

# LUKE BEDDOW

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## WORK EXPERIENCE

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### Doctoral Research, *University College London*

Oct 2020 - Sep 2024

- Developed deep reinforcement learning grasping methods, for a novel gripper which I designed and built.
- Extensively created and trained machine learning models, managed an extensive codebase (4 years, > 40k SLOC), deployed on real hardware with end-to-end integration (95%+ grasping reliability).
- Required creative problem-solving and high-level technical communication to achieve publication of research, first author of 1 journal article and 2 conference papers at top robotics venues (see below).

### Postgraduate Teaching Assistant, *University College London*

Jan 2021 - Jan 2024

- Teaching robotics masters modules, including vision-based grasping using OpenCV (C++ and Python).
- Gave lectures, created tutorials, ran classes, developed courseworks, managed and worked in teams.

### Research & Development Intern, *Jacob 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

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### PhD Computer Science, *pending viva, University College London*

2020 - 2024

Research Topic: Learning-based robotic grasping of grocery items. Thesis submission Sep. 2024.

### MEng Mechanical Engineering, *First Class (79%), University of Bath*

2015 - 2020

Dissertation: Computational mathematical modelling of flexure robots.

### A-Levels, *Alley's School*

2013 - 2015

4 A\*s in Maths, Further Maths, Physics, and Chemistry. 10 A\*s at GCSE, including German and French.

## SKILLS

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<b>Programming:</b>	Python, C/C++, MATLAB, ROS, Git, Make, CMake, Arduino, LaTeX
<b>Machine Learning:</b>	SL, RL, PyTorch, NumPy, SciPy, Weights & Biases, Stable Baselines, Lin. Algebra
<b>ML for Robotics:</b>	Expert knowledge of current research, 4 years applied experience with grasping
<b>Computer Vision:</b>	Torchvision, OpenCV, pyrealsense2, CNNs, GANs
<b>Design &amp; Build:</b>	CAD (Solidworks, Inventor, Solid Edge), Workshop (3D printer, lathe, mill, etc)
<b>Conscientiousness:</b>	Very disciplined and motivated, creative problem-solver, testing and safety focused
<b>Teamwork:</b>	Collaborative (PhD, R&D), friendly (teaching), team-orientated (team sports, band)
<b>Communication:</b>	Highly adept technical communicator (papers, posters, international presentations), received exceptional feedback on teaching (delivering lectures and running tutorials)

## RESEARCH PUBLICATIONS

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### Reinforcement learning grasping with force feedback from modeling of compliant fingers, *IEEE/ASME Transactions on Mechatronics, 2024*

L. Beddow, H. Wurdemann and D. Kanoulas

Designed a novel gripper, created a mathematical model in a physics simulator (MuJoCo), and developed a reinforcement learning method, learning to grasp 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*

L. Beddow, H. Wurdemann and D. Kanoulas

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.

**Reinforcement learning-based grasping via one-shot affordance localization and zero-shot contrastive languageimage learning, IEEE/SICE International Symposium on System Integration (SII), 2024**

X. Long\*, L. Beddow\*, D. Hadjivelichkov, A. M. Delfaki, H. Wurdemann and D. Kanoulas (\*equal contribution)

Combined a reinforcement learning grasping approach with a visual affordance model (AffCors) and object identification, using CLIP. Showed 72.0% real world grasp success rate in moderate clutter.

**A caging-inspired gripper using flexible fingers and a movable palm, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2021**

L. Beddow, H. Wurdemann and D. Kanoulas

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.

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## AWARDS AND ACHIEVEMENTS

**2016 – BP Centurion Prize**

University of Bath

*£1000 prize for top three academic placement in cohort.*

**2017 - 2020 – Academic commendations**

University of Bath

*Received university commendation for outstanding performance in each of 2nd, 3rd, and 4th year of degree.*

**2009 - 2014 – School scholarship and prizes**

Alleyns School

*Academic scholarship at 11+, prizes for academic achievement 2011, 2012, 2014.*

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## 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.

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## INTERESTS

- I am passionate about robotics, including automation and grasping, as shown by my PhD topic.
- I enjoy sport, having represented school 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.