Andrea Cini

Ph.D. Candidate

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Research interests

My research focuses on methods, theory, and practice of processing **time series** and **graph-structured data**. Applications are in time series analysis and **forecasting**, with a focus on **energy analytics** and **biomedical signal processing**. I am also broadly interested in the use of machine learning methods to accelerate scientific discovery and engineering.

Education

2019– 2024(expected) **PhD in Informatics**, *The Swiss AI Lab IDSIA USI-SUPSI, Università della Svizzera italiana*, Lugano, Switzerland, Advisor: Prof. **Cesare Alippi**.
- Time Series Analysis
- Graph Deep Learning

2023 **Visiting PhD**, *Imperial College London*, London, United Kingdom, Host: Prof. Danilo Mandic.
- Graph-based spatiotemporal forecasting.
- Hierarchical time series.

2016–2018 **MSc in Computer Science and Engineering**, *Politecnico di Milano*, Milan, Italy, Final grade: 110/110 cum Laude, GPA: 29.3/30.
- Machine Learning
- Data Science

2013–2016 **BSc in Computer Science and Engineering**, *Politecnico di Milano*, Milan, Italy, Final grade: 110/110, GPA: 28.3/30.
- Computer Science
- Software Engineering

Job Positions

2019– (ongoing) **Teaching Assistant**, *Università della Svizzera italiana (USI)*, Lugano, Switzerland.
- Designing and delivering lectures and tutorials.
- Hands-on sessions.
- Student assessment and supervision.

2018–2019 **R&D Machine Learning Engineer**, *Argotec*, Turin, Italy.
Working on research-oriented Machine Learning projects for aerospace applications.
- Reinforcement learning for satellite attitude control.
- Applied computer vision.

Teaching

Courses

2022 **Graph Deep Learning**, *MSc, USI*, Teaching assistant and lecturer, Director: Prof. Alippi.

2020–2024 **Advanced Topics in Machine Learning**, *MSc, USI*, Teaching assistant and lecturer, Director: Prof. Alippi.

2020,2021 **Machine Learning**, *BSc & MSc, USI*, Teaching assistant and lecturer, Director: Prof. Alippi.

2019 **Software Performance**, *MSc, USI*, Teaching assistant, Director: Prof. Hauswirth.

Thesis Supervisor

2023– (ongoing) **Valentina Moretti**, *MSc @ Politecnico di Milano*, Thesis: State Initialization in Recurrent Neural Networks.

2022 **Arshjot Khehra**, *MSc @ USI*, Thesis: Hierarchical Graph Reinforcement Learning, Data Scientist at Swiss Data Science Center.

2022 **Simone Eandi**, *MSc @ USI*, Thesis: Spatio-Temporal Graph Neural Networks for aggregate load forecasting, Machine Learning Engineer at Intesa.

2022 **Hrittik Roy**, *MSc @ USI*, Thesis: Geometric Aspects of Reinforcement Learning, PhD student at Technical University of Denmark.

2020 **Gabriel Carraretto**, *BSc @ USI*, Thesis: Graph Representations for Skeleton-based Action Recognition, MSc student at USI.

2019 **Gloria Sassone**, *BSc @ USI*, Thesis: Exploiting AI for automatic gender stereotypes detection in Disney movies, MSc student at USI.

Talks

Seminars and invited talks

2024 **Graph Deep Learning for Time Series Forecasting**, *Oxford Networks and Society Group*, Held a seminar to Prof. Xiowen Dong's group at the University of Oxford.

2023 **Scalable Spatiotemporal Graph Neural Networks**, *Temporal Graph Learning Reading Group (online)*, Invited to present my work on scalable graph-based predictors.

2022 **Graph Deep Learning for Time Series Imputation**, *Baker Hughes*, Invited to give a seminar about my work on time series imputation to the AI team of Baker Hughes.

2022 **Deep Reinforcement Learning with Weighted Q-Learning**, *TU Dresden*, Invited to talk about my work on Weighted Q-Learning at the Conference on Reinforcement Learning at TU Dresden.

Tutorials

2023 **Graph Deep Learning for Spatiotemporal Time Series**, *Organized tutorial on graph deep learning for time series processing at ECML PKDD 2023.*

Paper presentations

2024 **Graph-based Virtual Sensing from Sparse and Partial Multivariate Observations**, *Presentation of [1] at the International Conference of Learning Representations (ICLR).*

2023 **Graph-based Time Series Clustering for End-to-End Hierarchical Forecasting**, *Presentation of [1] at the Neural Information Processing Systems (NeurIPS) conference.*

2023 **Sparse Graph Learning from Spatiotemporal Time Serie**, *Presentation of [6] at the Neural Information Processing Systems (NeurIPS) conference.*

2023 **Taming Local Effects in Graph- based Spatiotemporal Forecastin**, *Presentation of [5, 6] at the Neural Information Processing Systems (NeurIPS) conference.*

2023 **Scalable Spatiotemporal Graph Neural Networks**, *Presentation of [3] at the 37th AAAI Conference on Artificial Intelligence.*

2022 **Scalable Spatiotemporal Graph Neural Networks (spotlight)**, *Spotlight presentation of [3] at the Temporal Graph Learning workshop within NeurIPS 2022.*

2022 **Learning to Reconstruct Missing Data from Spatiotemporal Graphs with Sparse Observation**, *Presentation of [8] at the Neural Information Processing Systems (NeurIPS) conference.*

2022 **Filling the G_ap_s: Multivariate Time Series Imputation by Graph Neural Networks**, *Presentation of [7] at the International Conference on Learning Representations (ICLR).*

2022 **Deep reinforcement learning with weighted Q-Learning**, *Presentation of [13] at The Multi-disciplinary Conference on Reinforcement Learning and Decision Making (RLDM).*

2020 **Cluster-based aggregate load forecasting with deep neural networks**, *Presentation of [17] at the International Joint Conference on Neural Networks (IJCNN).*

2019 **Exploiting Action-Value Uncertainty to drive Exploration in Reinforcement Learning**, *Presentation of [19] at the International Joint Conference on Neural Networks (IJCNN).*

Awards

2022 **Scalable Spatiotemporal Graph Neural Networks**, *TGL @ NeurIPS 22*, Best paper award at Temporal Graph Learning Workshop at NeurIPS 2022.

Research Grants

2023 **Doctoral mobility grant**, *Università della Svizzera italiana*, Grant for 6 months of doctoral mobility to investigate graph-based spatiotemporal forecasting at Imperial College London (**PI**, **18.5K CHF**).

Program Committee Member

Reviewer

Journals Journal of Machine Learning Research (JMLR), IEEE Transactions on Neural Networks (TNNLS), Neural Networks.

Conferences	Advances in Neural Information Processing Systems (NeurIPS) (top reviewer 2023), International Conference on Machine Learning (ICML), International Conference on Learning Representations (ICLR), AAAI Conference on Artificial Intelligence (AAAI), Learning on Graphs Conference (LOG), International Joint Conference on Neural Networks (IJCNN), European Symposium on Artificial Neural Networks (ESANN).

Scholarships

2013–2018	**Scholarship**, *Politecnico di Milano*, Reduced tuition for high merits.
2013	**Scholarship**, *Liceo Scientifico Giovanni da Castiglione*, Scholarship awarded to the best high-school graduate.

Open-source projects

2022	**Torch Spatiotemporal**, *https://github.com/TorchSpatiotemporal/tsl*, A PyTorch library built to accelerate research on neural spatiotemporal data processing methods, with a focus on Graph Neural Networks, Lead developer.

Languages

Italian	Mother tongue
English	Full professional working proficiency

References

Selected papers

[1] **A. Cini**, D. Mandic, and C. Alippi. "Graph-based Time Series Clustering for End-to-End Hierarchical Forecasting". In: *International Conference on Machine Learning* (2024).

[2] G. De Felice, **A. Cini**, D. Zambon, V. Gusev, and C. Alippi. "Graph-based Virtual Sensing from Sparse and Partial Multivariate Observations". In: *International Conference on Learning Representations*. 2024.

[3] **A. Cini**, I. Marisca, F. M. Bianchi, and C. Alippi. "Scalable Spatiotemporal Graph Neural Networks". In: *Proceedings of the AAAI Conference on Artificial Intelligence* (2023).

[4] **A. Cini**, I. Marisca, D. Zambon, and C. Alippi. "Graph Deep Learning for Time Series Forecasting". In: *arXiv preprint arXiv:2310.15978* (2023).

[5] **A. Cini**, I. Marisca, D. Zambon, and C. Alippi. "Taming Local Effects in Graph-based Spatiotemporal Forecasting". In: *Advances in Neural Information Processing Systems (NeurIPS)* (2023).

[6] **A. Cini**, D. Zambon, and C. Alippi. "Sparse Graph Learning from Spatiotemporal Time Series". In: *Journal of Machine Learning Research* 24.242 (2023), pp. 1–36.

[7] **A. Cini**, I. Marisca, and C. Alippi. "Filling the G_ap_s: Multivariate Time Series Imputation by Graph Neural Networks". In: *International Conference on Learning Representations (ICLR)* (2022).

[8] I. Marisca, **A. Cini**, and C. Alippi. "Learning to Reconstruct Missing Data from Spatiotemporal Graphs with Sparse Observations". In: *Advances in Neural Information Processing Systems (NeurIPS)* (2022).

Full list

[1] **A. Cini**, D. Mandic, and C. Alippi. "Graph-based Time Series Clustering for End-to-End Hierarchical Forecasting". In: *International Conference on Machine Learning* (2024).

[2] G. De Felice, **A. Cini**, D. Zambon, V. Gusev, and C. Alippi. "Graph-based Virtual Sensing from Sparse and Partial Multivariate Observations". In: *International Conference on Learning Representations*. 2024.

[9] L. Butera, **A. Cini**, A. Ferrante, and C. Alippi. "Relational Inductive Biases for Object-Centric Image Generation". In: *arXiv preprint arXiv:2303.14681* (2023).

[3] **A. Cini**, I. Marisca, F. M. Bianchi, and C. Alippi. "Scalable Spatiotemporal Graph Neural Networks". In: *Proceedings of the AAAI Conference on Artificial Intelligence* (2023).

[4] **A. Cini**, I. Marisca, D. Zambon, and C. Alippi. "Graph Deep Learning for Time Series Forecasting". In: *arXiv preprint arXiv:2310.15978* (2023).

[5] **A. Cini**, I. Marisca, D. Zambon, and C. Alippi. "Taming Local Effects in Graph-based Spatiotemporal Forecasting". In: *Advances in Neural Information Processing Systems (NeurIPS)* (2023).

[6] **A. Cini**, D. Zambon, and C. Alippi. "Sparse Graph Learning from Spatiotemporal Time Series". In: *Journal of Machine Learning Research* 24.242 (2023), pp. 1–36.

[10] N. A. Efkarpidis, S. Imoscopi, M. Geidl, **A. Cini**, S. Lukovic, C. Alippi, and I. Herbst. "Peak shaving in distribution networks using stationary energy storage systems: A Swiss case study". In: *Sustainable Energy, Grids and Networks* 34 (2023), p. 101018.

[11] T. Marzi, A. Khehra, **A. Cini**, and C. Alippi. "Feudal Graph Reinforcement Learning". In: *arXiv preprint arXiv:2304.05099* (2023).

[12] D. Zambon, **A. Cini**, L. Livi, and C. Alippi. "Graph state-space models". In: *arXiv preprint arXiv:2301.01741* (2023).

[13] **A. Cini**, C. D'Eramo, J. Peters, and C. Alippi. "Deep reinforcement learning with weighted Q-Learning". In: *The Multi-disciplinary Conference on Reinforcement Learning and Decision Making (RLDM)* (2022).

[7] **A. Cini**, I. Marisca, and C. Alippi. "Filling the G_ap_s: Multivariate Time Series Imputation by Graph Neural Networks". In: *International Conference on Learning Representations (ICLR)* (2022).

[14] S. Eandi, **A. Cini**, S. Lukovic, and C. Alippi. "Spatio-Temporal Graph Neural Networks for Aggregate Load Forecasting". In: *2022 International Joint Conference on Neural Networks (IJCNN)*. IEEE. 2022, pp. 1–8.

[15] L. Ferretti, **A. Cini**, G. Zacharopoulos, C. Alippi, and L. Pozzi. "Graph Neural Networks for High-Level Synthesis Design Space Exploration". In: *ACM Transactions on Design Automation of Electronic Systems* (2022).

[8] I. Marisca, **A. Cini**, and C. Alippi. "Learning to Reconstruct Missing Data from Spatiotemporal Graphs with Sparse Observations". In: *Advances in Neural Information Processing Systems (NeurIPS)* (2022).

[16] C. D'Eramo, **A. Cini**, A. Nuara, M. Pirotta, C. Alippi, J. Peters, and M. Restelli. "Gaussian Approximation for Bias Reduction in Q-Learning". In: *Journal of Machine Learning Research* 22 (2021), pp. 1–51.

[17] **A. Cini**, S. Lukovic, and C. Alippi. "Cluster-based aggregate load forecasting with deep neural networks". In: *2020 International Joint Conference on Neural Networks (IJCNN)*. IEEE. 2020, pp. 1–8.

[18] **A. Cini**, M. E. Hariry, and A. Balossino. "Neural Attitude Control: Nanosatellite attitude control with Deep Reinforcement Learning". In: *Interplanetary CubeSat Workshop (iCubeSat)*. 2019.

[19] C. D'Eramo, **A. Cini**, and M. Restelli. "Exploiting Action-Value Uncertainty to drive Exploration in Reinforcement Learning". In: *International Joint Conference on Neural Networks (IJCNN)*. 2019.