JUAN PEDRO BOLÍVAR PUENTE

CTO · Consultant · Software Engineer

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Berlin-based software engineer working on music and interactive systems, architecture, programming languages and libre software — and on building systems and organisations that work for human beings. CTO at BRONZE, independent consultant to teams in music technology, robotics, industrial software, AI and large-scale infrastructure. Author of the C++ libraries Immer, Lager and Zug; regular speaker at international C++ and functional programming conferences.

Experience

Chief Technology Officer

BRONZE

2020 – present · Remote

- Built and led the engineering and product team (10+), setting the development process and owning architectural decisions. Joined as a consultant in 2020, CTO since 2022.
- Architected and built the next generation of the composition and arrangement software, enabling non-linear, generative and augmented music.
- Productised the stack: a complete rewrite of the inherited prototypes to meet performance, scalability and productivity standards.
- Defined a modular architecture letting third parties embed the BRONZE Engine via HTTP services, Emscripten, Swift and C++.
- Shipped streaming infrastructure scaling to tens of thousands of concurrent listeners of non-linear music.

Founder & Software Engineering Consultant

Sinusoidal Engineering

2017 – present · Remote

- Consulting practice on interactive systems, framework design, performance and modern C++, much of it helping companies adopt *value-oriented design* with Immer and Lager.
- Engagements combine hands-on architecture and implementation with mentoring of in-house teams.
- **Clients:** Darkmatter, Meta, Google, Steinberg, Ableton, Ipolog, BRONZE, Magnopus, Dusty Robotics, Plum, Kapela, Audulus, Prenav, OMICRON Energy, SoundX, WAVY, zenAud.io.

Interim CTO & Development Lead

Kapela — via Sinusoidal Engineering

2018 – 2019 · Remote

- Set up and led the development team, defined the technical product strategy and owned the architecture for a system for connected live electronic performances. C++, Rust, QML, Clojure and Nix.

Software Engineer

Ableton

2011 – 2016 · Berlin, Germany

- Worked on *Push*, a hardware music instrument, *Live*, a leading DAW with millions of users, and research teams imagining future products.
- Member of the architecture team reviewing the evolution of the architecture across 30+ developers over multiple teams.
- Designed new systems and rearchitected legacy ones; collaborated with designers and UX experts on user-facing features; mentored developers in modern C++, Python and QML; prototyped in ClojureScript and Haskell.
- Bootstrapped the *Open Source Guild*, aligning legal, business and engineering to liberate internal components.
- Represented Ableton at tech conferences, music hackathons and interviews.

Open Source

Author and maintainer of three widely used C++ libraries.

Immer

2016 – present · `sinusoid.es/immer`

Postmodern immutable and persistent data structures for C++. RRB-trees with improvements of its own. 2.9k stars; ICFP'17; in production at Meta, Google, Amazon, etc.

Lager

2017 – present · `sinusoid.es/lager`

Value-oriented design for C++ with unidirectional data-flow — "Redux for C++".

Zug

2019 – present · `sinusoid.es/zug`

Transducers for C++: composable transformations over pull- and push-based sequences.

Past maintainer of **GNU Psychosynth** and **GNU Jump**, contributor to **GNU PDF** and **Mixxx**; author of **Ewig** and **Schmutz**; **Atria** and **Aqt.Cassowary** at Ableton. Co-founder of *Hacklab Colina Roja*, Granada.

Expertise

Software Architecture · Immutability · Value-Oriented Design · Real-time · Audio · Interactivity · Graphics · UI · Performance · Functional Programming · Technical Leadership · Mentoring · Libre Software

Languages & Tools

C++ · Python · Rust · Clojure · Scheme · Haskell · TypeScript · QML · Nix · Kubernetes · C · Qt · OpenGL · WebGL · USD · WebAssembly · CMake · Git · NixOS · Emacs

Selected Consulting Engagements

2026 **Darkmatter** — Tech lead on Nixmac, an agent that configures macOS declaratively with Nix and Git, over a custom harness spanning several LLM backends. Wrote crypto trading and analysis tools in Rust, deployed on Kubernetes with ArgoCD

2026 **WAVY** — Built their streaming infrastructure on the BRONZE Engine, scaling to thousands of concurrent multi-channel streams

2025 **Plum** — Cleaned up the robotics architecture behind their construction-site automation, and its USD-based control and monitoring tools. Built a C++ behaviour-tree library that integrates with Lager

2024 **Dusty Robotics** — Rewrote the viewer for the building plans their robots print onto construction-site floors in Rust and WebGL, orders of magnitude faster, and mentored the team in software design and graphics programming

2023 **Meta — Shard Manager** — Added transients to Immer's HAMTs; across millions of machines, average latency fell by an order of magnitude and memory usage halved

2021 **Steinberg — Cubasis** — Oversaw the rewrite of the whole data model value-oriented, decoupling the UI and data model threads

2021 **Magnopus** — Designed the real-time data-flow architecture behind robotic film recording, with a USD visualiser, UDP multicast and an EtherCAT engine

2020 **Prenav** — Rearchitected their structural inspection software on unidirectional data-flow with Lager, mentored the team and built new core features

2019 **OMICRON Energy** — Brought their C++ team up to date, with application-wide refactors, a new data model and user profiles for the MPD-800 measurement software

2017 **Ableton — Live** — Ported Live's core to embedded Linux and tuned it on the board, the groundwork for the standalone Push 3

Also Audulus, Google, Ipolog, SoundX and zenAud.io. Full portfolio: `sinusoid.es/do`

Publications

Persistence for the Masses: RRB-Vectors in a Systems Language. Proc. ACM Program. Lang. 1, ICFP, Article 16 (2017). `doi.org/10.1145/3110260`

GNU Psychosynth: A Framework for Modular, Interactive and Collaborative Sound Synthesis and Live Music Performance. Master's thesis, University of Granada (2009), passed with Honours. `psychosynth.gnu.sinusoid.es/misc/pfc.pdf`

Speaking

Regular speaker at **CppCon**, **Meeting C++**, **C++ on Sea**, **C++ Russia**, **C++Now**, **std::cpp**, **ICFP** and **EmBO++**. Each title below links to its portfolio entry, with slides and video.

2025–26 **Persistence²** — CppCon, Meeting C++

2019–26 **Squaring the Circle** — C++ Russia, C++ on Sea, std::cpp

2018–19 **The Most Valuable Values** — CppCon, Meeting C++

2016–19 **Postmodern Immutable Data Structures** — CppCon, ICFP, C++Now

2015–19 **Transducers: from Clojure to C++** — CppCon, EmBO++, CppCast

Teaching & Research

Teacher — Advanced Python

Instituto de Astrofísica de Andalucía

2011 · Granada, Spain

A 25-hour course for the institute's researchers and developers: object-oriented and functional programming, metaprogramming, C interfacing, test automation, GTK and Django. Materials at `sinusoid.es/python-avanzado`.

Research & Teaching Intern

Dept. of Computer Science and AI, University of Granada

2009 – 2011 · Granada, Spain

Teaching Innovation Project with the Computer Vision Group; assisted in "Methodology of Computer Programming". Lead developer of Moodle modules with interactive algorithm visualisations, released as libre software and presented at FINDTI'09.

Education

Ingeniero Informático

University of Granada

2006 – 2011 · Granada, Spain

Five-year Master's-level degree, 300 ECTS. Thesis passed with Honours. Erasmus exchange at Åbo Akademi, Finland (2009–10).

Certifications

2026 **Massage Practitioner** — Medios Seminare, Berlin — sports massage and myofascial trigger point therapy

2017 **telc Deutsch B2** — German, CEFR level B2

2006 **Ciclo superior de Inglés** — Escuela Oficial de Idiomas, Huelva

2005 **Advanced GNU/Linux Administration** — University of Huelva — with Honours

2004 **Certificate in Advanced English** — University of Cambridge

Spoken Languages

Spanish
English
German



Native · Fluent, working language 15+ years · telc Deutsch B2. Basic French and Swedish.

Awards

2008 **Honour distinction** — School of Software Engineering, Univ. Granada

2008 **First prize** — Spanish Libre Software Contest (Psychosynth)

2006 **Gold medal** — Iberoamerican Contest in Informatics

2006 **First place** — Spanish Olympiad in Informatics

2006 **Bronze medal** — Spanish Olympiad in Mathematics

Interests

Massage practitioner — see *Certifications*.

DJ and electronic musician, as *INTERNET.MP3* (`@internet_mp3`) and earlier *Arximboldi* (`@magnicida`).

Amateur **powerlifter** and **painter**.