

FEDERICO DEL MONDO

Mechanical Engineer - PhD candidate

January 10, 2024

Birth: 25/04/1994 (Udine, Italy)

SUMMARY

Master's Graduate in Mechanical Engineering at the University of Trieste on 15th October 2021 with a thesis: « *Pointing System for Satellite Optical Communication* ». The postgraduate path started with a research fellowship at University of Trieste, focusing on the development of a Digital Twin for a large-bore dual-fuel engine for marine application. Currently PhD student emphasizing the efficiency improvement of the hydrogen value chain through the development of numerical models and data analytics within the North Adriatic Hydrogen Valley (NAHV) project.

EXPERIENCE

- **PhD candidate** University of Trieste, Italy
PhD student *Nov 2023 - Present*
 - **Task:** Development of numerical models and data analytics to improve the efficiency across the hydrogen value chain.
 - **Activities:** Data processing, Data analysis, Numerical models development, Model GUI implementation
 - **Research Program:** Research program within the North Adriatic Hydrogen Valley (NAHV) project.
- **Research Fellowship** University of Trieste, Italy
Junior researcher *Apr 2022 - Present*
 - **Task:** Engine Digital Twin model development - Investigation on hydrogen value chain development strategies.
 - **Activities:** Data processing, Data analysis, Model GUI implementation.
 - **Research Program:** Analysis, Design, and Development of Digital Twins Models for industrial Products and Processes for Live Demo SMACT Industry 4.0
- **Academic Tutor** University of Trieste, Italy
Academic Tutoring Service *Feb 2021 - Oct 2021*
 - **Task:** Student orientation and assistance.
 - **Activities:** Student support in troubleshooting, departmental meetings and communications for students.
- **Formula SAE Internship** University of Trieste, Italy
Aerodynamicist @UniTS Racing Team *Nov 2019 - Oct 2021*
 - **Task:** Design and Development of Aerodynamics car components.
 - **Activities:** Components modelling, CFD and FEM analysis under steady state conditions.
 - **Other:** <https://formulasae.units.it/>
- **Sailing Lab Internship** University of Udine, Italy
Technician @UniUD Sailing Lab *Oct 2017 - May 2018*
 - **Task:** Shrouds and Forestay tensioning analysis to optimize navigation conditions.
 - **Activities:** Data analytics, Shrouds and Forestay tensioning measurement and polar chart analysis.
 - **Other:** https://lambda-iot.uniud.it/sailing_lab/website/
- **Borsa Lavoro** Corno di Rosazzo City Council, Italy
Town hall worker *Summer 2011*
 - **Task:** Supporting activities of cleaning and urban renovation.
 - **Work Activities:** Cleaning green areas, playground and kindergarten renovation services.

EDUCATION

- **University of Trieste** Trieste, Italy
Mechanical Engineering Master Degree *Oct 2018 - Oct 2021*
 - **Course:** Mechanical Engineering (Design and Prototyping)
 - **Thesis:** Pointing system model for satellite optical communication.
 - **Degree grade:** 108/110.
- **University of Udine** Udine, Italy
Mechanical Engineering Bachelor Degree *Oct 2013 - July 2018*
 - **Course:** Mechanical Engineering
 - **Thesis:** Regulation of Shrouds and Forestay to optimize sailboat (Archambault A35) performances.
 - **Degree grade:** 92/110.
- **Convitto Nazionale Paolo Diacono** Cividale del Friuli, Italy
High School Diploma *Sept 2008 - July 2013*
 - **Course:** Scientific.

SKILLS

- **Languages:** Italian (native), English (B2), Spanish (B1).
- **Programming:** MATLAB, C*, Python (packages: Pandas-Plotly-Dash-Numpy), LaTeX.
- **Software:** MATLAB, Simulink, ADAMS, ANSYS Fluent & Mechanical, ModeFrontier, CATIA V5, EES, Solidworks*.
- **Platforms:** Windows, Arduino*.
- **Experience:** Data processing, Data analysis, Control systems, Hydrogen technologies.
- **Soft Skills:** Team working, Adaptability, Proactivity, Resourcefulness, Flexibility, Motivation.

ACADEMIC PROJECTS

- **Drag and Lift Keel Analysis** University of Trieste
Academic course: CFD - 2019 -
 - **Abstract:** Analysis of water flow over a sailboat's keel (NACA 63A010): determination of foil lift and drag properties, comparison with experimental data and simulation error evaluation.
 - **Software:** ANSYS Fluent, Xfoil, Xflr5.
- **Trajectory optimization using Genetic Algorithm** University of Trieste
Academic course: Design methods - 2019 -
 - **Abstract:** Generation of an ideal car's track with Bezier curves and investigation of minimum length trajectory with genetic algorithm.
 - **Software:** MATLAB
- **UniTS Racing Team Aerodynamic development** UniTS Racing Team
Academic course: Internship & Extracurricular 2019 - 2021
 - **Framework:** Aerodynamic Department
 - **Informations:** UniTS Racing Team is the University of Trieste Formula SAE Team with the aim to design and develop a monoseater electric car to take part in the international university competitions organized by Formula SAE.
 - **Abstract:** Design and simulation of the car aerodynamic package.
 - **Software:** ANSYS Fluent, ANSYS Optimization Tools, Xfoil, Xflr5.
- **4 DOF Motorcycle model analysis** University of Trieste
Academic course: Mechanical vibrations - 2020 -
 - **Abstract:** Dynamic behaviour of a 4 DOF motorcycle model below different types of road signals.
 - **Software:** MATLAB, Amesim.
- **Wind turbine design** University of Trieste
Academic course: Machine design engineering - 2020 -
 - **Abstract:** Generation of blade's profile with Bezier curves, efficiency analysis with Xfoil and shape optimization.
 - **Software:** ModeFrontier, Xfoil.
- **Environmental, health and safety issues of batteries for electric vehicles** University of Trieste
Academic course: Environment, health and safety management - 2021 -
 - **Abstract:** Life cycle analysis of lithium batteries for electric vehicles. Cost, production process, environmental impact and benefits report considering technical standards aspects.
 - **Technical Standards:** UNI EN ISO 9000, UNI EN ISO 14000, D.Lgs 81/08, SA8000.
- **Rear wing FEM analysis** University of Trieste
CAD/CAE Design - 2021 -
 - **Abstract:** UniTS Racing Team vehicle's rear wing structural analysis. Investigation of an economic production method, materials analysis and design decision process based on Formula SAE rules constraints.
 - **Software:** CATIA V5, ANSYS Mechanical.
- **Pointing System Model for Satellite Optical Communication** University of Trieste
Thesis - 2021 -
 - **Abstract:** The concept of autonomous navigation has significant potential for practical application and could revolutionize traditional maritime navigation. Autonomous shipping refers to a ship's ability to independently control its actions while transporting goods. Laser communication relies on acquisition, tracking, and pointing (ATP) motions, which requires precise alignment in line-of-sight to enable ship-satellite communication. Quantum laser communication with satellites and cubesats necessitates minimal line-of-sight error and the pointing process is influenced by wave motion. Scanning methodologies are employed to increase satellite hooking before the communication establishment. Results shown complexities in satellite hooking related to the presence of errors during the acquisition of satellite coordinates and ship motions. The wave motion, instead, not affects significantly the pointing suitability. A scanning strategy, such as the Helix and Bernoulli Lemniscate methods, significantly improves pointing accuracy and these strategies can be implemented by tuning the optical system by a swaying mirror reflecting the laser beam.
 - **Software:** Onshape, MSC ADAMS, MATLAB, Simulink .

*Basic Knowledge.

PUBLICATIONS

- **Development of a Numerical Simulation Model to Support the Design of a Ship–Satellite Communication System for Autonomous Marine Navigation**
Type: Technical notes article
 - **Authors:** F. Del Mondo, , S. Seriani, P. Gallina, A. Gregorio, R. Taccani
 - **Editor:** MDPI
 - **Journal:** Remote sensing
 - **Publication Date:** 12/12/2023
 - **DOI:** <https://doi.org/10.3390/rs15245729>
- **Preliminary experimental data analysis for Digital Twin development of a large bore Dual-Fuel engine**
Type: Conference proceedings paper
 - **Authors:** F. Del Mondo, D. Pivetta, S. Fratti, L. Parussini, E. Padoano, P. Gallina, R. Taccani
 - **Editor:** IOP Science
 - **Journal:** Journal of Physics: Conference series
 - **Publication Date:** 26/12/2023
 - **DOI:** <https://doi.org/10.1088/1742-6596/2648/1/012075>

TEACHING EXPERIENCE

- **Multi-objective optimization examples for engineering component and system design:**
Organizator: Prof. A. Tessarolo (University of Trieste)
Activity: Presentation of bidimensional optimization of a rear wing for a SAE monoseater electric vehicle.
Date: 18-19 November 2021
- **Engineering Equation Solver (EES) software seminary:**
Organizator: Prof. R. Taccani (University of Trieste)
Activity: Example cases of using the software to calculate thermophysical properties within a cycle.
Date: 10 November 2022 - 9 March 2023 - 13 November 2022

INTERESTS

- **Working interests:** Data processing, Data analysis, Numerical Models and Control System also connected to energy systems.

OTHER

- **Qualifications:** Certification for industrial engineering profession - Dec 2021 (University of Trieste).
- **Professional Affiliations:** Associazione Termotecnica Italiana (ATI)
- **Driving Licence:** A,B