# Luigi **Capogrosso**

PH.D. CANDIDATE IN ARTIFICIAL INTELLIGENCE

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## Education

**Ph.D. in Artificial Intelligence**                                                                                  *Verona, Italy*

POLYTECHNIC OF TURIN, IN COLLABORATION WITH THE UNIVERSITY OF VERONA                        *Nov. 2021 - Nov. 2024*

- Thesis title: "Learning-Based Methods for Enabling On-Edge, Accurate, Sustainable, and Human-Centered Intelligent Manufacturing".

**Ph.D. Visiting Scholar**                                                                                         *Lisbon, Portugal*

INSTITUTO SUPERIOR TÉCNICO                                                                            *Mar. 2024 - Sep. 2024*

- I had the privilege of being a visiting scholar at the Pattern Recognition and Automatic Learning lab, headed by Prof. Mário A. T. Figueiredo, where I worked on relative representation and grokking in deep neural networks.

**M.Sc. in Computer Engineering for Robotics and Smart Industry**                                  *Verona, Italy*

UNIVERSITY OF VERONA                                                                                                *2019 - 2021*

- Grade: 110/110 Cum Laude.
- Thesis title: "Embedded Deep Learning for Computer Vision: A Case Study on Object Tracking".

**B.Sc. in Computer Science**                                                                                      *Verona, Italy*

UNIVERSITY OF VERONA                                                                                                *2016 - 2019*

- Thesis title: "Linux Kernel – Organization, Structures and Process Management".

## Research Experiences

**Research Fellow**                                                                                                  *Verona, Italy*

UNIVERSITY OF VERONA - DEPARTMENT OF ENGINEERING FOR INNOVATION MEDICINE                      *Dec. 2024 - Present*

- Grant title: "Sustainability: Tools and Models for Innovation Towards Carbon Neutrality". FSE Project Code: 1001-0001-231- 2024 (DGR No. 231 of 13/03/2024). Research and development of innovative strategies for achieving carbon neutrality.

**Research Assistant**                                                                                              *Verona, Italy*

HUMATICS | SYS-DAT GROUP                                                                               *Jan. 2021 - Aug. 2021*

- Deep learning models are often computationally expensive, hindering their use in resource-constrained edge systems. During this period, my work was focused on implementing pruning and quantization optimization techniques on company confidential deep learning models.

**Research Fellow**                                                                               *San Giovanni Lupatoto, Italy*

EDALAB S.R.L.                                                                                           *Oct. 2019 - Dec. 2021*

- Communication protocols are the foundation of Internet of Things (IoT) applications. During this period, my work was focused on implementing the Modbus, OPC-UA, and MQTT protocols inside the company's BOX-IO embedded system.

## Teaching Experiences

**Teaching Assistant**                                                                                            *Verona, Italy*

UNIVERSITY OF VERONA                                                                                                *2020 - 2025*

- Course "Topics on Computer Architecture and Operating Systems (2024/2025)" of the Bachelor's degree in Computer Science.
- Course "Hardware Components Design on FPGA (2023/2025)" of the Bachelor's degree in Computer Science.
- Course "Systems Design Laboratory (2023/2024)" of the Master's degree in Computer Engineering for Robotics and Smart Industry.
- Course "Machine Learning & Artificial Intelligence (2022/2023)" of the Master's degree in Computer Engineering for Robotics and Smart Industry.
- Course "Computer Vision & Deep Learning (2022/2023)" of the Master's degree in Artificial Intelligence.
- Course "Signal and Image Processing (2022/2023)" of the Bachelor's degree in Computer Science.
- Course "Topics of Operating Systems and Networks (2020/2021)" of the Bachelor's degree in Bioinformatics.
- Course "Network Programming and Security (2020/2021)" of the Bachelor's degree in Computer Science.
- Course "Programming I (2020/2021)" of the Bachelor's degree in Computer Science.

## Reviewer Experiences

JOURNALS

| 2023 - Present | **International Journal of Computer Vision**, Springer Netherlands. |
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| 2023 - Present | **IEEE Internet of Things Journal**, IEEE Inc. |
| 2023 - Present | **Future Generation Computer Systems**, Elsevier B.V. |
| 2022 - Present | **Pattern Recognition**, Elsevier Ltd. |

### CONFERENCES

| 2024 - Present | **Computer Vision and Pattern Recognition Conference (CVPR)**, CVF/IEEE Inc. |
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| 2023 - Present | **International Conference on Learning Representations (ICLR)**, OpenReview. |
| 2024 | **European Conference on Computer Vision (ECCV)**, Springer. |
| 2023 - Present | **Design, Automation and Test in Europe Conference (DATE)**, IEEE Inc. |

# Committees

| 2025 | **Area Chair**, 23rd International Conference on Image Analysis and Processing (ICIAP). | *Rome* |
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| 2025 | **Publicity Chair**, 3rd International Conference on Frontiers of Artificial Intelligence (FAIEMA). | *Stavanger* |
| 2024 | **Program Committee**, Unifying Representations in Neural Models Workshop (UniReps) at NeurIPS. | *Vancouver* |

# Honors & Awards

| 2023 | **Young Entrepreneur Prize**, Premio Nazionale per l'Innovazione. | *Milan, Italy* |
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| 2022 | **Honorable Mention**, ICCAD 2022 ACM/IEEE TinyML Design Contest. | *San Diego, U.S.A* |
| 2016 - 2021 | **Academic Student Excellence Grant**, University of Verona. | *Verona, Italy* |

# Personal Qualities & Interests

| **Scientific interests** | Efficient Deep Learning, Representation Learning, Multi-Task Learning, Industry 4.0, IoT, Embedded Systems. |
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| **Personal traits** | Ambitious, hard-working, practical, eager to learn new skills, and highly focused on goals. |
| **Programming** | Python, PyTorch, TensorFlow, C, C++. |
| **Languages** | Italian, English. |

# Selected Publications

### Human-Centered Digital Twin for Industry 5.0

F Biondani, **L Capogrosso**, N Dall'Ora, E Fraccaroli, M Cristani, F Fummi *2025*
- Design, Automation and Test in Europe Conference (DATE).

### LO-SC: Local-only Split Computing for Accurate Deep Learning on Edge Devices

**L Capogrosso**, E Fraccaroli, M Cristani, F Fummi, S Chakraborty *2025*
- International Conference on VLSI Design (VLSID).

### SITUATE: Indoor Human Trajectory Prediction through Geometric Features and Self-Supervised Vision Representation

**L Capogrosso**, A Toaiari, A Avogaro, U Khan, A Jivoji, F Fummi, M Cristani *2024*
- International Conference on Pattern Recognition (ICPR).

### Learning-Enabled CPS for Edge-Cloud Computing

**L Capogrosso**, S Xu, E Fraccaroli, M Cristani, F Fummi, S Chakraborty *2024*
- International Symposium on Industrial Embedded Systems (SIES).

### Leveraging Latent Diffusion Models for Training-Free In-Distribution Data Augmentation for Surface Defect Detection

F Girella, Z Liu, F Fummi, F Setti, M Cristani, **L Capogrosso** *2024*
- International Conference on Content-based Multimedia Indexing (CBMI).

### MTL-Split: Multi-Task Learning for Edge Devices using Split Computing

**L Capogrosso**, E Fraccaroli, S Chakraborty, F Fummi, M Cristani *2024*
- Design Automation Conference (DAC).

### A Machine Learning-oriented Survey on Tiny Machine Learning

**L Capogrosso**, F Cunico, DS Cheng, F Fummi, M Cristani *2024*
- IEEE Access.

### Diffusion-based Image Generation for In-distribution Data Augmentation in Surface Defect Detection

L Capogrosso, F Girella, F Taioli, M Dalla Chiara, M Aqeel, F Fummi, F Setti, M Cristani *2024*

- International Conference on Computer Vision Theory and Applications (VISAPP).

### Disentangled Latent Spaces Facilitate Data-Driven Auxiliary Learning

G Skenderi, **L Capogrosso**, A Toaiari, M Denitto, F Fummi, S Melzi, M Cristani *2024*

- Currently under review.

### Split-Et-Impera: A Framework for the Design of Distributed Deep Learning Applications

L Capogrosso, F Cunico, M Lora, M Cristani, F Fummi, D Quaglia *2023*

- Design and Diagnostics of Electronic Circuits and Systems (DDECS).

### HermesBDD: A Multi-Core and Multi-Platform Binary Decision Diagram Package

L Capogrosso, L Geretti, M Cristani, F Fummi, T Villa *2023*

- Design and Diagnostics of Electronic Circuits and Systems (DDECS).

### I-SPLIT: Deep Network Interpretability for Split Computing

F Cunico, **L Capogrosso**, F Setti, D Carra, F Fummi, M Cristani *2022*

- International Conference on Pattern Recognition (ICPR).

## Presentations

### Presenter for the International Centre for Theoretical Physics (ICTP) *Trieste, Italy*

Workshop on Machine Learning on Low-Power Devices: Applications and Advanced Topics *2024*

- Presentation title: "A Machine Learning-oriented overview on Tiny Machine Learning: Theory, Methods and Applications".

### Presenter for the Department of Computer Science of the University of Verona *Verona, Italy*

How to Leverage Artificial Intelligence to Grow Your Business: The Humatics SYS-DAT Group Workshop *2023*

- Presentation title: "Enabling Machine Learning Systems in Industry 4.0".

### Presenter for the Department of Engineering for Innovation Medicine of the University of Verona *Verona, Italy*

A Holistic Approach to Computer Engineering for Industry 4.0 Workshop *2023*

- Presentation title: "TinyML: How to Fit Heavy Networks Almost Everywhere".

## Extracurricular Activities

### Executive Committee of the Associazione Italiana Arbitri *Trento*

Member *Jan. 2021 - Present*

### Culture Commission of the Municipality of Pergine Valsugana *Pergine Valsugana*

Member *Nov. 2020 - Present*

### Youth Commission of the Municipality of Pergine Valsugana *Pergine Valsugana*

Member *Jan. 2021 - Present*