

Francisco Bernardo PhD • AFHEA • MA • MSc • ENG

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PROFILE

Research engineer and designer with 8 yrs in industry and 10+ in public R&D. Ship from prototype to production: user-centred design, DSP/ML pipelines for sensor, audio, and physics-sim data, complex UI architectures for the Web. Lead agile, greenfield, SaaS across the stack, with strong CS fundamentals, management and documentation.

EDUCATION

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| PhD Computer Science – Goldsmiths, University of London | 2020 |
| MA Management in Creative Industries – Universidade Católica Portuguesa | 2013 |
| MSc Mobile Systems – University of Minho | 2009 |
| BSc Computer Science and Systems Engineering (5-year degree–300 ECTS) – University of Minho | 2006 |

INDUSTRY EXPERIENCE

Frontend Software Engineer – Cegid Primavera, Portugal Jan 2011 – April 2013

- Developed a modular software architecture and components for business analytics dashboards for OLAP and data warehousing in the Primavera Elevation SaaS (**Silverlight, C#.NET, SQL Server, Analysis Services, WCF**).
- Designed and developed the UI architecture, UX and content for Business Intelligence dashboards.
- Designed, developed and managed the project for a mobile iOS app for ERP global sales indicators (**Objective-C**).

Senior Software Engineer and Project Manager – Ubisign, Digital Signage, Portugal May 2007 – Jan 2011

- Advocated and accelerated the transition of a desktop software product to a cloud-based software-as-a-service, contributing to the company's acquisition by a larger market player.
- Led architecture and development of progressive Web applications for network and channel management, and content orchestration for a digital signage SaaS (**Silverlight, XAML, Prism, C#.NET, WCF, SQLServer**).
- Developed a high-performance desktop multimedia system and video plugins (**C#.NET, WPF and DirectShow**).
- Created new products including a gesture-based interactive catalogue for multimedia kiosks with audience analytics for intelligent content segmentation (**WPF, C#.NET, Kinect, Intel AIM, C++, DirectShow, OpenCV**).
- Instituted best practices for architecture and engineering of complex Web user interfaces.

RESEARCH EXPERIENCE

Research Associate in Digital Musical Instrument Design – Imperial College London, UK Sept 2024–current

- Applied research on virtual analog modelling of circuits with Wave Digital Filters (**Python, C++, Rust**).
- Led design, engineering, and experimental evaluation of hybrid analog-digital audio circuits with ultra-low latency embedded systems (**STM32H750, Altera DE-10 FPGA, Quartus Prime, System Verilog, Analog–Digital conversion**).

Research Fellow in Computational Design – University College London, UK Sept 2021 – Sept 2024

- Led prototyping and evaluation projects with industry partners (Meta Reality Labs, Sony R&D, Ultraleap).
- Prototyped ultrasonic phased arrays, acoustic waveguides and metamaterials for wearable mid-air haptics (**CAD, COMSOL Acoustics simulation, acoustic field measurement, Python, electronics, embedded C++, Verilog**).
- Authored a computational framework for AI-driven optimisation with geometric modelling, finite elements method, and wave scattering simulation for metamaterials (**Python, Fortran90, SALOME, ElmerFEM, HPC**).
- Generated synthetic datasets and applied deep learning for generative design and optimisation of acoustic metamaterials (**Python, scikit-learn, Pytorch**).
- Supervised a PhD student in Computer Science (CS) and two MSc students in Data Science and Machine Learning.
- Delivered seminars in Algorithms and Data Structures to CS undergraduates (**Python**).

Postdoctoral Fellow in Music Technology (AH/R005154/1) – University of Sussex, UK Jan 2019 – Aug 2021

- Led system design, full-stack engineering, systems administration, and documentation for <https://sema.codes>, a Web-based integrated development environment for audio and machine learning (C++, Emscripten, WebAssembly, Javascript, CSS, HTML, Web Audio API, Svelte, NodeJS, Tensorflow.js, Nginx, AWS).
- Co-authored a new method and middleware for client-side browser compilation of domain-specific languages for audio signal processing and machine learning (won a Best Paper award, published in Audio Engineering Society).
- Conducted user research with mixed methods to refine user experience, workflows, documentation, instructional content and video tutorials (ethnography, usability evaluation, 5 workshops, 3 large scale surveys).
- Led community-building actions (2 summer schools, 2 performances, 4 public speaking events).
- Coordinated design work, mentored two interns, contributed to open-source software (<https://mimicproject.com>, Maximilian C++ DSP library).

Doctoral Researcher – Computing, Goldsmiths, University of London, UK Feb 2015 – August 2021

- Doctoral thesis examined the design and the developer experience of machine learning APIs and tooling.
- Identified client research needs and strategic research goals for a technology transfer and innovation consortium with 3 leading-edge European research centres and 5 music technology start-ups (EU Horizon 2020).
- Co-designed/developed a software developer-friendly machine learning toolkit for multimodal experiences with sensor data (<https://rapidmixapi.com>) (C++, Emscripten, Javascript, HTML, CSS, React).
- Structured a developer-centric design research system for the consortium, carried out research with stakeholders and end users (co-design workshops, large-scale hackathons, surveys, interviews, ethnography, prototyping, cognitive walkthroughs, discount usability, mixed methods data analysis), contributed to the final official EU evaluation rating of “Excellent”.
- Led research interventions and data collection with project stakeholders, machine learning researchers and creative developers (2 co-design workshops, 3 hackathons, 40+ interviews, ethnography, prototyping, cognitive walkthroughs, usability evaluation, mixed methods analysis) which informed the development of 6 new products.
- Produced 3 prototypes and middleware for data visualisation, machine learning, and mobile AR for Google ATAP Soli, the millimetre-wave radar-on-a-chip sensor (featured at Google I/O 2016, published research paper).

TECHNICAL SKILLS

- **Software Engineering and Architecture:** desktop, web, mobile, embedded, and augmented reality applications.
- **Programming Languages:** C#, C/C++, Python, Rust, Obj-C, Java, Javascript, HTML, CSS, Haskell, SQL, Fortran, Verilog.
- **Mobile Development:** iOS, WP7, Windows Mobile 6.5, J2ME, Bluetooth protocol development.
- **Software Design Methodologies:** Agile, eXtreme Programming, SCRUM, design patterns and TDD.
- **Hardware, signals and systems:** Analog and digital electronic circuit design, embedded systems, signal processing
- **Machine Learning:** Foundational algorithms, Tensorflow.js, Pytorch.
- **Modelling and Simulation:** COMSOL Multiphysics, Salome, Elmer FEM, FreeCAD, Wave Digital Filters
- **Front-end Frameworks:** Svelte, React, WPF, DirectShow, Prism, Tensorflow.js, Fiddler, GraphEdit, SourceSafe, Openframeworks, OpenCV.
- **Backend:** Node.js, Webpack, Rollup, MySQL, MongoDB, MS SQL Server, MS Analysis Server, Apache Web Server, Nginx, Express, AWS, RIA Services, WCF, ADO.NET.
- **Development Environments:** VSCode, Visual Studio, XCode, Unity3D, Quartus, PureData, Git, CI/CD, Github Actions, Travis, NUnit, FxCop, CruiseControl, Team Foundation Server.
- **Prototyping:** storyboards, sitemaps, user journeys, wireframes, mockups, 3D modelling and printing Free, KiCAD.
- **Other:** NVivo, RStudio, LaTex, Mendeley, MS Office Suite, Project and Visio, Adobe Premier, After Effects.

AWARDS AND HONOURS (selected)

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| 3x European Commission Seal of Excellence on H2020 Marie Skłodowska-Curie grant proposals | 2021-2024 |
| Best Paper award at Web Audio Conference, Trondheim, Norway. | 2019 |
| Prototypes for Google ATAP Soli Alpha Developer featured at the Google I/O 2016. | 2016 |
| Best Paper award at Vienna Music Business Research Days, Vienna, Austria. | 2013 |

ADDITIONAL INFO

Languages: Portuguese (native), English (proficient), Spanish (intermediate), French (basic).

Canadian, Portuguese, and British (triple) citizenship. Multi-instrumentalist (guitar 20+ years, piano 6 years)