

# LUCA MARZARI

PhD Candidate

Department of Computer Science, University of Verona, Italy

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## EDUCATION

### Ph.D. in Computer Science University of Verona

October 2022 - March 2026

 Verona, Italy

Dissertation title: "Advanced Neural Networks Verification for Safe and Explainable Intelligent Systems"

My thesis proposed novel, efficient, and reliable methods for verifying and enhancing the safety and explainability of deep neural networks, particularly in the context of deep reinforcement learning applications. These methods have been applied in simulation and realistic domains, ranging from ground and aquatic robots to surgery assistants and games.

Advisors: Prof. Alessandro Farinelli, Ph.D., and Prof. Ferdinando Cicalese, Ph.D.

Examination committee: Prof. Nils Jansen, Ph.D., and Prof. Ezio Bartocci, Ph.D.

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### Master's Degree in Computer Eng. (110/110 cum laude) University of Verona

October 2020 - July 2022

 Verona, Italy

Dissertation title: "Deep Reinforcement Learning for Robotic Tasks: Enhancing Efficiency and Safety"

My master's thesis proposed two innovative techniques based on a hierarchical approach, either by decomposing a complex task into simpler subtasks for a robotic pick-and-place task or by providing the agent with incremental knowledge about the environment for mapless navigation tasks. The results of this work were published in the proceedings of the IEEE International Conference on Advanced Robotics and the ACM/SIGAPP Symposium on Applied Computing (SAC IRMAS 2022).

## EXPERIENCE

### Technische Universität Wien - (Incoming) Postdoctoral Research Associate

April 2026-

Robustifying Generative AI through human-centric integration of neural and symbolic methods.

 Vienna, AT

Advisor: Prof. Ezio Bartocci, Ph.D.

### Imperial College London - Visiting Researcher

Feb 2026-March 2026

Research visit at the Centre for Explainable AI. Invitation: Prof. Francesco Leofante, Ph.D.

 London, UK

### University of Verona - Research Associate

Oct 2025 - March 2026

Lead researcher on the BEHAVE- Learning Safe Behaviours for human-robot cooperation project.

 Verona, IT

Advisor: Alessandro Farinelli

### Carnegie Mellon University - Visiting Researcher

Jul 2023 - Feb 2024

Research visit at the Intelligent Control Lab for the development of ModelVerification.jl verification tool.

 Pittsburgh (PA), USA

Advisor: Prof. Changliu Liu, Ph.D.

## PUBLICATIONS

Up-to-date research indicators are available in my [Google Scholar profile](#). (\* indicates equal contribution when not first-author)

### Journal papers:

#### [J.1] Probabilistically Robust Counterfactual Explanations under Model Changes

*Artificial Intelligence Journal (AIJ)*, Q1 2025

L. Marzari, F. Leofante, F. Cicalese and A. Farinelli

#### [J.2] Probabilistically Tightened Linear Relaxation-based Perturbation Analysis for Neural Network Verification

*Journal of Artificial Intelligence Research (JAIR)*, Q1 2025

L. Marzari, F. Cicalese and A. Farinelli

#### [J.3] Verifying Online Safety Properties for Safe Deep Reinforcement Learning

*ACM Transaction on Intelligent Systems and Technologies (TIST)*, Q1 2025

L. Marzari, F. Cicalese, A. Farinelli, C. Amato and E. Marchesini

#### [J.4] Designing Control Barrier Function via Probabilistic Enumeration for Safe Reinforcement Learning Navigation

*IEEE Robotics and Automation Letters (RA-L)*, Q1 2025

L. Marzari, F. Trott, E. Marchesini and A. Farinelli

### Conference papers:

#### [C.1] On the Probabilistic Learnability of Compact Neural Network Preimage Bounds

*AAAI Conference on Artificial Intelligence (AAAI)* 2026

L. Marzari, M. Bicego, F. Cicalese, and A. Farinelli

#### [C.2] Enumerating Safe Regions in Deep Neural Networks with Provable Probabilistic Guarantees

*AAAI Conference on Artificial Intelligence (AAAI)* 2024

L. Marzari, D. Corsi, E. Marchesini, A. Farinelli and F. Cicalese

- [C.3] **The #DNN-Verification Problem: Counting Unsafe Inputs for Deep Neural Networks**  
*International Joint Conference on Artificial Intelligence (IJCAI) 2023*  
**L. Marzari**, D. Corsi, F. Cicalese, and A. Farinelli
- [C.4] **Improving Policy Optimization via  $\varepsilon$ -Retrain**  
*International Conference on Autonomous Agents and Multiagent Systems (AAMAS) 2025*  
**L. Marzari**, P.L. Donti, C. Liu, and E. Marchesini
- [C.5] **Rigorous Probabilistic Guarantees for Robust Counterfactual Explanations**  
*European Conference on Artificial Intelligence (ECAI) 2024*  
**L. Marzari**, F. Leofante, F. Cicalese, and A. Farinelli
- [C.6] **Online Safety Property Collection and Refinement for Safe Deep Reinforcement Learning in Mapless Navigation**  
*International Conference on Robotics and Automation (ICRA) 2023*  
**L. Marzari**, E. Marchesini, and A. Farinelli
- [C.7] **Advancing Neural Network Verification through Hierarchical Safety Abstract Interpretation**  
*European Conference on Artificial Intelligence (ECAI) 2025*  
**L. Marzari**, I. Mastroeni, and A. Farinelli
- [C.8] **Safe Deep Reinforcement Learning by Verifying Task-Level Properties**  
*International Conference on Autonomous Agents and Multiagent Systems (AAMAS) 2023*  
E. Marchesini\*, **L. Marzari\***, A. Farinelli, and C. Amato
- [C.9] **Constrained Reinforcement Learning and Formal Verification for Safe Colonoscopy Navigation**  
*IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2024*  
D. Corsi\*, **L. Marzari\***, A. Pore\*, A. Farinelli, A. Casals, P. Fiorini and D. Dall'Alba
- [C.10] **ModelVerification.jl: A Comprehensive Toolbox for Formally Verifying Deep Neural Networks**  
*International Conference on Computer-Aided Verification (CAV) 2025*  
T. Wei, H. Hu\*, **L. Marzari\***, K. Yun\*, P. Niu\*, X. Luo, and C. Liu
- [C.11] **RobustX: Robust Counterfactual Explanations Made Easy.**  
*International Joint Conference on Artificial Intelligence (IJCAI) 2025*  
J. Jiang\*, **L. Marzari\***, A. Purohit, and F. Leofante
- [C.12] **Verifying Learning-Based Robotic Navigation Systems.**  
*International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS) 2023*  
G. Amir, D. Corsi, R. Yerushalmi, **L. Marzari**, D. Harel, A. Farinelli, and G. Katz
- [C.13] **Curriculum Learning for Safe Mapless Navigation**  
*ACM/SIGAPP Symposium on Applied Computing (SAC IRMAS) 2022*  
**L. Marzari**, D. Corsi, E. Marchesini and A. Farinelli
- [C.14] **Towards Hierarchical Task Decomposition using Deep Reinforcement Learning for Pick and Place Subtasks**  
*IEEE International Conference on Advanced Robotics (ICAR) 2021*  
**L. Marzari**, A. Pore, D. Dall'Alba, G. Aragon-Camarasa, A. Farinelli and P. Fiorini

#### Workshop/Bridge papers (peer-reviewed)

- [W.1] **Formal Verification for Counting Unsafe Inputs in Deep Neural Networks**  
*2nd Workshop on Formal Verification of Machine Learning - International Conference on Machine Learning (ICML) 2023*  
**L. Marzari**, D. Corsi, F. Cicalese, and A. Farinelli
- [W.2] **Scaling #DNN-Verification Tools with Efficient Bound Propagation and Parallel Computing**  
*10th Italian Workshop on Artificial Intelligence and Robotics (AIRO) 2023*  
**L. Marzari**, G. Roncolato and A. Farinelli
- [W.3] **Tackling Environment Sustainability Challenges via Reinforcement Learning and Counterfactual Explanations**  
*Bridge Programme on Explainable AI, Energy and Critical Infrastructure Systems - AAAI Conference on Artificial Intelligence (AAAI) 2025*  
**L. Marzari** and E. Marchesini
- [W.4] **Explaining Reinforcement Learning Policies for Power Grid Operations**  
*CINI National Lab AllS Conference on Artificial Intelligence (Ital IA) 2025*  
**L. Marzari**, F. Leofante and E. Marchesini

#### Conference and journal papers under review:

- [C.1] **Formal Verification of Variational Quantum Circuits**  
*Submitted at PLDI 2026*  
N. Assolini\*, **L. Marzari\***, I. Mastroeni, and A. Di Pierro
- [C.2] **Probabilistic Verification of Recurrent Neural Networks for Single and Multi-Agent Reinforcement Learning**  
*Submitted at IJCAI 2026*  
**L. Marzari** and E. Marchesini
- [C.3] **A Survey on the Verification of Reinforcement Learning Policies**  
*Submitted at IJCAI 2026*  
**L. Marzari**, E. Bartocci, and E. Marchesini

## Summary

Reference	Articles	Citations	h-index
Google Scholar	23	300	9
Scopus	18	137	8

## FELLOWSHIPS, AWARDS, GRANTS AND RESEARCH PROJECTS

- **Project title:** "BEHAVE - Learning Safe Behaviours for human-robot cooperation"  
Funding entity: Italian Ministry of University and Research  
Page: <https://isla-lab.github.io/projects/behave/>  
Role: Proposal Writing author and Researcher (first-author papers: [J.2],[J.3], [J.4], [C.1],[C.7])  
Principal Investigator(s): Alessandro Farinelli  
Funds: ≈ 200,000 EUR
- **Project title:** "ModelVerification.jl: a Comprehensive Toolbox for Formally Verifying Deep Neural Networks."  
Funding entity: The Boeing Company and Carnegie Mellon University  
Page: <https://github.com/intelligent-control-lab/ModelVerification.jl>  
Role: Toolbox documentation, tutorial, and main author of the final paper report (accepted at CAV 2025 [C.10]).  
Principal Investigator(s): Changliu Liu
- **Project title:** "RobustX: Robust Counterfactual Explanations Made Easy."  
Funding entity: Imperial College London  
Page: <https://github.com/RobustCounterfactualX/RobustX>  
Role: Toolbox developer, tutorial, and main author of the final paper report (accepted at IJCAI 2025 [C.11]).  
Principal Investigator(s): Francesco Leofante
- **3-years Doctoral Grant** for a PhD in Computer Science at University of Verona.  
Funding entity: Italian Ministry of University and Research  
Role: PhD Student  
Funds: ≈ 41,000 EUR
- **Mobility Grant for non-EU destinations** for the research visit at Carnegie Mellon University (CMU), Pittsburgh (PA), USA.  
Duration: 7 months  
Funds: ≈ 3,400 USD
- **Travel Grants** Several awards for attending and presenting papers at international conferences such as the 40th AAAI Conference on Artificial Intelligence, 27th and 28th European Conference on Artificial Intelligence and the 24th International Conference on Autonomous Agents and Multiagent Systems  
Funds: ≈ 3,600 USD

## SELECTED SERVICE AND PROGRAM ORGANIZATION

- **Organizer and presenter** of the outreach activity *Rigorous Probabilistic Guarantees for Robust Counterfactual Explanations* at the 27th European Conference on Artificial Intelligence (ECAI 2024).
- **Program Committee member** for AAAI 2026, AE TACAS 2026, XAISEC 2026.
- **Reviewer** for several international conferences and journal letters such as ICML, ICLR, IJCAI, ECAI, ICRA, AAMAS, RA-L, JAIR, EURO Journal on Computational Optimization.
- **Presenter** at several top-level international conferences such as AAAI, CAV, ICML, ICRA, AAMAS.
- Participation as an **exhibitor** at Sea Drone tech summit 2022 to present the European Project INTCATCH 2020.

## SELECTED PRESENTATIONS AND INVITED TALKS

- "Introduction to Deep Learning". Mini course of 8 hours.  
**Companies:** Cromodora Wheels SpA and Salvagnini Group, Verona, Italy 2025
- "Artificial Intelligence and Industry 5.0".  
**Host:** Digital Transformation Training, SMACT Competence Center, Cortina, Italy 2025
- "Enhancing safety of intelligent agents via Formal Verification and Safe Deep Reinforcement Learning".  
**Host:** Prof. Christopher Amato, Northeastern University, Boston, USA 2024
- "Formal and Probabilistic Verification for Deep Neural Networks".  
**Host:** Prof. Changliu Liu, Carnegie Mellon University, Pittsburgh, USA 2024

## SELECTED TEACHING AND MENTORING

**Teaching Assistant or Instructor** at the University of Verona from 2022 to 2026:

- C Programming (120 hours), first year of BSc in Computer Science
- Artificial Intelligence (30 hours), third year of BSc in Computer Science
- Reinforcement Learning (24 hours), first year of MSc in Artificial Intelligence

- *Planning and Automated Reasoning* (24 hours), first year of MSc in Artificial Intelligence
- *Programming and Database* (24 hours), first year of MSc in Data Science

#### **Students Mentored**

- Buzzoni Riccardo, undergraduate student at the BSc in Computer Science at the University of Verona, Italy 2026.  
Thesis: "TBD"
- Pullia Domenico, undergraduate student at the BSc in Computer Science at the University of Verona, Italy 2026.  
Thesis: "TBD"
- Nicolò Squarzoni, graduate student at the MSc in Computer Science and Engineering at the University of Verona, Italy 2024.  
Thesis: "*A Reinforcement Learning approach to Strategy Optimization for Battery Energy Storage Systems*"
- Gabriele Roncolato, graduate student at the MSc in Computer Science and Engineering at the University of Verona, Italy 2023.  
Thesis: "*Accelerating Formal Verification Techniques for Neural Networks*".  
Part of the thesis has led to the production of the article [W.2]

#### **REFERENCES**

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- Changliu Liu - Associate Professor at the Carnegie Mellon University ([clius@andrew.cmu.edu](mailto:clius@andrew.cmu.edu))
- Enrico Marchesini - Postdoctoral Associate at MIT (incoming Assistant Professor) ([emarche@mit.edu](mailto:emarche@mit.edu))
- Francesco Leofante - Assistant Professor at Imperial College London ([f.leofante@imperial.ac.uk](mailto:f.leofante@imperial.ac.uk))
- Alessandro Farinelli - Full Professor at the University of Verona ([alessandro.farinelli@univr.it](mailto:alessandro.farinelli@univr.it))

I authorize the processing of my personal data contained in the curriculum vitae in accordance with Legislative Decree 30 June 2003, no. 196, and the GDPR (EU Regulation 2016/679).

Verona, February 8, 2026  
Luca Marzari