DARIO PISANTI

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Postdoctoral Researcher | Learning-based Visual Navigation for Planetary Exploration

Researcher in computer vision and machine learning for space robotics, developing learning-based methods for map-relative navigation of aerial and landing platforms in planetary environments.

RESEARCH EXPERIENCE

University of Luxembourg - Space Robotics Group *Luxembourg City, Luxembourg*
Postdoctoral Researcher Jun 2025 - Present

- **Core research**: learning-based vision for map-relative navigation of aerial and landing platforms under challenging illumination and over unknown terrain.
- LunarAssembly (Project Manager): Luxembourg National Research Fund (FNR) project on teleoperated navigation and manipulation under large time delays for robotic lunar assembly, combining XR telepresence, 3D terrain reconstruction and hazard detection for rovers. In collaboration with TU Wien (Austria).
- AI4SPACE-XPLORE (Project Coordinator): ESA-funded study to build a strategic roadmap for AI integration in space exploration activities. In collaboration with DLR (Germany).

NASA Jet Propulsion Laboratory - Mobility and Robotic Systems *Pasadena, CA*
Visiting Student Researcher, LoRNA project Feb 2023 - Dec 2024

- Researched vision-based map-relative localization techniques for the LoRNA project (Long-range Navigation for Mars Helicopters), enabling long-distance flights in GNSS-denied environments and challenging lighting conditions for next-generation Mars rotorcraft.
- Conceived and developed Geo-LoFTR, a geometry-aided deep learning model for image registration that fuses orbital imagery and elevation data via cross-attention mechanisms, improving robustness to significant illumination and scale changes.
- Implemented a map-relative localization pipeline that uses Geo-LoFTR to register onboard navigation camera imagery onto georeferenced orbital maps, improving localization accuracy at 1 m by up to 31.8% over prior methods, in challenging illumination conditions.
- Developed MARTIAN, an open-source Blender rendering framework that synthesizes pose-annotated aerial Mars imagery from HiRISE orbital data, with a generated dataset of 150k labeled examples.
- Adapted and benchmarked learning-based localization on embedded processors (NVIDIA Jetson AGX Xavier, ModalAI VOXL 2), using ONNX and Qualcomm Neural Processing SDKs as optimization frameworks.

Visiting Student Researcher, LCRT project Oct 2021 - Dec 2022

- Developed a science forward model for the Lunar Crater Radio Telescope (LCRT), a radio telescope concept funded by NASA Innovative Advanced Concepts (NIAC) to detect the redshifted 21-cm signal of neutral hydrogen from the Cosmic Dark Ages.
- Integrated a signal extraction pipeline using a pattern recognition approach in a simulated lunar observation framework, achieving signal retrieval accuracy to within 20 mK in a 1-year mission.
- Generated training and test datasets of simulated sky observations from the far side of the Moon with the full LCRT antenna model, including crater morphology and regolith dielectric properties.

European Space Agency - 72nd Parabolic Flight Campaign *Bordeaux, France*
Payload Operator Nov 2019 - Dec 2019
Assembled and operated a payload from Université Libre de Bruxelles to test artificial droplet morphogenesis in low gravity over three days of flight aboard the Airbus A310 ZERO-G.

Université Libre de Bruxelles - Microgravity Research Centre *Brussels, Belgium*
Erasmus+ Trainee Mar 2019 - Sep 2019
Researched graphene-enhanced loop heat pipes for space thermal management.

EDUCATION

Scuola Superiore Meridionale, University of Naples "Federico II" *Naples, Italy*
Ph.D. in Cosmology, Space Science and Space Technology (GPA: 3.9/4.0) Feb 2025
Doctoral research conducted at NASA Jet Propulsion Laboratory (2021–2024)
Thesis: Vision-based Geo-Localization of Future Mars Rotorcraft in Challenging Illumination Conditions using Deep Learning.

University of Naples "Federico II" *Naples, Italy*
M.S. in Aerospace Engineering and Astronautics (110/110 *Magna Cum Laude*) Oct 2019
B.S. in Aerospace Engineering (110/110 *Cum Laude*) Mar 2017

GRANTS AND PROPOSALS

AI4SPACE-XPLORE: Advanced AI Solutions for Space Exploration.
Co-author and Project Coordinator; consortium led by the University of Luxembourg.
ESA Invitation to Tender, ref. 1-12786: Study for the Integration of AI in Space Exploration Activities.
Submitted July 2025. Awarded (EUR 250k) and completed in September 2026.

NEURO-LAND: A Neuromorphic Vision Landing System for Autonomous Pinpoint and Safe Landing on the Lunar South Pole.
First author and PI; University of Luxembourg.
Luxembourg National Research Fund (FNR), CORE Junior.
Submitted April 2026. Under review.

PHAROS: Precision Hazard Aware Map-Relative Navigation for Optical Landing Systems.
Co-author and WP Manager; University of Luxembourg as consortium member.
ESA Invitation to Tender, ref. 1-13516: Vision Based Navigation Techniques for Mars Landers.
Submitted August 2026. Under review.

AWARDS

Workshop Best Poster Award, ICRA 2026 Vienna, Austria, *2026*
Awarded by the IEEE-RAS Technical Committee on Space Robotics for the best paper contribution to the *Perceptual Challenges for Planetary Exploration Workshop* at ICRA 2026, for *"MARTIAN: A Rendering Framework for Aerial Mars Imagery from HiRISE Orbital Data"*.

NOVA Award, NASA Jet Propulsion Laboratory Pasadena, CA, *2024*
Awarded by the Mobility and Robotic Systems Section of NASA JPL with the Notable Organizational Value Added (NOVA) award *for outstanding work in developing a science pipeline for the Lunar Crater Radio Telescope Project.*

AIAA Spacecraft Structures Best Paper Award, AIAA SciTech National Harbor, MD, *2023*
For M. Arya et al., "Kilometer-Scale Parabolic Reflector for a Radio Telescope in a Lunar Crater".

1st place in the Lab2Moon Global Challenge, Team Indus Bangalore, India, *2017*
Awarded by the Google X Prize finalist, Team Indus, for conceiving the lunar experiment *Radio-Shield.*

PUBLICATIONS

Vision-based Navigation and Robotics

- Incremental 3D Environment Reconstruction Pipeline for Mission Planning of Planetary Exploration Rovers
  A. Frantz, C. Kyriazis, R. Castilla, **D. Pisanti**, S. Coloma, . . . , M. Olivares-Mendez
  IEEE International Conference on Robotics and Automation (ICRA), 2027 (under review)

- Single-view Lunar Hazard Segmentation using Deep Learning: Datasets, Models, and Cross-Dataset Generalization
  C. Kyriazis, **D. Pisanti**, M. Olivares-Mendez
  Manuscript in preparation, 2026

- Earth to Moon Bilateral Teleoperation for Lunar Assembly: A Unified Framework for Shared Autonomy, Skill Learning, and Telepresence
  H. T. Dinc, J. Heidersberger, C. Kyriazis, T. Wagner, A. Frantz, **D. Pisanti**, . . . , C. Ott
  IEEE Conference on Telepresence, 2026

- Geometry-aided Vision-based Localization of Future Mars Helicopters in Challenging Illumination Conditions
  D. Pisanti, R. Hewitt, R. Brockers, G. Georgakis
  IEEE International Conference on Robotics and Automation (ICRA), 2026 [DOI]

- MARTIAN: A Rendering Framework for Aerial Mars Imagery from HiRISE Orbital Data
  D. Pisanti, G. Georgakis
  ICRA Workshop on Perceptual Challenges for Planetary Exploration, 2026 (Best Poster Award) [arXiv]

- A Map-based Localization System for Ingenuity using Deep Image Matching
  G. Georgakis, **D. Pisanti**, N. Williams, C. Mauceri, G. Kubiak, A. Ansar, R. Brockers
  IEEE Transactions on Field Robotics (T-FR), 2025 [DOI]

- Design and Case Studies of CORTO, an Open Access Rendering Tool for Celestial and Artificial Bodies
  M. Pugliatti, C. Buonagura, **D. Pisanti**, N. Faraco, M. Maestrini, A. Pizzetti, F. Topputo
  International Astronautical Congress (IAC), 2024 [DOI]

Lunar Radio Astronomy

- Survey of Mission Concepts for Exploring the Dark Ages Universe
  S. Bandyopadhyay, A. Goel, G. Gupta, **D. Pisanti**, P. Goldsmith, T.-C. Chang, . . . , J. Lazio
  IEEE Aerospace Conference, 2025 [DOI]

- Modelling Science Return from the Lunar Crater Radio Telescope on the Far Side of the Moon
  D. Pisanti, A. Goel, G. Gupta, M. Arya, B. Byron, . . . , S. Bandyopadhyay
  Philosophical Transactions of the Royal Society A, 2024 [DOI]

- Reflector Antenna for Lunar Crater Radio Telescope
  G. Gupta, N. Chahat, A. Goel, M. Arya, **D. Pisanti**, P. Goldsmith, . . . , S. Bandyopadhyay
  IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting, 2023 [DOI]

- Lift Wire Deployment and Anchoring System for the Lunar Crater Radio Telescope on the Far Side of the Moon

R. Wang, V. P. Gehlot, S. Bandyopadhyay, P. M. McGarey, B. Byron, **D. Pisanti**, ..., K. Jenks
AIAA SciTech Forum, 2023 [DOI]

- Kilometer-Scale Parabolic Reflector for a Radio Telescope in a Lunar Crater
  M. Arya, J. T. Herrscher, **D. Pisanti**, A. Verniani, M. Delapierre, ..., S. Bandyopadhyay
  AIAA SciTech Forum, 2023 (AIAA Spacecraft Structures Best Paper Award) [DOI]

- Lunar Crater Radio Telescope (LCRT) on the Far Side of the Moon
  S. Bandyopadhyay, A. Goel, **D. Pisanti**, J. Lazio, P. Goldsmith, ..., V. Vustyansky
  NASA Innovative Advanced Concepts (NIAC) Phase II Final Report, 2023 [PDF]

OPEN-SOURCE SOFTWARE AND DATA

MbL-Mars: map-based localization pipeline for Mars rotorcraft, with trained Geo-LoFTR models.
NASA-JPL GitHub, 2026 [Code] [Weights]

MARTIAN: Blender-based framework for rendering pose-annotated aerial Mars imagery from HiRISE orbital data.
NASA-JPL GitHub, 2026 [Code]

Geo-LoFTR Dataset: synthetic Mars training and test data rendered with MARTIAN, including orthographic maps, navigation queries, and training pairs under varied illumination.
JPL Open Repository, 2026 [Data]

LCRT Science Model: radio sky simulations and code for the LCRT science forward model.
JPL Open Repository, 2023 [Code & Data]

MENTORING

Christos Kyriazis, PhD Advisor — University of Luxembourg, *2025-Current*
Advising PhD research on teleoperated robotic navigation for lunar assembly, including deep learning hazard segmentation for lunar surface robots.

Lakshmikanth Nageswar, MSc Thesis Advisor — IIT Kharagpur, *2025-2026*
Advised an MSc thesis on "Robust State Estimation in GPS-Denied, Perceptually Degraded Environments," focusing on the fusion of map-relative localization with visual-inertial odometry.

Ariane Marongiou, MSc Internship Supervisor — University of Luxembourg, *2026*
Supervised an MSc internship at the Space Robotics group, contributing to the ESA-funded AI4SPACE-XPLORE study.

PEER REVIEW

Reviewer for: IEEE International Conference on Robotics and Automation (ICRA); International Journal of Robotics Research (IJRR); International Conference on Space Robotics (iSpaRo).

SKILLS

Programming Languages	Python, MATLAB/Simulink, C++
Tools	Blender, OpenCV, Git, LaTeX
Machine Learning Frameworks	PyTorch, TensorFlow, ONNX
Embedded ML Deployment	TensorFlow Lite, Qualcomm Neural Processing SDK
Technical Expertise	Map-relative localization, image registration, multimodal deep learning, feature matching, camera pose estimation (PnP, RANSAC), synthetic data generation, image processing

LICENSES AND CERTIFICATIONS

Space Resources Professional Course, ESRIC Luxembourg City, Luxembourg *2026*
Completed a 2-day intensive course on space resource identification, extraction, and processing systems, along with economic and legal feasibility for in-situ resource utilization scenarios.

NASA's Transform to Open Science (TOPS), NASA Pasadena, CA *2024*
Certified in NASA's Open Science 101, gaining expertise in software and data management plans, open code practices and fostering transparency and collaboration in research.

Licensed Professional Engineer, University of Naples Federico II Naples, Italy *2021*