

# LUKE BEDDOW

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## WORK EXPERIENCE

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

- Developed and deployed novel machine learning methods for robotic grasping, particularly using 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).
- Deployed ML models in large-scale, distributed computing environments (real robots, cluster), improved upon existing models (+19%), conducted rigorous model validation and fine-tuning (>5000 grasps).
- Successfully bridged the gap between research and deployment, requiring exceptional practical skills and problem solving. Solely developed, maintained, and tested a scalable codebase (>40k source code lines).
- Managed end-to-end workflows, from data collection and preprocessing (Python, NumPy), to model training and evaluation (PyTorch), and final deployment in resource-constrained environments (C++).

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

- Taught robotics masters modules, including grasping in physics simulators (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

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**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  
Dissertation: Computational mathematical modelling of flexure robots.

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

## SKILLS

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- Programming:** Advanced Python (4+ years, incl. PyTorch, NumPy, SciPy, Matplotlib, Pandas); advanced C/C++ (4+ years); experienced Bash, Make, CMake, Unix, Git, Docker
- Machine Learning:** Reinforcement learning expert (with publications); experienced with imitation learning, supervised learning, computer vision, and applying ML to real systems
- Robotics:** Grasping and manipulation; physics simulation; applied machine learning; software and hardware integration; embedded programming; vision, sensors, and actuators
- Data & Modelling:** Proven record managing data pipelines for applied ML; advanced knowledge of data preprocessing techniques, statistical analysis, and computational modelling
- Conscientiousness:** Very disciplined, self-motivated, organised, and effective (PhD, side projects)
- 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)

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

Created the first reinforcement learning grasping approach to combine force feedback and compliant grasping, training using physics simulation and a derived model, integrating hardware, and achieving 95.0% reliability.

**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

Utilised reinforcement learning, an automated data collection pipeline, and rigorous real-world testing, to train 24 different models for different hardware, in order to optimise design parameters and reach 96.0% reliability.

**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

Created a novel grasping concept and demonstrated its effectiveness using a prototype and real-world testing. Required embedded programming in C++ to interface with custom circuit board and control actuators.

## AWARDS AND ACHIEVEMENTS

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**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

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- 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

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- I am passionate about 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.