Gabriele Accarino, Ph.D.

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Fields of Specialization and Research Interests

My research focuses on applying Data Science and Machine Learning to tackle pressing challenges in Earth System Science. I specialize in the development of climate emulators, statistical downscaling methods, and the detection of extreme weather events such as tropical cyclones and wildfires. Currently, I am a Postdoctoral Research Scientist at Columbia University and the Learning the Earth with Artificial Intelligence and Physics (LEAP) STC, where I investigate multi-scale similarity metrics and spatio-temporal verification techniques for climate fields, as well as benchmark data- and physics-driven models.

Work & Academic Experience

Oct. 2024 – present **Postdoctoral Research Scientist** Columbia University, New York, NY, U.S.A.
Department of Earth and Environmental Engineering, Columbia University and the Learning the Earth with Artificial Intelligence and Physics (LEAP) NSF Science and Technology Center
Supervisors: Prof. Viviana Acquaviva (CUNY), Prof. Sara Shamekh (NYU) and Prof. Duncan Watson-Parris (UCSD)

Mar. 2024 – May 2024 **Visiting Research Scientist** Columbia University, New York, NY, U.S.A.
Department of Earth and Environmental Engineering, Columbia University and the Learning the Earth with Artificial Intelligence and Physics (LEAP) NSF Science and Technology Center
Supervisor: Prof. Pierre Gentine

Feb. 2023 – Sep. 2024 **Junior Scientist** Euro-Mediterranean Center on Climate Change, Lecce, Italy
Advanced Scientific Computing (ASC) Division, Institute for the Earth System Prediction (IESP)
Head of the Machine Learning Research Unit, group of 5 people

Nov. 2022 – Jan. 2023 **Adjunct Professor** in Information Processing Systems University of Salento, Lecce, Italy
Department of Biological and Environmental Sciences and Technologies, Nursing degree
Number of students: 96

Feb. 2022 – Jan. 2023 **Research Fellowship** in Computer Science University of Salento, Lecce, Italy
Department of Engineering for Innovation

Feb. 2022 – Jun. 2022 **Adjunct Professor** in High Performance Computing University of Salento, Lecce, Italy
Department of Engineering for Innovation, Computer Engineering degree
Number of students: 15

Dec. 2021 – Feb. 2022 **Appointment** Italian Government, Presidency of the Council of Ministers
Development of an automatic speech recognition system for investigative and forensic applications

May 2018 – Oct. 2018 **Post-Degree Research Assistant** Euro-Mediterranean Center on Climate Change, Lecce, Italy
Advanced Scientific Computing (ASC) Division

Education

Nov. 2018 – May 2022 **Ph.D.** in Environmental Sciences University of Salento, Lecce, Italy
Department of Biological and Environmental Sciences and Technologies.
Thesis title: "Exploring Machine Learning for Applications to the Climate Science Domain" (Hybrid computer–environmental science thesis)
Supervisors: Prof. Giovanni Aloisio and Prof. Luigi De Bellis

Jul. 2020 **Professional Qualification as Licensed Engineer (ICT Area)** University of Salento, Lecce, Italy

2016 – 2018 **M.Sc.** in Computer Engineering (summa cum laude) University of Salento, Lecce, Italy
Thesis title: "On the use of Deep Learning in the Climate Change domain"

2012 – 2015 **B.Sc.** in Information Engineering University of Salento, Lecce, Italy
Thesis title: "Control systems with Smith's Predictor, analysis and fundamental properties"

European & International Projects

Sep. 2022 – present **interTwin – Grant agreement ID: 101058386** HORIZON-RIA
Co-Supervisor and contributor in WP4, WP6 and WP7
Funds raised: € 581,562.50, total € 11,731,665.00
doi: https://cordis.europa.eu/project/id/101058386

Sep. 2022 – present **iMagine – Grant agreement ID: 101058625** HORIZON-RIA
Co-Supervisor and contributor in WP3 – Use Case 4
Funds raised: € 213,125.00, total € 4,500,000.00
doi: https://cordis.europa.eu/project/id/101058625

Oct. 2021 – present **SILVANUS – Grant agreement ID: 101037247** Innovation Action
Scientific Officer, WP4 leader, other Tasks leadership, Member of the Steering Committee of the project
Funds raised: € 571,375.00, total € 24,199,862.87
doi: https://cordis.europa.eu/project/id/101037247

Skills

Technical Skills

Data Analysis and Data Visualization (NumPy, Matplotlib, Pandas, SciPy, Sklearn, Pandas, etc.) ●●●●●
Knowledge and processing of climate data formats (e.g., NetCDF, Zarr) ●●●●●
Deep Learning Frameworks (PyTorch, TensorFlow, Keras) ●●●●◐
Design and development of ML pipelines, models and complex architectures ●●●●◐
Distributed training of ML models and parallel computing on HPC infrastructures ●●●●◐

Soft Skills

- **Strong Emotional Intelligence and Leadership**: my self-awareness and social skills make me an excellent leader and team player. Empathy is one of my core strengths, enabling me to connect deeply with my team members. I am an active listener, open to feedback, and excel in negotiations and conflict management, fostering a collaborative and positive work environment.
- **Effective Communication Skills**: confident in both public speaking and networking, I can present technical concepts with ease and clarity to both expert and non-expert audiences. My ability to communicate effectively ensures that project goals and objectives are clearly understood by all stakeholders.
- **Independent Work and Project Management**: I am ambitious, serious, and reliable, with a strong sense of responsibility. I excel in decision-making, time management, and organizing work effectively. My ability to focus, combined with creative and critical thinking skills, is essential for solving complex problems. Additionally, I have a proven track record in leading and supervising projects, ensuring they are completed successfully and on time.
- **Passionate, Self-Motivated, and Adaptable**: my positive and patient attitude makes me particularly flexible and adaptable to a wide range of working situations. My enthusiasm and self-motivation drive my continuous learning and passion for my field, enabling me to inspire and motivate my team to achieve their best.

Honors

2018 Leonardo Innovation Award 2018, Ph.D. Category — Leonardo S.p.a., Italy
ANIMA: An artificial intelligence tool for the migration analysis and projections

Publications

Publications in Peer-Reviewed Journals

1. Immorlano, F., Eyring, V., de Gouville, T. L. M., **Accarino, G.**, Elia, D., Mandt, S., Aloisio, G., & Gentine, P. (2025). Transferring climate change physical knowledge, *Proc. Natl. Acad. Sci. U.S.A.*, 122 (15) e2413503122. doi: https://doi.org/10.1073/pnas.2413503122

2. **Accarino, G.**, Donno, D., Immorlano, F., Elia, D., & Aloisio, G. (2023). An ensemble machine learning approach for tropical cyclone localization and tracking from ERA5 reanalysis data. *Earth and Space Science*, 10(11), e2023EA003106. doi: https://doi.org/10.1029/2023EA003106

3. Aloisi, V., Gatto, A., **Accarino, G.**, Donato, F., & Aloisio, G. (2022). The effect of known and unknown confounders on the relationship between air pollution and Covid-19 mortality in Italy: A sensitivity analysis of an ecological study based on the E-value. *Environmental research*, 207, 112131. doi: https://doi.org/10.1016/j.envres.2021.112131

4. Gatto A., Aloisi V., **Accarino G.**, Immorlano F., Chiarelli M. & Aloisio G. (2022). An Artificial Neural Network-Based Approach for Predicting the COVID-19 Daily Effective Reproduction Number Rt in Italy. *AI*, 3(1):146-163. doi: https://doi.org/10.3390/ai3010009

5. **Accarino G.**, Chiarelli M., Immorlano F., Aloisi V., Gatto A. & Aloisio G. (2021). MSG-GAN-SD: A Multi-Scale Gradients GAN for Statistical Downscaling of 2-Meter Temperature over the EURO-CORDEX Domain. *AI*, 2(4):600-620. doi: https://doi.org/10.3390/ai2040036

6. **Accarino, G.**, Chiarelli, M., Fiore, S., Federico, I., Causio, S., Coppini, G., & Aloisio, G. (2021). A multi-model architecture based on Long Short-Term Memory neural networks for multi-step sea level forecasting. *Future Generation Computer Systems*, 124, 1-9. doi: https://doi.org/10.1016/j.future.2021.05.008

7. Gatto, A., **Accarino, G.**, Aloisi, V., Immorlano, F., Donato, F., & Aloisio, G. (2021, August). Limits of Compartmental Models and new opportunities for machine learning: A case study to forecast the second wave of COVID-19 hospitalizations in Lombardy, Italy. In *Informatics*, Vol. 8, No. 3, p. 57. doi: https://doi.org/10.3390/informatics8030057

8. **Accarino, G.**, Lorenzetti, S., & Aloisio, G. (2021). Assessing correlations between short-term exposure to atmospheric pollutants and COVID-19 spread in all Italian territorial areas. *Environmental Pollution*, 268, 115714. doi: https://doi.org/10.1016/j.envpol.2020.115714

Pre-prints & Submitted Papers

1. **Accarino, G.**, De Carlo, M. M., Atake, I., Elia, D., Dissanayake, A. L., Sepp Neves, A. A., Peña Ibañez, J., Epicoco, I., Nassisi, P., Fiore, S., & Coppini, G. (2025). Improving Oil Slick Trajectory Simulations with Bayesian Optimization. arXiv preprint. doi: https://doi.org/10.48550/arXiv.2503.02749

Workshop & Conference Publications

2. **Accarino, G.**, Acquaviva, V., Shamekh, S., & Watson-Parris D. (2024). Improved Evaluation Methods for Earth System Models (No. GC51X-0297). AGU 2024, 9-13 December 2024, Washington D.C.

3. Atake, I., **Accarino, G.**, De Carlo, M., Elia, D., Coppini, G., & Aloisio, G. (2024). Optimizing Medslik-II: Parametrization through a bayesian search algorithm applied at the Baniyas oil spill incident (Syria, 2021) (No. EGU24-7256). *Copernicus Meetings*.

4. D'Anca, A., Scardigno, S., Ejarque, J., **Accarino, G.**, Peano, D., Immorlano, F., ... & Aloisio, G. (2024). An end-to-end workflow for climate data management and analysis integrating HPC, Big Data and Machine Learning (No. EGU24-11774). *Copernicus Meetings*.

5. Elia, D., Antonio, F., Fiore, S., Donno, E., **Accarino, G.**, Nassisi, P., & Aloisio, G. (2024). A Data Space environment for big data and ML-based climate applications in the European Open Science Cloud (No. EGU24-17472). *Copernicus Meetings*.

6. Elia, D., Scardigno, S., Ejarque, J., D'Anca, A., **Accarino, G.**, Scoccimarro, E., ... & Aloisio, G. (2023, November). End-to-End Workflows for Climate Science: Integrating HPC Simulations, Big Data Processing, and Machine Learning. In Proceedings of the SC'23 Workshops of *The International Conference on High Performance Computing, Network, Storage, and Analysis* (pp. 2042-2052).

7. **Accarino, G.**, Elia, D., Donno, D., Immorlano, F., & Aloisio, G. (2023). A machine learning-powered Digital Twin for extreme weather events analysis (No. EGU23-6060). *Copernicus Meetings*.

8. Elia, D., Scardigno, S., D'Anca, A., **Accarino, G.**, Ejarque, J., Immorlano, F., ... & Aloisio, G. (2023). Convergence of HPC, Big Data and Machine Learning for Earth System workflows (No. EGU23-6857). *Copernicus Meetings*.