Ryan J. Hayward

PhD Candidate in Robot Learning

School of Computer Science
University of St Andrews, St Andrews
United Kingdom
rjh29@st-andrews.ac.uk
rjhayward.com
ryanjhayward

Research Interests

My research aims to enable robots to learn long-horizon industrial tasks, such as assembly, purely from human demonstrations collected with an easy-to-operate human-machine interface. My PhD focuses on skill chaining: splitting tasks into sub-skills (by hand or automatically), learning them separately and then chaining them together. I also have a keen interest in VR, and build teleoperation systems for demonstration collection.

Education

2022–present **PhD Computer Science**, *University of St Andrews*, St Andrews, UK

Working Title: On Imitation Learning of Complex Multi-Step Tasks in Robotics by Skill Chaining
Supervisor: Dr. Kasim Terzić

- Developing imitation learning methods which split long-horizon sequential robotic manipulation tasks into sub-skills to be learned and then chained together (TASC, published at ICINCO 2026; DTW-chain, in preparation).
- Built a VR teleoperation system for collecting robot demonstrations, currently in use in simulation to collect data for DTW-chain experiments.

*Transferred from an **MSc (Res)** to **PhD** in 2023.*

2017–2021 **BSc (Hons) Computer Science**, *University of Dundee*, Dundee, UK

First Class Honours (highest classification)
Dissertation: Ego-centric Training Data Synthesis. Using Unity, created an agent which walks through a virtual multi-floored environment using a user-tunable transition matrix, generating first-person video data based on desired behaviours. This training data was successfully used for a PhD project at the university.

Publications

2026 **Hayward, R. J.** and Terzić, K. (2026). "TASC: Fast Skill Chaining for Complex Sequential Robotic Tasks via Pure Imitation Learning." In *Proceedings of the 23rd International Conference on Informatics in Control, Automation and Robotics (ICINCO 2026)*, Vol. 1. *[doi:10.5220/0015378800004979]*

An imitation learning method which learns each sub-task and its termination probability jointly for long-horizon sequential robotic tasks, from demonstrations with sub-task labels. Consistently outperformed several state-of-the-art methods, with success rates around 15 percentage points higher (around 70 points higher on the longer-horizon Franka Kitchen task), in under 30 minutes of training. Presented as a poster at ICINCO 2026, Angers, France, and at the SICSA PhD Conference 2026, Glasgow, UK.

In prep. **Hayward, R. J.** and Terzić, K. "DTW-chain: Segmenting and Imitating Complex Sequential Robotic Tasks from Unsegmented Demonstrations via Dynamic Time Warping."

Uses a Mahalanobis-distance-based DTW method to segment demonstrations into sub-tasks. Initial results: with no demonstration labelling required, 95% success rate on the 7-DoF Fetch pick and place task, outperforming TASC's published 90%, which requires labelled demonstrations.

Relevant Experience

Summer 2019 **Land and Air Systems Research Intern**, *Thales UK*, Reading, UK
- Researched efficient computer vision methods for embedded inference hardware.
- Wrote an internal technical report and presented the findings to management.

Summer 2017, Summer 2018 **Control Systems Engineering Intern**, *Engineering Control Solutions*, Essex, UK
- Assisted control systems engineers with on-site commissioning and fault-finding of industrial robots and other PLC-based control systems.
- First-hand exposure to the practical constraints of factory automation, motivating my current focus on industrial robot learning from demonstrations.

Awards

2023 **School of Computer Science Scholarship**, *University of St Andrews, UK*
Fully funded PhD Studentship covering both tuition fees and stipend.

Teaching

2022–present **Lab Demonstrator (Teaching Assistant)**, *University of St Andrews*, St Andrews, UK
- Teaching theoretical concepts and programming to a wide range of undergraduate students in the Computer Science labs.
- Providing support with Java, C++ and Python assignments and projects.

Skills

Simulators	MuJoCo, PyBullet, Unity
Programming	Python (PyTorch), C#, C++, Java
VR Interfacing	OpenXR (Python), Unity (C#)
Tools	Linux, Git, Slurm (HPC GPU cluster), Docker, Weights & Biases

Outreach

2023 Robotics talk and demonstration (online) for around 30 pupils aged 5–12 at Port Ellen Primary School, a remote school on the Isle of Islay, Scotland.

Languages

English	Native	
Japanese	Intermediate	*Attended the Intensive Japanese Program at Sophia University, Tokyo, Japan (2018)*
Mandarin	Lower Intermediate	*A-level Mandarin Chinese, received Achievement Award*

Personal Interests

Technology	Games Development (rjhayward.com), Music Production
Other	Piano, Music Composition