

Juan Cruz-Benito, PhD

Quantum + AI Research & Engineering Leader

Spain – open to remote | juanCB.es (contact form)

linkedin.com/in/juanCB | github.com/cbjuan | huggingface.co/cbjuan | Google Scholar | ORCID

Summary

Research and engineering leader who turns AI research into production tools for quantum computing. Manages the Quantum+AI team at IBM Research (10 reports: 7 direct across 3 countries plus 3 in-country) that improves **IBM Granite** LLMs for the quantum domain, with 8+ years at IBM Quantum and 13+ years in software engineering and research. Led the teams behind **qiskit-ibm-transpiler** (981K+ downloads, #3 in the Unitary Foundation 2025 survey) and the open-source **Qiskit Code Assistant** LLMs (8B–24B, 30K+ downloads). **IBM Master Inventor**, **IEEE Senior Member**, 80+ publications (7,100+ citations, h-index 42) and 12 patent filings, including a granted US patent. PhD in Computer Engineering (Cum Laude, International).

Core strengths: LLMs for code & science · Reinforcement learning · Quantum circuit synthesis & transpilation · AI agents & MCP · Benchmarks & evaluation · Team building & people management · Product strategy · Open source · IP strategy

Experience

IBM Research / IBM Quantum

Spain (Remote) | Jan 2018 – Present

Quantum+AI Manager, IBM Research

Jan 2026 – Present

- Lead the team responsible for improving **IBM Granite** LLMs in the quantum domain, extending our Qiskit Code Assistant work into IBM's flagship open model family.
- Manage **10 people**: 7 direct reports across 3 countries plus 3 in-country (non-functional) reports; certified as Senior Software Engineering Manager (Jan 2026).
- Created **Qiskit QuantumKatas**, a 350-task benchmark for LLM-generated quantum code; evaluated 16 models across 7 prompting setups (39,200 runs).
- Led an LLM-guided evolutionary search for quantum error-correcting codes: screened ~200K candidates and discovered **465 distinct bivariate-bicycle codes** (arXiv, 2026; invited keynote, IEEE Quantum Week 2026).

AI for Quantum Product Owner & Software Engineering Manager, IBM Quantum

May 2023 – Jan 2026

- Built the AI for Quantum engineering team from the ground up and led projects with **up to 15 individual contributors across 4 countries**, while staying hands-on as an individual contributor.
- Owned product strategy for **qiskit-ibm-transpiler** and its AI transpiler passes: **981K+ downloads**, ranked #3 in the Unitary Foundation 2025 survey; 20% average (up to 60%) two-qubit gate reduction on Benchpress.
- Shipped **Qiskit Code Assistant**, a family of open-source LLMs (8B–24B) for quantum code with **30K+ downloads** on Hugging Face, plus the Qiskit HumanEval benchmarks; released local GGUF/Ollama versions for VS Code and JupyterLab.
- Supervised post-training with quantum-verifiable rewards (checked by execution on quantum hardware) to improve generated Qiskit code.
- Released **Qiskit Gym** (RL environments for circuit synthesis) and **Qiskit MCP servers** that connect AI assistants and agents to IBM Quantum services.
- Co-invented further patent applications on intelligent unitary synthesis and automated quantum problem solving; named **IBM Master Inventor** (2024).

Data & Intelligence Chapter Lead, IBM Quantum

May 2023 – Jun 2024

- Led data and machine-learning projects across IBM Quantum platform teams, including ML models that **predict QPU processing time** for user jobs (IEEE QCE 2025).
- Kickstarted the **AI transpiler** effort, which grew into qiskit-ibm-transpiler; co-invented patent applications on RL-based circuit synthesis and transpilation, attention-based neural networks for quantum simulation, quantum source-code generation, and static analysis of quantum programs.

Research Developer (2021–23) & Senior Software Engineer, contractor (2018–20)

Jan 2018 – May 2023

- Designed and implemented the **fair-share queue** that schedules **every job run on every IBM Quantum QPU**, still in production today.
- Led development of **IBM Quantum Lab**, a JupyterHub-on-Kubernetes notebook platform open to ~**240K enrolled users**, with peaks of ~800 concurrent user servers (presented at JupyterCon 2020).
- Led development and deployment of IBM Quantum's **first deep-learning platform**, which screened users against export regulations; resulted in **US Patent 12,244,596** (granted 2025).

University of Salamanca – GRIAL Research Group

Salamanca, Spain

Software Engineer & Researcher; Teaching Assistant, Human-Computer Interaction

Sep 2013 – Dec 2017

- Researched data-driven human-computer interaction and applied machine learning; built research software and taught HCI. Best Conference Paper Award, TEEM 2017.

Selected Publications & Patents

80+ publications, 7,100+ citations, h-index 42 (Google Scholar, Sep 2026), and 12 patent filings (1 granted) – full list on [Google Scholar](#).
Last-author entries: work I led as team lead / senior author.

- **Cruz-Benito, J.**, Cross, A. W., Kremer, D., Faro, I. *Evolutionary Discovery of Bivariate Bicycle Codes with LLM-Guided Search*. arXiv:2606.02418, 2026.
- Vishwakarma, S., et al., **Cruz-Benito, J.** *Qiskit HumanEval: An Evaluation Benchmark for Quantum Code Generative Models*. IEEE QCE, 2024.
- Dupuis, N., et al., **Cruz-Benito, J.** *Qiskit Code Assistant: Training LLMs for Generating Quantum Computing Code*. IEEE LLM Aided Design Workshop (LAD), 2024.
- Dupuis, N., Tiwari, A., Mroueh, Y., Kremer, D., Faro, I., **Cruz-Benito, J.** *Quantum Verifiable Rewards for Post-Training Qiskit Code Assistant*. arXiv:2508.20907, 2025.
- Kremer, D., Villar, V., Paik, H., Duran, I., Faro, I., **Cruz-Benito, J.** *Practical and Efficient Quantum Circuit Synthesis and Transpiling with Reinforcement Learning*. arXiv:2405.13196, 2024.
- Peral-García, D., **Cruz-Benito, J.**, García-Peñalvo, F. J. *Systematic Literature Review: Quantum Machine Learning and its Applications*. Computer Science Review, 2024. (470+ citations)
- **Cruz-Benito, J.**, Vishwakarma, S., Martin-Fernandez, F., Faro, I. *Automated Source Code Generation and Auto-Completion Using Deep Learning: Comparing and Discussing Current Language Model-Related Approaches*. AI, 2021.
- Aleksandrowicz, G., et al. (incl. **Cruz-Benito, J.**) *Qiskit: An Open-source Framework for Quantum Computing*. Zenodo, 2019. (2,250+ citations)
- **Cruz-Benito, J.**, et al. *Natural Language Processing for Restricting User Access to Systems*. US Patent 12,244,596 B2, granted 2025.
- Patent applications (US, 2024–2026): RL-based transpilation of quantum circuits; intelligent unitary synthesis; quantum code generation from a modeling system; static characterization of quantum programs.

Honors & Awards

IEEE Senior Member	2025
IBM Master Inventor	2024 – 2027
SCIE–BBVA Foundation Research Award – top 6 young researchers in Computer Science, Spain	2019
Qiskit Advocate, Qiskit Community	2019
Best Conference Paper Award, ISELEAR’17 / TEEM 2017	2017

Selected Talks

Invited keynote: Quantum Error Correction Meets AI for Science: Lessons from LLM-Guided Code Discovery – AI4QC Workshop, IEEE Quantum Week, Toronto	2026
Full-day tutorial: AI Methods for Quantum Circuit Optimization (co-presenter) – IEEE Quantum Week, Albuquerque	2025
Bring useful quantum computing to the world – Metafuturo Bizkaia Quantum, Bilbao	2025
AI for Qiskit: hackathon starter pack – BasQ Qiskit Fall Fest, Bilbao	2025
IBM Quantum Experience Notebooks: serving JupyterHub at scale for the quantum community – JupyterCon	2020

Education

PhD in Computer Engineering – University of Salamanca	2018
	Cum Laude, International Doctorate
MEng in Intelligent Systems – University of Salamanca	2013
BSc in Computer Engineering – University of Salamanca	2012

Skills & Languages

AI / ML:	LLM training & post-training, evaluation & benchmarks, reinforcement learning, AI agents, Model Context Protocol (MCP)
Quantum:	Qiskit, circuit synthesis & transpilation, quantum error-correcting codes, IBM Quantum platform
Engineering:	Python, open-source libraries, JupyterHub, Kubernetes, Hugging Face, Ollama / GGUF, VS Code & JupyterLab extensions
Leadership:	Hiring and growing teams, product ownership, research-to-product transfer, patent portfolio
Languages:	Spanish (native), English (professional)