LUCA URBINATI

PhD, Electronic Engineer

Rimini, Italy
February 13th, 1995

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LinkedIn
Personal website
Driving licence: B
Italian: Native
English: B2 IELTS 2017

Personal Interests

Travel, photography, cycling, sailing, digital marketing, sci-fi movies, board games

Education

POLITECNICO DI TORINO
PhD in Hardware Accelerators for Quantized Deep Neural Networks · summa cum laude · 2020-2024

POLITECNICO DI TORINO
Electronic Engineering (Electronic Systems) · 110/110 · 2017-2019

LINKÖPING UNIVERSITET
European Union Programme ERASMUS+ · 2016-2017 (5 months)

UNIVERSITY OF BOLOGNA (CESENA HEADQUARTER)
Electronic Engineering for Energy and Information · 109/110 · 2014-2017

Last update: 12/01/2025

Work Experience

JUN 2024 - NOW

RESEARCHER AT NATIONAL RESEARCH COUNCIL OF ITALY (CNR-IEIIT), BOLOGNA

- **Integrate AI algorithms in Reconfigurable Intelligent Surfaces (RIS) for smart radio environments (PNRR RESTART project)**

MAY 2024 - MAY 2020

PHD AT POLITECNICO DI TORINO

- **Digital hardware design of accelerators for quantized neural network layers (2D/DW-Conv, FC) using precision-scalable multipliers**

Skills: High-Level synthesis (Catapult HLS, C language), Design and simulation of RTL and gate-level digital circuits (VHDL, QuestaSim), Logic synthesis (Design Compiler), Scripting (Python, Bash, TLC), Versioning (GitHub), Linux environment, Time management.

- **End-to-end Machine-Learning projects**

Skills: Data collection, Data pre-processing (Scikit-Learn), Model training (TensorFlow, Keras), Hyper-parameters tuning (Bayesian Optimization), Quantization (QKeras), Pruning, Inference on microcontrollers or FPGAs (TFLite, TFLiteMicro, Vivado, hls4ml).

- **Author and co-author of 10+ scientific papers**

Skills: Scientific paper writing (LaTex, Draw.io, Gnuplot), Analytical skills, Critical thinking, Team working.

- **Speaker at 7 national/international conferences, including PRIME, ISCAS, TinyML EMEA, and NorCAS**

Skills: Slide and poster creation (Power Point, Prezi), Public speaking, Networking.

- **Reviewer of 5+ scientific papers**

Skills: Critical thinking, Attention to details, Objectivity, Communication skills.

- **Co-supervisor of 7+ Master's thesis students**

Skills: Linux administration (e.g. accounts, lxc containers) and software installation (e.g. pip, conda), Project management (define students' activities and deadlines).

- **Lab assistant for the Microelectronics Course held by Prof. Casu, for Academic Years 2022/2023, 2021/2022**

Skills: Simulations and layout of simple digital circuits, DRC and LVS (Cadence Virtuoso).

JUL 2022 - APR 2020

PROJECT-BASED EXPERIENCE AS FREELANCER

- **Custom programmable charger/discharger device for lead-acid batteries**

Skills: Customer requirements translation, Customer management, Project and time management, Chargers/dischargers KPIs analysis, Research of state-of-the-art solutions, Analog Devices' ADALM1000 dev board programming, Python, GUI development, Virtual machine, Technical report, User documentation.

Other Soft Skills

- Autonomy & Teamwork
- Multicultural mindset
- Collaborative demeanor
- Open-mindedness & Curiosity
- Complex problem-solving
- Attention to details
- Fast and continuous learning
- Public speaking & Communication

Awards

BEST STUDENT PAPER AWARD AT 2023 INT. CONF. ON AGRIFOOD ELECTRONICS (CAFE)

As co-author of the work: "Enhanced Machine-Learning Flow for Microwave-Sensing Systems to Detect Contaminants in Food" · Certificate · Sep 2023.

GOLD LEAF AWARD AT 2023 INT. CONF. ON PHD RESEARCH IN MICROELECTRONICS AND ELECTRONICS (PRIME)

For ranking among the top 10% of the best papers with my work: "Design-Space Exploration of Mixed-precision DNN Accelerators based on Sum-Together Multipliers" · Certificate · Jun 2023.

YOUNG FELLOWS POSTER PRESENTATION AWARD AT 2020 DESIGN AUTOMATION CONFERENCE (DAC)

One of the best 2-minutes elevator pitches, presenting my Master's Thesis work: "Detection of food contaminants with Microwave Sensing and Machine Learning" · Certificate · Jul 2020.

Recommendations

https://www.linkedin.com/in/luca-urbinati/details/recommendations/

Publications

2025 — **AN END-TO-END FLOW TO DEPLOY AND ACCELERATE TINYML MIXED-PRECISION MODELS ON RISC-V MCUS**
Manca E., Urbinati L., and Casu M.R., submitted to IEEE Tran. on Computer-Aided Design of Integr. Circuits and Systems (TCAD)

JUL 2024 — **ENHANCED MACHINE-LEARNING FLOW FOR MICROWAVE-SENSING SYSTEMS FOR CONTAMINANT DETECTION IN FOOD**
Štitic B., et al., in IEEE Trans. on AgriFood Electronics 2 (2), 181-189.

MAR 2024 — **HIGH-LEVEL DESIGN OF PRECISION-SCALABLE DNN ACCELERATORS BASED ON SUM-TOGETHER MULTIPLIERS**
Urbinati L., and Casu M.R., in IEEE Access, vol. 12, pp. 44163–44189.

MAR 2024 — **STAR: SUM-TOGETHER/APART RECONFIGURABLE MULTIPLIERS FOR PRECISION-SCALABLE ML WORKLOADS**
Manca E., Urbinati L., and Casu M.R., in Proc. Design, Automation & Test in Europe Conf. & Exhibition (DATE), pp. 1–6, IEEE, Valencia (Spain).

NOV 2023 — **ACCELERATING QUANTIZED DNN LAYERS ON RISC-V WITH A STAR MAC UNIT**
Manca E., Urbinati L., and Casu M.R., in Proc. Annual Meeting of the Italian Electronics Society (SIE), Springer, Noto (Italy).

SEP 2023 — **ENHANCED MACHINE-LEARNING FLOW FOR MICROWAVE-SENSING SYSTEMS TO DETECT CONTAMINANTS IN FOOD**
Štitic B., et al., in Proc. Int. Conf. on Agrifood Electronics (CAFE), pp. 40–44, IEEE, Turin (Italy).

JUN 2023 — **DESIGN-SPACE EXPLORATION OF MIXED-PRECISION DNN ACCELERATORS BASED ON SUM-TOGETHER MULTIPLIERS**
Urbinati L. and Casu M.R., in Proc. 18th Int. Conf. on PhD Research in Microelectronics and Electronics (PRIME), pp. 377–38, IEEE, Valencia (Spain).

NOV 2022 — **A RECONFIGURABLE DEPTH-WISE CONVOLUTION MODULE FOR HETEROGENEOUSLY QUANTIZED DNNS**
Urbinati L. and Casu M.R., in Proc. IEEE Int. Symp. Circuits and Systems (ISCAS), pp. 128-132, Austin, (TX, USA).

SEP 2022 — **A RECONFIGURABLE 2D-CONVOLUTION ACCELERATOR FOR DNNS QUANTIZED WITH MIXED-PRECISION**
Urbinati L. and Casu M.R., in Proc. ApplePies, pp. 210–215, Springer, Genoa (Italy).

SEP 2022 — **A RECONFIGURABLE MULTIPLIER/DOT-PRODUCT UNIT FOR PRECISION-SCALABLE DEEP LEARNING APPLICATIONS**
Urbinati L. and Casu M.R., in Proc. Annual Meeting of the Italian Electronics Society (SIE), Springer, Pizzo (Italy).

JUL 2021 — **MACHINE-LEARNING-BASED MICROWAVE SENSING: A CASE STUDY FOR THE FOOD INDUSTRY**
Ricci M., et al., in IEEE Journal on Emerging and Selected Topics in Circuits and Systems (JETCAS), 11(3), pp. 503–514.

OCT 2020 — **A MACHINE-LEARNING BASED MICROWAVE SENSING APPROACH TO FOOD CONTAMINANT DETECTION**
Urbinati L. et al., in Proc. IEEE Int. Symp. Circuits and Systems (ISCAS), Seville (Spain).

OCT 2019 — **FAULT TOLERANT PHOTOVOLTAIC ARRAY: A REPAIR CIRCUIT BASED ON MEMRISTOR SENSING**
Gnoli L., et al., in Proc. IEEE Int. Symp. Defect Fault Tolerance VLSI Nanotech. (DFT), Noordwijk (The Netherlands).

Main University Projects

DEC 2019

TRAINING OF MACHINE-LEARNING MODELS AND HARDWARE IMPLEMENTATION ON FPGA (MASTER'S THESIS)

- **Detection of food contaminants in hazelnut-cocoa spread jars using Microwave Sensing and Machine Learning**

Skills: Training Support Vector Machine (SVM) and Multilayer Perceptron (MLP) binary classifiers (Python, Scikit-Learn, Keras, Jupyter Notebook, conda), Generate synthetic datasets (Matlab), Hyper-parameter search with Bayesian Optimization, Hardware acceleration of the best MLP model on FPGA (hls4ml, Vivado HLS).

GEN 2019 - OCT 2017

DIGITAL HARDWARE DESIGN IN RTL (VHDL) AND SIMULATION (QUESTASIM) (ALL TEAMWORK ACTIVITIES)

- **Finite Impulse Response (FIR) filter** with unfolding and pipelining
- **Modified Booth Encoded Multiplier** with compressors
- **MIPS-lite processor** with data hazard bypasses
- **A repair circuit based on memristor sensing for fault tolerant perovskite solar panels (Multidisciplinary workshop: hardware designers and technologists working together)**
- **Logic Analyzer**: 8 channels, programmable sampling frequency, trigger condition, glitch detector, RS232 interface, tested on FPGA Altera DE2 (Quartus).
- **Radix-2 "Butterfly" Fast Fourier Transform (FFT) processing element**
- **CMOS AND4 X1 standard cell**: transistor sizing, schematic, simulation, layout, characterization with parasitics extraction (Cadence Virtuoso).

OCT 2017

PCB DESIGN AND FIRMWARE (BACHELOR'S THESIS)

- **Interface circuit based on Near-Field Communication (NFC) for low-power sensor nodes**

Skills: Research components, Datasheet reading, Circuit design and simulation (LTSpice), Breadboard prototyping, Printed Circuit Board (PCB) design (KiCad), Microcontroller firmware development (C language).

JUN 2017

FRONT-END DEVELOPMENT

- **Smartphone App called "Rimini Audioguida"**

It plays Italian/English audioguides near the main monuments of Rimini's city center using phone geolocalization.
Skills: HTML, JavaScript, CSS, Apache Cordova.