Matteo **Tiezzi**

PostDoctoral Research Fellow · Artificial Intelligence and Machine Learning

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I am a Post-Doctoral Research Fellow at the Siena Artificial Intelligence Lab (SAILab), University of Siena. My research interests lie in the areas of Graph Representation Learning and Continual Learning. My current focus revolves around foundational research on novel learning algorithms with the final goal of developing agents capable of processing and learning from continuous streams of data, mostly within dynamic visual environments. I am deeply passionate about the emerging field of Graph Representation Learning, specifically in defining novel paradigms for expressive and powerful Graph Neural Networks. I am committed to developing open-source libraries for training and inference in GNNs.

Education

Ph.D. in Information Engineering and Machine Learning - **Final grade: Excellent with honours** — *Siena, Italy*

University of Siena, SAILab (Siena Artificial Intelligence Laboratory) — *2020*

- *Thesis title* : Local Propagation in Neural Network Learning by Architectural Constraints; *Advisor*: Prof. Marco Maggini

M.Sc. Computer and Automation Engineering - **Final grade: 110/110 with honours** — *Siena, Italy*

University of Siena — *2017*

- *Thesis title* : Traffic events monitoring with Recurrent Neural Networks; *Advisor*: Prof. Marco Maggini

B.Sc. Computer and Information Engineering - **Final grade: 108/110** — *Siena, Italy*

University of Siena — *2014*

- *Thesis title* : Automatic extraction of relevant information from Web pages using XPath; *Advisor*: Prof. Marco Maggini

Experience

Postdoctoral Research Fellow — *SAILab, University of Siena*

Grant PRIN 2017 REXLEARN - Advisor: Prof. Stefano Melacci — *October 2020-Present*

- Conducted research studies on unsupervised and self-supervised learning in the open-set class incremental setting, in order to devise agents that live and learn continuously in visual environments.
- Research on reliability, interpretability of machine learning models and their robustness to adversarial attacks in visual environments.
- Investigated learning algorithms that alter the input data with the goal of facilitating the learning process of a neural classifier.
- Introduced novel neural architectures based on human-like focus of attention mechanisms, in order to hinder spurious correlations, foster continual learning schemes and improve computational capabilities for Computer Vision.
- Investigated and explored the usage of GNNs to speed-up and generalize graph visualization in the area of Graph Drawing.

PhD Candidate, University of Siena — *SAILab, University of Siena*

Three years PhD Scholarship at the Department of Information Engineering, University of Siena, Italy — *2017-2020*

- Foundational studies on novel learning algorithms for feedforward neural networks and Graph Neural Networks (GNNs). Development of open-source code multi-platform (Tensorflow 1.x, PyTorch) libraries for GNN training and inference.
- Analysis on the role of human-like focus of attention mechanisms for the information transfer in neural architectures.
- Designed, developed and maintained code repositories to support result reproducibility.
- Presented at multiple international venues/conferences, represented the research group at external meetings/seminars and press interviews.

Intern, isTech — *Pistoia, Italy*

Six months scholarship as a graduate intern student at IsTech, Pistoia, Italy — *2017*

- Research internship for the validation of a prototype system for vehicle traffic events monitoring. Collected and preprocessed data, contributed on the engineering and design of datasets. Devised architectures, training and testing pipelines for the proposed solution. Deployment of the proposed solution in a real world environment.

Intern, QuestIt — *DIISM. Siena, Italy*

Three months scholarship as an undergraduate student at QuestIt, Siena, Italy — *2014*

- Usage of XPath to extract relevant information from web pages as input to the sentiment analysis tool MySnooper.

Courses: Graph Neural Networks and Neural-Symbolic Computation — *MAASAI, Universite Cote d'Azur (Nice, France) and UNIFI (Florence, Italy)*

Course assistant, seminar, lecturer and organization of the laboratory session — *2021, 2022*

- International M.Sc. course, 2022, MAASAI, Universite Cote d'Azur
- PhD and M.Sc. course, 2021, MAASAI, Universite Cote d'Azur and UNIFI (Florence, Italy)
- Deep Learning Summer School @ UCA, 2021, UCA, Nice, France

Selected Publications

Journal Articles

Graph neural networks for graph drawing — *[DOI]*

M. Tiezzi, G. Ciravegna and M. Gori — *2022*

IEEE Transactions on Neural Networks and Learning Systems (TNNLS)

Deep Constraint-based Propagation in Graph Neural Networks [DOI]

M. Tiezzi, G. Marra, S. Melacci, M. Maggini 2020

IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)

Conference Proceedings

Continual Learning with Pretrained Backbones by Tuning in the Input Space [ArXiv]

S. Marullo, M. Tiezzi, M. Gori, S. Melacci, T. Tuytelaars 2023

International Joint Conference on Neural Networks - IJCNN 2023

Foveated Neural Computation [DOI]

M. Tiezzi, S. Marullo, A. Betti, E. Meloni, L. Faggi, M. Gori and S. Melacci 2022

23rd European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases - ECML-PKDD 2022

Stochastic Coherence Over Attention Trajectory For Continuous Learning In Video Streams [DOI]

M. Tiezzi, S. Marullo, L. Faggi, E. Meloni, A. Betti and S. Melacci 2022

31st International Joint Conference on Artificial Intelligence - IJCAI-ECAI 2022

Being Friends Instead of Adversaries: Deep Networks Learn from Data Simplified by Other Networks [DOI]

S. Marullo, M. Tiezzi, M. Gori, S. Melacci 2022

2022 AAAI Conference on Artificial Intelligence - AAAI 2022

A Lagrangian Approach to Information Propagation in Graph Neural Networks [DOI]

M. Tiezzi, G. Marra, S. Melacci, M. Maggini, M. Gori 2020

European Conference on Artificial Intelligence - ECAI2020

Local Propagation in Constraint-based Neural Networks [DOI]

G.Marra, M. Tiezzi, S. Melacci, A.Betti, M. Maggini, M. Gori 2020

International Joint Conference on Neural Networks (IJCNN2020)

Focus of Attention Improves Information Transfer in Visual Features [DOI]

M. Tiezzi, S. Melacci, A.Betti, M. Maggini, M. Gori 2020

34th Conference on Neural Information Processing Systems - NeurIPS 2020

Inductive–transductive learning with Graph Neural Networks [DOI]

A. Rossi, M. Tiezzi, GM. Dimitri, M. Bianchini, M. Maggini, F. Scarselli 2018

Artificial Neural Networks in Pattern Recognition: 8th IAPR TC3 Workshop - ANNPR 2018

Selected Projects

The Graph Neural Network Framework [Link]

Documentation: http://sailab.diism.unisi.it/gnn/ 2018/2020

*Tensorflow 1.x **(link)** and PyTorch **(link)** implementations of the original GNN model*

Foveated Convolutional Layers [Link]

Documentation **(link)** 2022

PyTorch package for the Foveated Convolutional Layers (FCL)

Program Committees & Peer Reviewer

PC Member: AAAI2023, IJCA-ECAI2022, ICANN2022, AAAI2022

Peer Reviewer: **International Conferences:** NeurIPS 2023, IJCAI 2023, IJCAI-ECAI 2022, ICPR 2022, ICANN 2019. **Journals:** IEEE TPAMI, IEEE TNNLS, IEEE TKDE, Artificial Intelligence Journal, Knowledge-Based Systems (KNOSYS), Neurocomputing, AI Open

Competitions, Grants & Awards

2022 **Special Mention**, ”Marco Cadoli” prize for Best PhD thesis on Artificial Intelligence *AIxIA*

2018 **Hackaton**, SoBigData Soccer Data Challenge, member of the winning team and main speaker *Pisa, Italy*

2018 **Scholarship**, Recurrent neural networks for vehicle traffic event and state monitoring, *DIISM and IsTech*

2017 **Scholarship**, Three years Ph.D. Scholarship at Department of Information Engineering *Siena, Italy*

2017 **”Matteo Lanzoni” Prize** , winner of the best thesis award on road safety *Florence, Italy*

Skills

Programming languages (sorted) Python, C++, C

Frameworks and Tools PyTorch, TensorFlow, OpenCV, SciPy, NumPy, Pandas, NetworkX, Git, Bash

Document Preparation Systems LaTeX, Markdown, Microsoft Office

Languages Italian, English