Matteo **Tiezzi**

PostDoctoral Research Fellow · Artificial Intelligence and Machine Learning

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I am generally interested in Artificial Intelligence, Machine learning, and other connected areas of Computer Science. In particular I am delving into the application of Deep Learning models to sequence and video analysis, and fundational studies regarding novel learning algorithms and neural models. I am currently working in the development of visual agents able to process and learn from a continuous stream of data (*Learning in Visual Environments)*. This approach rises from the conjuction of several notions, such as the Principle of Cognitive Action, Motion Invariance, Focus of Attention and Information Theory, in order to develop robust visual features and devise a Lifelong Learning scheme. My recent contributes are related to foundational studies on novel learning algorithms based on constraint-based optimization (*Constraint-based Neural Networks*). Moreover, my interests include the emerging field of non-euclidean Deep Learning, in particular Graph Neural Networks. I proposed a novel model, based on a constraint-based approach and solved with a Lagrangian formulation, to foster the Information diffusion in Graph Neural Networks.

Education

Ph.D. in Information Engineering, Artificial Intelligence and Machine Learning

Siena, Italy

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

- *Final grade*: Excellent with honours
- *Thesis title* : Local Propagation in Neural Network Learning by Architectural Constraints
- *Advisor*: Prof. Marco Maggini

M.Sc. Computer and Automation Engineering (Information Systems)

Siena, Italy

University of Siena *2017*

- *Final grade*: 110/110 with honours
- *Thesis title* : Traffic events monitoring with Recurrent Neural Networks
- *Advisor*: Prof. Marco Maggini

B.Sc. Computer and Information Engineering

Siena, Italy

University of Siena *2014*

- *Final grade*: 108/110
- *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 *October 2020-Present*

- Devising agents that live and learn continuously in visual environments, leveraging time-related information and consistencies.
- Conducted research studies on unsupervised and self-supervised learning in the open-set class incremental setting.
- Studies on the interpretability of machine learning models and their robustness to adversarial attacks in visual environments.
- Investigate learning algorithms that alter the input data with the goal of facilitating the learning process of a neural classifier.
- Introduction of 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.

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.
- Unsupervised learning to maximize the visual information transfer of neural networks models in online/streaming settings.
- 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, using Recurrent Neural Networks.
- Collected and preprocessed data, contributed expertise on the engineering and design of datasets.
- Devised architecture, 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*

- Analysis and information extraction from web pages HTML content.
- Usage of XPath to extract relevant information from web pages as input to the sentiment analysis tools MySnooper.

Academic Experience

Graph Neural Networks and Neural-Symbolic Computation @ MAASAI — *MAASAI, Universíte Coíe d'Azur*

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

- International M.Sc. course

PhD course on Graph Neural Networks and Neural-Symbolic Computation — *MAASAI, Universíte Coíe d'Azur and UNIFI (Florence, Italy)*

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

- PhD and M.Sc. courses

UCA Summer School: Graph Neural Networks and Neural-Symbolic Computation — *Deep Learning Summer School @ UCA, Nice, France*

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

- Summer School

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 Unsupervised Learning for Optical Flow Estimation with Deep Networks — *[DOI:TBA]*

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

1st Conference on Lifelong Learning Agents - CoLLas 2022

Continual Learning through Hamilton Equations — *[DOI:TBA]*

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

1st Conference on Lifelong Learning Agents - CoLLas 2022

Foveated Neural Computation — *[DOI:TBA]*

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 — *[Arxiv]*

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

2022 AAAI Conference on Artificial Intelligence - AAAI 2022

Evaluating Continual Learning Algorithms by Generating 3D Virtual Environments — *[Arxiv]*

E. Meloni, A. Betti, L. Faggi, S. Marullo. M. Tiezzi, S. Melacci — *2021*

CSSL@IJCAI 2021 International Workshop on Continual Semi-Supervised Learning - CSSL 2021

Messing Up 3D Virtual Environments: Transferable Adversarial 3D Objects — *[DOI]*

E. Meloni, M. Tiezzi, L. Pasqualini, M. Gori, S. Melacci — *2021*

20th IEEE International Conference on Machine Learning and Applications - ICMLA 2021

Friendly Training: Neural Networks Can Adapt Data To Make Learning Easier — *[DOI]*

S. Marullo, M. Tiezzi, M. Gori, S. Melacci — *2021*

2021 International Joint Conference on Neural Networks - IJCNN 2021

SAILenv: Learning in Virtual Visual Environments Made Simple — *[DOI]*

E. Meloni, L. Pasqualini, M. Tiezzi, M. Gori, S. Melacci — *2020*

International Conference on Pattern Recognition 2020 - ICPR 2020

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

Deep Lagrangian Propagation in Graph Neural Networks [DOI]

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

Graph Representation Learning and Beyond, ICML 2020 Workshop - GRL+

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 - ECAI 2020

Vulgaris: Analysis of a Corpus for Middle-Age Varieties of Italian Language [Arxiv]

A. Zugarini, M. Tiezzi, M. Maggini 2020

VarDial@COLING 2020 - VarDial2020

Lagrangian Propagation Graph Neural Network [DOI]

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

AAAI 2020 W8S Workshop (Deep Learning on Graphs: Methodologies and Applications - DLGMA'20

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

Video Surveillance of Highway Traffic Events by Deep Learning Architectures [DOI]

M. Tiezzi, S. Melacci, M. Maggini, A. Frosini 2018

International Conference on Artificial Neural Networks (ICANN2018)

Inductive–Transductive Learning with Graph Neural Networks [DOI]

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

IAPR Workshop on Artificial Neural Networks in Pattern Recognition - ANNPR2018

Program Committees

2022 **Thirty-Seventh AAAI Conference on Artificial Intelligence (AAAI2023)**, PC member

2022 **31st International Joint Conference on Artificial Intelligence (IJCA-ECAI2022)**, Emergency PC member

2022 **International Conference on Artificial Neural Networks (ICANN2022)** , PC member

2021 **Thirty-Six AAAI Conference on Artificial Intelligence (AAAI2022)**, PC member

Peer Reviewer

International Conferences

IJCAI-ECAI 2022, ICPR 2022, ICANN 2019

Journals

IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), IEEE Transactions on Neural Networks and Learning Systems (TNNLS), Transactions on Knowledge and Data Engineering (TKDE), Artificial Intelligence Journal, Knowledge-Based Systems (KNOSYS), Entropy, Neurocomputing, Computational and Structural Biotechnology Journal, AI Open

Students supervision

M.Sc. Thesis "Aggregation Functions in Graph Neural Networks" *Siena, Italy*

Co-advisor of the student Faezeh Amou Najafabadi *2022*

B.Sc. Thesis "Real world experimentation of Systems for Video Object Detection" *Siena, Italy*

Co-advisor of the student Giulio Campagna *2018*

Speaker and organization

ACDL Workshop on Graph Neural Networks *Siena, Italy*

Organizer and Speaker *July 2019*

LinuxDay meets Artificial Intelligence @ SIENA *Siena, Italy*

Speaker *June 2019*

Artificial Intelligence, Machine Learning and Big Data — *Pistoia, Italy*
Speaker — *June 2018*

Grants & Awards

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	**Winner**, "Matteo Lanzoni" Prize for best thesis on road safety	*Florence, Italy*
2018	**Hackaton**, SoBigData Soccer Data Challenge, member of the winning team	*Pisa, Italy*
2022	**Special Mention**, "Marco Cadoli" prize for Best PhD thesis on Artificial Intelligence	*Italian Association for AI (AIxIA)*

Skills

Programming	C, C++, Python, Bash, OCaml, LaTeX
Frameworks and Libraries	PyTorch, TensorFlow, OpenCV, SciKit
Development Env	Microsoft Visual Studio, Pycharm, NetBeans, Jupyter Notebook
Document Preparation Systems	LaTeX, Markdown, Microsoft Office
Applications	Microsoft Office, OpenOffice, Gimp, Sony Vegas
Operative Systems	Windows (all versions), Linux (mainly Ubuntu)
Languages	Italian, English