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Professional Profile

Hands-on R&D engineer (PhD in **ultrasonic imaging**, 1st-class BEng) who designs, builds, and validates **integrated hardware-software systems**. Deep background in **ultrasonics, acoustic wave modelling, and signal processing**, applied through the design and build of custom experimental systems, including an **automated multi-axis ultrasonic scanning system** (mechanical design, acquisition electronics, **C/C++** firmware, motion control, analysis software) and a camera-based inspection instrument with a **machine-vision** pipeline.

Technical lead on a **£100k industrial automation project** (2× productivity gain). Comfortable owning the full development lifecycle: concept, prototype construction, **experiment design and validation**, data analysis, and client-facing delivery.

Technical Skills

Prototyping & Integration: experimental rig, fixture, and test-hardware design; mechanical CAD (Fusion 360) and 3D printing; PCB design in KiCad with DFM for volume manufacture; assembly, bring-up, and hardware-software debug.

Acoustics, Imaging & Signal Processing: ultrasonic transducers and instrumentation, acoustic wave propagation modelling, DSP, imaging and inversion algorithms, machine vision (OpenCV: camera calibration, homography rectification, segmentation), validation against experiment.

Software: C++ (Visual Studio), Python, MATLAB, scripting for automation, testing, and data analysis; Git, CMake, Bash/Linux, parallel computing, LaTeX.

Robotics, Embedded & Control: motion control, ROS, sensing and actuation, C/C++ firmware on microcontrollers and FreeRTOS (ESP-IDF), real-time systems, FPGA/VHDL (Quartus Prime, ModelSim).

Experimentation & Validation: experiment design, automated data acquisition, throughput and reliability testing, data analysis and interpretation, technical reporting and documentation.

Key Achievements

- Designed and built an **automated multi-axis ultrasonic scanning system** from scratch: mechanical design, acquisition electronics, embedded firmware, motion control, and analysis software integrated into a single validated platform.
- Led technical delivery on a **£100,000 KTP project**, contributing to a redesigned industrial automation system that achieved a **2× productivity improvement**.
- Research Lead for a **£19,000 industry-funded ultrasound consultancy**, designing experiments and delivering client-facing validation results and reports.
- Designed and implemented **custom instrumentation** and software for automated data acquisition, signal processing, and system validation.
- Built **parallel-processing analysis pipelines** for large ultrasonic datasets, reducing runtime by **70%**.

Education

PhD	London South Bank University , Electronic Engineering	Sept 2022 – July 2026
	Title: Three-Dimensional Ultrasound Imaging of the Crystal Structure of Ice Cores. - Designed and executed ultrasonic experiments end to end: transducer selection and instrumentation, acquisition, signal processing, and validation against numerical models. - Built an automated multi-axis ultrasonic scanning rig integrating mechanical, electronic, firmware, and control-software subsystems. - Developed acoustic wave propagation simulation and inversion tools in MATLAB and Python, with parallel-processing workflows reducing	

analysis runtime by **70%**.

BEng London South Bank University, Electrical and Electronic Engineering (1st Class)

Sept 2017 – June 2020

- **Key Modules:** Circuit Design (97%), Digital Systems (88%), Control Engineering (87%).
- **Final Year Project:** Designed a ROS-based quadrupedal robot with embedded control, mechanical design, and terrain-adaptive motion.

Research and Engineering Experience

London South Bank University, Doctoral Researcher (SPE3D Ultrasonic Lab)

London, UK

Sept 2022 – July 2026

- Designed and built an **automated multi-axis ultrasonic scanning system**: embedded acquisition firmware on **microcontrollers**, **motion control**, and integrated mechanical, electronic, and control-software subsystems.
- Built a **camera-based optical inspection instrument**: three-axis motion control on a custom PCB, polarised LED lighting, and a Python/OpenCV **machine-vision pipeline** for camera calibration, image rectification, and grain segmentation.
- Designed and executed experiments characterising **ultrasonic wave propagation in anisotropic media**, from rig setup and data acquisition through analysis and interpretation.
- Developed automated analysis and simulation pipelines in **MATLAB and Python**, with parallel-processing workflows reducing processing time by **70%**.
- Validated experimental results against numerical models, feeding findings back into apparatus design and measurement methodology.
- Worked across hardware, software, and modelling in a multidisciplinary lab under tight project timelines.

London South Bank University, Lecturer / Teaching Assistant

London, UK

Jan 2023 – 2026

- Delivered teaching and practical support in **Python, MATLAB, instrumentation, and engineering systems**.
- Supported student projects involving software development, embedded systems, and electromechanical integration.
- Developed technical teaching resources and assessed project and laboratory work.

London South Bank University & Industrial Partner, Knowledge Transfer Partnership Associate Researcher – Embedded Systems and Engineering Development

London, UK

Jan 2021 – Jan 2022

- Served as the technical lead on a **£100,000 Knowledge Transfer Partnership** between LSBU and an industrial partner.
- Developed **FPGA/SoC motion-control functionality in VHDL** for an industrial electromechanical platform, with **HDL simulation in Quartus Prime and ModelSim**.
- Led **verification and timing/logic debug** of embedded control and **motion-coordination** behaviour, contributing to a **2× productivity increase** in the redesigned system.
- Produced engineering documentation, prototypes, and system-level design outputs supporting deployment and manufacturing.

London South Bank University & KURE, Research Lead in Ultrasound Testing

London, UK

2022 – 2023

- Served as Research Lead for a **£19,000 industry-funded consultancy project** in ultrasound testing.
- Designed and executed automated experimental workflows and technical analysis for **client-facing product development**.
- Delivered validation reports used directly by the client to support engineering and product decisions.

Relevant Projects

Automated 3D Ultrasound Scanning System

PhD

- Built an **automated multi-axis scanning machine: microcontroller firmware, motion control, and custom acquisition hardware** integrated with mechanical, electronic, and software subsystems into a validated inspection rig.
- Tools Used: C++, Python, MATLAB, microcontrollers, Fusion 360.

Machine-Vision Instrument for Crystal Orientation Measurement

PhD

- Built an automated **cross-polarised imaging instrument**: USB camera, three-axis stepper gimbal (custom **KiCad** PCB, **C++** firmware), and a **Python/OpenCV** pipeline covering camera calibration, homography rectification, and per-grain segmentation across 72-position rotation scans.
- Deployed as a co-registered optical reference to **validate ultrasonic measurements** on the same specimens.

Ultrasound Imaging and Inversion Pipeline

PhD

- Developed algorithms to estimate crystal orientations from azimuthal time-of-flight measurements.
- Built reproducible analysis workflows in **MATLAB/Python** for signal processing, optimisation, and model comparison.

Acoustic Wave Propagation Simulation Tool for Anisotropic Media

PhD

- Created a simulation framework for elastic wave propagation in anisotropic materials.
- Used modelling results to validate experimental behaviour and refine analysis methodology.

Industrial Printer Redesign: Motion Control and System Integration

Industry

- Contributed to the **motion-control and system redesign** of an industrial automation platform, doubling throughput.
- Developed and verified embedded control logic (**VHDL, SoC platforms**) and debugged system-level behaviour across electronics, firmware, and mechanics.

Quadrupedal Robotic Platform for Research on Legged Motion

BEng

- Designed and built a ROS-enabled quadruped robot integrating embedded control, sensing, and actuation.
- Tools Used: C++, ROS, Fusion 360, 3D printing.

Publications

A Finite-Difference Simulation Framework for Ultrasonic Crystal Orientation Fabric Estimation in Ice: Timing Methodology, Forward Model Selection, and the Cramér-Rao Accuracy Limit, *IEEE International Ultrasonics Symposium*

2026 (accepted)

Jerome Graves, Dr Sevan Harput, Dr Ben Lishman

Non-Destructive Ultrasonic Estimation of Ice Crystal Orientation Fabric: Multi-Frequency Experimental Validation and Failure Mode Characterisation, *IEEE International Ultrasonics Symposium*

2026 (accepted)

Jerome Graves, Dr Sevan Harput, Dr Ben Lishman

The Coding Industry: A Technological Retrospective and Forecast, white paper, [doi:10.5281/zenodo.20887829](https://doi.org/10.5281/zenodo.20887829) [🔗](#)

2026

Jerome Graves

Measuring Predominant Orientations of Ice Crystal Fabrics From Ultrasonic Measurements of Ice Cores, *Cold Regions Science and Technology*

(preprint)

Jerome Graves, Dr Ben Lishman, Dr Sevan Harput

Determining the Grain Geometry From Ultrasonic Measurements of Large-Grained Temperate Ice Cores, *IEEE International Ultrasonics Symposium*, [doi:10.1109/ius51837.2023.10307539](https://doi.org/10.1109/ius51837.2023.10307539)


2023

Jerome Graves, Dr Ben Lishman, Dr Sevan Harput

An Algorithm for Determining the Grain Geometry From Ultrasonic Measurements of Large-Grained Temperate Ice Cores, *Port and Ocean Engineering under Arctic Conditions*

2023

Jerome Graves, Dr Ben Lishman, Dr Sevan Harput