# FRANCESCO MAZZEI

**Msc. in Space & Astronautical Engineer**

## EDUCATION

### Masters Thesis: Dynamic interaction and control of an indoor blimp inside the CERN FCC-hh magnetic environment

**CERN - The University of Rome "La Sapienza" – Supervisors: Prof. Fabio Curti and Dr. Ing. Lorenzo Teofili**

June 2021 – Jan 2022 Rome (IT) – Geneve (CH)

- My master thesis belongs to a CERN R&D project which I was part of as an intern. The study is focused on the use of robotic systems in the design of future particle accelerators.
- The thesis project analyses the modelling and testing of the control system of a blimp. The main contribution was to be able to understand the behaviour of electric motors within a magnetic field and model the disturbance on the system dynamics.
- At CERN, I have expanded and developed skills in electromagnetic simulations with FEM modeling software (FEMM, CST), in CAD design (CATIA), in programming languages (Matlab, Python), in dynamics and control theory. Furthermore, I assembled a real blimp with an Arduino control board and tested it with a motion capture system (PhaseSpace).

### Msc. Space and Astronautical Engineering (110/110 cum Laude)

**The University of Rome "La Sapienza"**

Sept 2019 – Jan 2022 Rome (IT)

- **Title of thesis:** "Dynamic interaction and control of an indoor blimp inside the CERN FCC-hh magnetic environment"
- **Main courses:** Control systems, Gas Dynamics, Space Flight Mechanics, Space Structures, Electronics, Space Missions and Systems, Space Propulsion, Space Robotics Systems, Spacecraft Propulsion, Aerospace Materials Technologies, Human Factors, Space System Electronics, Spacecraft Design

### B.Sc. Aerospace Engineering (110/110 cum Laude)

**The University of Rome "La Sapienza"**

Sept 2016 – Nov 2019 Rome (IT)

- **Title of thesis:** "Doses of radiation from solar protons absorbed for a trip to Mars"
- **Main courses:** Mathematical analysis, Geometry, Physics, Chemistry, Technical physics, Mathematical physics, Construction science, Materials Engineering, Electrical Engineering, Applied mechanics, Aerodynamics, Flight Mechanics, Aerospace construction, Aerospace Propulsion, Telecommunication, Programming and Numerical Methods, Rocket Propulsion (with laboratory), Space Environment, Space Systems, Exploration Space System

## UNIVERSITY PROJECTS

### GNC/AOCS for S5Lab Teamwork Project

**The University of Rome "La Sapienza"**

Feb – June 2021 Rome (IT)

- Team leader of the AOCS group for the analysis and design of a 6U CubeSat in the "Spacecraft Design" course supported by the S5Lab.

## LIFE PHILOSOPHY

*"The only way to do great work is to love what you do."*

## COMPUTER SKILLS

**Advanced:** Matlab & Simulink | Phyton | Microsoft Office Suite | Google Suite | LaTeX | CAD SolidEdge | FEMM | NASA GMAT | AGI STK | Arduino | SPENVIS

**Intermediate:** IDM-CIC + SketchUp | CATIA V5 | Wolfram Mathematica | CST Studio Suite

## EXPERIENCES

### Internship Trainee

**CERN**

Nov 2021 – Jan 2022 Geneve (CH)

- I worked in the CERN EP-R&D to develop and control an indoor blimp for robotics environmental inspection in the future particle detectors. Furthermore, I also investigated the effects of the intense detector magnetic field on the robot actuation system.

### Private Tutor

2015 – 2019 Rome (IT)

- I tutored high school students in mathematics, physics and chemistry.

## LANGUAGES

**Italian**
**English**
**Spanish**

## CERTIFICATIONS

- International Computer Driving Licence (ICDL)
- Matlab Onramp (Mathworks)
- Simulink Onramp (Mathworks)
- Control Design Onramp with Simulink (Mathworks)
- Python Essential Training (LinkedIn)
- Python for Non-Programmers (LinkedIn)
- Python for Students (Madecraft)

- The mission was aimed at obtaining precise spectral information on land, water resources and atmosphere, by using hyperspectral data.
- With the use of simulation software such as STK, GMAT and Matlab I have simulateed a scenario of orbital and attitude determination and control.
- The activity concluded with the production of a market analysis, requirement document and PDR of the CubeSat.

### CubeSat Teamwork Project

**The University of Rome "La Sapienza"**

Feb – June 2020 Rome (IT)

- Team leader of a small group of collegues during the "Space Structures" course, with whom I designed a complete space mission by a preliminary feasibility study (phase A) using a modern Concurrent Engineering tool (CNES IDM-CIC) and analysis software such as Matlab.
- The mission had the objective of putting into orbit a self-sufficient Environmental Control Life Support System (ECLSS) ECLSS on a Cubesat 12U for monitoring and life support of a plant (Rucola) in hydroponics studying the effects of microgravity, hypobaric conditions, radiations on the growth of plants in the space environment.

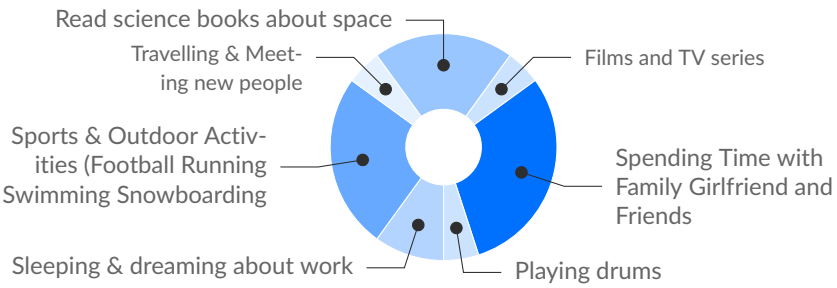
### Sapienza Rocketry Challange

**The University of Rome "La Sapienza" – AVIO Spa**

Feb – June 2019 Rome (IT) – Colleferro (IT)

- Team leader in the Space Propulsion laboratory in which together with a group of colleagues, I designed, built and launched a single-stage rocket model with a commercial solid propellant motor.
- I developed a software program in Matlab for the analysis and simulation of the trajectory and finally tested the models through a launch during an event promoted by Avio Spa in Segni - Colleferro (IT), in order to collect the data and compare them with the results of the simulations.
- I prepared accurate Preliminary Design Review (PDR), Critical Design Review (CDR) and Post Flight Analysis of the rocket model project.

## MY INTERESTS




- Python for Data Visualization (CPE credits: 2.20) (Madecraft)
- Python Quick Start (CPE credits: 2.80) (Madecraft)
- Python for Data Science (Sololearn)
- Python for Engineers and Scientists (LinkedIn)
- Learning Arduino: Foundations (LinkedIn)
- Python for Data Analysis (CPE credits: 4.80) (LinkedIn)

## PUBLICATIONS

### Master Thesis

- Mazzei, F. (2022). *Dynamic interaction and control of an indoor blimp inside the CERN FCC-hh magnetic environment*. Presented 24 Jan 2022. Retrieved from http://cds.cern.ch/record/2802982

## MOST PROUD OF

**CERN internal presentations**
I presented the developments of the thesis research work to the robotics team of the CERN Detector Technologies group

## SOFT SKILLS

Hard-working
Team working and problem solving
Highly motivated and resourceful
Good adaptation to multicultural environment
Good communication skills
Flexible and adaptable to change

## BIO

Motivation, passion and creativity are the key elements of my personality. I approach teamwork activities and personal challenges with enthusiasm. My academic career has allowed me to specialize in the field of missions and space systems. I am ready to get involved, to learn and to broaden my knowledge and skills.