Leonardo Bove

Graduate Research Fellow in
Quantum & Electronic Engineering

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EDUCATION

M.Sc. in Electronic Engineering   Pisa, Italy
University of Pisa   Sep. 2023 – Oct. 2025

- Specialization: Embedded Systems & Mechatronics
- Thesis title: "*Superconducting qubit readout and control system based on FPGA and development of a pulse sequencer*"
- Thesis advisors: Professor Massimo Macucci, Professor Stefano Di Pascoli, Dr. David Van Zanten
- Relevant attended courses: *Wireless Integrated Circuits, Telecommunications, Digital System Design* (FPGA), *Embedded Systems* (analysis and design of the low-level computer architecture for embedded applications)
- Degree grade: 110/110 *summa cum laude* (highest distinction)
- Overall GPA: 4.0/4.0

B.Sc. in Electronic Engineering   Pisa, Italy
University of Pisa   Sep. 2020 – Jul. 2023

- Thesis title: "*Dispersive readout of the Transmon qubit*"
- Thesis advisor: Professor Massimo Macucci
- Relevant attended courses: *Programming Languages and Computer Architecture* (C/C++, Object-oriented programming, fundamentals of data structures and computational complexity), *Programmable Electronic Systems* (C and Assembly for microcontrollers), *Computer Systems* (UNIX operating system, kernel and shell usage, C for UNIX, computer networks and fundamentals of computer security), *Random Signals, Solid State Electronics*
- Degree grade: 110/110 *summa cum laude* (highest distinction)
- Overall GPA: 4.0/4.0

RESEARCH EXPERIENCE

Graduate Research Fellow in Quantum & Electronic Engineering   Pisa, Italy
Department of Information Engineering, University of Pisa   Sep. 2025 – Present

Recipient of a 3-month research fellowship titled "*Measurement of relaxation and decoherence times in superconducting qubits*".

- Characterization of multiple qubits using frequency multiplexing strategies. Performed the first qubit measurements ever conducted within the engineering department.
- Management of the laboratory's dilution refrigerator infrastructure.
- Microwave path engineering: component sizing and selection, and system characterization using RF instrumentation (VNA, spectrum analyzer). Maximizing the available SNR in the readout chain without relying on quantum-limited amplifiers.
- Developed FPGA-based qubit control and readout using the *QICK* platform, adapting it to our experimental setup. Achieved comparable performance to off-the-shelf commercial qubit controllers while significantly reducing hardware costs.
- Established a remote-access infrastructure for qubit experiments (*JupyterLab server*).
- Trained and supervised master's students in laboratory research, with a focus on qubit calibration procedures.

Master Thesis Project   Batavia, IL, USA
SQMS, Fermilab   May 2025 – Jul. 2025

- Designed and analyzed *QPCB*, a custom pulse frequency conversion board, using microwave EM simulations (*ADS Keysight*).
- Engineered *Qubase*, a high-level Python pulse sequencer for the *QICK* FPGA platform, leveraging *rustworkx* for sequence graph analysis.
- Applied Qubase to characterize 2D and 3D superconducting qubits and support advanced quantum experiments (e.g. parallel fast-decay detection sequence).
- Automated calibration workflows for high-throughput measurements.

PROFESSIONAL EXPERIENCE

Chief Technology Officer   Pisa, Italy
E-Team Squadra Corse, FSAE team   Sep. 2023 – Sep. 2024

- Directed the development of the University of Pisa's EV race car (*Electronics & Software Divisions*) for the 2023–2024 season.
- Achieved a significant performance improvement at Formula Student Germany 2024, finishing 11 positions higher in the overall ranking compared to the previous year, and ranking as the only Italian team to successfully complete the endurance event.
- Approved and validated engineering projects.
- Oversaw high-voltage battery systems.
- Administered and maintained the team's GitLab server. Coordinated CI pipelines. Reviewed pull requests and issue workflows.
- Fostered team cohesion through structured team-building initiatives.
- Organized personnel logistics and supervised technical activities.

Embedded Software Developer   Navacchio (PI), Italy
Sintonica s.r.l.   May 2023 – Sep. 2023

- Developed firmware drivers for TFT LCD displays on a custom embedded OS using Infineon PSoC ARM microcontrollers.
- Contributed to the layout and enhancement of the company's development kit PCB, integrating Cypress and nRF PSoC platforms.

PCB Designer and Embedded System Developer   Pisa, Italy
E-Team Squadra Corse, FSAE team   Sep. 2022 – Sep. 2023

- Led development of embedded software for onboard PCB systems.
- Implemented components of the Vehicle Control Unit using the FreeRTOS real-time OS.
- Engineered a multi-architecture bootloader (ARM/AVR) with CAN bus support, enabling rapid firmware updates for inaccessible microcontrollers in time-critical scenarios.
- Conducted unit and integration testing of firmware modules. Co-developed a virtualization framework enabling *Model-in-the-loop* and *Software-in-the-loop* testing of firmware prior to deployment on physical hardware.

SKILLS

Software Development Tools & OS
Git, Linux, Windows

Programming Languages
C/C++, Python, Verilog, VHDL, MATLAB, Bash, Assembly

Quantum Computing
Superconducting qubit characterization, Qiskit, QuTiP

FPGA Design
Vivado, Quartus, ModelSim

Embedded Systems
STM32CubeIDE, PSoC Creator, Simulink Model-Based Design

Analog Design
SPICE, ADS, KiCad, Altium

MEMS Design & Simulation
COMSOL Multiphysics

Microcontroller Architectures
AVR, ARM

PCB Design
KiCad, Altium

Lab & Fabrication
VNA, soldering, prototyping, Autodesk Fusion 360, 3D printing

LANGUAGES

Italian	Native speaker
English	C2 level (Cambridge *Certificate in Advanced English*, 2020)
German	B2 level (Linguistic Center *CLI* University of Pisa, 2022)
French	A2 level

INVITED TALKS & PRESENTATIONS

"Superconducting qubit readout and control system based on FPGA and development of a pulse sequencer", Quantum Device Lab, Department of Physics, ETH Zürich, Zürich, Switzerland, July 23, 2025.

GRAD COURSE PROJECTS

SpaceFibre PLL   Pisa, Italy
University of Pisa, *Wireless Integrated Circuits*, Professor Daniele Rossi   Sep. 2022 – Sep. 2023

- Modeled and simulated a SpaceFibre-compatible 6.25GHz PLL, using the SG25H4 0.25 μm SiGe BiCMOS technology.
- Evaluated system stability and performance metrics.

Handwritten Digit Recognition   Pisa, Italy
University of Pisa, *Digital System Design*, Professor Roberto Saletti   Jan. 2025 – Feb. 2025

- Engineered a neural-network–based handwritten digit recognizer on the Altera DE10-Lite (MAX10 FPGA).
- Built a Python digital twin for training and quantization.
- Implemented custom Verilog drivers for touchscreen control and LT24 visualization.

Dual Axis Accelerometer Pisa, Italy

University of Pisa, *Sensor and Microsystem Design*, Professor Massimo Piotto   Dec. 2024 – Jan. 2025

- Simulated a dual-axis MEMS accelerometer with T-shaped beams using COMSOL.
- Analyzed device performance and application range, benchmarking against lumped-element models.

Rubik's Cube Automatic Solver Pisa, Italy

University of Pisa, *Mechatronic Systems Design*, Professor Roberto Di Rienzo   Nov. 2024 – Dec. 2024

- Designed a servo-actuated Rubik's Cube solver robot controlled by an S32K144EVB.
- Developed the system using Simulink Model-Based Design.
- Built a digital twin of the complete robotic system.

Honors & Awards

Industry 5.0 Excellence Learning Path 2025

FoReLab project, University of Pisa

Specialized training program designed to develop advanced skills in next-generation industrial technologies by integrating research, innovation, and hands-on projects aligned with the principles of Industry 5.0.

Industry 4.0 Learning Path 2025

University of Pisa

Training program that provides practical and theoretical skills in digital manufacturing, smart automation, and modern industrial technologies aligned with the principles of Industry 4.0.

Extracurricular activities

Private Tutoring Pisa, Italy

2023 – 2025

- Conducted weekly one-to-one tutoring sessions for more than 5 high school students.
- Provided support across multiple subjects, including Computer Science (e.g., graph theory, computer networks, Java), Electronics (digital and analog circuits), Physics, and Mathematics.
- Achieved an average 30% improvement in students' grades.

Violin Montepulciano, Italy

"Hans Werner Henze" Institute of Music 2009 – 2021

- Individual lessons and orchestral performances with the *Poliziana Orchestra* at the annual *Cantiere Internazionale d'Arte di Montepulciano*, in addition to periodic symphonic music concerts.
- Recipient of three merit-based scholarships awarded by the *Cantiere Internazionale d'Arte di Montepulciano* foundation.