



# Vincenzo D'Antuono

PhD student

29 years old

## Contact



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VD github profile



www.linkedin.com/in/v-d-antuono

## Interests

Autonomous vehicles, Aerospace, Estimation, Modeling, Computer Technology, Travelling, Music, Tennis



## About me

I am a PhD student in Aeronautical and Space Engineering at Sapienza University of Rome. Engineering is my passion, in particular for Aerospace systems and everything concerning autonomous vehicles. Usually, my personality leads me to achieve the goals I previously set, but, as a very determined and ambitious person, I always look for new challenging ones; when I'm trusted, I give my best



## Soft skills

Communication

teamwork

Organizational

leadership

Priority Scheduling

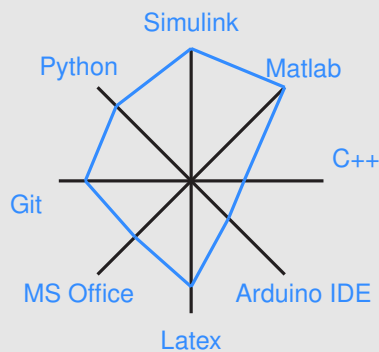
Problem solving



## Hard skills

</> Windows, Linux and Unix

Arduino, Raspberry pi



(\*) The skill scale is from 0 (Fundamental Awareness) to 5 (Expert), the latter is denoted by the tip of the black line

## Education



### PhD in Aeronautical and Space Engineering

Nov 2020 - Present

Sapienza University - Rome, Italy

My research aims at investigating the modeling and analysis of nonlinear estimation algorithms in order to apply them in the field of launch vehicles trajectory reconstruction and in system identification like vehicle model parameters estimation, in order to improve simulation models in post-flight analysis by combining a priori knowledge of the model and data provided by the sensors for the mission.

### Master's degree in "Aeronautical Engineering" (Flight systems and Air Transport)

Gen 2017 - Mar 2020

Sapienza University - Rome, Italy

- Final grade: 107/110 (27.33/30, 3.67 GPA);

- Main courses:

Control systems, Robust Control, Dynamics of flight, Helicopter Flight Mechanics, Flight Assistance systems, Aircraft Electrical systems and Avionics, Aeroelasticity, Aircraft Structures, Aircraft Engines, Environmental impact of aircraft Engines, Gasdynamics;

- Thesis title: "Robust control for fixed-wing UAVs".

### Bachelor's degree in "Aerospace Engineering"

Sep 2013 - Dec 2016

Sapienza University - Rome, Italy

- Thesis title: "Auxetic Materials and their Applications".

## Experiences



### Visiting scholar

Jan 2023- Present

The University of Texas at Austin - Austin, Texas USA

I served as a visiting scholar with the Nonlinear Estimation and Autonomy Research Group led by Prof. Renato Zanetti at the University of Texas at Austin, to pursue research on system identification and estimation applied for aerospace vehicles.

### Flight Dynamics Tutor

Mar 2022-Sept 2022

Sapienza University - Rome, Italy

I provided support to the students for the production of the assigned group projects during the course and in the exam preparation.

### Flight Mechanics Tutor

Sept 2021-Sept 2022

Sapienza University - Rome, Italy

I provided support to students in the exam preparation.

### Post-graduate Research Fellow

Aug 2020 - Oct 2020

Sapienza University - Rome, Italy

"Analysis of techniques for trajectory reconstruction of launch vehicles in atmospheric flight"

### Front-Office

Feb 2019 - Sep 2019

Erasmus Office at Sapienza - Rome, Italy

I provided my support to the office staff in order to solve student problems



## Languages

Italian

English

(\*) The language scale is from 0 (A1) to 5 (Mother tongue).

Levels: A1/A2: basic user,

B1/B2: independent user,

C1/C2: proficient user.

## Research experiences



### Estimation

Since 2021

Sapienza University – Rome, Italy

Recently, I started working on the estimation of dynamic systems, in particular, the last work concerned the offline estimation of the angle of attack and the atmospheric wind components for a LV flight exploiting true airspeed, IMU, and GPS observations, whereas in early 2022 filters for trajectory reconstruction were developed in order to estimate position, velocity, attitude and IMU systematic errors for a generic Launch vehicle (LV). Estimation algorithms such as Extended Kalman filter (EKF) and Unscented Kalman filter (UKF) were employed for this purpose together with the use of a Fraser-Potter smoothing algorithm. These filters were realized in the framework of independent support and cross-check activity for ESA-ESRIN, and ASI PhD research agreement activity.

### Adaptive Augmenting control (AAC)

Since 2021

Sapienza University – Rome, Italy

I Studied the effects of integration of Adaptive augmenting control (AAC) in a LV flight control system, in the framework of independent support and cross-check activity for ESA-ESRIN.

### Launch vehicle modeling

Since 2021

Sapienza University – Rome, Italy

I worked on LV medium-fidelity modelling and simulation characterizing i) Rigid-body translation and rotation, ii) Aerodynamic and thrust force and moments, iii) Structural elastic dynamics modeled using rocket bending modes, iv) Inertial coupling effects due to nozzle rotation, v) Sensors, vi) Attitude Control system with notch and low-pass filters to manage the elastic dynamics.

### Optimal tuning for Robust control of a fixed wing UAVs

Since 2020

Sapienza University, Laboratory of Flight Dynamics - Rome, Italy

I've been working on optimization of UAV's control system inner loop gains by exploiting a genetic algorithm in order to maximize a weighted sum of suitably defined performance metrics. A systematic design approach was developed to reduce the burden of trial and error procedures generally adopted in control systems tuning.

### Robust control for fixed wing UAVs

Apr 2019 – Mar 2020

Sapienza University, Laboratory of Flight Dynamics - Rome, Italy

The work relative to the Master's thesis forms part of the development projects of autopilot systems for small Remotely Piloted Vehicle (RPV), conducted in recent years by the Department of Mechanical and Aerospace Engineering of Sapienza University of Rome. Main aspects:

- Study of Robust control techniques for fixed-wing UAVs.
- Study of frequency domain analysis method for MIMO systems.
- Model Based Design approach for the realization of an entire flight control system for an UAV autopilot in Matlab® e Simulink®. Development of PID controllers for external control loops and use of RSLQR (robust servomechanism LQR) technique for the realization of the inner loops.
- Software in the Loop (SIL) simulation carried out in Matlab® e Simulink® to demonstrate control system robustness and command tracking performance in presence of model parameters uncertainties, noise and atmospheric disturbances.

## Project and training courses



### PhD courses

2021 - 2022

Sapienza University – Rome, Italy

- Nonlinear Spacecraft Attitude Control
- Probabilistic robotics
- Filtering and optimal control

### General english course

Aug 2021

Everest Language School – Dublin, Ireland

four-week course with 20 hours per week.

### Coding Python and Deep Learning Applications

Sep 2018 – Nov 2018

Spazio Chirale – Rome, Italy

Object Oriented programming in Python - Use of standard and nonstandard Python libraries - Basic knowledge of Tensor flow library - Analysis of different DNN (Deep Neural Network) codes in Python.

### Sapienza Flight Team Member

Oct 2017 – May 2018

Sapienza University – Laboratory of Flight Dynamics - Rome, Italy

- The team focuses on designing an Unmanned Aerial Vehicle (UAV) and present their work at international competitions (AUVSI-SUAS) among peer teams;
- Development of experimental methodologies to building servo models, subsequent implementation of the models in Simulink® and testing via Software in the Loop (SIL) and Hardware in the Loop (HIL) simulations.
- Integration of sensors using the S-Function for embedded devices in the autopilot software
- Use of Simulink® to automatically generate C code for embedded platform.
- Sizing and data management of telemetry system.

## Publications



1. Giovanni Di Monaco, Vincenzo D'Antuono, Alessandro Zavoli, Guido De Matteis, Simone Pizzurro, and Enrico Cavallini. Trajectory reconstruction of launch vehicle in atmospheric flight using the unscented kalman filter. In *AIAA Scitech 2023 Forum, National Harbor, AR, USA*, page 2315, 2023
2. Vincenzo D'Antuono, Giovanni Di Monaco, Alessandro Zavoli, Guido De Matteis, Simone Pizzurro, and Enrico Cavallini. Estimation of aerodynamic angles and wind components for a launch vehicle. In *Proceedings of the AAS/AIAA Astrodynamics Specialist Conference, Charlotte, NC, USA*, 2022
3. Vincenzo D'Antuono, Guido De Matteis, Domenico Trotta, and Alessandro Zavoli. Optimal tuning for robust control of a small fixed-wing uav. In *AIAA Scitech 2021 Forum*, page 1057, 2021