Fabio Merizzi

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https://github.com/fmerizzi/

Summary

Currently pursuing a PhD at the University of Bologna, I specialize in neural architectures with a keen interest in their application to the meteorological field, including forecasting, downscaling and extreme event detection. My work extends beyond atmospheric science, applying neural network techniques to image restoration, anti-money laundering and terrain generation.

Education

2022 – **PhD in Computer Science and Engineering** at University of Bologna. Project title: *Neural technique for statistical downscaling of weather features, in cooperation with CINECA and OptimESM.*

2020 – 2022 **M.Sc. in Artificial Intelligence** at University of Bologna. (110/110 with honours) Thesis title: *Inpainting of medieval frescoes with neural techniques.*

2016 – 2020 **B.E. Computer Engineering** at University of Bologna. (103/110)
Thesis title: *Development of solutions for the security of SDN networks based on programmable data planes in P4.*

Employment History

spring 2022 **Research intern** I3S, Laboratoire d'Informatique, Signaux et Systèmes de Sophia Antipolis. *Project work on digital art restoration using DIP and style transfer*

Fall 2023 **Teaching assistant** Machine Learning, Master degree in Computer Science. *Practical lectures on SKlearn, Numpy, Tf/Keras and Torch.*

Spring 2024 **Teaching assistant** Deep Learning, Master degree in Artificial Intelligence. *Design of Neural Models with Keras3*

Conferences

November 2023 **Workshop on "Rossby waves, heatwaves and compound extreme events"** organized by the Institute for Atmospheric Science and Climate (ISAC). Presenting our paper: *Precipitation nowcasting with generative diffusion models.*

IAMAHA : artificIAl intelligence and applied MAthematics for History and Archaeology co-organised by CEPAM, INRIA Côte d'Azur and I3S. Presenting our paper: *Deep image prior inpainting of ancient frescoes in the Mediterranean Alpine arc.*

Publications

To stay informed about my latest research and publications, kindly visit my Google Scholar Profile.

Academic Interests

Generative Models

Generative modeling involves discerning unseen probability distributions through analysis of sample data. In recent times, the emergence of neural networks-based generative models, including Variational Autoencoders (VAEs), Generative Adversarial Networks (GANs), and Diffusion Models, has revolutionized atmospheric modeling. These models leverage ensemble methods to generate a range of potential weather events. My research focuses on exploring the use of these generative techniques across various meteorological tasks, examining their effectiveness in comparison to other state of the art architectures.

Spatio-Temporal learning

In the realm of meteorology, most tasks can be conceptualized as spatio-temporal challenges. Essentially, these tasks involve interpreting gridded data across spatial dimensions at various time points, translating this into a new sequence of gridded information. Such tasks might include forecasting, downscaling, or addressing other pertinent weather-related issues. Addressing these challenges requires incorporating models such as U-Net, GANs (Generative Adversarial Networks), Diffusion Models, and Vision Transformers. My research delves into spatio-temporal architectures broadly, applying these models to a wide array of meteorological challenges.

Skills

Languages	Strong reading, writing and speaking competencies for English and Italian. Basic French and Spanish.
Coding	Python, C, Java, P4, Prolog, LaTeX, Bash, SQL, XML/XSL …
Libraries and Enviroments	Tf/Keras, Torch, SkLearn, Numpy, Linux, Arch, Debian, Anaconda, Cuda, Jupyter, Docker, Virtual Network Environments, VMs, matplotlib …
Web Dev	HTML, CSS, JavaScript, Java Swing, java Spring.

References

Available on Request