Fully Funded 4-year Doctoral Studentship

Joint with **Toshiba Research** and the EPSRC CDT in **Autonomous Intelligent Machines & Systems (AIMS)**

Note: This studentship is fully-funded.

Supervisor(s): Jabob Foerster & Lars Kunze (AIMS CDT)

Harit Pandya & Stephan Liwicki (Toshiba)

Start Date: October 2023

Autonomous systems powered by artificial intelligence will have a transformative impact on economy, industry and society as a whole. Our mission is to train cohorts with both theoretical, practical and systems skills in autonomous systems - comprising machine learning, robotics, sensor systems and verification- and a deep understanding of the cross-disciplinary requirements of these domains. Industrial partnerships have been and will continue to be at the heart of AIMS, shaping its training and ensuring the delivery of Oxford's world-leading research in autonomous systems to a wide variety of sectors, including smart health, transport, finance, energy and extreme environments. Given the broad importance of autonomous systems, AIMS provides training on the ethical, governance, economic and societal implications of autonomous systems. For more information regarding the AIMS programme, see our web pages at: aims.robots.ox.ac.uk.

Effective Collaborative Robot Learning for Varying Manipulation Tasks and Environmental Contexts

Abstract

Collaborative robots (or cobots) are designed to work alongside the human workforce with the aim of making monotonous and/or physically demanding tasks more efficient. In contrast to traditional, pre-programmed industrial robots, cobots have the advantage that they can, in principle, easily adapt to new tasks, contexts, and environments due to general learning. Hence, they are a key enabler for flexible and resilient manufacturing. However, how to effectively adapt cobots to new situations is still an open research question.

In this project, we will investigate how the adaptation of cobots can benefit from both human-in-the-loop interaction and minimal expert supervision. To this end, we will explore the role of robot-human (causal) explanation as well as human-robot supervision, human interaction on a task and guidance (through natural language). Specifically, we will focus on robotic (dual-) arm manipulation tasks in simulation and/or on real-world platforms using digital twin technology. Our aim is to determine how cobots can efficiently learn and generalise to new tasks, contexts, and environments using general purpose learning methods (e.g. deep RL, few shot learning, zero-shot coordination and transfer learning) in complex, partially observable environments.

Award Value

The studentship covers the full course fees (Home) plus a stipend (tax-free maintenance grant) of £17,668 p.a. for the first year, and at least this amount for a further three years.

Eligibility

This studentship is available to all applicants.

Prospective candidates will be judged according to how well they meet the following criteria:

- Applicants are normally expected to be predicted or have achieved a first-class or strong upper second-class undergraduate degree with honours (or equivalent international qualifications), as a minimum, in computer science, engineering, physics, mathematics, statistics or other related disciplines. A previous master's qualification is not required.
- Excellent English written and spoken communication skills

Candidates will also need to demonstrate a broad interest in some or all of the four AIMS themes:

- machine learning, as a unifying core
- robotics & vision
- cyber-physical systems (e.g. sensor networks)
- control & verification

The deadline for applying is Friday 20th January 2023 TBC. Candidates are therefore recommended to apply as soon as possible to and to inform wendy.adams@eng.ox.ac.uk when they have done so.

If you have any technical questions about the DPhil Studentship, please email wendy.adams@eng.ox.ac.uk

Please quote **AIMS-TOSHIBA-2023** in the studentship reference box.

There are other sources of funding through the CDT associated with Industry, and all applicants will be considered for these.

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