William Powell

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Education

Imperial College London October 2023 - Present
Applied Machine Learning MSc

- Distinction with 80% overall (4.0 GPA and top 5th percentile).
- Thesis: *Rethinking Stress Monitoring: Convenient Modular Early-Onset Multimodal Stress Detection with Attention Score Caching.* Available here.

University of Bath September 2019 – June 2023
Integrated Mechanical and Electrical Engineering BEng (Hons)

- First Class Honours with 75% overall (4.0 GPA and top in cohort). Transcript available here.
- Dissertation: *Design and Implementation of a Single-Lead Chest Strap ECG Recorder for Stress Classification using Lightweight Machine Learning Methods.* Available here.

Experience

Machine Learning Research Intern at Mixedbread.ai October 2024 – January 2025

- Helping to research, implement, and optimize state-of-the-art embedding and re-ranking models that have 15 million monthly downloads on Hugging Face and used by companies like Google and IBM.

Research Engineer at BrainPatch.ai June 2021 – September 2024

- Designed from conception to deployment the machine learning pipeline, software, firmware, and hardware to wirelessly stream EEG/ECG data to the cloud.
- Implemented cloud computing (model inference) using AWS and SQL to process data and transmit it to a web interface in real time.
- Device used in trials for monitoring the real-time participant biosensing information remotely. Now integrating it into a commercial machine learning consumer product to detect stress.

Software Engineer at AB Dynamics September 2021 – August 2022

- Embedded lead for a new MISRA compliant product using CAN for the various peripherals of the STM32 microcontroller written in C++.
- Device developed and launched to customers in six months, sold at £10k per piece.
- Researched and developed a neurostimulation prototype to mimic motion on a static driving simulator.

Founder and CEO of PhoneCave (phonecave.co.uk) November 2019 – September 2020

- Created a start-up, PhoneCave, that aims to get people off their phones.
- Designed and manufactured the electronics, firmware and hardware.
- Shipped PhoneCaves to over 10 countries worldwide, held a promotional campaign on Kickstarter, and sought investors.

Publications (Forthcoming)

Modular Sliding Cross-Attention Network for Early-Onset Real-time Stress Detection.

- As an extension to my Master's thesis, we propose a novel architecture and attention mechanism inspired by the Transformer, commonly used in NLP tasks. This adaptation is designed for real-time biosignal classification.
- The architecture required significantly smaller feature extraction windows resulting in up to 500% less compute to achieve state-of-the-art accuracies in stress classification datasets.

Sliding Cross-Attention Network For Low-Latency Wearable Motion Capture on Edge Devices.

- From my previous paper it quickly came apparent that this architecture is well suited not only for biosignal classification but other real-time, compute limited classification tasks.
- The idea is to detect human motion using wearable sensors instead of external cameras with the eventual goal of capturing human motion in users' own homes which will be utilised to diagnose various patient conditions.

Projects

Contribution to Open Source Machine Learning Accelerator Framework Code Available Here

- Contributed to the integration of runtime optimizations such as TensorRT and ONNXRuntime into a 200k+ line codebase Machine-Learning Accelerator System Exploration Tools (MASE).
- Developed by Imperial and Cambridge researchers, MASE aims to keep up with the pace of development of ML models which is much faster than accelerator design cycle, rendering many accelerators obsolete.

Design of a Self-Organising Multi-Agent System Code Available Here

- Co-lead the infrastructure team to design a base platform architecture for 70+ students to utilize.
- Six publications are currently being written at Imperial using the system environment.

COVID Volunteering - 3d Printing PPE for National Health Service

- Collaborated in a 3d printing community to print PPE for NHS staff. Saved an estimated 20,000 additional face shields due to slicer optimizations.

Technical Skills

Languages: English (native), Russian (B1), French (B1)
Programming Languages: C, C++, Python, Golang, MATLAB, Julia, JS, ReactJS, Bash, System Verilog.
Computer Skills:

- **Deep Learning**: PyTorch, TensorFlow, Keras, OpenCV, CUDA.
- **Developer Tools**: Git, Linux, Docker, VMs, RTOS, HPC, Cloud Computing (AWS), Databases (SQL).
- **Engineering**: Networking, PCB Design, CAD, multiphysics simulation and modeling.

Activities and Interests

- Photography, running, sailing, skiing, freediving, investing, philosophy.