James **Devine**

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Education

Lancaster University *Lancaster, England*

PH.D. COMPUTER SCIENCE *Jan. 2016 - May. 2020*

Undertook research on lowering the barrier to entry for innovation with microcontroller-based devices. Collaborated with a number of companies, including Microsoft, ARM, Farnell, and Samsung to produce the device runtime for the BBC micro:bit. Generalised this runtime to support a range of other products, enabling Microsoft MakeCode to reach millions of users. Applied this research in a number application contexts including Energy in Schools, where I implemented a wireless IoT infrastructure for educators and students to reduce energy consumption, and Project Brookdale, where I designed systems and hardware for designers to use in a tech-enhanced fashion show.

Lancaster University *Lancaster, England*

B.SC. COMPUTER SCIENCE, FIRST CLASS (HONS) *Oct. 2012 - June 2015*

In my 3 year undergraduate program, I started my own 3D printing design company, led a prizewinning group project, and spent two years developing the university's flagship smart phone application whilst achieving a grade within the 95th percentile of my cohort. For my dissertation project I created a per-appliance current sensing device, accompanying IoT infrastructure, and a cross-platform smart phone application for visualising data.

Experience

Senior Software Engineer, Microsoft *Cambridge, UK*

AZURE SPHERE *April. 2022 - Present*

Azure Sphere is an all in one IoT hardware platform that removes security from customer responsibility. I was originally recruited to handle customer support escalations and build tooling to ease the development experience for Azure Sphere. In addition to these responsibilities, I now lead a team improving the quality and security of internal test infrastructure and tooling.

- Improved the quality posture of Azure Sphere by rewriting, refactoring, and improving the test infrastructure. Languages span from C#, to scripting languages, to Rust and C.
- Manage a team of 4 engineers, responsible for the quality and success rate of internal test infrastructure.
- Acted as a technical lead for the Azure Sphere customer support team, handling escalations and developing tooling to improve the customer experience.
- Implemented and shipped Azure Sphere support for Linux, which included writing a systemd service in Rust.

Researcher, Microsoft Research *Cambridge, UK*

DEMOCRATIZING HARDWARE *June. 2020 - April. 2022*

Developing tools, systems, and experiences that make it easier to produce prototypes (one-off) and convert them to isotypes (many-off) hardware at scale. Fundamental to this research is Jacdac, a technology contributed in my PhD thesis.

- Led Project MakeAccessible, a hackathon project centred around empowering more people to build customised assistive technology. Jacdac hardware kits were given to hackers, and over 80 hackers participated across 4 continents.
- Designed and developed the micro:bit MakeCode Arcade shield.
- Designed and developed software, firmware, and hardware for over 20 Jacdac modules.

Intern, Microsoft Research *Redmond, USA*

PROJECT BROOKDALE *Feb. 2019 - May 2019*

Collaborated with Microsoft Research and the University of Calgary to develop intuitive wearable fashion technology, subsequently deployed and evaluated at a high profile fashion show in Brooklyn, New York. Fashion designers were able to realise their design vision for fashion-tech garments, by embedding microcontrollers and sensors and dynamically integrating them via Jacdac. This was documented in a Microsoft Research blog post.

- Worked with fashion designers and models to build and debug garments at a Brooklyn Fashion Show.
- Created a custom PCB for prototyping Jacdac devices.
- Developed a Jacdac typescript stack to enable the Web browser to act as a Jacdac debugger and device over WebUSB.
- Presented Jacdac and Project Brookdale at Microsoft Research TechFest 2019.

Intern, Microsoft Research *Redmond, USA*

JACDAC *Jun. 2018 - Sep. 2018*

Created a wired networking protocol for dynamically integrating embedded devices and peripherals. Jacdac is used as the interconnectivity solution for MakeCode Arcade devices.

- Defined and developed the Jacdac protocol stack from the physical layer, to the control layer, to the software driver models used by developers.
- Implemented the protocol on three different processor classes to prove viability.
- Presented the protocol to colleagues within Microsoft Research and the MakeCode team for input and feedback.

Intern, Microsoft Research   *Redmond, USA*

EMBEDDED LEARNING LIBRARY (ELL)   *Jun. 2017 - Sep. 2017*

Undertook an internship with the ELL team in Microsoft Research Redmond to create a wake-word recognition solution (like "Hey Cortana!") for resource-constrained microcontrollers.

- Investigated the theory of recurrent neural networks and their role in machine learning
- Developed an efficient C implementation of mel-frequency cepstrum cepstral coeffient calculations
- Created implementations of various neural networks in LLVM and C++: LSTM, GRU, RNN

Research Associate, Lancaster University   *Lancaster, England*

THE BBC MICRO:BIT, MAKECODE, AND CODAL   *Jun. 2015 - 2020*

I co-wrote the micro:bit runtime, a memory efficient lightweight operating system designed to support higher level languages like JavaScript. I later generalised the micro:bit runtime into CODAL, which now supports upwards of 50 devices in the MakeCode programming editor. The BBC micro:bit is a small embedded physical computing device that was given to 750,000 11–12 year old students in the UK in 2015. Designed to provide an engaging, low barrier way to learn computer science concepts, there are now over 6 million micro:bits in use worldwide.

- Helped design and develop the micro:bit runtime, a lightweight operating system that runs in less than 2 kB of RAM.
- Worked as part of a large project team that involved a number of partners, including ARM, Farnell, Samsung, the BBC, and Microsoft.
- I continue to be involved in design discussions and future directions for the micro:bit foundation, and Microsoft MakeCode. I also add new devices to the MakeCode ecosystem using CODAL

Publications

Jacdac: Service-Based Prototyping of Embedded Systems
  Thomas Ball, Peli Halleux, James Devine, Steve Hodges, Michał Moskal
  Proc. ACM Program. Lang. 8.PLDI (June 2024). Association for Computing Machinery, 2024

MakeDevice: Evolving Devices Beyond the Prototype with Jacdac
  Kobi Hartley, Joe Finney, Steve Hodges, Peli De Halleux, James Devine, Gabriele D'Amone
  Proceedings of the Seventeenth International Conference on Tangible, Embedded, and Embodied Interaction, 2023, Warsaw, Poland

Plug-and-play Physical Computing with Jacdac
  James Devine, Michal Moskal, Peli Halleux, Thomas Ball, Steve Hodges, Gabriele D'Amone, David Gakure, Joe Finney, Lorraine Underwood, Kobi Hartley, Paul Kos, Matt Oppenheim
  Proc. ACM Interact. Mob. Wearable Ubiquitous Technol. 6.3 (Sept. 2022). Association for Computing Machinery, 2022

Understanding How People with Limited Mobility Use Multi-Modal Input
  Johann Wentzel, Sasa Junuzovic, James Devine, John Porter, Martez Mott
  Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems, 2022, New Orleans, LA, USA

Rethinking the Runway: Using Avant-Garde Fashion To Design a System for Wearables
  Teddy Seyed, James Devine, Joe Finney, Michal Moskal, Peli Halleux, Steve Hodges, Thomas Ball, Asta Roseway
  Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems, 2021

The BBC micro: bit–from the UK to the World
  Jonny Austin, Howard Baker, Thomas Ball, James Devine, Joe Finney, Peli Halleux, Steve Hodges, Michał Moskal, Gareth Stockdale
  Communications of the ACM (2020). ACM, 2020

Enabling intuitive and efficient physical computing
  James Devine
  Thesis (2020). Lancaster University, 2020

MakeCode and CODAL: Intuitive and Efficient Embedded Systems Programming for Education
  James Devine, Joe Finney, Peli Halleux, Michał Moskal, Thomas Ball, Steve Hodges
  Proceedings of the 19th ACM SIGPLAN/SIGBED International Conference on Languages, Compilers, and Tools for Embedded Systems, 2018

Full publication history available on Google Scholar.

Hobbies & Interests

Maker · Electronics · Hacker · Musician · 3D printing