Giovanni **Catalani**

PhD Deep Learning for Physics

9 March 1998, Italy

giovannicatalani98@gmail.com | giovannicatalani | giovanni-catalani-2a87a4136 | Giovanni Catalani

Experience

Airbus
Toulouse, France

Deep Learning Research Engineer — *Sep. 2023 - Present*

- Developing novel deep learning models for advanced physical simulations of the aircraft aerodynamics on large meshes, aimed at accelerating the design of new aircrafts. Extended Airbus data-driven simulation capabilities to full 3D configurations.
- Running large scale training on High Performance Computing cluster. Deep theoretical and practical understanding of advanced architectures as Graph Neural Networks, Neural Operators, Neural Fields. Experience in Python development with ML libraries (`Pytorch, Jax, Tensorflow`) and Devops (`Git, Bash, Tensorboard`).
- Regularly present novel research both internally and externally in top tier international conferences, journal publications and competitions.

Netherlands Aerospace Centre (NLR)
Amsterdam, Netherlands

Thesis Intern — *January. 2022 - October. 2022*

- Flight Dynamics Department, perfomed research within a NATO funded project aimed at developing data-driven models for the simulation of the aerodynamics of combat aircraft.
- Developed a methodology based on advanced dimensionality reduction and recurrent neural networks (LSTM) to quickly predict the aerodynamics on a maneuvering aircraft, massively improving the capabilities of previous models.

ISAE-Supaero
Toulouse, France

Research Intern — *Aug. 2021 - Dec. 2022*

- Deep Learning for Computational Fluid Dynamics. Implemented end-to-end multiscale Convolutional Neural Networks for the prediction of transonic aerodynamic simulations.
- Internship resulted in a top tier Journal Publication in collaboration with Neural Concept.

Education

PhD Researcher
Toulouse, France

ISAE-Supaero — *Sep. 2023 - Present*

- ISAE-Supaero is a French Grand Ecole and a leading institution for aerospace research.
- Research in the field of Deep Learning for advanced aerodynamic modeling, performed for Airbus.
- Teaching Master level classes in Machine Learning and Optimization. Mentoring Master students on various research topics.

M.Sc. Aerospace Engineering
Delft, Netherlands

TU Delft — *Sep. 2020 - Nov. 2022*

- TU Delft Aerospace and Mechanical Engineering faculties are among the top 3 universities worldwide.
- Followed a strongly quantitative track on Fluid Dynamics, Numerical Analysis for PDEs and Computational Modeling. Final Grade: Cum Laude (top 5%). Thesis: Machine Learning based local ROMs for unsteady aerodynamics. Awarded with 9.0/10.
- Teaching Assistant: offered guidance and prepared course assignments to 100+ B.Sc. students.

B.Sc. in Aerospace Engineering
Rome, Italy

Sapienza University of Rome — *Sep. 2017 - Jul. 2020*

- Final Grade: 110/110 Cum Laude. Honour Student Scholarship 2017 and 2018
- Excellence Program: for top students (5%) of the faculty of Aerospace Engineering. Additional Courses on advanced math topics.

Skills

Software Python (TensorFlow, PyTorch, Jax), Matlab, C++, Git, Bash, LateX, Microsoft Office

Languages Italian, English (C2), French (C1), Spanish (B2)

Publications & Talks

2024	**MARIO:Multiscale Aerodynamic Resolution Invariant Operator**, ML4CFD Competition Workshop-Neural Information Processing Systems (NeurIPS 2024)	*Oral Presentation*
2024	**Neural Fields for Rapid Aircraft Aerodynamics Simulations**, Catalani, G., Agarwal, S., Bertrand, X., Tost, F., Bauerheim, M., Morlier, J. (2024). - Scientific Reports	*Journal Paper*
2024	**Neural Fields for Physical Simulations**, ELLIS Talk within TU Delft AI initiative.	*Invited Talk*
2023	**A comparative study of learning techniques for the compressible aerodynamics over a transonic RAE2822 airfoil**, G.Catalani,D. Costero, M. Bauerheim, L. Zampieri, V. Chapin, N. Gourdain, P. Baquè - Computers & Fluids	*Journal Paper*

Achievements

2024	**Third Place ML4CFD Challenge NeurIPS 2024**, International Machine Learning competition on Machine Learning for physical simulations. More than 200 academic and industrial participating teams. Represented the Airbus team and awarded with 1000 euros in money prize.	*NeurIPS*
2023	**Third Place Machine Learning for Physical Simulations Challenge**, Sponsored by Ansys, NVIDIA. More than 120 academic and industrial participating teams. Represented the Airbus team and awarded with 1000 euros in money prize.	*Codabench*
2017	**Member of the Italian Excellence Honours Roll**, Awarded to the high school students who graduate with 100/100 cum laude from Italian High School.	*MIUR*
2016	**Finalist of the 30^{th} and the 31^{st} Italian Physics Olympiad**, National Stage of the competition. Selected in the top 100 out of 40 thousand contestants (0.3 %).	*Olifis*
2015	**Finalist of the Italian Math Olympiad**, National Stage of the competition. Individual and Team Captain.	*Olimato*

Volunteer & Interests

2022	**Amateur Actor REST Rotterdam**, Performed in a minor role for the English Speaking Theather.	*REST*
2021	**IT Coordinator Best Delft**, Maintained the website and the databases of the association.	*BEST*
2022	**Amateur Football Player**, Played football for 15+ years in 5+ teams in Italy and in the Netherlands.	*Ariston*
2017	**Tutor Pontireti Onlus**, Tutored primary school students with special needs.	*Onlus*