

# SCIENTIFIC AND ACADEMIC CURRICULUM

## PAOLO LAZZARONI

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s [thezep96](#)  
in [Paolo Lazzaroni](#)

### EDUCATION AND ACADEMIA

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2023 – now	Junior Technological Researcher <b>Istituto Nazionale di Fisica Nucleare</b> , Pavia <i>Keywords:</i> ASIC design, PCB design, FPGA design, data analysis, ASIC characterisation
2020 – 2023	Doctor of Philosophy (Ph.D.) -- Microelectronics for High Energy Physics <b>Università degli Studi di Bergamo</b> , Bergamo <i>Thesis:</i> “Design of a pixel readout processor for nano-meter resolution x-ray ptychography” <i>Advisor:</i> Massimo Manghisoni, Lodovico Ratti <i>Keywords:</i> Radiation detection, front-end electronics, low noise, x-ray ptychography
2018 – 2020	Master of Science (M.Sc.) -- Computer Engineering (Mechatronics) LM-32 <b>Università degli Studi di Bergamo</b> , Bergamo <i>Thesis:</i> “Characterization of a Modular System for the Realisation of the Si(Li) Tracker of GAPS experiment” <i>Advisor:</i> Massimo Manghisoni, Elisa Riceputi, Mauro Sonzogni <i>Keywords:</i> GAPS, Front-end Electronics, Analogue IC Design, Data Analysis <i>Final Grade:</i> 110/110 cum laude
2015 – 2018	Bachelor of Science (B.Sc.) -- Computer Engineering LM-8 <b>Università degli Studi di Bergamo</b> , Bergamo <i>Thesis:</i> “Analysis of Reinforcement Learning Algorithms for Control in OpenAI Gym Simulated Environment” <i>Advisor:</i> Fabio Previdi, Mirko Mazzoleni <i>Keywords:</i> Machine Learning, Reinforcement Learning, Control, OpenAI Gym <i>Final Grade:</i> 107/110
2010 – 2015	Technical Certificate – Accounting & IT for Enterprise <b>Istituto di Istruzione Superiore “Lorenzo Lotto”</b> , Trescore Balneario (BG) <i>Final Grade:</i> 100/100

### SCIENTIFIC ACTIVITY

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The scientific activity and research interest of Paolo Lazzaroni fall mainly in the design of low-noise, low-power analogue front-end integrated circuit for semiconductor detectors readout in high energy physics and their characterisation.

The research activity to date encompasses the following:

1. **Development of readout electronics for x-ray imaging**

Paolo Lazzaroni has developed a pixel readout processor in a CMOS 65 nm technology in the frame of the FALCON project, an international collaboration between Argonne National Laboratory (ANL, Chicago, USA), University of Bergamo and University of Pavia (both part of Istituto Nazionale di Fisica Nucleare, INFN, section of Pavia, Italy).

The main challenges posed by the design of the pixel readout processor lie in the strict requirements on both noise and power, together with the high rate, 1 MHz, at which each channel of the pixel needs to operate and the 256x256 pixel envisioned for the final ASIC.

## 2. Testing of front-end circuitry for XFELs and astrophysics

Paolo Lazzaroni has been testing and analysing data coming from low-noise front-end circuitry for HEP. The two main frame in which this activity was pursued are GAPS (General AntiParticle Spectrometer) collaboration Front-End Board and ASIC testing and DESY's DSSC camera sensor and ASIC testing and validation.

## 3. Design and development of affordable IoT solutions

The activity is collateral to the main topic of Paolo Lazzaroni's research and consist of designing efficient, precise and smart IoT networks to address different needs and developing machine learning solutions both on the back-end and on the IoT node.

The main achievement to date coming from this activity is the first prize at Bosch SensorTec's "Making SensorTec" challenge for a smart IoT system to monitor domestic boilers, together with the microlab team.


## 4. Testing of electrically conductive cotton fabric coatings

The activity was pursued together with "A. J. Zaninoni" textile technology laboratory at the University of Bergamo.

The research work consists in performing high-precision, low-current measurement on different types of cotton coatings – based on carbon nanotubes and tungsten selenide – in order to check their conductivity properties against different temperature, humidity levels and their reversibility after repeated test cycles.

## SCIENTIFIC PUBLICATIONS

Paolo Lazzaroni is author or co-author of 6 scientific publications. More details are found in the ORCID profile at the link:

 <https://orcid.org/0000-0002-8443-1101>

## ORAL COMMUNICATIONS AT SCIENTIFIC CONFERENCES

Paolo Lazzaroni gave oral communications at 2 international scientific conferences.

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| 2023 | “Characterisation of the pFREYA16 ASIC for low-noise ptychography applications,” <i>2023 IEEE Nuclear Science Symposium, Medical Imaging Conference and Room Temperature Semiconductor Detector Conference</i> , Vancouver (Canada), 04 – 11 November 2023 |
| 2022 | “A low-noise readout channel for x-ray ptychography applications,” <i>2022 IEEE Nuclear Science Symposium, Medical Imaging Conference and Room Temperature Semiconductor Detector Conference</i> , Milano (Italy), 05 – 12 November 2022                   |

2022 | “FALCON readout channel for x-ray ptychography applications,” 2022 17th Conference on Ph.D Research in Microelectronics and Electronics (PRIME), Villasimius (Italy), 12 – 15 June 2022

## REVIEWER ACTIVITY FOR JOURNALS AND ASIC DESIGN

Paolo Lazzaroni serves as reviewer for conferences in the field of microelectronics and electronics design

APPLEPIES | International Conference on Applications in Electronics Pervading Industry, Environment, and Society

MOCAS | International Conference on Modern Circuits and Systems Technologies on Electronics and Communications

He also served as an ASIC reviewer for Cornell University Detector Group.

## PROJECTS

CMS | (2023 – today) CMS collaboration at CERN.  
Characterization of integrated circuits and modules developed for hybrid pixel readout at the CMS inner tracker.

FALCON | (2020 – today) ANL, UniPV, and UniBG collaboration.  
Design of a pixel readout processor for nano-meter resolution x-ray ptychography.

GAPS | (2020 – today) GAPS collaboration.  
Testing and verification of the performance of the Si(Li) tracker of the experiment.

DSSC | (2021 – 2023) EuXFEL, DESY and INFN (Milano and Pavia) collaboration.  
Testing and verification of the performance of the DEPFET sensors and ASICs.

## NATIONAL AND INTERNATIONAL SCIENTIFIC COLLABORATIONS

ANL | Argonne National Laboratory, Chicago, USA

FNAL | Fermi National Accelerator Laboratory, Chicago, USA

INFN | Istituto Nazionale di Fisica Nucleare, Pavia, Italy

UniPV | Università degli Studi di Pavia, Pavia, Italy

## AWARDS AND RECOGNITIONS

2023 | Bosch SensorTec “Making SensorTec!” challenge winner  
First prize awarded to the University of Bergamo uLab team for the development of an intelligent IoT infrastructure for boiler monitoring, alert managing and data analysis. The team was invited to present the work both at Bosch SensorTec (BST) in Milan, Italy, and at the BST headquarters in Reutlingen, Germany.

2023 | PRIME 2022 Bronze Leaf Certificate  
Certificate awarded to the paper “FALCON readout channel for x-ray ptychography applications” as one of the top 30% paper of the PRIME 2022 conference.

## ACADEMIC ACTIVITY

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### TEACHING ACTIVITY

Starting from 2021, Paolo Lazzaroni has carried out teaching assistant activities for Computer Engineering and Mechanical Engineering degree at the University of Bergamo and Medicine and Surgery degree at the University of Milano-Bicocca. A detailed list of the aforementioned activities, with the corresponding academic year, follows:

2022 – 2023	Teaching assistant for the course “Fundamentals of Electronics” (9 CFU). Teaching assistant for the course “Sensors” (6 CFU). Lecturer for the course “Prosthesis and Rehabilitation in Practice” (1 CFU).
2021 – 2022	Teaching assistant for the course “Fundamentals of Electronics” (9 CFU). Teaching assistant for the course “Electronics and Elaboration of Biomedical Signals” (6 CFU). Teaching assistant for the course “Sensors” (6 CFU). Lecturer for the course “Prosthesis and Rehabilitation in Practice” (1 CFU). Lecturer for the summer school “Non Linear Life”.
2020 – 2021	Teaching assistant for the course “Fundamentals of Electronics” (9 CFU). Teaching assistant for the course “Electronic Instrumentation” (6 CFU).

### TUTORING ACTIVITY

Paolo Lazzaroni has been the co-advisor for 2 M.Sc. theses and for 1 B.Sc. thesis at the University of Bergamo.

## MEMBERSHIPS

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2023 – today	Staff associate II <b>Columbia University</b> , New York Construction and testing of the GFP, the GAPS Functional prototype, as part of the GAPS experiment.
2020 – today	INFN Memeber <b>Istituto Nazionale di Fisica Nucleare</b> , Pavia Member of INFN CSN5 group as Technological Ph.D., section of Pavia.
2020 – today	SIE Member <b>Società Italiana di Elettronica</b> , Bergamo Member of SIE, section of Bergamo.
2020 – today	IEEE Graduate Student Member <b>Institute of Electrical and Electronics Engineers</b> , Italy Graduate student membership.

## SCHOLARSHIPS AND CERTIFICATES

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2020 – 2023	Ph.D. Scholarship <b>Università degli Studi di Bergamo</b> , Bergamo
2016 – 2019	TOP 10 Student Program 2015/2016, 2016/2017, 2017/2018, 2018/2019 <b>Università degli Studi di Bergamo</b> , Bergamo Fee exemption awards issued by Università degli Studi di Bergamo to best students.
2018	C1 Advanced (Grade B) <b>Cambridge Assessment English</b> , Cambridge

## OTHER WORK EXPERIENCES

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03/2019 – 03/2020	Computer Engineer at ASST Papa Giovanni XXIII, Genetics Department, Bergamo <i>System administrator and programmer</i> Winner of a scholarship given by ASST Papa Giovanni XXIII to a computer engineer for RARE (Rapid Analysis for Rapid carE) project.
01/2017 -- 08/2018	Apprentice Computer Engineer at ASST Papa Giovanni XXIII, Genetics Department, Bergamo <i>System administrator and programmer</i> Administrator of 2 Linux-based servers (Ubuntu, Redhat). Software development on Linux and Windows (mainly Python, Java, bash scripting).

## LANGUAGES

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ITALIAN:	Mother tongue
ENGLISH:	Fluent (C1)
FRENCH:	Intermediate (B2)
RUSSIAN:	Intermediate (B2)
JAPANESE:	Beginner (A2)

## INTERESTS AND ACTIVITIES

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Technology, Electronics, Space, Nuclear Physics.  
Music, Books, Travels.