WILLIAM LEENEY

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TECHNICAL SKILLS

- Python
- Julia
- Typescript
- Git
- LaTeX
- C/C++
- MATLAB
- Java
- html
- css

ML Libraries

- Pytorch
- Pytorch-lightning
- TensorFlow
- Weights and Biases

References

Supervisor
Ryan McConville, University of Bristol
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EDUCATION

University of Bristol
2020 - Present
PhD Student – Artificial Intelligence

2016 - 2020
MEng 1st Class – Master's in Engineering Mathematics

PhD RESEARCH

Areas of Interest:
Unsupervised Representation Learning, GNNs, Randomness in ML Benchmarks, Federated Learning, Community Detection, Hyperparameter Optimisation, Using AI for Good.

Thesis: How to Train and Benchmark Graph Neural Network Clustering Algorithms

Published Papers:

- *(Oral) William Leeney and Ryan McConville. Uncertainty in GNN Learning Evaluations: The Importance of a Consistent Benchmark for Community Detection. Twelfth International Conference on Complex Networks & Their Applications (2023).*

- *(Invited) William Leeney and Ryan McConville. Uncertainty in GNN Learning Evaluations: A Comparison Between Measures for Quantifying Randomness in GNN Community Detection. Advances in Complex Networks and Their Applications, from COMPLEX NETWORKS, 2023. Complexity, Entropy (2023).*

- *William Leeney and Ryan McConville. A Framework for Exploring Federated Community Detection. Graphs and more Complex Structures For Learning and Reasoning Workshop at the Thirty-Eighth AAAI Conference on Artificial Intelligence (2024).*

- *Two papers under review*

Applications of Research

- Encode patient information for health care to predict drug treatment recommendation.
- Represent information flow on social media networks to then GNNs to detect fake news.
- To compress financial indicator signals for price prediction trading algorithms.

Undergraduate Projects

Reinforcement Learning and Decision Making | Dissertation
2019/20
Implemented biologically plausible reward modulated Hebbian learning rule for chaotic recurrent neural networks. Learning mechanisms were compared to mathematically optimal performance and reinforcement learning solutions of Drift-Diffusion model for human decision-making analysis.

Atmospheric Chemistry | Summer Internship
2018/19
Employed algorithm for procedurally generating hydrocarbon chains. Implemented novel algorithm to calculate rate constants for reactions between hydrocarbons and chemicals in atmosphere. Research aimed to quantify contributions to global warming affect between hydrocarbons and functional groups.

Open-Source Code

willleeney/ugle

Python library for training GNNs to perform node clustering. Here, I reimplemented ten different architectures and provide trainer objects to handle the training process. Complete with in-built custom logger and visualisation functions. Extendible framework that can perform hyperparameter optimisation.

willleeney/wrandai

This repository quantifies the uncertainty of a machine learning benchmarking investigation. Functions provide tools for calculating the presence of randomness due to random seeds. PyPi Package and pip install available.

Undergraduate Units

- Applied Deep Learning
- Machine Learning
- Information Processing and the Brain
- Bio-Inspired Artificial Intelligence
- Introduction to Artificial Intelligence
- Applied Data Science
- Intelligent Information Systems
- Uncertainty Modelling for Intelligent Systems
- Computational Genomics and Bioinformatics Algorithms
- Computational Neuroscience
- Optimisation Theory and Applications
- Applied Statistics
- Mathematics and Data Modelling 3
- Continuum Mathematics
- Nonlinear Dynamics and Chaos
- Dynamics of Networks.

Personal Projects

Holistic Spotify Control
I wanted to play music in my room using the posters of album art. My project uses a camera to detect when I 'click' on the album art on my wall using my hand to play the corresponding music on my speakers. This is an ongoing project; the next step is to put the software on a standalone device.
- Uses 3D CNNs to detect hand landmark positions on video footage
- Recognises simple gestures to control user interface.
- Object detection and google vision API to detect album art on wall and search for associated album.
- Spotify API to play music on speakers.

AI Crypto Trader
I built a cryptocurrency wallet on a Raspberry Pi. I then modified a custom reinforcement learning environment to train a deep belief network to trade cryptocurrencies. This is also ongoing; my next step is to combine this with my research in continual unsupervised learning to identify trading signals.

Obsidian Notetaking
Obsidian is tool for notetaking which I build and open-sourced a plugin that allows you to create branching possibilities in text generation, visualised as a graph, using OpenAI LLM capabilities.

Poem Generator
This project uses the OpenAI API to recognise voice input and convert the audio to text; generate a poem from the trigger words then play the poem in a generated voice.

Teaching Experience

Introduction to Artificial Intelligence
Unit gives a broad introduction to various ML topics which is assessed by student interest driven projects.
- Aid students in laboratory work
- Help with coursework where needed
- Weekly supervision of group projects

Example Student Projects Supervised:
- Using CNNs to analyse plant health
- Combining decision trees with unsupervised clustering for recommending tv shows/films

Mathemathtics and Data Modelling
Unit focused on applying skills learnt in the degree to real world problems.
- 1st term - Provide weekly supervision for groups for Industrial/Academic sponsored projects
- 2nd term - Aid with student start-up projects

Example Student Projects Supervised:
- Bayesian ML for quantum internet network optimisation.
- Using sentiment analysis on social media for cryptocurrency price spike event prediction.
- "DeepDance" – Creating an AI dance teacher using body landmark detection.

Further Computer Programming, Introduction to Data Science, Introduction to MATLAB
- Provide assistance for students in laboratory work
- Aid with marking coursework