relevant ML/DL libraries (PyTorch, TensorFlow, W&B) and considerable experience with software testing software and hardware deployment tools (MATLAB, LabVIEW)

- Proficient using various robotics-based simulation tools (ROS, CoppeliaSim/V-REP, MUJOCO) for testing and deployment