CURRICULUM VITAE

Giulio Gori, PhD

Full-time Researcher in Fluid Dynamics (Untenured),
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EDUCATION

28/1/2019   Ph.D. in Aerospace Engineering
Thesis: *Non-Ideal Compressible Fluid-Dynamics: Developing a Combined Perspective on Modeling, Numerics and Experiments.* Department of Aerospace Science and Technology, Politecnico di Milano, Italy. Advisor: Prof. Alberto Matteo Attilio Guardone

22/7/2013   Master Degree in Aeronautical Engineering
Thesis: *PoliMIce: un ambiente di simulazione per la previsione dell'accrescimento di ghiaccio su velivoli.* Department of Aerospace Science and Technology, Politecnico di Milano, Italy. Advisor: Prof. Alberto Matteo Attilio Guardone

22/9/2010   Bachelor's Degree in Aerospace Engineering
Department of Aerospace Science and Technology, Politecnico di Milano, Italy

CURRENT AND PREVIOUS POSITIONS

04/10/2021 – Current
Full-time Researcher in Fluid Dynamics (Untenured), Department of Aerospace Science and Technology, Politecnico di Milano, Italy

15/01/2021 – 03/10/2021
Post-doc researcher, CS2 H2020 MONNALISA Project, Department of Aerospace Science and Technology, Politecnico di Milano, Italy

02/10/2017 – 31/12/2020
UTOPIAE MSCA-ITN ESR, Platon Team, INRIA/CMAP, École Polytechnique, France

16/06/2014 – 15/07/2017
Research fellow, CREALab/Department of Aerospace Science and Technology, Politecnico di Milano, Italy

QUALIFICATIONS

03/02/2022 – 03/02/2031
National Scientific qualification as associate in the Italian higher education system, in the call 2021/2023 (Ministerial Decree n. 553/2021 and 589/2021) for the disciplinary field of 09/A1 - Aeronautical and aerospace engineering and naval architecture.

2014 (2nd session) – Not expiring
State Professional Examination for the qualification as Industrial Engineer – Section A.

SCIENTIFIC ACHIEVEMENTS

In my Ph.D., I have delivered advancements in the field of Non-Ideal Compressible Fluid Dynamics by demonstrating the admissibility of the so-called *non-ideal oblique shock-waves*. The formalization of this unprecedented phenomenon fostered new prolific research activities, ranging from theoretical studies to experimental activities, in the field of renewable energies. The impact of the incipient scientific paper I authored in 2017, "Non-ideal compressible-fluid effects in oblique waves", Journal of Physics: Conference Series, Vol. 821, is testified by the diverse scope of the citing research. I also delivered the first-ever accuracy assessment of a computational model for non-ideal flows, a fundamental step toward improving computerized models. Moreover, I exploited data-driven techniques and Bayesian calibration methods to provide substantial indications for developing novel experiments.
I co-authored several works concerning the robust optimization of ORC turbine blades via Bayesian methods. Along the same line, I recently authored a paper (currently under peer-review) introducing a novel design approach robust to epistemic uncertainty related to the structure of turbulence closures in RANS models.

In the field of in-flight ice accretion, I identified a mathematical inconsistency in the state-of-the-art model, proposing a consistent solution leading to more accurate predictions. I am the creator, and I have been the leading developer (from 2012 to 2017) of the PoliMIce ice accretion code, see "G. Gori, M. Zocca, M. Garabelli, A. Guardone, and G. Quaranta, *PoliMIce: a Simulation Framework for Three-Dimensional Ice Accretion*, Journal of Applied Mathematics and Computation, 267(96-107), 2015". The PoliMIce suite is currently employed in several European research projects, e.g., H2020 UTOPIAE MSCA-ITN (Uncertainty Treatment and OPtimisation in Aerospace Engineering, ESR10), H2020 NITROS MSCA-EJD (Network for Innovative Training on ROtorcraft Safety, ESR1), the H2020 ICE-GENESIS project coordinated by Airbus and the H2020 MONNALISA CS2-JU project (Modelling Non-Linear Aerodynamics of Lifting Surfaces, WP 4).
Since 2014, I am a principal developer of the SU2 Computational Fluid Dynamics open-source suite (currently a reference in research). I contributed to developing several modules, e.g., the non-ideal gas solver and the sliding mesh interface (at the root of the SU2 rotorcraft simulation module). I actively contributed to the development of SU2 by participating in the Annual Developer's meeting and by providing code maintenance regularly.

Currently, I am developing multi-fidelity GPR methods under epistemic uncertainty in the frame of the H2020 MONNALISA CS2-JU. In particular, I am developing efficient sampling strategies for constructing databases for research, validation, and design purposes. First research outputs are the proceeding "Multi-fidelity surrogate models in aerodynamic optimization problems", presented at the XXVI International Congress of the Italian Association of Aeronautics and Astronautics, and the seminar titled "Agnostic Multi-Fidelity Gaussian Process Regression for Modeling Complex Systems in Aerospace Applications", which I delivered at DAER and which was live streamed openly worldwide, through the department's dedicated channels. The work carried out in this research field constitutes the bulk of a research proposal submitted to the HORIZON-MSCA-PF-01 fellowship call. The proposal was titled UN-BIASED, "UNcertainty quantification and modelling Bias Inhibition by means of an Agnostic Synergistic Exploitation of multi-fidelity Data". In the evaluation process, the proposal scored 96.6% and was therefore deemed eligible for a 173k award funding from the EU Commission.

RESEARCH EXPEDITIONS LED

I successfully submitted a proposal to the Summer Program 2018 of the Center for Turbulence Research (CTR) at Stanford University, California, USA. I was responsible for leading a research project titled *On the calibration of turbulence models for a siloxane MDM in the Non-Ideal regime and application to the robust optimization of turbine cascades*, devoted to the development of innovative data-driven approaches for the calibration of molecular complex fluid models and the robust optimization of Organic Rankine Cycle turbine blades.

COMMISSIONS OF TRUST

- Invited referee for the following international scientific Journals: Journal of Computational Physics, Physics of Fluids, Mathematics and Computers in Simulations, Applied Mathematics and Computation.
- Co-supervisor, tutoring master students in authoring their final thesis at DAER-PoliMI.
- Coordinator of the SU2 open-source CFD solver User Group (2014-2017) at DAER-PoliMI.

MOBILITY

2019	Visiting fellow, Von Karman Institute for Fluid Dynamics, Belgium (4 mths). Uncertainty Quantification for hypersonic flows and heat shield ablation for atmospheric entry applications.
2018	Visiting fellow, Center for Turbulence Research at Stanford University (1.5 mths), Palo Alto, CA, USA. Development of robust optimization approaches for Organic Rankine Cycle applications.
2016	Visiting Ph.D. candidate, UT Twente, Faculty of Engineering Technology, Enschede, Netherlands (3 mths). Developing numerical methods for sliding mesh interfaces in computational fluid dynamics.
2014	Visiting fellow, Aerospace Design Lab (ADL) at Stanford University (1 mth), Palo Alto, CA, USA. Development and implementation of the SU2 non-ideal compressible-fluid dynamics solver.

MAJOR INTERNATIONAL COLLABORATIONS

Prof. Juan J. Alonso, full professor in Aeronautics & Astronautics at Stanford University, CA, USA. Founder and director of the Aerospace Design Lab.
Prof. Gianluca Iaccarino, full professor in Mechanical Engineering and director of the Institute for Computational Mathematical Engineering (ICME) at Stanford University, CA, USA.
Prof. Thierry Magin, associate professor at the Aeronautics and Aerospace Department at the Von Karman Institute for Fluid Dynamics, Belgium. Winner of a European Research Council Starting Independent Researcher Grant.
Prof. Piero Colonna, full professor, Chair of Propulsion and Power at TU Delft, Netherlands.
Prof. Olivier Le Maître, Senior Researcher at Platon Team CNRS/CMAP/INRIA, École Polytechnique, France
Pietro M. Congedo, Head of Platon Team CMAP/INRIA, École Polytechnique, France

AWARDED FELLOWSHIPS

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2022	Post-doctoral Fellowship HORIZON-MSCA-PF-01, UN-BIASED "UNcertainty quantification and modelling Bias Inhibition by means of an Agnostic Synergistic Exploitation of multi-fidelity Data", Department of Aerospace Science and Technology, Politecnico di Milano, Italy
2021	Temporary Research Fellowship for Research Activities UOR DAER "Development of simplified models for the aerodynamics of wings at high angle of attack" CS2-H2020 MONNALISA/Department of Aerospace Science and Technology, Politecnico di Milano, Italy
2017 – 2020	Early-Stage Researcher Fellowship, H2020-MSCA-ITN-2016, UTOPIAE-ESR3 "Inference and Design of Experiments in Large Scale Flow Problems", INRIA/Centre de Mathématiquées Appliqueé, École Polytechnique, IPP, France
2015 – 2017	Temporary Research Fellowship for Research Activities UOR DAER "Metodi numerici per la simulazione di correnti di fluidi comprimibili non-ideali" CREALab/Department of Aerospace Science and Technology, Politecnico di Milano, Italy
2014 – 2015	Temporary Research Fellowship for Research Activities UOR DAER "Simulazione numerica di correnti di gas densi con codici fluidodinamici per griglie chimera" CREALab/Department of Aerospace Science and Technology, Politecnico di Milano, Italy

FUNDINGS RECEIVED

2018 Personal scholarship of $ 3,550 from the CTR Sumer Program 2018 at Stanford University, CA, USA.

2022 HORIZON-MSCA-PF-01 UN-BIASED 173 k€

PUBLICATION RECORD

I delivered more than 30 scientific contributions in a time frame of about 7 years. Among these, 11 are peer-reviewed Journals articles, 11 are peer-reviewed conference proceedings, and 1 is a chapter in a book. Publications cover a wide range of topics, from in-flight ice accretion to non-ideal compressible fluid flows, atmospheric entry in space applications, uncertainty quantification, and turbomachinery design.

According to Google Scholar metrics, my current H-index is 10. Since 2014, yearly citations have grown consistently, attracting 279 referencing works.
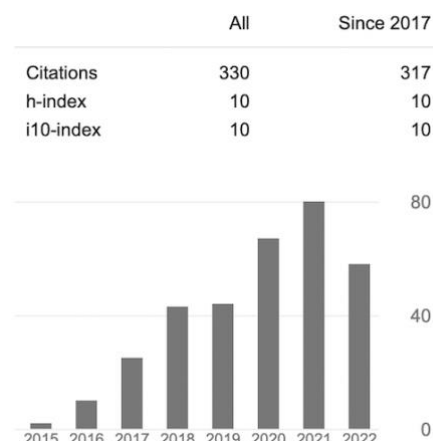
Peer Reviewed Journals

- **G. Gori**, O. Le Maître and P. M, Congedo, *A Confidence-based Aerospace Design Approach Robust to Structural Turbulence Closure Uncertainty*, Computers & Fluids, 2022, https://doi.org/10.1016/j.compfluid.2022.105614.
- **G. Gori**, P. M, Congedo, O. Le Maître, T. Bellosta, and A. Guardone, *Modeling In-flight Ice Accretion Under Uncertain Conditions*, Journal of Aircraft, 2021, https://doi.org/10.2514/1.C036545.
- **G. Gori**, O. Le Maître and P. M, Congedo, *On the Sensitivity of Structural Turbulence Uncertainty Estimates to Time and Space Resolution*, Computer & Fluids, 2021, https://doi.org/10.1016/j.compfluid.2021.105081
- **G. Gori**, M. Zocca, A. Guardone, O. Le Maître and P. M. Congedo. *Bayesian Inference of Thermodynamic Models from Vapor Flow Experiments*, Computer & Fluids, Vol. 205, 104550, 2020.
- N. Razaaly, G. Persico, **G. Gori,** and P.M. Congedo, *Quantile-Based Roust Optimization of a Supersonic Nozzle for Organic-Rankine Cycle Turbines*, Appl. Math. Model., 2020, https://doi.org/10.1016/j.apm.2020.01.048
- **G. Gori**, M. Zocca, G. Cammi, A. Spinelli, P. M. Congedo and A. Guardone, *Accuracy Assessment of the Non-Ideal Computational Fluid Dynamics Model for Siloxane MDM from the open-source SU2 suite*, European Journal of Mechanics-B/Fluids, 2020, https://doi.org/10.1016/j.euromechflu.2019.08.014
- **G. Gori**, A. Guardone, *VirtuaSchlieren: a Hybrid GPU/CPU-based Schlieren Simulator for Ideal and Non-Ideal Compressible-Fluid Flows*. Appl. Math. Comput., 2018., https://doi.org/10.1016/j.amc.2017.07.041
- D. Vimercati, **G. Gori**, A. Guardone, *Non-Ideal Oblique Shock Waves*, J. Fluid Mech, 2018, https://doi.org/10.1017/jfm.2018.328.
- **G. Gori,** G. Parma, M. Zocca and A. Guardone, Journal of Aircraft, *Local Solution to the Unsteady Stefan Problem for In-Flight Ice Accretion Modeling*, 2018, https://doi.org/10.2514/1.C034412
- M. Zocca, **G. Gori** and A. Guardone, *Blockage and Three-Dimensional Effects in Wind-Tunnel Testing for Ice Accretion over Wings*, Journal of Aircraft, 2017, https://doi.org/10.2514/1.C033750
- **G. Gori**, M. Zocca, M. Garabelli, A. Guardone, and G. Quaranta, *PoliMIce: a Simulation Framework for Three-Dimensional Ice Accretion*, Appl. Math. Comput, 2015, https://doi.org/10.1016/j.amc.2015.05.081

Chapter in Books

- J. Reis, **G. Gori**, P.M. Congedo and O. Le Maître, *Introduction to Spectral Methods for Uncertainty Quantification,* Chapter in *Optimization Under Uncertainty with Applications to Aerospace Engineering*, Massimiliano Vasile, Springer Nature, 2021.

Peer-Reviewed Conference Proceedings

- **G. Gori**, O. Le Maître and P.M. Congedo, *A Review of some recent advancements in Non-Ideal Compressible Fluid Dynamics*, International Conference on Uncertainty Quantification & Optimization, Virtual Event, 2020.
- **G. Gori**, N. Razaaly, G. Iaccarino, and P. M. Congedo, *Structural Uncertainty Estimation of Turbulence Models in Organic Rankine Cycle Applications,* ORC2019 conference, Athens, Greece, 2019.
- N. Razaaly, **G. Gori**, G. Iaccarino, P. M. Congedo, *Optimization of an ORC Supersonic Nozzle Under Epistemic Uncertainties due to Turbulence Models*, GPPS2019 Conference, Zurich, Switzerland, 2019.
- N. Razaaly, **G. Gori**, O. Le Maître, G. Iaccarino, P. M. Congedo, *Robust Optimization of Turbine Cascade for Organic Rankine Cycles Operating with Siloxane MDM*, CTR Summer Program, Stanford University, USA, 2018.

- **G. Gori**, M. Zocca, G. Cammi, A. Spinelli, and A. Guardone, *Experimental Assessment of the Open-Source SU2 CFD suite for ORC Applications*, Energy Procedia, Vol. 129, pp. 256-263, 2017.
- D. Vimercati, **G. Gori**, A. Spinelli, and A. Guardone, *Non-Ideal Effects on the Typical Trailing Edge Shock Pattern of ORC turbine Blades*, Energy Procedia, Vol. 129, pp. 1109-1116, 2017.
- P. Molesini, **G. Gori** and A. Guardone, *An Analysis of fast-Response Pressure Probes Dynamics for ORC Power Systems*, Energy Procedia, Vol. 129, pp. 264-271, 2017.
- M. Pini, S. Vitale, P. Colonna, **G. Gori**, A. Guardone, T. Economon, J. J. Alonso and F. Palacios, *SU2: the open-source software for Non-Ideal Compressible Flows*, Journal of Physics: Conference Series, Vol. 821, 2017.
- **G. Gori**, P. Molesini, G. Persico and A. Guardone, *Non-Ideal Compressible-Fluid Dynamics of Fast-Response Pressure Probes for Unsteady Flow Measurements in Turbomachinery*, Journal of Physics: Conference Series, Vol. 821, 2017.
- **G. Gori**, D. Vimercati and A. Guardone, *Non-Ideal Compressible-Fluid Effects in Oblique Shock Waves*, Journal of Physics: Conference Series, Vol. 821, 2017.
- **G. Gori**, A. Guardone, S. Vitale, A. Head, M. Pini, P. Colonna, *Non-Ideal Compressible-Fluid Dynamics Simulations with SU2: Numerical Assessment of Nozzle and Blade Flows for Organic Rankine Cycle Applications*, 3rd International Seminar on ORC Power Systems, Brussels, Belgium, 2015.

Conference Proceedings

- **G. Gori**, G. Rossi, and A. Guardone, *How do Uncertain Flow Parameters Affect the Shock Pattern in Nonequilibrium Gas Flows Around Blunt Bodies?,* AIAA 2022-3532. *AIAA AVIATION 2022 Forum*. June 2022.
- A. Rausa, **G. Gori**, A. Guardone, A. Zanotti and F. Auteri, *Multi-fidelity assessment of the aerodynamic performances of unconventional aircraft tail configurations*, AIAA 2022-3902. *AIAA AVIATION 2022 Forum*. June 2022.
- F. Auteri, G. Gibertini, **G. Gori,** A. Guardone, A. Rausa, A. Zanotti, P. M. Congedo, A. Menzago and R.C. Llamas-Sandin, *Monnalisa: Modelling Nonlinear Aerodynamics of Lifting Surfaces*, AIAA 2022-4149. *AIAA AVIATION 2022 Forum*. June 2022.
- **G. Gori** and A. Guardone, *Multi-fidelity surrogate models in aerodynamic optimization problems*, XXVI Italian Association of Aeronautics and Astronautics AIDAA Congress, 31st August - 3rd September 2021, Pisa, Italy.
- **G. Gori**, A. Guardone. *Snowflakes shape characterization via Bayesian inference: exploring the challenges*, AIAA Aviation forum, and Exposition, ASE-16, Icing Physics Part 1, Virtual Event, 2021.
- T. Bellosta, A. Guardone, **G. Gori**, P.M. Congedo, O. Le Maître. *Uncertainty quantification for in-flight ice accretion under Appendix-C and Appendix-O conditions*, AIAA Aviation Forum and Exposition, ASE-05, Measurement of Icing Clouds, Virtual Event, 2021.
- **G. Gori**, A. Turchi, T. Magin, O. Le Maître and P. M. Congedo. *Exploring the Impact of the Initial Temperature Field Uncertainty on the Response of Ablative Materials*, International Conference on Flight Vehicles, Aerothermodynamics and Re-Entry Missions and Engineering, Bari, Italy, 2019.
- B. Arizmendi, T. Bellosta, A. del Val, **G. Gori**, M. O. Prazeres, and J. Reis, *On Real-Time Management of On-Board Ice Protection Systems by Means of Machine Learning*, AIAA Aviation Forum 2019, Dallas, USA, 2019.
- **G. Gori**, D. Vimercati and A. Guardone, *A Numerical Investigation of Oblique Shock Waves in Non-Ideal Compressible-fluid Flows*, 31st International Symposium on Shock Waves ISSW31, Nagoya, Japan, 2018.
- M. Zocca, **G. Gori**, O. Le Maître, P. M. Congedo, and A. Guardone, *A Robust Experiment Design for the Investigation of Non-Ideal Compressible Fluid Flow Effects*, ECFD7, Glasgow, United Kingdom, 2018.
- N. Razaaly, G. Persico, **G. Gori**, P. M Congedo, *Robust Optimization of a Supersonic ORC Turbine Cascade: a Quantile-Based Approach*, ECFD7, Glasgow, United Kingdom, 2018.
- S. Vitale, **G. Gori**, M. Pini, A. Guardone, T. D. Economon, F. Palacios, J. J. Alonso, and P. Colonna, *Extension of the SU2 Open-Source CFD Code to the Simulation of Turbulent Flows of Fluids Modelled with Complex Thermophysical Laws*, 22nd AIAA Computational Fluid Dynamics Conference, Dallas, Texas, USA, 2015.
- **G. Gori**, M. Zocca and A. Guardone, *A Model for In-flight Ice Accretion Based on the Exact Solution of the Unsteady Stefan Problem*, 7th AIAA Atmospheric and Space Environments Conference, Dallas, Texas, USA, 2015.

TEACHING ACTIVITY

From 2023 - Lecturer for the course "Fundamentals of Hypersonic Flows" at the Department of Aerospace Science & Technology, Politecnico di Milano.

2022 - Teaching assistant for the course "Fundamentals of Hypersonic Flows" held by Prof. Aldo Frezzotti at the Department of Aerospace Science & Technology, Politecnico di Milano. In charge of tutoring students in developing CFD projects concerning the numerical investigation of hypersonic applications.

2022 - Teaching assistant for the course "Compressible Fluid Dynamics" held by Prof. Alberto Guardone at the Department of Aerospace Science & Technology, Politecnico di Milano. In charge of delivering exercise sessions and numerical laboratories (frontal lectures).

2021 - Teaching assistant for the course "Computational Fluid Dynamics" held by Prof. Alberto Guardone at the Department of Aerospace Science & Technology, Politecnico di Milano. In charge of tutoring students in developing CFD projects concerning the numerical investigation of fluid dynamics applications.

2021 - Teaching assistant for the course "Compressible Fluid Dynamics" held by Prof. Alberto Guardone at the Department of Aerospace Science & Technology, Politecnico di Milano. In charge of delivering exercise sessions and numerical laboratories (frontal lectures).

SUPERVISING ACTIVITY

Supervision/co-supervision of MSc students developing their final thesis:
- 2022, *Low-order models for the fast aerodynamic analysis of unconventional aircraft tail configuration: assessment and improvement*, F. Gajo
- 2022, *Numerical investigation of hypersonic flows in thermochemical nonequilibrium with uncertainty quantification*, G. Rossi
- 2021, *A Bayesian approach for uncertainty characterization in in-flight snow accumulation problems*, V. Aisya
- 2021, *A new Statistical Snow Cloud Model for Aeronautical Applications*, A. Raimondi.
- 2017, *Un Modello Semplificato per l'Accrescimento di Ghiaccio su Profili Alari Oscillanti*, D. Sangaletti.
- 2016, *Dynamics of Line-Cavity Systems for Ideal and Non-Ideal Compressible-Fluid Flows*, P. Molesini.
- 2015, *Generazione di Immagini Schlieren da Simulazioni Fluidodinamiche su Architettura GPU*, L. Virtuani.
- 2015, *A Model for In-Flight Ice Accretion Based on the Exact Solution of the Unsteady Stefan Problem*, G. Parma.
- 2013, *Effetti di Galleria nelle Misure di formazione di Ghiaccio su Velivoli*, M. Zocca.

I am currently supervising six ongoing MSc students: M. Salvatori (CFD acceleration using GPUs), T. Davoli (Aerodynamic model calibration), G. Girardello (Optimization of a hypersonic air intake), A. Meo (Heat shield shape optimization), C. Capecchi (Thermochemical models), E. Monti (Physics informed surrogate models).

CONFERENCE ORGANIZATION

2022	Mini-symposium titled *Numerical Simulation of Ice Accretion,* ESCO2022, Plizen, CZ
2019	Member of Organizing Committee (Local Organizer), *UQOP2019,* March 18-20, Paris, France.
2017	Staff member, *4th International Seminar on ORC Power Systems*, September 13-15, Milano, Italy.
2016	Staff member, *NICFD-PP 2016*, October 20-21, Varenna, Italy.

SOFTWARE DEVELOPMENT

- PoliMIce   Core developer member of the integrated CFD-multiphase PoliMIce software (2012-2017).
- SU2   Member of the Principal Developers team of the SU2 open-source CFD solver (since 2014).
- PoliUQ   An in-house Python library for Uncertainty Quantification and robust optimization.

Milano,
August 25th, 2022

'I hereby authorize the use of my personal data in accordance with the GPR 679/2016.'