Mateusz Ochal

Ph.D. Candidate · Deep Learning · Few-Shot Learning · Robotics · Bayesian Methods

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I am a self-motivated second-year Ph.D. student passionate about solving real-world challenges using deep learning; a published researcher (AAMAS, NeurIPS workshop); and a software engineer with experience in testing. I develop machine learning systems daily using Python and PyTorch, with GitHub for version control. I have the ability to learn quickly, a good attention to details, and a strong work ethic.

Education

Ph.D. in Robotics and Autonomous Systems *(RAS-CDT)* *2019 – Now*

Jointly awarded by University of Edinburgh and Heriot-Watt University.

- *Research:* "Few-Shot Learning for Autonomous Systems" explores the problem of training deep-learning algorithms using limited labelled data, with algorithm application on real-world problems and robotics systems. Related articles: [1, 2]
- *Highlights:* implementing own machine learning algorithms and technical papers; building systems for experiment analysis; performing statistical analysis of data; working closely with industry (SeeByte Ltd.) to tackle relevant research problems.

M.Sc. in Robotics and Autonomous Systems *(RAS-CDT)* *2018 – 2019*

Distinction (∼77.4%) · *Courses attended at University of Edinburgh and Heriot-Watt University*

- *Research:* "An Analysis of Few-shot Learning Techniques for Underwater Optical and Simulated Sonar Images". Related article: [3]
- *Courses:* robotics and autonomous systems (Bayesian filtering, localization); advanced vision (image processing, deep-learning, 3D object reconstruction); reinforcement learning.

B.Sc. in Computer Science *2015 – 2018*

1ST Class (∼79.5%) · *University of Southampton, UK*

- *Research:* "Multi-Agent Reinforcement Learning with Opponent Awareness".
- *Courses*: advanced machine learning (probability, Bayesian principles, SVMs, kernels, optimization, clustering, PCA); computer vision (deep learning, classification, segmentation); embedded systems (low-level programming).

A-Levels in Maths, Further Maths, Computing, and Physics *2013 – 2015*

A*A*AA · *Hills Road Sixth Form College, Cambridge, UK*

- *Extended Project (EPQ Level 3):* "3D Graphics Software in C#" (*A**).

Employment

Research Assistant Intern • *University of Southampton, UK* *2017 – 2019*

A research project spanning across two summer internships and part-time work in between

- *Responsibilities*: to design and implement a fair resource allocation system using reinforcement learning and strategy-proof mechanism design.
- *Achievements*: publishing and presenting preliminary work at the AAMAS-IJCAI 2018 workshop [4]; publishing a later iteration at AAMAS 2020 conference [5].

Software Engineer Intern • *ARM Ltd., Cambridge, UK* *Summer 2016*

A 12 week summer internship.

- *Responsibilities*: to automate the generation of micro-controller documentation.
- *Highlights*: programming in C# using test-driven development; deploying applications using Microsoft Azure Services; website design; Agile workflow.

Projects

"Robotics: Science and Systems" Project • *University of Edinburgh, UK* *Autumn 2018*

A group university project to design and build an autonomous robot.

- *Highlights*: going beyond the project requirements, I built a real-time recognition system to track the robot's position within a defined arena. The localization system was integrated with input from other sensors using Bayesian Particle Filter algorithm.

Robotics Society (RoboSoc) • *University of Southampton, UK* *2015 – 2018*

A university society run by students.

- *Responsibilities*: building robotic systems, integrating sensors (inertial units, optical cameras, odometry) and microcontrollers; directing the society as a committee member; participating in and organising competitions and workshops.
- *Achievements*: I taught over 15 students the basics of robotics and helped lead the society's team to achieve 1st place in the national round of Eurobot 2018 in London.

Project Arduino Competition • *University of Southampton, UK* *Nov 2015*

A group project involving designing, engineering, and programming innovative solutions using an Arduino; team achieved 2nd place out of 6 teams from the University of Southampton.

Programming Languages

Main (daily driver)	Python (PyTorch, Tensorflow, Keras, Numpy, Scikit-learn, OpenCV, Pandas)
Experienced	C/C++, C#, Java, MatLab

Knowledge and Skills

Research

Supervised Learning	Few-Shot Learning; Meta-Learning; Implementation of Bayesian Algorithms; Optimization; Regression; Deep Convolutional Neural Networks; Continual Learning; Class Imbalance; Clustering Algorithms; Variational Auto-Encoders.
Reinforcement Learning	Q-Learning; SARSA; Dynamic Programming; Multi-Agent Systems; Game Theory; Learning with Opponent Learning Awareness (LOLA); Markov Processes
Computer Vision	Image and Video Processing; Object Detection; Object Tracking; Segmentation; Scene Understanding; 3D Geometry; 3D Model Reconstruction from Point Clouds; Outlier Detection
Robotics	Localization; Mapping; Bayesian Filtering (Particle Filters); SLAM
General	Statistical Analysis of Data; Experiment System Building; Reading and Implementing Technical Articles; Writing and Publishing Research Articles

Engineering

Software Development	Version Control (Git/GitHub); Test-Driven Development; GUI Testing; Debugging; Web Design; Agile Workflow; Contribution to Existing Code Bases
Embedded Systems	Low-Level Programming on Arduino, Raspberry Pi, ARM-Based Micro-Controllers; Sensor Integration and Calibration (IMU, Pressure Sensors); Odometry; Motor Control (Stepper, Servo, DC); CAD and 3D Printing
Operating Systems	Ubuntu Linux, MacOS, Windows 10

Languages

English (Proficient) · Polish (Native)

Personal Interests

Hackathons · Running · Martial Arts · Meditation · Drumming · Podcasts · Discussions · DIY

Publications

Conference Proceedings

[3] A Comparison of Few-Shot Learning Methods for Underwater Optical and Sonar Image Classification
Mateusz Ochal, Jose Vazquez, Yvan Petillot, Sen Wang
Global OCEANS, 2020

[5] Strategyproof Reinforcement Learning for Online Resource Allocation
Sebastian Stein, Mateusz Ochal, Ioana-Adriana Moisoiu, Enrico Gerding, Raghu Ganti, Ting He, Tom La Porta
AAMAS, 2020

Workshops

[1] Defining Benchmarks for Continual Few-Shot Learning
Antreas Antoniou, Massimiliano Patacchiola, Mateusz Ochal, Amos Storkey
NeurIPS workshop on Meta-Learning (MetaLearn), 2020

[4] Online Mechanism Design using Reinforcement Learning for Cloud Resource Allocation
Mateusz Ochal, Sebastian Stein, Fan Bi, Matthew Cook, Enrico Gerding, Ting He, Thomas La Porta
AAMAS-IJCAI workshop on Agents & Incentives in AI (AI^3), 2018

Preprints

[2] Few-Shot Learning with Class Imbalance
Mateusz Ochal, Massimiliano Patacchiola, Amos Storkey, Jose Vazquez, Sen Wang
arXiv preprint arXiv:2101.02523, (under review), 2021