



EDUCATION AND TRAINING

- [10/2022 – 10/2025] **Master's degree in Space and Astronautical Engineering, Curriculum "Space payloads and applications for telecommunication, navigation, and Earth observation"**
Sapienza University of Rome
City: Rome | **Country:** Italy | | **Final grade:** 104/110 | **Thesis:** Exploiting Raw GNSS Observations from a Dedicated Payload during Experimental Rocket Launch: Algorithms Evaluation and Comparison
- Development of an autonomous GNSS system for raw observation acquisition.
 - Analysis of GNSS raw-observation continuity.
 - Positioning algorithms.
 - Variometric techniques.
 - Statistical analysis and algorithm comparison.
- [09/2018 – 10/2022] **Bachelor's degree in Space and Astronautical Engineering**
Sapienza University of Rome
City: Rome | **Country:** Italy |
- [09/2021 – 03/2025] **Work at Sapienza Space Surveillance and Space Systems Laboratory (S5Lab)**
Sapienza University of Rome
City: Rome | **Country:** Italy |
- Worked with optical telescopes.
 - Took part in the project of analog missions GEA.
 - Experience in constellation mission analysis and orbital mechanics.
 - Experience in brightness reflectance estimation using an experimental facility for both orbiting satellites and debris produced by on-ground hypervelocity impacts.
 - 34/35 BEXUS experiment "RETINA (Real-time Experiment for Thermal management, Inertial Navigation and Attitude)" as responsible for the GNSS software implementation and data evaluation.
 - 35/36 REXUS experiment "VIPER (Vibro-mechanical and Inertial Positioning Experiment on Rocket)" as project manager.
- [12/2024 – 03/2025] **Research scholarship for the activity titled: "ReMo-QU&HE: Advanced tools for the protection and management of the archaeological heritage: REMote MONitoring the archaeological risk from modern quarries in central southern Italy (steps forward of the QU&HE project) ."**
Sapienza University of Rome, Department of Science of Antiquities
- [11/2023 – 03/2024] **Research scholarship for the activity titled: "Support for operations of the EQUO-AD observatories and data analysis for characterization, identification, and orbital determination of space debris and objects in orbit."**

Sapienza University of Rome, Department of Astronautic, Electric and Energetic engineering

Research scholarship for the activity titled: "Evaluation of innovative mission envelopes for constellations of small satellites for Earth Observation and preliminary design of constellations."

[07/2022 – 07/2023]

Sapienza University of Rome, Department of Mechanical and Aerospace engineering

PUBLICATIONS

[2026] **Exploiting Raw GNSS Observations from a Prototype Payload during Rocket Launch**

Abstract accepted for PNT (Position, Navigation and Timing) 2026 conference in Sydney, Australia.

Authors: Carolina Ghini, Augusto Mazzoni

C. Ghini, A. Delfini, L. Olivieri, A. Francesconi, "Ground-Based Experimental Reflectance Verification for satellite hypervelocity impact characterization."

Reference: IAC-24,A6,3,9,x90388

Proceedings of the 75th International Astronautical Congress (IAC), 14 - 18 October 2024, Milan, Italy

A. Di Giacomo et al., "Stratospheric validation for TRL elevation of hybrid navigation systems, two-phase cooling systems and AI-assisted attitude determination for launch vehicles."

Reference: IAC-24,D2,6,10,x90336

Proceedings of the 75th International Astronautical Congress (IAC), 14 - 18 October 2024, Milan, Italy

G. Lorenzi, C. Ghini, L. Mariani, P. Marzioli, and F. Piergentili, 'Reflectance characterization of Starlink-like satellite with HELIOS brightness testing facility'

Reference: Adv. Space Res., 2024, doi: 10.1016/j.asr.2024.04.031.

L. Chiavari et al., "Hands-on stratospheric balloon experiment as a stepping stone to the space: the RETINA students' experience"

Reference: IAC-24,E1,IPB,8,x90333

Proceedings of the 75th International Astronautical Congress (IAC), 14 - 18 October 2024, Milan, Italy

Carolina Ghini et al., "Spacecraft reflectance experimental facility for Space Traffic Management and brightness estimation: lessons learned from HELIOS at S5Lab"

Reference: IAC-23,A6,IP,11,x79820

Proceedings of the 74th International Astronautical Congress (IAC), 2-6 October 2023, Baku, Azerbaijan

Gaia Lorenzi et al., "Satellites reflectance and brightness testing facility for reducing spacecraft constellations light pollution"

Reference: IAC-23,B4,9- GTS.5,6,x79814

Proceedings of the 74th International Astronautical Congress (IAC), 2-6 October 2023, Baku, Azerbaijan

M. Boscia et al., "Mapping Lunar Transient Phenomena with a CubeSat Constellation: MOTHS mission concept and design."

Reference: IAC-24,B4,IPB,3,x90310

Proceedings of the 75th International Astronautical Congress (IAC), 14 - 18 October 2024, Milan, Italy

Paolo Marzioli et al "Early identification and attitude reconstruction of LED equipped satellites for Space Traffic Management and improved trackability"

Reference: IAC-22,A6,4,7,x73755

Proceedings of the 73rd International Astronautical Congress (IAC), 18-22 September 2022, Paris, France

Lorenzo Frezza et al., "Advances in spaceborne LED payloads attitude determination and autonomous units design for Space Traffic Management"

Reference: IAC-23,A6,4,1,x79847

Proceedings of the 74th International Astronautical Congress (IAC), 2-6 October 2023, Baku, Azerbaijan

Paolo Marzioli et al., "Nano-satellites with Light-Emitting Diodes (LEDs) for optical monitoring improvement and reconnaissance of in-orbit payloads"

44th COSPAR Scientific Assembly, 2022

Paolo Marzioli et al., "Lessons learned from the first student-led Sapienza GEA cave exploration analog mission"

Reference: IAC22,E1,4,14,x73748

Proceedings of the 73rd International Astronautical Congress (IAC), 18-22 September 2022, Paris, France

Angelo Fabbrizi et al., "Lunar lava tube infrastructure and innovative technologies testing through speleology analog mission: the Sapienza GEA project"

Reference: IAC-23,A5,1,10,x79828

Proceedings of the 74th International Astronautical Congress (IAC), 2-6 October 2023, Baku, Azerbaijan

PROJECTS

RETINA: Stratospheric Experiment for the first in-orbit demonstration of different technologies, ranging from Thermal Management to Inertial Navigation and Attitude exploitation

[10/2023 – 10/2024]

- RETINA (Real-time Experiment for Thermal management, Inertial Navigation and Attitude) is a stratospheric experiment aimed at demonstrating the innovative implementation of four state of the art technologies on a launch vehicle. RETINA aims to conduct the **first in flight demonstration of these technologies in order to increase their technology readiness level (TRL)** in order to pave the way to future space applications. The four technologies are all interconnected: Attitude and data fusion experiment test and validate real time attitude and positioning data fusion algorithm, The artificial intelligence experiment test an innovative approach for attitude determination through AI algorithms. FTT-Ethernet Technology Demonstrator test the implementation of an FTT-Ethernet and real

time communication system for launch vehicle instrumentation and Thermal Management Experiment demonstrates the functionality of an innovative miniaturized two-phase mechanically pumped loop cooling system to manage heat exchange produced by high-power electronics.

- The experiment has been conceived by the students at Sapienza University of Rome, with the collaboration of three different Engineering Departments (DIMA, DIAEE and DIET) and with the support of ENEA. The experiment has been selected for the **REXUS/BEXUS program**, coordinated by **SNSA, DLR and ESA**.
- Desinged, Built, Tested and Operated by the participating students, **launched on the 4th October 2024 from the Estrange Space Center, Kiruna, Sweden**.

[11/2022 – 03/2024] **HELIOS (High Efficiency Light Intensity Observation System)**

HELIOS is a ground-based facility designed to characterize the **brightness of satellites before launch**. Using a precise setup consisting of a camera, a robotic arm, a light source replicating the Sun's spectrum, and a satellite model, it is possible to **simulate the light reflected by the satellite's surfaces during a passage** above an observatory. The resulting light curves obtained on the ground are comparable to those derived from optical observations. Given the increasing number of satellites launched each year, this approach allows for the enforcement of **regulations on surface reflectance** before deploying constellations that could disrupt the dark sky.

As part of the EQUO project, the same procedure was applied to a picosatellite **debris generated by a hypervelocity impact** at the University of Padua. By analyzing and characterizing its brightness, it becomes possible to identify significant differences in luminance trends and RGB channels behavior, which are directly related to the **fragment's geometry**.

[09/2023 – 02/2024] **Constellation design in the framework of a Thales Alenia Space Italy project**

Evaluation of a telecommunication constellation design aimed at optimizing the number of satellites, inter-satellite link paths, and coverage of the area of interest.

[06/2023 – 12/2023] **MOTHS (Moon Observation Through Hyperspectral Satellites): 6U Lunar CubeSat constellation for the observation and analysis of Transient Lunar Phenomena**

Carried out in the framework of the UNISEC-Global's 8th Mission Idea Contest (MIC8).

- Participation to the 8th Mission Idea Contest proposed by UNISEC-Global with project MOTHS winning the first prize of the 8th MIC. •
- The Mission Idea Contest (MIC) is a student competing for the **design of space systems** carried out by University students group that are members of UNISEC Global.

Role: **Mission Analysis Engineer**

[07/2022 – 07/2023] **Constellation design in the framework of IRIDE project**

Evaluation of innovative space mission envelopes for Earth Observation small satellites and preliminary constellation design in the framework of IRIDE project in collaboration with Taitus Software Italia Srl

[04/2022 – 07/2024] **GEA: Analog Exploration Group**

Role: Mission Control Center Responsible

Objective: First student-led analog mission project that aims to develop an analog infrastructure and to organize long term analog missions on Earth that simulates human life conditions on Moon and Mars surfaces.

[09/2021 – 07/2022] **EDUSCOPE - Educational Telescope**

EDUSCOPE is a telescope built by students on the rooftop of the university. Its primary purpose is to teach students how optical observations work, starting with the restoration of the dome, aligning the telescope to the polar axis, and ultimately tracking satellites. The best images captured were analyzed using specialized software to perform orbit determination.

CONFERENCES AND SEMINARS

[04/02/2026 – 06/02/2026] **Position, Navigation and Timing (PNT) 2026** Sydney, Australia

Scheduled oral presentation of the paper "Exploiting Raw GNSS Observations from a Prototype Payload during Rocket Launch"

[14/10/2024 – 18/10/2024] **International Astronautical Congress (IAC) 2024** Milan, Italy

Main Author:

1. "Ground-Based Experimental Reflectance Verification for satellite hypervelocity impact characterization."

Others:

1. "Stratospheric validation for TRL elevation of hybrid navigation systems, two-phase cooling systems and AI-assisted attitude determination for launch vehicles."
2. "Hands-on stratospheric balloon experiment as a stepping stone to the space: the RETINA students' experience."
3. "Mapping Lunar Transient Phenomena with a CubeSat Constellation: MOTHS mission concept and design."

[02/10/2023 – 06/10/2023] **International Astronautical Congress (IAC) 2023** Baku, Azerbaijan

Main Author:

1. "Spacecraft reflectance experimental facility for Space Traffic Management and brightness estimation: lessons learned from HELIOS at S5Lab."

Others:

1. "Satellites reflectance and brightness testing facility for reducing spacecraft constellations light pollution."
2. "Advances in spaceborne LED payloads attitude determination and autonomous units design for Space Traffic Management."
3. "Lunar lava tube infrastructure and innovative technologies testing through speleology analog mission: the Sapienza GEA project."

[28/11/2023 – 01/12/2023] **UNISEC GLOBAL - 8th Mission Idea Contest (MIC)** Tokyo, Japan

Participation at the UNISEC conference with the presentation and win of the project MOTHS (Moon Observation Through Hyperspectral Satellites) at the Mission Idea Contest.

[18/09/2023 – 22/09/2023] **International Astronautical Congress (IAC) 2022** Paris, France

Oral presentation of the paper "Lessons learned from the first student-led Sapienza GEA cave exploration analog mission"

Others:

"Early identification and attitude reconstruction of LED-equipped satellites for Space Traffic Management and improved trackability"

[18/07/2022 – 20/07/2022] **44th COSPAR Scientific Assembly** Athens, Greece

Poster Session for the paper "Nano-satellites with Light-Emitting Diodes (LEDs) for optical monitoring improvement and reconnaissance of in-orbit payloads"

44th COSPAR Scientific Assembly, 2022cosp...44.1997M

LANGUAGE SKILLS

Mother tongue(s): Italian

Other language(s):

English

LISTENING B2 READING B2 WRITING B2

SPOKEN PRODUCTION B2 SPOKEN INTERACTION B2

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

DIGITAL SKILLS

My Digital Skills

Good programming skills with: Python, C++, Arduino IDE, MATLAB