Aalok Patwardhan

Dyson Robotics Lab, Imperial College London

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Education

PhD — Robotics and Computer Vision | Advisor: Prof. Andrew J. Davison FREng FRS — *London, UK*

IMPERIAL COLLEGE LONDON — DYSON ROBOTICS LAB — *2021 – now*

- **Distributed Multi-Robot Coordination**
  for path planning, information acquisition and consensus within a swarm
  using Gaussian Belief Propagation (GBP) for Factor Graph inference.
- **Monocular Visual Odometry**
  using RGB data for Simultaneous Localisation and Mapping **(SLAM)**,
  exploiting scene structure for rotation estimation with uncertainty,
  using dense prediction of surface normals

MEng Engineering — 1st Class with **Distinction** — *Cambridge, UK*

UNIVERSITY OF CAMBRIDGE – EMMANUEL COLLEGE — *2014 – 2018*

- Computer Vision | Signal Processing | (Optimal) Control Systems | Deep Learning

Publications

- **Aalok Patwardhan**, Andrew J. Davison, 2025.
  DANCeRS: A Distributed Algorithm for Negotiating Consensus in Robot Swarms. [Under Review]
- **Aalok Patwardhan***, Callum Rhodes*, Gwangbin Bae, Andrew J. Davison, 2025.
  U–ARE–ME: Uncertainty-Aware Rotation Estimation in Manhattan Environments. * Equal contribution. 3DV 2025.
- **Aalok Patwardhan**, Andrew J. Davison, 2024.
  A Distributed Multi-Robot Framework for Exploration, Information Acquisition and Consensus. IEEE ICRA, 2024 **(oral)**.
- **Aalok Patwardhan**, Riku Murai, Andrew J. Davison. 2023.
  Distributing Collaborative Multi-Robot Planning With Gaussian Belief Propagation. IEEE Robotics and Automation Letters, 8(2): 552-559. **(oral)**.
- **Aalok Patwardhan**, Andrew J. Davison, 2023.
  Distributed Formation Planning for Robot Swarms. Workshop on Distributed Graph Algorithms for Robotics at IEEE ICRA, 2023.

Relevant Experience

Peer Reviewer, IEEE — ROBOTICS & AUTOMATION LETTERS (RA-L) | CONFERENCES: ICRA, IROS

Autonomy Flight Core Intern — SKYDIO INC. — *2025*

- Trained deep learning models for optical flow prediction using pytorch and internal tools, including profiling and optimization for deployment on an embedded Qualcomm QCU.
- Developed a visual servoing pipeline using real-time optical flow on embedded hardware, integrating tightly with planning and control for drone gimbal stabilisation.
- Integrated perception modules into real-time planning and control pipelines for autonomous flight.

Director of Studies, Engineering and AI — CAMBRIDGE PROGRAMMES LTD. — *2023 – now*

- Designed and delivered a two-week summer school curriculum on Engineering and AI for pre-university students.
- Managed a team of teachers and mentors; oversaw content delivery, hands-on workshops, and project supervision.

Signal Processing Engineer — CAMBRIDGE CONSULTANTS LTD. — *2018 – 2021*

- Lead engineer retrofitting generative deep learning models for use in the recovery of lossy compressed audio data.
- System modelling and unit testing of the PHY layer in 4G/5G communications software.
- Researched and deployed low-power signal processing algorithms on embedded systems, improved efficiency by 40%.
- Designed and implemented the sensory pipeline for a crowd-navigating robot including radar data and computer vision.
- Project manager for a portfolio of worth over £200,000 of software license tools, with regular presentations to senior officers at budget planning meetings

Undergraduate Research Placement — University of Cambridge, Toyota Motors Europe *2017*

- Modelled the effects of predictive control in semi-autonomous vehicles to minimise discomfort in humans using the principle behind 'why we can't tickle ourselves'. Liaised with Toyota for validation against experimental results.

Teaching Experience

2022 – now	**Teaching Assistant, Robotics**, Imperial College London
2020	**Presentation Skills Coach**, Cambridge Consultants
2017 – now	**Private Tutor**, GCSE, A-Level Mathematics and Physics, University Admissions Guidance
2015 – now	**Lead Mentor**, Cambridge Programmes Ltd. Summer School

Invited Talks

2024	**Oxford Robotics Institute**, Oxford Univeristy, UK
2024	**Delft University of Technology**, Delft
2024	**TNO Research**, The Hague, Netherlands

Awards

2021 – 2025	**Dyson Research Fellowship Award**, Dyson Ltd. & EPSRC
2023	**Best Poster Prize (runner-up)**, Imperial College London PhD Competition
2018	**Wallace Prize in Engineering**, Emmanuel College, University of Cambridge

Skills

Software Development

- Python, Numpy and PyTorch for deep learning.
- Parallelised C++ for distributed algorithms.
- 3D simulation and OpenGL graphics.
- Gitlab for Continuous Integration (CI).

Languages

- Fluent in English, Marathi and Hindi.
- Conversational in Spanish and French.