William Powell

me@willpowell.uk   www.linkedin.com/in/william-f-powell   www.willpowell.uk

EDUCATION

Imperial College London   October 2023 - Present
Applied Machine Learning MSc

- On track for a Distinction thus far.

- Modules taken: Machine Learning, Self-Organising Multi-Agent Systems, Topics in Large Dimensional Data Processing, Digital Image Processing, Laboratory in Applied Machine Learning, Topics in Control Systems, Deep Learning, Advanced Deep Learning, Computer Vision and Pattern Recognition.

- Thesis: Modular Sliding Co-Attention Network for Early-Onset Real-time Stress Detection.

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

- First Class Honours with 75% overall (4.0 GPA). 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

Product Development Contractor and Research Engineer at BrainPatch.ai   June 2021 – Present

- 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 / 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 Intern 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.

- Identified the potential of using vestibular stimulation in a static driving simulator to emulate dynamic motion, and integrated a brain stimulation device to simulate rotational forces (roll, pitch, yaw).

- Research project still being investigated at AB Dynamics in collaboration with BrainPatch.

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 circuitry, casing, firmware, electronics to produce a commercial product.

- Shipped PhoneCaves to over 10 countries worldwide, held a promotional campaign on Kickstarter, and sought investors.

PUBLICATIONS (FORTHCOMING)

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

- As an extension to my Master's thesis, we propose an innovative architecture that leverages three strengths utilised in the decoder of the transformers for NLP tasks for real-time biosignal classification. These are the early fusion and multimodal alignment capabilities of cross-attention blocks, noise attenuation and feature importance selection through self-attention blocks and key-value (KV) caching of previous temporal slices to act as a memory state for sequence-to-sequence classification.

- The architecture required significantly smaller feature extraction windows resulting in up to 500% less compute to achieve state-of-the-art accuracies.

Sliding Co-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).

- Aims to combat the pace of development of ML software models which is much faster than accelerator design cycle, rendering many accelerators obsolete, see paper.

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 using the system environment at Imperial College London.

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 (TCP/IP, UDP), PCB Design (Altium, Eagle), CAD (Autodesk Inventor, Solidworks, NX, Fusion 360), Multiphysics Simulation (Simulink, Comsol, ModelSim).