



Alessandro Lotti

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EDUCATION AND TRAINING

11/2021 – CURRENT Forlì, Italy

DOCTORATE - AEROSPACE SCIENCE AND TECHNOLOGY Alma Mater Studiorum - Università di Bologna

Research topic: “*autonomous navigation of satellites for proximity and docking operations*”. Specialized in monocular pose (position and attitude) estimation using deep learning, emphasizing algorithm deployability and domain gap.

Other activities and achievements:

- Scored 4th place in ESA's 2021 Pose Estimation Challenge (research presented at AII 2022)
- **Conducted a research visit at the Australian Institute for Machine Learning, Adelaide, Australia (February - July 2024).**
- Designed a sun simulator for an attitude determination and control testing platform under ESA-ESTEC contract (presented at EUCASS-CEAS 2023).
- **Co-organised** the conferences **AIDAA III Aerospace PhD Days** and 2nd IFAC Workshop on Aerospace Control Education (**WACE 2024**).
- **Co-supervised** 7 BSc and 1 MSc students for internships and theses on various deep learning topics for space applications, contributing to top teams in the ESA-sponsored #HYPERVIEW and OrbitalAI competitions.
- **Reviewer** activities: 2nd IFAC Workshop on Aerospace Control Education (9 papers) - 2024; 2nd International Conference on Applied Intelligence and Informatics (1 paper) - 2022; Acta Astronautica (1 paper) - 2023.
- **Associate Editor, co-chair** of *Session 3: Emerging Technologies and Tools for Teaching Aerospace Control Systems* and *Session 8: Teaching and Learning Theory and Experiences in Aerospace Control Education II*, **chair** of *Session 6: Project-Based Learning in Aerospace Control Education* at the **2nd IFAC Workshop on Aerospace Control Education (WACE 2024)**.

10/2018 – 12/2020 Forlì, Italy

MASTER OF SCIENCE - AEROSPACE ENGINEERING (LM-20) Alma Mater Studiorum - Università di Bologna

- Course taught in English.
- Final weighted exam average: **29.87 / 30**.
- **Curricular internship 1/2 - “Pre-Phase A study of a microsatellite for amateur astronomy purposes”:** contribution to the Pre-Phase A of a new microsatellite mission with a focus on the **attitude determination and control and power subsystems**; identification of applicable ECSS standards; preliminary budgets.
- **Curricular internship 2/2 - “Numerical models for thermal analysis of spacecraft in LEO”:** development of a numerical model to predict the temperature evolution of a LEO satellite along its orbit through the software COMSOL Multiphysics.
- **Winner of an Erasmus+ traineeship position** (A.Y. 2019/2020), not carried out due to the COVID-19 pandemic.
- Thesis developed in collaboration with the Spanish company **Alén Space**.

Final grade 110/110 with honors (cum laude) |

Thesis Robotic exploration of lunar caves: concept analysis of the communication system for an ESA Moon mission

09/2015 – 10/2018 Forlì, Italy

BACHELOR OF SCIENCE - AEROSPACE ENGINEERING (L-9) Alma Mater Studiorum - Università di Bologna

- Final weighted exam average: **29.40 / 30**.
- **Curricular internship** - “Collaboration to the first UniBo CubeSat project”: involvement in the team responsible for the conceptual design of the GPS payload.

Final grade 110/110 with honors (cum laude) |

Thesis Study and implementation of GPS navigation algorithms for orbital determination applications.

● WORK EXPERIENCE

07/2024 – 09/2024 Bertinoro, Italy

TUTOR - SUMMER SCHOOL IN INDUSTRIAL ENGINEERING FOR ADVANCED AUTOMOTIVE (4TH EDITION)
ALMA MATER FOUNDATION; ABOUT 80 HOURS.

- **Tutored the educational activities** of the Summer School in Industrial Engineering for Advanced Automotive, 4th edition, 2024. The initiative was promoted by the Department of Industrial Engineering of the University of Bologna in collaboration with leading companies in the automotive sector (Ducati, Lamborghini, Ferrari) and was dedicated to students of the Motorvehicle University of Emilia-Romagna (MUNER). **Director: Prof. Dario Croccolo.**
- **Secretary of the Admission Committee for CV evaluation and conducting interviews.**
- Coordinated institutions, administration, students, teachers, experts, and companies, and managed the website.
- Activities were primarily conducted in English.

06/2023 – 09/2023 Bertinoro, Italy

TUTOR - SUMMER SCHOOL IN INDUSTRIAL ENGINEERING FOR ADVANCED AUTOMOTIVE (3RD EDITION)
ALMA MATER FOUNDATION; ABOUT 80 HOURS.

- **Tutored the educational activities** of the Summer School in Industrial Engineering for Advanced Automotive, 3rd edition, 2023. Director: **Prof. Dario Croccolo.**
- **Secretary of the Admission Committee for CV evaluation and conducting interviews.**
- Coordinated institutions, administration, students, teachers, experts, and companies, and managed the website.
- Activities were primarily conducted in English.

10/2022 – 06/2023 Forlì, Italy

MATLAB STUDENT AMBASSADOR THE MATHWORKS, INC. (VIA ADECCO ITALIA S.P.A.), PART-TIME CONTRACT 12.5%.

Conducted seminars in both Italian and English on the scientific software **MATLAB** for engineering students at the University of Bologna, covering the following areas: **MATLAB fundamentals, numerical computing, and deep learning.**

- **MATLAB Onramp**, November 22, 2022: a 2-hour seminar on the basics of the software for undergraduate students at the Forlì campus.
- **Numerical Computing with MATLAB**, February 15, 2023: a 3-hour seminar on the fundamentals of numerical computing using MATLAB, aimed at Master's students in Mechanical and Energy Engineering (**Proff. Gian Marco Bianchi and Michele Celli**).
- **MATLAB Workshop**, May 29, 2023: an exercise session using MATLAB Grader for undergraduate students in Mechanical and Aerospace Engineering (**Prof. Mirko Ravaoli**).

08/2022 – 09/2022 Bertinoro, Italy

TUTOR - SUMMER SCHOOL IN INDUSTRIAL ENGINEERING FOR ADVANCED AUTOMOTIVE (2ND EDITION)
ALMA MATER STUDIORUM - UNIVERSITÀ DI BOLOGNA; 40 HOURS.

- **Tutored the educational activities** of the Summer School in Industrial Engineering for Advanced Automotive, 2nd edition, 2022. Director: **Prof. Dario Croccolo.**
- **Secretary of the Admission Committee for CV evaluation and conducting interviews.**
- Coordinated institutions, administration, students, teachers, experts, and companies, and managed the website.
- Activities were primarily conducted in English.

Department Department of Industrial Engineering

11/2021 – 06/2022 Forlì, Italy

MATLAB STUDENT AMBASSADOR THE MATHWORKS, INC. (VIA ADECCO ITALIA S.P.A.), PART-TIME CONTRACT 12.5%.

Conducted seminars in both Italian and English on the scientific software **MATLAB** for engineering students at the University of Bologna, covering the following areas: **MATLAB fundamentals, numerical computing, and deep learning.**

- **MATLAB Onramp**, December 14 and December 20, 2021: a 2-hour seminar on software basics for undergraduate students (online).
- **MATLAB Fundamentals**, February 17, 2022: a 3-hour seminar on intermediate-level software usage, aimed at Master's students in Mechanical Engineering (**Proff. Marco Carricato and Michele Celli**).

- **Numerical Computing with MATLAB**, February 18, 2022: a 3-hour seminar on the basics of numerical computing using MATLAB, aimed at Master's students in Mechanical Engineering (**Proff. Marco Carricato and Michele Celli**).
- **MATLAB Workshop**, May 11, 2022: an exercise session using MATLAB Grader for undergraduate students in Mechanical and Aerospace Engineering (**Prof. Mirko Ravaioli**).
- **MATLAB Deep Learning Workshop**, May 14, 2022: **a 3-hour workshop on deep learning algorithm applications in the space domain**, focusing on image classification and pose estimation from images (Student Association EUROAVIA).

10/2021 – 09/2022 Bologna, Italy

TEACHING TUTOR - CALCULUS AND LINEAR ALGEBRA ALMA MATER STUDIORUM - UNIVERSITÀ DI BOLOGNA; 20 HOURS.

- **Delivered lessons** for students with additional learning requirements (OFA) in the Calculus and Linear Algebra course (**Prof. Lars Halvard Halle**).
- Prepared educational materials and exam simulations.
- Activities conducted in English.

Department Department of Economics

09/2021 – 12/2021 Bologna, Italy

WEBINAR ASSISTANT ALMA MATER FOUNDATION

- Provided technical support for a course on Labor Law and Procedure.

08/2021 – 09/2021 Bertinoro, Italy

TUTOR - SUMMER SCHOOL IN INDUSTRIAL ENGINEERING FOR ADVANCED AUTOMOTIVE (1ST EDITION) ALMA MATER STUDIORUM - UNIVERSITÀ DI BOLOGNA; 40 HOURS.

- **Tutored the educational activities** of the Summer School in Industrial Engineering for Advanced Automotive (1st edition). Director: **Prof. Dario Croccolo**.

Department Department of Industrial Engineering

02/2021 – 10/2021 Forlì, Italy

GRADUATE RESEARCH FELLOW ALMA MATER STUDIORUM - UNIVERSITÀ DI BOLOGNA

Research topic: *Artificial Intelligence for real time satellite pose estimation from monocular images in a docking scenario;*

- **Development of a satellite image dataset** using 3D computer graphics software Blender for in-orbit servicing scenarios.
- **Development of neural networks for estimating the relative pose** between target and chaser from monocular images.
- Drafting and periodic updating of the technical note (in English).
- Preparation of periodic progress presentations.
- Research funded and supported by **Thales Alenia Space Italia** (Dr. Maria Antonietta Perino).

Department Interdepartmental Centre for Industrial Aerospace Research - CIRI Aerospace

12/2018 – 10/2019 Forlì, Italy

DEGREE PROGRAM TUTOR ALMA MATER STUDIORUM - UNIVERSITÀ DI BOLOGNA

- Conducted presentations during informational events.
- Managed the application process for international students applying to the Master's Degree in Aerospace Engineering.
- Offered support and guidance to students, both current and prospective, within the Bachelor's and Master's degree programs.

Department Department of Industrial Engineering

● LANGUAGE SKILLS

Mother tongue(s): **ITALIAN**

Other language(s):

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken production	Spoken interaction	
ENGLISH	C1	C1	C1	C1	C1
FRENCH (DELF B2)	B2	B2	B2	B2	B2

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

● DIGITAL SKILLS

Tensorflow | Blender | TracePro | Astro | Python | MATLAB | Simulink | Cloud Computing | GitHub

● PUBLICATIONS

2023

[The Nanosatellite-Class Attitude Control Facility at ESA-ESTEC](#)

A. Curatolo, D. Modenini, G. Curzi, A. Lotti, D. Pecorella, E. Strollo, A. Locarini, A. Hyslop, D. Oddenino. Presented at the Joint 10th EUCASS – 9th CEAS, Lausanne, Switzerland, July 9-13, 2023. doi: <https://doi.org/10.13009/EUCASS2023-760>

2023

[Improving Satellite Pose Estimation Across Domain Gap with Generative Adversarial Networks](#)

A. Lotti. Presented at the 3rd AIDAA Aerospace PhD Days, Bertinoro, Italy, April 16-19, 2023. Published in Aerospace Science and Engineering – III Aerospace PhD-Days, pp. 376–381, 2023. doi: <https://doi.org/10.21741/9781644902677-55>

2023

[Investigating Vision Transformers for Bridging Domain Gap in Satellite Pose Estimation](#)

A. Lotti, D. Modenini, and P. Tortora. Presented at the 2nd International Conference on Applied Intelligence and Informatics - The use of Artificial Intelligence for Space Application, Reggio Calabria, Italy, September 1-3, 2022. Published in Studies in Computational Intelligence, vol. 1088, pp. 299–314, 2023. doi: https://doi.org/10.1007/978-3-031-25755-1_20

2023

[Deep Learning for Real-Time Satellite Pose Estimation on Tensor Processing Units](#)

A. Lotti, D. Modenini, P. Tortora, M. Saponara, and M. A. Perino. Journal of Spacecraft and Rockets, vol. 60, no. 3, pp. 1034–1038, May 2023. doi: <https://doi.org/10.2514/1.A35496>

2024

[Estimating Soil Parameters From Hyperspectral Images: A benchmark dataset and the outcome of the HYPERVIEW challenge](#)

J. Nalepa, L. Tulczyjew, B. Le Saux, N. Longép  , B. Ruszczak, A.M. Wijata, K. Smykala, M. Myller, M. Kawulok, R.S. Kuzu, F. Albrecht, C. Arnold, M. Alasawedah, S. Angeli, D. Nobileau, A. Ballabeni, A. Lotti, A. Locarini, D. Modenini, P. Tortora, and M. Gumiela. IEEE Geoscience and Remote Sensing Magazine, Volume 12, pp. 35–63, 2024. doi: <https://doi.org/10.1109/MGRS.2024.3394040>

2024

[Artificial Intelligence-Based Challenges as an Educational Tool in Aerospace Engineering: the u3S Laboratory Experience](#)

A. Lotti, D. Modenini. Presented at the 2nd IFAC Workshop on Aerospace Control Education, Bertinoro, Italy, July 22-24, 2024. Published in IFAC-PapersOnLine, vol. 58, pp. 65-70, 2024. doi: <https://doi.org/10.1016/j.ifacol.2024.08.463>.

2024

[Efficient Close-Range Navigation Around a Known Uncooperative Resident Space Object](#)

R. Prokazov, A. Lotti, D. Modenini, P. Tortora. Accepted for interactive presentation at the 75th International Astronautical Congress (IAC), Milan, Italy, October 14-18, 2024.

● HONOURS AND AWARDS

12/2021

1st place - Telespazio Technology Contest (#T-TeC 2021) – Telespazio SpA

Led the proposal for 'Multi-Purpose Modular Satellite Servicer': a modular 12U CubeSat concept for on-orbit life extension of space assets.

Prize: € 10.000

Team members: A. Lotti, G. Curzi, A. Bahu, A. Locarini, D. Modenini

Link <https://www.telespazio.com/en/news-and-stories-detail/-/detail/winners-t-tec-2021>

11/2020

Study award - engineering courses – Alma Mater Studiorum - Università di Bologna

Recipient of a study award by the Department of Industrial Engineering, for his year of course, recognizing academic achievements especially during the challenging 2019/2020 second semester amidst COVID-19. The award considers the ECTS and overall exam average.

Prize: € 1.500

05/2017

AlmaContest – Alma Mater Studiorum - Università di Bologna

Developed an Android application to promote counseling for prospective students and facilitate the search for information about the courses, structures, and services of the University of Bologna.

Prize: € 2.750

Team members: L. Fernandez Gonzalez, A. Lotti, M. Mariotti

Link <https://magazine.unibo.it/archivio/2017/05/15/almacontest-proclamazione-dei-vincitori-del-concorso-di-idee-sullorientamento>

● VOLUNTEERING

09/2018 – 09/2019 Forlì

EUROAVIA Forlì-Bologna Co-Founder and Executive Member

● CERTIFICATIONS

2021

Deep Learning Specialization - Coursera - DeepLearning.AI

Online non credit Specialization with modules: Neural Networks and Deep Learning, Improving Deep Neural Networks, Hyperparameter Tuning, Regularization and Optimization, Structuring Machine Learning Projects, Convolutional Neural Networks, Sequence Models.

2013

ECDL - European Computer Driving Licence - Full

Modules: M1 - Basic Concepts of Information Technology, M2 - Computer Use and File Management
M3 - Word Processing, M4 - Spreadsheets, M5 - Databases, M6 - Presentation Tools, M7 - Computer Networks.

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Forlì , 10/14/2024