Mattia **Pugliatti**

Space Engineer · GNC & Mission design

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"You never fail until you stop trying"

Areas of interest

I am a curious, ambitious and creative person. My areas of interest are autonomous optical navigation, GNC and small-bodies exploration. My career goal is to become a specialist in interplanetary missions & atuonomous GNC design.

Experience

Ph.D. Student & Early Stage Researcher

Milan, Italy

Politecnico di Milano, *DART laboratory* — *November. 2019 - Present*

- Research focused on autonomous optical navigation for interplanetary CubeSats, Artificial Intelligence for enhanced optical navigation techniques around small-bodies.
- Mission analysis and GNC design of the Milani mission
- Marie Skłodowska Curie researcher of the Stardust-R, the ETN on asteroids and space debris.

GNC project engineer

Madrid, Spain

GMV, *SPS/GNC division - interplanetary section* — *Sept. 2018 - Sept. 2019*

- GNC project engineer of the HERA mission, a technology demonstration mission to visit the Didymos binary system after DART impact.
- Phases A and B1.
- Testing of the visual based navigation strategy for the proximity operation phases. Incremental testing using higher fidelity models: model-in-the-loop (with PANGU), software-in-the-loop and hardware-in-the-loop.

Visiting researcher

Sagamihara, Japan

JAXA, *Institute of Space and Astronautical Science* — *March. 2017 - Nov. 2017*

- Kawakatsu laboratory: Member of the trajectory design team of EQUULEUS cubesat and DESTINY smallsat missions.
- EQUULEUS: 6U cubesat to be deployed during the maiden flight of the SLS to reach a NRHO about the L2 point of the Earth-Moon system. Team leader of the first-guess trajectory design group. Maintenance and implementation of a toolbox for the generation of large set of first-guess transfer trajectories in full-ephemeris model of the Sun-Earth-Moon system using SPICE and jPRO.
- DESTINY: Technology demonstration mission to investigate Phaethon asteroid. Trajectory design of the multiple lunar flyby phase with the application of a Moon-to-Moon database in the Earth-Moon CR3BP.

Master's thesis

Sagamihara, Japan

JAXA, *Institute of Space and Astronautical Science* — *Apr. 2017 - Mar. 2018*

- Usage of the Extended Tisserand-Poincaré graph for multi-body trajectory design in the patched CR3BP model.
- Extension of the current theoretical framework in the CR3BP of the Tisserand parameter about the primary to a modified Tisserand parameter about the secondary, existing on a specific family of Poincaré sections.
- Generic formulation valid for any patched CR3BP model sharing the same body as primary and secondary, with applicability for EQUULEUS and DESTINY in the Sun-Earth-Moon system and for capture trajectories in the Sun-Jupiter-Europa system.
- Graduated with a 9.5/10 Cum Laude. Available at TU Delft repository.

Internship

Friedrichshafen, Germany

Airbus Defence and Space, *Future programmes department* — *Jul. 2016 - Dec. 2016*

- Mission and spacecraft design of $NEOT\omega IST$, a low-cost impactor demonstration and characterization mission on Itokawa.
- Focus on the flyby trajectory and formation flight design, high level assessment of a tracking strategy and system engineering design of the flyby module.
- Part of the NEOShield-2 project, supported by European programme H2020.

Education

Delft University of Technology *Delft, The Netherlands*

M.Sc. in Spaceflight *Sep. 2015 - Mar. 2018*

- Specialization in space exploration, transfer orbit profile
- Key courses: Mission Geometry and Orbit design, Astrodynamics I & II, Space Project, Microsatellite engineering, Planetary sciences
- Final grade: 9.5/10 Cum Laude.

Politecnico di Milano *Milan, Italy*

B.Sc. in Aerospace Engineering *Sep. 2012 - Sep. 2015*

- Key courses: Fundamental of Space Missions, Applied Numerical Analysis, Theoretical Mechanics, Automatic Control
- Final grade: 106/110

Publications (Selected)

- *Navigation about irregular bodies through segmentation maps*, **Pugliatti, M.**; Topputo, F. 31^{st} Space Flight Mechanics Meeting, Charlotte, NC, 1-3 Feb 2021.
- *Onboard Small-Body semantic segmentation based on morphological features with U-Net*, **Pugliatti, M.**; Maestrini, M.; Di Lizia, P.; Topputo, F. 31^{st} Space Flight Mechanics Meeting, Charlotte, NC, 1-3 Feb 2021.
- *Preliminary mission profile of Hera's Milani CubeSat*, Ferrari, F.; Franzese, V.; **Pugliatti, M.**; Giordano, C.; Topputo, F; (2021). Advances in Space Research.
- *Small-Body shape recognition with Convolutional Neural Network and comparison with explicit features based methods*, **Pugliatti, M.**; Topputo, F; Astrodynamic Specialist Conference, Lake Tahoe, CA, 9-12 Aug 2020.

Missions

- **MILANI**: Mission analysis and GNC design and analysis, with a particular focus of autonomous OpNav techniques. From proposal to phase C. (1+year of experience)
- **HERA**: Testing of the visual-based navigation strategy. MIL, SIL, HIL with engineering camera model, optical laboratory and robotic simulation environment. Phases A and B1.(1 year of experience)
- **EQUULEUS**: Mission Analysis and trajectory design in a high-fidelity multi-body system. Phase A. (9 months of experience)
- **DESTINY+**: Mission Analysis and trajectory design in a patched conics dynamic. Phase A. (9 months of experience)

Skills

- Programming software: Matlab, Simulink, Python, STK, jPRO, C++
- Operative systems: Linux, Microsoft, MacOS
- Others: Blender, PANGU, GitLab, GitHub, SPENVIS, LaTeX, Excel, Word, Power point
- Teamwork: Problem solving, international team experience of 6+ years, fit for leadership positions, at ease with pressure.

Languages

- Italian: Mother tongue
- English: Advanced - (TOEFL:114/120 Nov 2017)
- Spanish & German: Basic

Interests

- I love backpacking, travelling around the world, exploring disparate cultures and tasting the most extravagant foods.
- I am an avid reader, especially about news of space exploration achievements.