

# Luca Baldesi

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## Interests

All aspects of **Internet-of-Things**, including **real-time** communication, privacy, and **machine learning/AI** at the edge. Applications of interest include medical devices, testbeds, and telecommunication.

## Experience

- 08/2023–now **Project Scientist**, *Proper Data NSF SaTC Frontier Center*, [University of California, Irvine](#), USA.
- Privacy and security of smart home IoT devices and smart glasses;
  - Large language model (LLM) agents and privacy;
  - Network fingerprinting and analysis.
- 01/2023–07/2023 **Team Lead for IoT/IoMT**, [Hamilton Medical](#), Switzerland.  
Design and development of IoT technologies, including:
- Internet-of-Medical-Things to cloud systems;
  - Real-time content distribution and processing.
- 04/2022–01/2023 **Software Engineer for IoT/IoMT**, [Hamilton Medical](#), Switzerland.  
Design and development of IoT technologies, including:
- Developing and maintaining a custom Unix-based operating system for ARM architectures;
  - Real-time content distribution and OS development.
- 10/2020–03/2022 **Postdoctoral Research Associate**, *Institute for the Wireless Internet-of-Things*, [Northeastern University](#), USA.  
Design and development of machine learning solutions for 5G wireless systems, including:
- Prototyping with linux kernels, FPGA and Software Defined Radio systems;
  - Contributing source code to the srsRAN project for 5G-and-beyond networks;
  - Developing of residual stack Deep Neural Networks targeting raw wireless I/Q samples.
- 10/2019–02/2020 **Research and Development Engineer**, [MindMaze](#), France.  
Design and development of embedded software for signal processing applications.
- 05/2018–09/2019 **Research Fellow**, [University of Trento](#), Italy.  
Design and development of distributed platforms for live video streaming on community networks; theoretical analysis of stochastic delay bounds for flooding on mesh networks.
- 03/2016–12/2016 **Visiting PhD. Student**, [University of California, Irvine](#), USA.  
Research on privacy and anonymization on social networks.
- 05/2013–09/2014 **Research Fellow**, [University of Trento](#), Italy.  
Research in the fields of peer-to-peer live video streaming and Wireless Community Networks.

## Education

- 2014–2018 **PhD. on Real-Time Content Delivery in Distributed Networks**, *University of Trento*, Italy, Advisor: [Renato Lo Cigno](#).  
Thesis: Distributed Live Streaming on Mesh Networks.

- 2011–2013 **M.S. in Computer Science Engineering**, *The University of Florence*, Italy, **cum laude and career mention**. Advisor: [Romano Fantacci](#).  
Thesis: Analysis of the Bluetooth protocol and robustness testing of its implementations in mobile devices and operating systems.
- 2007–2011 **B.S. in Computer Science Engineering**, *The University of Florence*, Italy, Advisor: [Romano Fantacci](#).  
Thesis: Analysis and implementation of a seamless handover system using a router with two Wi-Fi interfaces.

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## Awards

- 2022 **Best Paper Award** at IEEE Conference on Computer Communications, INFOCOM. Paper: *ChARM: NextG Spectrum Sharing Through Data-Driven Real-Time O-RAN Dynamic Control*.
- 2018 **Best in-Session Presentation** at IEEE Conference on Computer Communications, INFOCOM. Paper: *Spectral graph forge: Graph generation targeting modularity*.
- 2013 **Summa Cum Laude and Career Mention** for my M.S. degree, at the University of Florence, Italy, titled: *Analysis of the Bluetooth protocol and robustness testing of its implementations in mobile devices and operating systems*.

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## Teaching and Outreach

- 2024-2025 **Instructor**, *University of California, Irvine*, Undergraduate course EECS 22: *Advanced C programming*, Length: 10 weeks, Students: ~150.
- 2023-2024 **Curriculum Lead and Instructor**, *University of California, Irvine*, **Summer school**: *Privacy, IoT & AI Research Exploration*, Summer program for under represented populations; I was responsible for the curriculum project design, based on OpenAI ChatGPT, and I contributed as lecturer. Length: 1 week, Students: 26.
- 2023-2024 **Guest Lecturer**, *University of California, Irvine*, Graduate course EECS 221: *Topics in Computer Engineering*, Class title: *Audio Security & Privacy for IoT devices*.
- 2021-2022 **Instructor**, *Northeastern University*, **Summer school**: *Colosseum Young Gladiators 2021: experimenting with a large scale spectrum emulator*, Length: 3 days, Students: ~30.
- 2015-2016 **Co-Lecturer**, *University of Trento, Italy*, Master course: *Privacy, Trust and Security*, Length: 10 weeks, Students: ~40.
- 2014-2016 **Teaching Assistant**, *University of Trento, Italy*, Master course: *Simulation and Performance Evaluation*, Length: 10 weeks, Students: ~50.

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## Mentoring

- 2023-2024 Working closely and supervising the research at different levels: post-doc researcher **Tu Le** on advertisement and user profiling; graduate student **Jad Aaraj** on smart glasses and network analysis; graduate student **Yu Duan** on social network graphs and misinformation spreading; undergraduate **Shraddha Hardikar** on social network profiling; undergraduate **Alison Iversen** on ML adversarial examples. University of California, Irvine.

2014-2019 Co-advising undergraduate thesis on real-time distributed streaming, working with **Lorenzo Ghio, Riccardo Francescato, Riccardo Martinelli, Enrico Egidi, Giulia Nardó,** and **Massimo Gironi** on real-time distributed streaming. University of Trento, Italy.

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## Service

2024-now **Program Committee Member**, *USENIX Security*.

2023-now **Program Committee Member**, *USENIX Security Artifact Evaluation*.

2020-2022 **Associate Editor**, *Elsevier Software Impact*.

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## Open Source & Industry Impact

ChARM Designed and implemented a wireless spectrum optimization mechanism based on wireless spectrum classification (5G, WiFi) using PyTorch. [Source Code](#).

srsRAN Extended the interface of the 5G RAN to support user handover between telecommunication cells. [Source Code](#).

OpenWiFi Extended the interface of the user- and kernel-land for FPGA radios (tested on the Xilinx boards), to allow the customization of the acknowledgement timeouts. This proved crucial in order to run state-of-art hardware and software in the wireless emulator [Colosseum](#). [Source Code](#).

mmpack Contributed to mmpack, a cross-platform, multi-versioning user package manager. [Source Code](#).

Python NetworkX Contributed two network graph generators:

- a generator for BGP autonomous system graphs. Source code in [NetworkX 2.4](#);
- a generator targeting global structural properties, such as modularity and community structure. Source code in [NetworkX 2.2](#).

PeerStreamer-ng Designed and built the PeerStreamer-ng platform (written in C, HTML, and Javascript), a real-time video streaming system meant to serve thousands of users. It has been designed to be fast, with very low system requirements and to minimize the latency. [Source Code](#).

NePA TesT Designed and built a distributed network emulator based on [mininet](#). [Source Code](#).

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## Publications ([Google Scholar link](#))

*J*: journal, *C*: conference.

J6 Mattia Milani, Michele Segata, Luca Baldesi, Marco Nesler, Renato Lo Cigno, and Leonardo Maccari. Optimizing MRAL on Large Scale BGP Networks: An Emulation-Based Approach. *Computer Communications*, 2024. Accepted, to appear

C8 Luca Colombo, Luca Baldesi, Tommaso Melodia, and Matteo Rinaldi. Neural Network-Aided Spurious Modes Optimization Targeting Lithium Niobate MEMS Resonators. In *IEEE IMS 2022 - IEEE International Microwave Symposium, 2022*

C7 Luca Baldesi, Francesco Restuccia, and Tommaso Melodia. ChARM: NextG Spectrum Sharing Through Data-Driven Real-Time O-RAN Dynamic Control. In *IEEE INFOCOM 2022 - IEEE Conference on Computer Communications, 2022*. **Best Paper Award**

- C6 Mattia Milani, Marco Nesler, Michele Segata, Luca Baldesi, Leonardo Maccari, and Renato Lo Cigno. Improving BGP Convergence with Fed4FIRE+ Experiments. In *39th IEEE Conference on Computer Communications (INFOCOM 2020), 5th International Workshop on Computer and Networking Experimental Research using Testbeds (CNERT 2020)*, 2020
- J5 Luca Baldesi, Leonardo Maccari, and Renato Lo Cigno. Infective Flooding in Low-Duty-Cycle Networks, Properties and Bounds. *Computer Communications*, 2020
- J4 Luca Baldesi, Athina Markopoulou, and Carter Butts. Spectral graph forge: A framework for generating synthetic graphs with a target modularity. *IEEE/ACM Transactions on Networking*, 2019
- C5 Luca Baldesi, Leonardo Maccari, and Renato Lo Cigno. Keep it fresh: Reducing the age of information in v2x networks. In *1st ACM Workshop on Technologies, mOdelS, and Protocols for Cooperative Connected Cars (TOP-Cars)*, 2019
- C4 Luca Baldesi, Leonardo Maccari, and Renato Lo Cigno. On the properties of infective flooding in low-duty-cycle networks. In *15 th Wireless On-demand Network systems and Services Conference*, 2019
- C3 Luca Baldesi, Carter T. Butts, and Athina Markopoulou. Spectral graph forge: Graph generation targeting modularity. In *IEEE INFOCOM 2018 - IEEE Conference on Computer Communications*, 2018
- J3 Leonardo Maccari, Nicolás Facchi, Luca Baldesi, and Renato Lo Cigno. Optimized P2P streaming for wireless distributed networks. *Pervasive and Mobile Computing*, 2017
- J2 Luca Baldesi, Leonardo Maccari, and Renato Lo Cigno. On the Use of Eigenvector Centrality for Cooperative Streaming. *IEEE Communications Letters*, 2017
- C2 Luca Baldesi, Leonardo Maccari, and Renato Lo Cigno. Optimized cooperative streaming in wireless mesh networks. In *IFIP Networking Conference (IFIP Networking) and Workshops*, 2016
- C1 Luca Baldesi and Leonardo Maccari. NePA TesT: network protocol and application testing toolchain for community networks. In *12th Annual Conference on Wireless On-demand Network Systems and Services (WONS)*, 2016
- J1 Luca Baldesi, Leonardo Maccari, and Renato Lo Cigno. Improving P2P streaming in Wireless Community Networks. *Computer Networks*, 2015

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## Patents

2022 Provisional Patent, Channel-Aware Reactive Mechanism (ChARM), US 63/244,192

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## Skills

Languages C, C++, Python, Ruby, JavaScript.  
 Operating Systems GNU/Linux, MacOS, Yocto/OpenEmbedded  
 Embedded ARMv7, STM32, Atmel attiny, NXP i.MX6ULL, AMD Zynq 7000 SoC  
 Protocols TCP/IP, UDP, WebRTC, CAN, USB, I2C, HTTP(S)  
 AI/ML PyTorch, CNN, ResNet, React LLM agents  
 Tools Docker, LXC, Jira, git

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## References

Available upon request.