

# Luca Furlani

## WORK EXPERIENCE

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 **La Sapienza, ENEA** – Rome, Italy

City: Rome | Country: Italy

### System Developer for the Hort3Space experiment for the AMADEE-24 Analog Mission

[ 09/2023 – 04/2024 ]

Participated as hardware system developer for the semi-automated hydroponic cultivation module, originally designed for the LOOPS-M project and adapted for operational use in a real Mars analog mission AMADEE-24. The goal was to make the robotic system reliable and safe for third-party use in a Mars-simulated environment. Key contributions included enhancing system robustness to ensure continuous microgreens production even under off-nominal conditions, by integrating manual operation procedures as a backup to automated functions. I contributed to drafting detailed operational protocols, supporting analog astronaut training, and preparing failure contingency plans, as well as improving the system's hardware. The project also involved providing 24/7 remote mission support from the Mission Control Center in Vienna throughout the one-month mission in the Armenian desert, as well as managing the logistics for the transportation and setup of the experimental module from the ENEA laboratories to Vienna and back.

 **La Sapienza University of Rome** – Rome, Italy

City: Rome | Country: Italy | Website: <https://space-innovation.ch/activities/igluna/>

Link <https://www.youtube.com/watch?v=4kmhhXeKz28>

### System Manager and System Developer for the LOOPS-M project

[ 01/09/2020 – 01/11/2021 ]

This was an extracurricular project in which I participated as system manager and system developer of the Automation unit subsection.

Through the LOOPS-M (Lunar Operative Outpost for the Production and Storage of Microgreens) project I took part in the IGLUNA 2021 mission, an ESA\_Lab@ initiative managed by Space Innovation. Through this experience I had the opportunity to be introduced in the managerial field but also to put into practice my theoretical knowledge. I had the chance to gain experience as teamworking and team leader and to get in touch with a lot of project partners (such as ENEA and MarsPlanet) and other agencies from all over the world who contributed to the project as providers.

In particular, my role within the automation unit concerned the hardware of the cultivation system and the associated robot for the implementation of the automated procedures.

Half of the project evolved during the COVID-19 lockdown and this was really challenging for the overall team. This experience resulted in digital skills gains and improved ability of remote working and communications.

## EDUCATION AND TRAINING

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### Space and Astronautical Engineering Master's degree

**La Sapienza University of Rome** [ 10/2021 – 10/2025 ]

Address: Via Eudossiana 18, 00184 Rome (Italy) | Level in EQF: EQF level 7 | Thesis: Ai-Based Battery Degradation Assessment for Space Applications

### Aerospace Engineering Bachelor degree

**La Sapienza University of Rome** [ 29/09/2016 – 24/05/2021 ]

Address: Via Eudossiana 18, 00184 Rome (Italy) | Field(s) of study: Engineering, manufacturing and construction | Thesis: Design of an Autonomous Cultivation System for a Lunar Greenhouse

Link: <https://www.youtube.com/live/4kmhhXeKz28?feature=share>

## High school degree

**Aeronautical technical institute** [ 17/09/2011 – 06/06/2016 ]

Address: Via francesco morandini 30, 00142 Rome (Italy) | Website: <https://www.depinedo.edu.it> |

Final grade: 86 | Thesis: Studio di un Sistema semiautomatico per il controllo del traffico aereo di droni civili

## LANGUAGE SKILLS

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**Mother tongue(s):** Italian

**Other language(s):**

### English

**LISTENING C1 READING C1 WRITING C1**

**SPOKEN PRODUCTION B2 SPOKEN INTERACTION B2**

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

## SKILLS

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Microsoft Office / Microsoft Word / Microsoft Powerpoint / Microsoft Excel / Zoom / LinkedIn / Skype / Google Drive / Facebook / Good listener and communicator / Team-work oriented / Decision-making / Instagram / Motivated / Organizational and planning skills / Creativity / robotic components / battery components / understand written English / MATLAB / Python (computer programming) / Programming: Python (Pycharm, Jupyter Notebooks) / Artificial Intelligence and Machine learning / Machine Learning ( AI, DL, CNN) / statistics / inspect data / process data

## PUBLICATIONS

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[2024]

**[The Hort3space Experiment: Hydroponic System for Life Support](#)** The publication presents the design, development, and experimental validation of **Hort3Space**, a partially automated multilevel hydroponic system for microgreens cultivation in space analog environments. Developed through the collaboration between ENEA (Biotechnology Laboratory, Casaccia), BIOAG, and Sapienza University of Rome (S5Lab), the system integrates sensors, full-spectrum LED lighting, and a robotic arm to enable remote cultivation. The experiment was selected for the AMADEE-24 Mars analog mission in Armenia (2024), aiming to test the feasibility of reliable, resource-efficient food production for future long-duration space missions.

**Authors:** Linda Misercola, Luca Nardi, Luca Furlani | **Journal Name:** International Astronautical Congress (IAC) | **Publisher:** International Astronautical Federation (IAF)

Linda Misercola, Luca Nardi, Luca Furlani,

[2022]

**[Designing Greenhouse Subsystems for a Lunar Mission: The LOOPS - M Project](#)** The LOOPS-M project, created by students from Sapienza University of Rome, had the objective to design and simulate some of the main features of a lunar greenhouse for the IGLUNA 2021 campaign. The project aimed to create an autonomous cultivation system, a bioconversion system to recycle waste, and a shield to protect the greenhouse from micrometeoroids impacts. The team faced different challenges, such as inexperience and a diverse range of objectives that required different fields of expertise. However, through careful planning and hard work, the project was successfully carried out, resulting in new knowledge and skills for the team members. This paper is focused on the lessons learned by the team members during this project activities. This paper was published in the context of the 4th SSEA (Symposium on Space for Educational Activities) which took place in Barcelona, in 2022.

[2021]

**[LOOPS-M Project: Structural and Bioregenerative Systems for a sustainable lunar greenhouse](#)** In the coming years, humanity is finally about to establish a lunar base for the long-term presence of the human beings on the

Moon. In this sense, the in situ production of fresh food will be a key factor for human survival in such a hostile environment. With the LOOPS-M (Lunar Operative Outpost for the Production and Storage of Microgreens) project, a groups of masters and phd student, in partnership with ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development) and MarsPlanet, have designed a new vertical autonomous cultivation module to produce fresh microgreens for a crew of five to six astronauts, a bioregenerative system to recycle the microgreens production waste and a shield to protect the lunar greenhouse from a micrometeoroids impact; all of these aspect where recreated in a virtual reality environment. This paper was published in the context of the 72nd IAC (International Astronautical Congress) which took place in Dubai, in 2021.

## CONFERENCES AND SEMINARS

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[ 28/01/2020 – 29/01/2020 ] Rome

**Attendee at the "What is a project and how it is done" Seminar** This seminar was focused on what is a project and how it can be done in the MSC Software environment; it was provided by La Sapienza University of Rome for the students and was held by Daniele Catelani (Senior project manager of MSC Software). During the seminar the environment of the software Nastran and Patran was shown. The project concept and its phases were illustrated always in the optics of the finite element analysis.

[ 25/10/2021 – 29/10/2021 ] Dubai, UAE

**Speaker at the 72nd IAC 2021** I was one of the speakers who presented the LOOPS-M (Lunar Operative Outpost for the Production and Storage of Microgreens) project at the 72nd International Astronautical congress in Dubai. This public presentation, as well as the related paper, are part of the outcome I have obtained thanks to the participation in the LOOPS-M project. I think this experience was important for improving my communication skills, boosting my confidence in front of the public or for increasing my creative and improvisational skills. On the other hand, the speech preparation was also important and a good occasion for increasing my english vocabulary in order to make the speech more captivating and interesting. Last but not least it was the ability of respecting the lineup even in the case of uncomfortable situation.

[ 22/02/2023 – 22/02/2023 ] Rome

**Attendee at the "Additive Manufacturing" Seminar** This seminar was provided by La Sapienza University of Rome for the students and was held by Daniele Catelani (from Hexagon), Barbara Orsola (from TMC People Drive Technology) and Filippo Ugolini (from AGT Engineering); It covered the following topics: The additive manufacturing process, Plastic and metallic material for AM, Design process for additive manufacturing, Case studies, AM process engineering, space industry applications, Demo Live of the MSC software application for AM, AM at La Sapienza University of Rome

[ 14/10/2024 – 18/10/2024 ] Milan, ITA

**Speaker at the 75th IAC 2024** I had the honor of presenting the Hort3Space project to the international astronautical community. The project focused on adapting an automated microgreens cultivation module, originally developed under the previous LOOPS-M project, for operational use by analog astronauts during the AMADEE-24 Mars analog mission in Armenia. The system was enhanced to increase reliability through both technical improvements and the development of comprehensive operational manuals and contingency procedures. These protocols enabled astronauts to operate the module effectively under both nominal and off-nominal conditions. Throughout the one-month mission, the experiment team provided continuous 24/7 remote support to the Mission Control Center, simulating the communication delays and operational constraints of a real Martian outpost.

## LICENSE

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[ 10/04/2017 – Current ]

### **FISO (FLight Information Service Operator) license**

This license allow me to work as a FISO; providing the FIS (Flight Information Service). The FIS provides the information necessary for safe and efficient flights within the flight information area, such as potential air traffic conflicts, potential airfield and flight hazards, and meteorological data. This service is provided only in the italian airspace.

This license was released by the ENAC (Ente Nazionale dell'Aviazione Civile), the national civil aviation agency.

[ 12/12/2021 – Current ]

### **Italian Nautical License – Sail & Motor (Offshore)**

## HOBBIES AND INTERESTS

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**Wado Ryu and its philosophy** I practiced karate for ten years but what I learned will always be a part of me. I believe that the practice of sport is a very important activity for the physical and mental well-being of the person and that one cannot work on just one of the two aspects while neglecting the other. The Wado Ryu practice as a karate style gave me the opportunity to understand it and to start my journey on that. Through dedication and perseverance I also won some competitions and this was important for me to understand the importance of the hard work for the obtaining of great results.