Luke Beddow

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Work Experience

Doctoral Researcher (PhD), *University College London* Oct 2020 - Sep 2024

- Developed and deployed new learning-based methods for robotic grasping, particularly using deep reinforcement learning. Resulted in three first author publications at top robotics venues (see below).
- Achieved state of the art 95%+ grocery grasping reliability (11% median improvement vs related work).
- Implemented entire robotic system, including: gripper design, embedded programming, and simulation modelling (C++); data collection and deep learning (Python); and distributed sytem deployment (ROS).
- Created and trained different machine learning models (Shell scripting, cluster), wrote and maintained an extensive codebase (Git, > 40k SLOC), conducted testing, debugging, and analysis (>5000 grasps).

Postgraduate Teaching Assistant (during PhD), *University College London* Jan 2021 - Jan 2024

- Taught robotics masters modules, including vison-based grasping with ROS (C++, Python). Gave lectures and tutorials, supervised dissertations, formulated assessments, worked in and managed teams.
- Received exceptional feedback from module leaders, colleagues, and students on quality of disseminating complex topics, management and organisational skills, as well as approachable and friendly demeanour.

Research & Development Intern, *Jacobs Douwe Egberts* Jul 2017 - Jul 2018

- Coffee machine development, patent analysis, prototyping, conducting experiments, presenting results.
- Highly collaborative team working, including three supplier visits abroad alongside different teams.

Education

PhD Computer Science, *pending viva, University College London* 2020 - 2024
Research Topic: Learning-based robotic grasping of grocery items. Viva scheduled Nov. 2024.

MEng Mechanical Engineering, *First Class (79%), University of Bath* 2015 - 2020
Disseration: Computational mathematical modelling of flexure robots.

A-Levels, *Alleyn's School* 2013 - 2015
4 A*s in Maths, Further Maths, Physics, and Chemistry.

Skills

Programming:	Python, C/C++, MATLAB, Bash, Make, CMake, Unix, LaTeX (all 4+ years)
Software tools:	PyTorch, NumPy, SciPy, Matplotlib, Pandas, Git, ROS, Pybind11, Docker, gprof
Machine Learning:	Reinforcement learning, imitation learning, supervised learning, computer vision
Robotics:	Grasping and manipulation, physics simulation, applied machine learning, software and hardware integration, embedded programming, vision, sensors, and actuators
Conscientiousness:	Very disciplined, self-motivated, organised, and effective (PhD, hobbies)
Teamwork:	Collaborative, friendly, team-orientated (PhD, R&D, teaching, team sports, band)
Communication:	Highly adept technical communicator (papers, posters, international presentations), received excellent feedback on teaching (delivering lectures and running tutorials)
Creativity:	Produced novel research and new ML methods, exceptional problem solver having integrated complex robotic grasping pipeline, innovative designer (CAD 10 years)

Research Publications (First Author)

Reinforcement Learning Grasping with Force Feedback from Modeling of Compliant Fingers. IEEE/ASME Transactions on Mechatronics, 2024. DOI: 10.1109/TMECH.2024.3450269

Created a novel grasping approach and a mathematical model for a compliant gripper in a physics simulator, and developed a reinforcement learning method which grasped 42 real groceries with 95.0% success rate.

Evaluating a Movable Palm in Caging Inspired Grasping using a Reinforcement Learning-based Approach. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2024. DOI: Presented at conference, open access available, IEEE XPlore pending

Applied a reinforcement learning approach to optimise gripper design parameters, and demonstrate an improvement from using a movable palm. Showed 96.0% grasp success rate in the real world.

A Caging Inspired Gripper using Flexible Fingers and a Movable Palm. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2021. DOI: 10.1109/IROS51168.2021.9635873

Presented a novel gripper design and grasping concept which combined compliant fingers and a movable palm, to cage objects, which is suited to grasping grocery items. Demonstrated grasping was robust to disturbances.

Awards and Achievements

2021 – Best Poster Award University College London
£100 prize for best poster at UCL Robotics Workshop.

2017 - 2020 – Academic commendations University of Bath
Received university commendation for outstanding performance in each of 2nd, 3rd, and 4th year of degree.

2016 – BP Centurion Prize University of Bath
£1000 prize for top three academic placement in cohort.

2009 - 2014 – School scholarship and prizes Alleyns School
Academic scholarship at 11+*, prizes for academic achievement 2011, 2012, 2014.*

Community Outreach

- Reviewer for top robotics conferences and journals: ICRA, IROS, RAL.
- Fundraising and running events as part of Jacob Douwe Egberts Banbury charity committee.
- Volunteer lecture teaching robotics to school girls as part of Bio-Robots: Crawl, Jump, and Slither!
- Local tennis coaching, children ages 5-14 over three years, and London Youth Games volunteering.

Interests

- I am passionate about robotics and applied machine learning, as shown by my PhD topic and research.
- I wrote from scratch a chess engine in C++, first with a traditional evaluation function and subsequently compiling it into Python and applying deep learning for a neural evaluator (see website).
- I enjoy sport, having represented school, club, and university for team sports (football, hockey, frisbee).
- I love music, I am self-taught at bass and guitar, have achieved Grade 8 trumpet, and play in a band.