Alex McKinney

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Education

Durham University   United Kingdom
MEng. Computer Science   *October 2018 – June 2022*
- Graduated with a first class honours degree with a 79.66% average.
- Master's thesis on fast image generation using step-unrolled denoising autoencoders, capable of generating megapixel images in ≈ 2 seconds.
- *Relevant Modules: Deep Learning, Reinforcement Learning, Machine Learning, Advanced Computer Vision, Natural Language Processing, Parallel Scientific Computing I/II, Single Mathematics A.*

Highlighted Projects

PyTorch Generative Models | *Python, PyTorch, Generative Modelling*
- Many projects reimplementing recent developments in deep generative modelling and incorporating novel additions where appropriate.
- VQ-VAE-2 implementation that can support an arbitrary number of vector quantization codebooks. Exceptional results on high resolution datasets such as FFHQ1024. **[Github]**
- Glow implementation with adjustable squeeze rate and gradient checkpointing for significant memory savings. Applied to datasets such as CelebA 128. **[Github]**
- Implementation of step-unrolled denoising autoencoders (SUNDAE) for non-autoregressive, character-level text generation. Modified with masking during batched sampling to improve inference time further. **[Github]**
- GPT-style network with efficient Performer self-attention for generating expressive MIDI piano performances using the Google Magenta MAESTRO dataset. **[Github]**

ptpt: PyTorch Personal Trainer | *Python, PyTorch, DL Tooling*
- Personal framework built around PyTorch for rapid experimentation and iteration. Focused on aggressively abstracting implementation details and engineering tricks whilst retaining flexibility.
- Features automatic mixed-precision, compute device management, arbitrary callback functions, and Weights and Biases integration that can all be applied with minimal code change.

ALBERT Multi-Label Sentiment Analysis | *Python, PyTorch, HuggingFace, Natural Language Processing*
- PyTorch implementation of *A Lite BERT* for multi-label sentiment analysis on the *Jigsaw Unintended Bias in Toxicity Classification dataset.*
- Pretrained on the English Wikipedia corpus provided by HuggingFace datasets.
- Deviates from the original formulation by providing options for linear space complexity self-attention approximations.

Rainbow DQN | *Python, PyTorch, OpenAI Gym, Deep Q-Learning*
- PyTorch implementations of many DQN variants, including Rainbow DQN – the combination of many DQN improvements.
- Evaluated on the Atari Learning Environment provided by OpenAI Gym.

sss: Simple Static Site Generator | *Rust, Markdown*
- Minimalist, markdown static site generator written in Rust. Used to generate my personal website. Supports rendering LaTeX expressions and syntax highlighting for code blocks.

Research

- **Alex F. McKinney** and Chris G. Willcocks | Megapixel Image Generation with Step-Unrolled Denoising Autoencoders | 2022 | [arXiv]

- **Alex F. McKinney** and Benjamin Cauchi | Non-intrusive Speech Intelligibility Prediction from Discrete Latent Representations | 2022 | [IEEE Signal Processing Letters]

Experience

AI Engineer | *Graphcore, Bristol HQ*   September 2022 – Present
- Part of the Large Models group, porting Bloom-176B inference to IPU and developing Stable Diffusion finetuning on IPU.

Teaching Assistant | *Durham University, United Kingdom*   September 2020 – March 2022
- Taught introductory Python programming and propositional logic to first-year students at a top-10 UK university.
- Involved remote and in-person teaching, presenting content provided by module leader, and answering questions from students with a variety of technical backgrounds.

Research Intern | *OFFIS – Institut für Informatik, Oldenburg, Germany*   June – September 2021
- Research Intern as part of the DAAD RISE Germany research exchange scheme and supervised by Dr. Benjamin Cauchi.
- Self-proposed project using contrastive predictive coding for the unsupervised representation learning of binaural audio to improve non-intrusive speech intelligibility prediction systems. Our measure highly correlated with the ground truth (>90%) and surpassed all baselines.
- Accepted at IEEE Signal Processing Letters.

Volunteer | *ICLR 2021*   May 2021
- Student volunteer at the Ninth International Conference on Learning Representations.
- Testing virtual poster sessions and conference website, and providing live technical assistance to the organisers of the workshop *"Neural Conversational AI: Bridging the Gap Between Research and Real World"*.

Cyber Security Intern | *Her Majesty's Government, United Kingdom*   July – September 2019
- Completed cyber security training courses on offensive and defensive tactics.
- Carried out an individual project into using LSTM neural networks for computer network intrusion detection.

Skills

Programming Languages	*Proficient in:*	Python.
	Experience with:	Rust, C/C++, JavaScript, LaTeX.
Libraries and Frameworks	*Proficient in:*	PyTorch, NumPy.
	Experience with:	JAX, TensorFlow, HuggingFace, Matplotlib, Scikit-learn, Pandas, Weights and Biases.
Software		Git/GitHub, Bash/Zsh, Linux, Conda, Slurm, Vim, Jupyter, Tmux.