Henry Charlesworth

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Github: https://github.com/henrycharlesworth
Personal Website/Blog: https://henrycharlesworth.com

Experience

Machine Learning Scientist, Rowden Technologies
(September 2020 - Present)

Research Fellow in Deep Reinforcement Learning, University of Warwick
(February 2019 – September 2020)

- Based in Warwick Manufacturing Group's Data Science team focussing on fundamental reinforcement learning research. My primary project has been looking at model-based planning using Generative Adversarial Networks in order to solve sparse-reward problems.

Education

PhD based in the Centre for Complexity Science, University of Warwick
(October 2015 – May 2019)

- Thesis title: "Future sate maximisation as an intrinsic motivation for decision making".
- Involved building large scale numerical models in C++/MATLAB and running these on the university's high-performance cluster (using MPI).
- Also involved building and training neural networks using Keras and Tensorflow.
- I taught support classes for all first year undergraduate Physics modules and the first year Maths module "Maths by Computer", teaching students to use MATLAB.

Mathematics of Systems MSc, University of Warwick
(October 2014 – October 2015)

- Passed with distinction. Modules included Data Analysis, Networks and Random Processes, Computational Methods for Complexity Science, Dynamical Systems and Numerical Methods.
- Conducted mini projects on "Mathematical Modelling of the Spread of Foot and Mouth Disease" and "Molecular Modelling of Polymer-Graphene Nanocomposites" (which involved running large scale molecular dynamics simulations using LAMMPS).

Physics MSci, University College London
(September 2009 – July 2014)

- First-class honours and included on the Dean's List for Academic Excellence for achieving the highest exam results during my final year. Final year modules included Advanced Quantum Theory, Electromagnetic Theory, Order and Excitations in Condensed Matter, Statistical Mechanics and Quantum Computation and Communication.
- Final year research project was on "Entropy Production in Small Systems" and supervised by Professor Ian Ford.

Seaford Head Community College, East Sussex
(2001 – 2009)

- A-Levels: Mathematics (A), Physics (A), History (A). GCSEs: 5 A*s, 6As.

Publications

- "PlanGAN – Model-based Planning with Sparse Rewards and Multiple Goals" – under review at Neurips (arXiv: https://arxiv.org/abs/2006.00900v1)
- "Intrinsically motivated collective motion", PNAS, 116 (31), 2019 (first author)
- "Stochastic entropy production arising from nonstationary thermal transport", Phys. Rev. E, 92, 042108 (2015) – arXiv: https://arxiv.org/abs/1506.00843
- "Application of self-play reinforcement learning to a four-player game of imperfect information", AAAI 2019 Reinforcement Learning for Games workshop (first author) – arXiv: https://arxiv.org/abs/1808.10442
- IOP blog post – "Summer school in Beijing provides excellent foundation in statistical physics" http://www.iopblog.org/summer-school-in-beijing-provides-excellent-foundation-in-statistical-physics/

Relevant Experience

In my spare time I have been working on a project to train a neural network to learn to play a four-player card game of imperfect information called "Big 2" using self-play deep reinforcement learning. This is now at a stage where it can regularly beat experienced amateur players. More details can be found on my Github page.

Internships

BMLL Technologies – Machine Learning Internship
(October 2018 – December 2018)

Carried out research using ensembles of random forests to predict the price impact of events in the limit order book. This involved generating complicated features from a huge data set, as well as building neural networks and support vector machines to benchmark the performance of the random forest ensemble.

Programming Languages/ Software

- Extensive experience using C++, Python (including Pytorch, Tensorflow, Pandas, NumPy and SciPy), MATLAB, Mathematica, HTML and CSS.
- Extensive experience using both Windows and Ubuntu operating systems.
- Some experience using the BOOST C++ libraries, Javascript (including D3.js and Node.js), PHP and MySQL
- Some experience using Microsoft Visual Studio.
- Some experience using Adobe Photoshop.
- Proficiency with LaTeX.

Invited Talks

- Future State Maximisation Workshop (University of Graz) – 17 December 2019
- International Soft Matter Conference 2019 (University of Edinburgh) – 4 June 2019
- Decision Research at Warwick (DR@W) Forum – 2 May 2019

Conferences/ Summer Schools

- Gaussian Processes Summer School, 3-6 September 2018, University of Sheffield
- Fundamental Problems in Statistical Physics Summer School, 16-29 July 2017, Bruneck.
- Introduction to Machine Learning Summer School, 21-23 June 2017, University of Warwick.
- Nonequilibrium Statistical Physics and Active Matter Summer School, 8-20 August 2016, Chinese Academy of Sciences, Beijing.
- Principles of Biological and Robotic Navigation, 29-31 August 2016, Max Planck Institute for Complex Systems, Dresden.

Additional Research Experience

Summer project at the Research Complex at Harwell
(June 2014 – August 2014)

- Conducted a 10-week research project looking at using a coherent diffraction imaging technique known as "Optical Ptychography" to study the growth of birefringent calcite films. Supervised by Professor Ian Robinson (UCL).

References

References are available upon request.