Giovanni Pagliarini, PhD

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Summary

Machine Learning Engineer & Researcher with expertise in Symbolic AI, NLP, parallel computing and strong experience in Julia and Python. Passionate about research and application of AI technologies, and interpretable AI.

Education

PhD in Computer Science and Mathematics

University of Parma, Italy
11/2020 – 01/2024

- Topics: machine learning, formal logic, time series classification, data science, efficient and parallel computing
- My research focused on symbolic learning, and on *interpretable* models for spatial and temporal reasoning
- I designed and coordinate the development the Sole.jl framework
- I worked on various projects for testing the effectiveness of new machine learning methods: COVID-19 diagnosis from cough/breath sounds; EEG signal interpretation; gas turbine trip prevention; land cover classification from satellite imagery; speech recognition
- I spent a 3-month period at the *University of Sydney* under the supervision of Prof. Sasha Rubin

Master Degree in Computer Science

University of Gothenburg, Sweden
08/2018 – 06/2020

- ECTS: 120, Grade: G
- Topics: machine learning, computer vision, bioinformatics, discrete optimization, logic, compilers
- Thesis: *Interactionwise – Semantic Awareness for Visual Relationship Detection*
- I spent a 6-month period at the *National University of Singapore (NUS)*, where I deepened my knowledge on computer vision

Bachelor Degree in Computer Science

University of Ferrara, Italy
09/2015 – 07/2018

- ECTS: 180, Grade: 110/110 with honors
- Topics: algorithms, computability and complexity theory, parallel computing, computer architecture, operating systems
- Thesis: *Optimization of Lattice Boltzmann simulations for Intel Xeon Phi 'Knights Landing'*

Experience

Research Software Engineer @ PlantingSpace AG

Remote
01/2025 – Present

- Julia Software Engineer
- Working on the core technology of a symbolic AI agent

Research Fellow @ University of Ferrara

Ferrara, Italy
02/2024 – 02/2025

- Research software engineer at the Applied Computational Logic in Artificial Intelligence Laboratory (ACLAI Lab)
- I contributed to the design and development of Machine Learning systems for several applicative domains
- I managed 2 on-premise (rack) computing servers
- I coordinated the construction of Sole.jl, the first framework for symbolic machine learning

Freelance Consultant

Ferrara, Italy
01/2021 – 12/2023

- I did consulting, mostly on Machine Learning topics
- I programmed some web scraping utilities and build datasets for research projects

Machine Learning Developer

Gothenburg, Sweden
01/2020 – 06/2020

- I tackled a problem of detection of interactions between objects in digital images (*Visual Relationship Detection*)
- I made extensive use of machine learning techniques for computer vision and natural language processing (NLP)

Teaching Assistant

Ferrara, Italy & Gothenburg, Sweden
01/2020 – 03/2023

- I held excercise sessions, prepared exercise documents, and graded home assignments
- Courses: *Algorithms I*, *Computability and Complexity*, *LaTeX Advanced*

Research Trainee @ University of Ferrara

Ferrara, Italy
09/2017 – 06/2018

- I optimized a C code for fluid dynamics simulations, targeting highly-parallel architectures
- I measured performance of different data layouts and memory access patterns

IT Technician @ Mercato delle Terre Estensi

Ferrara, Italy
01/2016 – 08/2018

- I built a website and a management/billing system in HTML, PHP, CSS and Javascript

Technical skills

Task automation	UNIX shell, Linux programming, Sublime, text processing
Development & Tooling	Visual Studio Code, git, GitHub CI, semantic versioning
Reporting	LaTeX, Jupyter, quarto
General purpose programming	Julia, Python, C++, Haskell, Java
Low-level programming	LLVM, C (parallel computing with MPI, OpenMP, pthread, CUDA)
Full stack programming	REST APIs (e.g., FastAPI), Angular, jQuery, SQL (MySQL, PostgreSQL, MariaDB), PHP, Typescript, Javascript
Machine learning	scikit-learn, pytorch, computer vision (opencv, R-CNNs), data processing & cleaning
Natural language processing	text embeddings, Large Language Models (llama.cpp, ollama, GPU, CPU)
Other	Reproducibility, abstraction, functional/recursive thinking

Soft skills

Communication	Precise communication, attention to the editorial style
Workload	Handling many projects in parallel, presenting results and meeting deadlines
Attitude	Constructive behavior, lateral thinking

Relevant projects

Sole.jl – Third Millennium Symbolic Learning in Julia — *University of Ferrara*, *2023–*

The first framework for symbolic machine learning. Presented at JuliaCon2023 and JuliaCon2024.

ModalDecisionTrees.jl – Interpretable models for time series classification! — *University of Ferrara*, *2021–2023*

Interpretable classification of data with dimensional components, such as audio recordings, images, videos, and EEG signals. Presented at JuliaCon2022.

Transparent COVID–19 diagnosis from audio samples of breath and cough — *University of Ferrara*, *2021*

Modal decision trees allow the extraction of knowledge in *explicit* form, able to explain the relation between vocal patterns in cough/breath samples and the presence of COVID-19 in a human subject. [1]

Pitòn – Rule extraction from MySQL databases — *University of Ferrara*, *2020*

Laravel Package (PHP) for training rule-based classification models from data stored in MySQL databases.

Dimensionality reduction: a performance comparison of PCA, LDA and FJLT — *National University of Singapore*, *2019*

EasyG – Classifying Electrocardiograms using deep learning — *University of Gothenburg*, *2019*

Extracurriculars & awards

2024 **Participant**, SEED Programme - Sustainable Entrepreneurial Ecosystem Development
Speaker, JuliaCon – Official Julia conference
2023 **Member**, it-ER Ambassador network
Speaker, JuliaCon – Official Julia conference
2022 **Winner**, Acceleration Programme @ MAGICA Summer School, H-Farm
Speaker, JuliaCon – Official Julia conference (online edition)
Participant, Technological Contest @ 37th Italian Conference on Computational Logic (CILC)
2021 **Finalist**, Huawei Italy University Challenge
Participant, Talents for Open Innovation
TV & news appearance, Focus on a research work I conducted on TV program “Oggi è un Altro Giorno”
2019 **Participant**, CS&E Hackathon (Göteborg)
2018 **Finalist**, How to fight global warming with your wallet (TEDxGöteborg)

Personal interests

Learning	Touch typing, ergonomics, codes, ricing, languages
Music	Arrangement, Professional studies of jazz guitar and piano
Entertainment	Video-editing, improv, stand-up comedy
Sport	Climbing, table tennis

Publications

[1] F. Manzella, **G. Pagliarini**, G. Sciavicco, and I. E. Stan. "Interval Temporal Random Forests with an Application to COVID-19 Diagnosis". In: *Proceedings of the 28th International Symposium on Temporal Representation and Reasoning (TIME)*. Vol. 206. LIPIcs. Schloss Dagstuhl – Leibniz-Zentrum für Informatik, 2021, 7:1–7:18. URL: https://doi.org/10.4230/LIPIcs.TIME.2021.7.

[2] P. Cavina, F. Manzella, **G. Pagliarini**, G. Sciavicco, and I. E. Stan. "(Un)supervised Univariate Feature Extraction and Selection for Dimensional Data". In: *itaDATA*. 2023. URL: https://ceur-ws.org/Vol-3606/paper51.pdf.

[3] **G. Pagliarini**. *Modal Symbolic Learning: from theory to practice*. Università degli Studi di Parma. Dipartimento di Scienze Matematiche …, 2024.

[4] G. Bonaccorsi, M. Giganti, M. Nitsenko, **G. Pagliarini**, G. Piva, and G. Sciavicco. "Predicting treatment recommendations in postmenopausal osteoporosis". In: *J. Biomed. Informatics* 118 (2021), p. 103780. URL: https://doi.org/10.1016/j.jbi.2021.103780.

[5] **G. Pagliarini** and G. Sciavicco. "Decision Tree Learning with Spatial Modal Logics". In: *Proceedings 12th International Symposium on Games, Automata, Logics, and Formal Verification (GandALF)*. Vol. 346. EPTCS. 2021, pp. 273–290. URL: https://doi.org/10.4204/EPTCS.346.18.

[6] **G. Pagliarini**, G. Sciavicco, and I. E. Stan. "Multi-Frame Modal Symbolic Learning". In: *Proceedings of the 3rd Workshop on Artificial Intelligence and Formal Verification, Logic, Automata, and Synthesis hosted by the 12th International Symposium on Games, Automata, Logics, and Formal Verification (GandALF)*. Vol. 2987. CEUR Workshop Proceedings. CEUR-WS.org, 2021, pp. 37–41. URL: https://ceur-ws.org/Vol-2987/paper7.pdf.

[7] M. Coccagna, F. Manzella, S. Mazzacane, **G. Pagliarini**, and G. Sciavicco. "Statistical and Symbolic Neuroaesthetics Rules Extraction from EEG Signals". In: *Proceedings of the 9th International Work-Conference on the Interplay Between Natural and Artificial Computation (IWINAC)*. Vol. 13258. Lecture Notes in Computer Science. Springer, 2022, pp. 536–546. URL: https://doi.org/10.1007/978-3-031-06242-1%5C_53.

[8] I. E. Stan, G. Sciavicco, E. Muñoz-Velasco, **G. Pagliarini**, M. Milella, and A. Paradiso. "On Modal Logic Association Rule Mining". In: *Proceedings of the 23rd Italian Conference on Theoretical Computer Science (ICTCS)*. Vol. 3284. CEUR Workshop Proceedings. CEUR-WS.org, 2022, pp. 53–65. URL: https://ceur-ws.org/Vol-3284/492.pdf.

[9] D. Della Monica, **G. Pagliarini**, G. Sciavicco, and I. E. Stan. "Decision Trees with a Modal Flavor". In: *Proceedings of the 21st International Conference of the Italian Association for Artificial Intelligence (AIxIA)*. Vol. 13796. Lecture Notes in Computer Science. Springer, 2022, pp. 47–59. URL: https://doi.org/10.1007/978-3-031-27181-6%5C_4.

[10] **G. Pagliarini**, S. Scaboro, G. Serra, G. Sciavicco, and I. E. Stan. "Neural-Symbolic Temporal Decision Trees for Multivariate Time Series Classification". In: *29th International Symposium on Temporal Representation and Reasoning (TIME)*. Vol. 247. LIPIcs. Schloss Dagstuhl – Leibniz-Zentrum für Informatik, 2022, 13:1–13:15. URL: https://doi.org/10.4230/LIPIcs.TIME.2022.13.

[11] **G. Pagliarini** and G. Sciavicco. "Interpretable Land Cover Classification with Modal Decision Trees". In: *European Journal of Remote Sensing* 56.1 (2023), p. 2262738. URL: https://doi.org/10.1080/22797254.2023.2262738.

[12] M. Milella, **G. Pagliarini**, A. Paradiso, and I. E. Stan. "Multi-Models and Multi-Formulas Finite Model Checking for Modal Logic Formulas Induction". In: *Short Paper Proceedings of the 4th Workshop on Artificial Intelligence and Formal Verification, Logic, Automata, and Synthesis hosted by the 21st International Conference of the Italian Association for Artificial Intelligence (AIxIA)*. Vol. 3311. CEUR Workshop Proceedings. CEUR-WS.org, 2022, pp. 81–85. URL: https://ceur-ws.org/Vol-3311/paper13.pdf.

[13] F. Manzella, **G. Pagliarini**, G. Sciavicco, and I. E. Stan. "The voice of COVID-19: Breath and cough recording classification with temporal decision trees and random forests". In: *Artificial Intelligence in Medicine* 137 (2023), p. 102486. URL: https://doi.org/10.1016/j.artmed.2022.102486.

[14] G. Bechini, E. Losi, L. Manservigi, **G. Pagliarini**, G. Sciavicco, I. E. Stan, and M. Venturini. "Statistical Rule Extraction for Gas Turbine Trip Prediction". In: *Journal of Engineering for Gas Turbines and Power* 145.5 (2023). URL: https://doi.org/10.1115/1.4056287.

[15] E. Caselli, M. Coccagna, A. Gatti, F. Manzella, S. Mazzacane, **G. Pagliarini**, V. Sironi, and G. Sciavicco. "Towards an Objective Theory of Subjective Liking: a First Step in Understanding the Sense of Beauty". In: *Plos ONE* 8.6 (2023), pp. 1–20. URL: https://doi.org/10.1371/journal.pone.0287513.

[16] **G. Pagliarini**, A. Paradiso, S. Rubin, G. Sciavicco, and I. E. Stan. "Heuristic Minimization Modulo Theory of Modal Decision Trees Class-Formulas". In: *Short Paper Proceedings of the 5th Workshop on Artificial Intelligence and Formal Verification, Logic, Automata, and Synthesis hosted by the 22nd International Conference of the Italian Association for Artificial Intelligence (AIxIA)*. Vol. 3629. CEUR Workshop Proceedings. CEUR-WS.org, 2023, pp. 49–53. URL: https://ceur-ws.org/Vol-3629/paper8.pdf.

[17] P. Cavina, F. Manzella, **G. Pagliarini**, G. Sciavicco, and I. E. Stan. "(Un)supervised Univariate Feature Extraction and Selection for Dimensional Data". In: *Proceedings of the 2nd Italian Conference on Big Data and Data Science (ITADATA)*. Vol. 3606. CEUR Workshop Proceedings. CEUR-WS.org, 2023. URL: https://ceur-ws.org/Vol-3606/paper51.pdf.

[18] M. Ghiotti, F. Manzella, **G. Pagliarini**, G. Sciavicco, and I. E. Stan. "Evolutionary Explainable Rule Extraction from (Modal) Random Forests". In: *ECAI 2023 - 26th European Conference on Artificial Intelligence, September 30 - October 4, 2023, Kraków, Poland - Including 12th Conference on Prestigious Applications of Intelligent Systems (PAIS 2023)*. Vol. 372. Frontiers in Artificial Intelligence and Applications. IOS Press, 2023, pp. 827–834. URL: https://doi.org/10.3233/FAIA230350.

[19] F. Manzella, **G. Pagliarini**, G. Sciavicco, and I. E. Stan. "Efficient Modal Decision Trees". In: *Advances in Artificial Intelligence - Proceedings of the 22nd International Conference of the Italian Association for Artificial Intelligence (AIxIA)*. Vol. 14318. Lecture Notes in Computer Science. Springer, 2023, pp. 381–395. URL: https://doi.org/10.1007/978-3-031-47546-7%5C_26.

Personal Data

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