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Aodhán Burke

PhD, MPhys

Summary

Scientist turned software engineer with a PhD in Particle Physics from the University of Manchester and experience working at CERN, Geneva. Skilled across the full stack in embedded firmware, backend and frontend development, cloud deployment, and large-scale data analysis. Currently developing IoT monitoring and optimisation tools for renewable energy systems, enabling efficient energy distribution to communities in need, including deployment to warzones and developing regions. Strong programming background in C/C++, Python, and JavaScript, combined with expertise in scalable, secure software solutions within the Microsoft Azure ecosystem. Experienced in collaborating with diverse stakeholders, mentoring junior team members, and delivering solutions that make a real social impact.

Technical Skills

Systems	Linux, Windows
Languages	C/C++, Python, JavaScript/TypeScript, Bash scripting, SQL
Frameworks	React, Flask, Nginx
Tools	FreeRTOS, Docker, pytest
DevOps	GitHub Actions, GitLab CI/CD
Cloud	Microsoft Azure: Web App Service, MySQL Database

Experience

2024–Present **Research Software Engineer**, *University of Liverpool*, Liverpool, UK

Implemented, from scratch, an interactive web portal designed to remotely monitor and optimise the performance of a fleet of portable energy storage (battery) units. These are designed as modular components of a renewable-energy mini-grid, intended for deployment in deprived areas of the world such as the warzone in Ukraine and construction sites in Sub-Saharan Africa.

The project IoT stack includes:

- firmware for microcontrollers, which interface with the battery units (and other devices e.g. GPS, radio transceiver, each using different communication protocols), written in C and utlising FreeRTOS task scheduling
- a web server backend, using the Python web app framework Flask, which manages secure, authenticated websocket connections between the server and both battery units and browser clients
- the management of telemetry data, stored in a MySQL database, through the Python toolkit SQLAlchemy
- a UI frontend built with TypeScript React
- hosting with Microsoft Azure cloud services

The portal includes digital twins and data visualisations of the unit telemetry data, as well as secured-access control sections for remote hardware management. Solved issue of lack of internet connection in deployment regions by integrating complex radio transmission network over long ranges to maintain unit connections to web server. I work in collaboration with manufacturers / charity organisations and, as such, present updates regularly to both technical and non-technical colleagues and stakeholders.

2020–2024 **Doctoral Research**, *University of Manchester*, Manchester, UK

Cutting-edge research in particle physics, performing high-precision measurements on very large data sets collected by the LHCb experiment. My work consisted of four years of high-level problem solving and in-depth data analysis, using mainly Python, machine learning and grid computing resources to manipulate the data, resulting in three journal published papers. During this time I also:

- spent a year at CERN in Geneva, Switzerland helping to monitor the LHCb detector and develop the hardware for its next upgrade.
- collaborated in another, larger team for a separate project to make early measurements with upgraded detector, where I designed a data analysis software tool for general use within the project.
- supervised the research of multiple Masters-degree students, mentoring and supporting junior developers / researchers in technical projects.
- taught the *'OOP in C++'* undergraduate course, as well as other teaching duties.

Education

2020–2024 **PhD in Particle Physics**, *University of Manchester*, Manchester, UK

2016–2020 **Masters in Physics**, *University of Manchester*, Manchester, UK

First Class Honours. Academically placed within top 10 (of ~ 250) in year group.

2014–2016 **A-Levels (high school)**, *St. Columbs College*, Derry, Northern Ireland

A* grades ($> 90\%$) in Mathematics, Physics and Chemistry.

Awards and Certifications

2022 Fundamentals of Accelerated Computing with CUDA C/C++

2016 Prize of £1,000 *Entry award from the University of Manchester phyics department for obtaining three A* grades at A-level*

2016 Monsignor Coulter Award *Highest performer in high school across Mathematics and Science subjects*

Interests

Side projects I occasionally program in my spare time for fun, for example re-creating classic video games such as snake and minesweeper in C++ with SFML. More recently, I started building a physics engine from scratch, on which I plan to make higher-level games when completed.

Football ~~Professional~~ Casual football player and avid Manchester United fan.

Bikes Buying cheap non-functioning vintage bicycles (80s Raleigh, Bianchi, etc) and restoring to like-new condition or converting to single-speed.

Music Aspiring guitarist – both acoustic & electric.

Languages

Native English

Other Good Spanish. Beginner Irish and Japanese.