Antonio **Pucciarelli**

AERONAUTICAL ENGINEER

Milan · Italy

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Summary

Highly motivated aeronautical engineer with a strong foundation in fluid dynamics and a passion for innovation. Leveraged my MSc studies to specialize in CFD, turbomachinery design, and flow modeling. Proficient in coding, software development, machine learning, and GUI creation, expanding my skillset beyond traditional engineering.

Developed a novel machine learning method for turbomachinery design during a training program at the prestigious von Karman Institute for fluid dynamics. Currently extending this method to create a universal design tool applicable across a wider range of turbomachines. Eager to contribute my skills and enthusiasm to the aeronautical and naval field, with interests spanning external flow simulations, aeroelasticity, and turbomachinery.

Education

von Karman Institute for Fluid Dynamics — *Sint-Genesius-Rode, Belgium*
SHORT TRAINING PROGRAM · TURBOMACHINERY & MACHINE LEARNING — *2022 - 2023*

Politecnico di Milano — *Milano, Italy*
MASTER DEGREE IN AERONAUTICAL ENGINEERING · AERODYNAMICS & PROPULSION TRACK — *2021 - 2023*
BACHERLOR DEGREE IN AEROSPACE ENGINEERING — *2017 - 2020*

Experience

`turbOpt` · **von Karman Institute for Fluid Dynamics** — *Sint-Genesius-Rode, Belgium*
INTERN · AERONAUTICAL ENGINEER & SOFTWARE DEVELOPER — *Oct 2022 - Apr 2023*
- von Karman Institute in-house program (developed from scratch)
- Machine learning adapted to turbomachinery blades

`blader` — *Salerno, Italy*
RESEARCHER · AERONAUTICAL ENGINEER & SOFTWARE DEVELOPER — *Oct 2023 - Jan 2024*
- Novelty program for the representation and parametrization of turbomachinery blades
- GUI generation for user-friendlyness

`datablade` · **Private & von Karman Institute for Fluid Dynamics** — *Salerno, Italy*
RESEARCHER · AERONAUTICAL ENGINEER & SOFTWARE DEVELOPER — *Oct 2023 - present*
- Improvements over `turbOpt` program
- Extension of the study domain to a wider range of turbine blades (including LP turbines)
- GUI generation for user-friendlyness

Writing

Paper Publication · **In Progress** — *Sint-Genesius-Rode, Belgium*
RESEARCHER · VON KARMAN INSTITUTE FOR FLUID DYNAMICS — *Oct 2023 - present*

A Novel Machine Learning Method for Data-Driven Design in Turbomachinery (co-authored with *Prof. Sergio Lavagnoli*). To be submitted to **Elsevier**. This paper details the development and application of a machine learning program for turbomachinery design, extending the concepts explored in my thesis work.

Skills

Programming Python, Fortran, C/C++, Matlab, LaTeX, CMake, GNUplot
Programs OpenFOAM, MISES, NASTRAN, openscad, xFOIL, NASA CEA, xflr5, Femap, SolidWorks, SolidEdge, Inventor

Languages

Italian Native
English Full Proficiency · writing, speaking, listening
Norwegian In Progress · self-learning

Projects

`datablade` *Salerno, Italy*
PRIVATE PROJECT *Oct 2023 - present*

- Continuation of my MSc thesis work
- Extention of the capabilities of the program to LPT and compressors
- Accuracy improvements over blade predictions
- GUI generation

`blader` *Salerno, Italy*
PRIVATE PROJECT *Oct 2023 - Jan 2024*

- Coordinate based blade converter into Kulfan parametrization representation
- Blade parametrization DOF reduction
- GUI generation

Machine Learning for Turbomachinery · Master Thesis *Sint-Genesius-Rode, Belgium*
SHORT TRAINING PROGRAM · VON KARMAN INSTITUTE FOR FLUID DYNAMICS *Oct 2022 - Nov 2022, Feb 2023 - Apr 2023*

- von Karman Institute in-house program (developed from scratch)
- 2D airfoil database generation
- Machine learning adapted to turbomachinery blades

Aerospace Control Systems *Milano, Italy*
`https://github.com/antoniopucciarelli/controlPRJ`
CONTROL DYNAMICS *May 2022 - Jun 2022*

- System dynamics study
- Stability analysis
- System uncertainties analysis
- Controllers design

Liquid Rocket Engine: Design, Analysis and Simulation *Milano, Italy*
`https://antoniopucciarelli.github.io/assets/pdf/spacePropulsionPRJ.pdf`
SPACECRAFT PROPULSION *May 2022 - May 2022*

- Tanks, combustion chamber and nozzle design
- Unsteady firing simulation with NASA CEA wrapping
- Monte Carlo analysis of the thrust with respect to the uncertainties related to the manufacturing process

Solid Rocket Motor: Firing Test Data Analysis and Simulation *Salerno, Italy*
`https://github.com/antoniopucciarelli/spacePropulsionFlipped`
SPACECRAFT PROPULSION *Apr 2022 - May 2022*

- Vieille's law computation from firing test pressure traces
- Ballistic simulation of a solid rocket engine with different nozzles
- Monte Carlo analysis of the firing time with respect to the uncertainties on the Vieille's law

Axial Compressor Preliminary Design *Salerno, Italy*
`https://github.com/antoniopucciarelli/turboLIB`
TURBOMACHINERY *Mar 2022 - May 2022*

- Mean line design
- Pressure losses modeling
- Non isentropic radial equilibrium study
- 3D blade shape design
- Python library – `turboLIB`

Combustion Chamber Modeling
`https://github.com/antoniopucciarelli/CFDprj` *Milano, Italy*

CFD · Fluid Dynamics & Combustion Modeling *Oct 2021 - Jan 2022*

- 2D & 3D analysis of an hydrocarbon combustion in a combustion chamber using the finite volume method
- Unsteady compressible reactive simulation in OpenFOAM
- Finite volume method analysis of the problem: topology, solution procedure and solvers
- Spray modeling in a finite volume method code
- Wall surface analysis in a finite volume method code
- Turbulence modeling

EnelX Value Proposition: Sketch, Analysis and Validation
`https://antoniopucciarelli.github.io/assets/pdf/HTSprj.pdf` *Milano, Italy*

High-Tech Startup *Sep 2021 - Jan 2022*

- Value proposition generation
- Validation of the value proposition and business model

Injector Study and Liquid Jet Break Up in Liquid Rocket Engines
`https://antoniopucciarelli.github.io/assets/pdf/LRE.pdf` *Milano, Italy*

Combustion *May 2021 - Jun 2021*

- Liquid rocket engine analysis
- Liquid jet break-up qualitative analysis and implication in the combustion chamber

Weissinger Method: Study, Analysis and Coding
`https://github.com/antoniopucciarelli/aeroWEISS` *Milano, Italy*

Aerodynamics *Dec 2020 - Jan 2021*

- Incompressible study of the flow over 3D wings using a horseshoe vortex based method
- Analysis of the 3D drag on a wing for a potential flow
- Ground effect study
- Matlab program – `aeroWEISS`

Hess-Smith Method: Study, Analysis and Coding
`https://github.com/antoniopucciarelli/aeroHS` *Milano, Italy*

Aerodynamics *Jun 2020 - Jan 2021*

- Potential flow study using the Hess-Smith model based on vortex/sources/sinks distribution over an airfoil
- Analysis of the interaction between two airfoils in tandem
- Ground effect analysis
- Fortran program – `aeroHS`

Satellite Orbital Transfer Analysis
`https://antoniopucciarelli.github.io/assets/pdf/IAMSprj.pdf` *Milano, Italy*

Orbital Dynamics *May 2020 - Jun 2020*

- Study and generation of three orbital transfers for a satellite
- Comparison the three sketched orbital maneuver

Canard Wing: Modeling and Analysis
Milano, Italy

Structural Dynamics *May 2020 - Jun 2020*

- Canard wing mesh generation and load application in FEMAP
- Results computation using NASTRAN
- Static analysis under loading
- Free modes analysis

RL10-A33A: Modeling, Study and Analysis
`https://antoniopucciarelli.github.io/assets/pdf/RL10.pdf` *Milano, Italy*
`https://github.com/antoniopucciarelli/NHE`

Aerospace Propulsion *Nov 2019 - Jun 2020*

- Analysis and reverse engineering design of the Pratt & Whitney liquid rocket engine
- 1D heat exchange simulation of the nozzle in Matlab – `NHE`