Prof. Francesco Topputo

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Prof. Topputo is a Full Professor of Space Systems at Politecnico di Milano, Italy. His core research activities involve interplanetary CubeSat mission and system design, autonomous guidance, navigation, and control, spacecraft flight dynamics. Prof. Topputo is an ERC laureate (CoG 2019) and has been PI in 19 main research projects, with over €4.5M research grants allocated to work under his direction. He leads the Deep-space Astrodynamics Research and Technology (DART) group, composed of 4 PostDoc Fellows, 10 PhD Students, and 1 Research Assistant. He has authored 67 peer-reviewed articles published in international journals and over 230 works in total. He is co-funder and partner at Nautilus Srl and holds a position as Visiting Professor at TU Delft, The Netherlands.

1 Current positions

2021– *Full Professor of Space Systems*, Politecnico di Milano

Main duties include: Plan, develop, and lead research projects • Produce applications for funding • Publish research on international journals • Participate to international conferences • Supervise PostDocs, PhD, and MSc students • Carry out teaching activities • Carry out community/academic service

2021– *Co-funder and business developer*, Nautilus – Navigation in space

Main duties include: Plan and develop the company business • Implement and coordinate the business plan • Develop a long-term vision for the company • Participate to management and administration

2016– *Visiting Professor*, TU Delft

Visiting Researcher on a 5% FTE (20% FTE in 2016–18) at TU Delft, Faculty of Aerospace Engineering, Space Engineering Department, Astrodynamics and Space Missions chair. Main duties include: Promote joint research projects • Generate publications • Supervise MSc students • Give invited lectures

2 Appointments held

2019–21 *Associate Professor of Space Systems*, Politecnico di Milano

2012–19 *Assistant Professor of Space Systems*, Politecnico di Milano

Led international research projects • Supervised PostDocs, PhD, and MSc students • Produced proposals for funding • Published on international journals • Carried out community and academic service

2008–17 *Co-founder and Chief Executive Officer (2011–12)*, Dinamica Srl

Led the company through direction and decision-making • Contributed to technical, management, financial, and administrative proposals • Managed the contracts (project manager) • Planned and carried out technical work • Participated to company administration • Guided the growth while CEO

2007–12 *Postdoctoral researcher*, Politecnico di Milano

Projects: “Optimization of space trajectories with deep-space maneuvers” (07–08), “Modeling power

generation systems for deep space missions" (09–12); Supervisor: Prof. Franco Bernelli-Zazzera

Developed assigned research themes: Dynamics and control of non-Keplerian orbits • Global optimization of interplanetary transfers • Modeling and simulation of Rosetta's Philae solar arrays

3 Fellowships

2006 *Research scholar*, Princeton University

Carried out research as visiting PhD student at the Department of Astrophysical Sciences on "Ballistic capture and resonance transition in multi-body models"; Supervisor: Dr. Edward Belbruno

4 Education

2007 PhD Cum Laude in Aerospace Engineering. Thesis on "Non-Keplerian Orbits: Analysis, Design, and Control"; Supervisor Prof. Amalia Ercoli-Finzi, Politecnico di Milano.

2003 MSc in Aerospace Engineering with full marks (100/100). Thesis on "The Invariant Manifolds of the Restricted Three-Body Problem: A New Tool for Low Energy Space Missions"; Supervisor Prof. Amalia Ercoli-Finzi, Politecnico di Milano.

5 Research activity

5.1 Research interests

Highly nonlinear astrodynamics • Optimal control theory • Autonomous interplanetary CubeSats • Multiphysics modeling, simulation and optimization • Numerical methods for astrodynamics

5.2 Scientific production

He has authored or coauthored 235 publications subdivided in: 67 articles published in international peer-reviewed journals • 8 book chapters • 1 PhD thesis • 130 papers published in proceedings of international congresses • 12 scientific reports • 4 articles published on national journals • 13 papers published in proceedings of national congresses.

5.3 Bibliometric indicators

The bibliometric indicators relative to his research products are given in Table 1. His identification codes are: ORCID: 0000-0002-5369-6887; Researcher ID: C-2569-2013; Scopus Author ID: 8712815100.

Web of Science	h-index: 20 Times cited: 1116 (826 w/o self-citations)
Scopus	h-index: 23 Times cited: 1641 (1211 w/o self-citations)
Google Scholar	h-index: 29 Times cited: 2787

Table 1: Bibliometric indicators (June 2022).

6 Research grants

6.1 *Coordination and direction* of research projects awarded through *competitive calls*

2021–25 *EXTREMA: Engineering Extremely Rare Events in Astrodynamics for Deep-Space Missions in Autonomy*
ERC-CoG-2019, Grant Agreement No. 864697 (Grant: 2M€)
Project funded within the European Research Council (ERC) Consolidator Grant (CoG) scheme
Success rate of ERC-CoG-2019 call: 12%

• PI of the five-year project. He directs a team composed of 9 people, including 4 PostDocs fellows (A. Morselli, P. Panicucci, C. Giordano, V. Franzese) and 5 PhD students (E. Andreis, A. Morelli, G. Merisio, G. Di Domenico, A. Mannocchi).

2020–24 *Hera's Milani CubeSat: Mission analysis and design of the GNC system (Phases A-E1)*
Tyvak International Contract, sub-contract to ESA Contract No. 4000131925/20/NL/GLC (Grant: 250k€)
Project funded within ESA's Invitation To Tender (ITT) scheme
Estimated success rate of ITT 8643 call: 50%

• PI for the Polimi unit. He directs a team composed of 7 people, including 1 external collaborator (F. Ferrari), 2 PostDoc fellows (C. Giordano, V. Franzese), 3 PhD students (A. Rizza, F. Piccolo, M. Pugliatti), and 1 Research Assistant (C. Bottiglieri).

2022–24 *Autonomous Guidance for Deep-Space CubeSats*
ESA Contract No. 4000136010/21/NL/GLC/my (Project value: 80 k€; Grant: 40k€)
Project co-funded within ESA's Open Space Innovation Platform (OSIP)
Estimated success rate of 2021 OSIP call: 15–20%

• PI and promotor of the partnering initiative with ESA. The grant covered a co-funded PhD position (A. Mannocchi) on a 50% basis for three years on the subject topic.

2022–23 *SENSE: A sensor for autonomous navigation in deep space*
ERC-PoC-2022, Grant Agreement No. 101069172 (Grant: 150k€)
Project funded within the European Research Council (ERC) Proof of Concept (PoC) scheme
Success rate of ERC-2022-PoC1 call: 48%

• PI of the project. He directs a team composed of 3 people, including 2 PostDocs fellows (P. Panicucci, V. Franzese) and 1 PhD student (E. Andreis).

2022–23 *PRESS: Proposal for RAMS Enhancing in Small Satellites*
Deimos Contract, sub-contract to ESA Contract No. TBD (Grant: 55k€)
Project funded within ESA's Invitation To Tender (ITT) scheme
Estimated success rate of AO/1-10765/21/NL/GLC call: N.A.%

• PI for the Polimi unit. He directs a team composed of 3 people, including 1 PostDoc fellow (V. Franzese) and 2 PhD students (A. Rizza, F. Piccolo).

2022–23 *DEEP-NAV: Deep learning for navigation of small satellites about asteroids*
AIKO Contract, sub-contract to ASI Project CUP F15F21002160005 (Project value: 96k€; Grant: 45k€)
Project co-funded within Italian Space Agency (ASI) call No. CI-UTN-2020-039
Estimated success rate of call CI-UTN-2020-039: N.A.

• PI for the Polimi unit. He supervises one PhD student (C. Buonagura).

2022 *Généralisation du concept de variétés invariantes et applications à la conception des missions d'exploration de petits corps*
CNES Contract No. 210782/00 (Grant: 40k€)
Project funded within Centre National D'Etudes Spatiales (CNES) call No. R-S20/BS-0005-066
Estimated success rate of call R-S20/BS-0005-066: N.A.

• PI for the Polimi unit. He supervises one PhD student (G. Merisio).

2021–22 *IMPRESA: Image Pattern Recognition for Enhanced Situational Awareness*
Ministry of Defense Contract No. 20570 (Project value: 190k€; Grant: 95k€)
Project co-funded within the "Piano Nazionale di Ricerca Militare" (PNRM) scheme
Estimated success rate of PNRM 2019: N.A.

• PI for the Polimi unit. He supervises two PhD students (C. Buonagura, A. Mannocchi). Project carried out in partnership with BV Tech SpA.

2019–22 *Stardust Reloaded (Stardust-R)*
H2020 ITN, Grant Agreement No. 813644 (Grant: 260k€)
Project funded within the highly competitive (Innovative Training Networks) ITN scheme
Success rate of MSCA-ITN-2018 call: 6.7%

• Unit PI and Scientist-in-Charge of the Initial Training Network; member of the Supervisory Board. He supervises an Early Stage Researcher (M. Pugliatti) for three years.

2018–21 *Autonomous Navigation for Interplanetary CubeSats at Different Scales*
ESA Contract No. 4000123920/18/NL/MH (Project value: 80 k€; Grant: 40k€)
Project co-funded within ESA's Networking/Partnering Initiative (NPI)
Estimated success rate of 2017 NPI call: 15–20%

• PI and promotor of the Networking/Partnering Initiative with ESA. The grant covered a co-funded PhD position (V. Franzese) on a 50% basis for three years on the subject topic.

2017 *LUMIO: Lunar Meteoroid Impacts Observer (Phase 0)*
ESA Contract No. 4000120225/17/NL/GLC/as (Grant: 120k€; F.T.'s share: 45k€)
Project funded within ESA's Invitation To Tender (ITT) scheme
Estimated success rate of ITT 8643 call: 10%

• PI and Project Manager of the Phase 0 study. He has coordinated a team of 21 people across 6 different partners: Politecnico di Milano (J. Biggs, M. Massari, P. Di Lizia, D. Dei Tos, K. Mani, S. Ceccherini, V. Franzese), TU Delft (A. Cervone, P. Sundaramoorty, R. Noomen, S. Mestry, S. Speretta, A. Cipriano), EPFL (A. Ivanov), Leonardo SpA (D. Labate, L. Tommasi), S&T Norway (A. Jochemsen, Q. Leroy), and University of Arizona (R. Furfaro, V. Reddy, K. Jacquinot).

— The project has been awarded winner of ESA's LUCE SysNova competition (see Section 7).

2016–17 *Feasibility of Ultra Low Thrust Transfers in L_1, L_2, Sun, Earth & Moon Systems*
ESA Contract No. 4000118201/16/F/MOS (Grant: 100k€)
Project funded within ESA's Invitation To Tender (ITT) scheme
Estimated success rate of ITT 8601 call: 15–20%

• PI and Coordinator of the project. He has supervised a PostDoc (M. Nakamiya) and a PhD student (D. Dei Tos). He has directed a team of 4 people, including a Senior Engineer (M. Rasotto) and an Intern (G. Aguiar) at Dinamica Srl.

2015–17 *SpaceSHIP: Space Systems with Hybrid Propulsion*
Regione Lombardia, Decree No. 5744 of 8/7/2015 (Project value: 164k€; Grant: 131 k€)
Project co-funded, granted to 2014 ERC applicants graded B or higher
Success rate of call issued with Decree 1954 of 13/3/2015: 61% (8 projects funded out of 13 submitted)

• Coordinator and PI of the project. He has supervised one PostDoc (M. Nakamiya) and two Research Assistants (K. Mani, S. Ceccherini). He has directed a team of 5 people, including 2 Assistant Professors at Polimi (P. Di Lizia, M. Massari).

2013–17 *Stardust: The Asteroid and Space Debris Network*
FP7 ITN, Grant Agreement No. 317185 (Grant: 240k€)
Project funded within the highly competitive Initial Training Network (ITN) scheme
Success rate of FP7-PEOPLE-2012-ITN call: 12.4%

• Unit PI and Scientist-in-Charge of the Initial Training Network; member of the Supervisory Board. He has supervised an Experienced Researcher (K. Kumar) for two years.

— The project has been awarded the 2015 Sir Arthur Clarke Award (see Section 7).

2014–15 *Space Shepherd: Saving Human Lives through Satellite Imagery*
Politecnico di Milano (Project value: 101k€; Grant: 52k€)
Project co-funded within Politecnico di Milano's Polisocial scheme
Success rate of 2013 Polisocial call: 15% (8 projects funded out of 52 proposals submitted)

• Creator, coordinator, and PI of the project. He has supervised directly a PostDoc researcher (R. Lombardi) and indirectly two PhD students (M. Aiello, F. Banda). He has coordinated a team of 6 people, including 3 Assistant Professors at Polimi (M. Massari, M. Gianinetto, S. Tebaldini).

— The project has been conferred with the 2014 Polisocial Award (see Section 7).

2012 *Hybrid Propulsion Transfer Strategies*
ESA Contract 105465/12 (Grant: 90k€)
Project funded within ESA's Invitation To Tender (ITT) scheme
Estimated success rate of ITT 6791 call: 20%

• PI and Project Manager of the study. He has supervised one PostDoc researcher (G. Mingotti), and has directed a team composed of 4 people, including one Senior Partner at Dinamica Srl (M. Massari) and 2 Senior Engineers at Surrey Satellite Technology Ltd. (R. Long, R. Bird).

6.2 *Coordination and direction* of research projects awarded through *direct negotiation*

2022–23 *CubeNav: Navigazione operativa di missioni CubeSat in Deep Space*
ASI PRoject CUP F35F22000490005 (Grant: 57k€)

• PI for the Polimi unit. He supervises 1 Research Assistant (C. Bottiglieri)

2020–21 *LUMIO: Lunar Meteoroid Impacts Observer (Phase A)*
ESA Contract No. 4000130257/20/NL/AS (Grant managed: 250k€; F.T.'s share: 90k€)

• PI and Project Manager of the Phase A study, funded through direct negotiation after the successful execution of the Phase 0. He has coordinated a team of 19 people across 4 different partners: Politecnico di Milano (J. Biggs, M. Massari, P. Di Lizia, C. Giordano, V. Franzese, G. Merisio), ISIS (E. Bertels, K. Woroniak, A. Paskeviciute), TU Delft (A. Cervone, S. Speretta, A. Menicucci), Leonardo SpA (D. Labate, G. Pilato, A. Taiti), S&T Norway (A. Thorvaldsen, A. Kukharenka).

2019–20 *M-ARGO: Mission analysis (Phase A)*
GomSpace Contract, sub-contract to ESA Contract No. 4000127373/19/NL/AF (Grant: 40k€)

• PI for the Polimi unit. He has directed a team of 3 PhD students (V. Franzese, C. Giordano, Y. Wang)

6.2.1 Minor projects awarded through *direct negotiation*

2016–17 *Integration of Earth Observation-based services with Decision Making systems*
Leonardo SpA, Purchase Order No. 8000018715 (Grant: 12k€)

• He has performed a study aimed to assessing the impact of new mission concepts on the emergency workflow and risk monitoring. He has supervised a MSc Student (P. Broggi).

2014 *Study of L- and P-band SAR Tomography Synergies*
ESA Contract 4000112571/14/NL/FF/GP (Grant: 24k€)

• He has coordinated an independent review of the Mission Analysis for the satellite SAOCOM–CS. He has directed a team of 2 people, including a PostDoc (R. Lombardi) and an assistant professor at Polimi (M. Massari). Project funded within ESA's ITT scheme (Prime contractor: DEIB Department).

2014 *Preliminary Design of Low-Cost Spacecraft for Lunar Missions*
Moon Memorials, Ltd., Subcontract of Innovative Orbital Design, Inc. (Grant: 52k$)

• He has coordinated the pre-Phase A study for a low-cost lunar probe. He has directed a team of 2 people, including a Senior Engineer (G. Di Mauro) and a Senior Partner (M. Massari) at Dinamica Srl. Project funded by Moon Memorial, Ltd., and executed under a subcontract with Innovative Orbital Design, Inc.

2011–14 *Trajectory design for future mission concepts*
Boeing Space Group, Subcontract of Innovative Orbital Design, Inc. (Grant: 50k$)

• He has worked as a consultant with Dr. Edward Belbruno at Innovative Orbital Design, Inc. on trajectory design to support feasibility assessment of future space missions. The activity has been carried out for the Boeing Space Group, under the guidance of K. Post.

2010 *Predictive Control of Industrial Plants*
Sanofi–Aventis Contract 127/09MP (Grant: 40k€)

• He has performed a study on system identification and predictive control of drug production plants. The project has been carried out in collaboration with a Senior Partner at Dinamica Srl (P. Di Lizia).

2009 *Remote Monitoring of Migrants Vessels in the Mediterranean Sea*
Italian Ministry of Defense (Grant: 10k€)

• He has executed an independent study in the framework of the "Research Plan 2009" of the "Military Centre for Strategic Studies" (CeMiSS, Ministry of Defense).

6.3 *Participation* to research projects awarded through *competitive calls*

Dr. Topputo has contributed to the research projects listed below, awarded through competitive calls. His involvement pertained writing the proposals, carrying out the research, producing the reports, managing the projects either as PhD Student/PostDoc at Polimi or as co-founder at Dinamica Srl.

2015–16 *Technology for Improving Re-Entry Predictions of European Upper Stages through Dedicated Observations*, ESA Contract 4000114349/15/D/SR

2014–15 *Nonlinear Propagation of Uncertainties in Space Dynamics based on Taylor Differential Algebra*, ESA Contract 4000109643/13/NL/MH

2013–14 *End-of-Life Disposal Concepts for Lagrange-Points and HEO Missions*
ESA Contract 4000107618/13

2008 *Predicting Asteroid Trajectories using Validated Integrators and Determining Impact Leading Conditions*, ESA Contract 20271/06

2008 *Support to the Design, Assembly, Test, and Launch of an Earth Observation Satellite (ESEO)* ESA Contract, Subcontractor of Carlo Gavazzi Space SpA

2007 *Global Trajectory Optimization: Can We Prune the Solution Space when Considering Deep Space Maneuvers?*, ESA Contract 20271/06

2004 *Assessment of Mission Design Including Utilization of Libration Points and Weak Stability Boundaries*, ESA Contract 18147/04

6.4 *Participation* to research projects awarded through *direct negotiation*

He has taken part to the research projects listed below, awarded through direct negotiations with institutions or companies. His role mainly concerned carrying out the research and producing the deliverables (reports, presentatons).

2007–15 *Rosetta Project: Phase E2*, ASI Contracts I/062/08/00 and I/024/12/00
2011 *Uncertainty Propagation Analysis Service of TEC-ECM*, ESA Contract 4000102634
2009 *Analysis of Covariance for Trajectories*, ESA Contract P1091397
2008 *Mechanical and Thermal Design for an X Telescope*, ASI Contract, Subcontractor of IASF
2008–10 *Stationkeeping of GEO Satellites with Nongrav. Forces*, Italian/Egyptian Mininstry of Foreign Affairs
2008 *Nuclear Multimodule ISRU Mission: Lunar Exploration Architecture*, Alcatel-Alenia Space

6.5 Technology transfer and creation of start-up companies

2021– Co-founder and Senior Partner at Nautilus Srl

• He co-funded Nautilus – Navigation in space. Nutilus Srl is a company born as a spin-off of both Politecnico di Milano and University of Bologna whose aim is to offer cost-efficient and tailored flight dynamics services for SmallSats. Within Nautilus, he has the business developer role, and participates to the company management and administration.

2008–17 Co-founder and Senior Partner at Dinamica Srl

• He co-funded Dinamica Srl, an engineering firm engaged in technology transfer from the space to the civil sector. As Senior Partner of Dinamica Srl he has participated to some of the projects listed above, for which he has been responsible for the technical, management, and financial proposals. Beside having the scientific responsibility and supervising the collaborators, he has had an active role in managing the projects, creation of the consortia, definition of the tasks and budget for the subcontractors. He has been Chief Executive Officer of Dinamica Srl in years 2011–2012.

7 Honors & awards

7.1 Major awards

2019 "ERC laureate" with the project "EXTREMA: Engineering Extremely Rare Events in Astrodynamics for Deep-Space Missions in Autonomy" submitted within the ERC Consolidator Grant 2019 call (November 2019).

2018 "Best paper award" for the paper "LUMIO: Achieving Autonomous Operations for Lunar Exploration with a CubeSat" presented at SpaceOps 2018 Conference and Exhibition, Marseille, France (June 2018).

2018 "Outstanding paper award for young scientists" awarded by COSPAR Bureau for the manuscript "Trajectory Refinement of Three-Body Orbits in the Real Solar System Model" (July 2018).
The prize is awarded to selected papers published on Advances in Space Research with first authors under 31 years old (D. Dei Tos in this case); 14 awards for the years 2016–2018 given, 3 for the field Celestial Mechanics.

2017 LUMIO (Lunar Meteoroid Impacts Observer) awarded winner (ex aequo) of ESA's SysNova Competition No. 4 "Lunar CubeSats for Exploration" (December 2017).
The award consisted in an independent review carried out by ESA's CDF experts in February 2018 in view of the future mission implementation.

2015 "The British Interplanetary Society 2015 Sir Arthur Clarke Award" awarded to the Stardust Network, of which he was member, for "Space achievement in academic study/research" (July 2015)

2014 "Polisocial Award" awarded for the proposal "Space Shepherd: Saving Human Lives through Satellite Imagery"; the grant allowed co-funding the research project (May 2014)

2013 "Best paper" award for the work "Simulation of Low-Intensity, Low-Temperature Solar Arrays with Software and Hardware Tools" presented at AIDAA XXII Conference, Naples, Italy (September 2013).

7.2 International reputation

2022 Appointed member of the Italian Space Agency's (ASI) working group "Artificial intelligence, robotics, and cybersecurity" (April 2022) [Reference: Dr. G. Saccoccia]

2021 Appointed Vice-Chair of the Panel on Satellite Dynamics (PSD), Committee on Space Research (COSPAR) (February 2021) [Reference: Dr. H. Peter]

2021 Invited to join the Editorial Board of the journal Mathematics, Section "Functional Interpolation", published by MDPI (January 2021) [Reference: Prof. D. Mortari]

2020 Appointed Associate Editor at the Journal of Optimization Theory and Application (JOTA), published by Springer (June 2020) [Reference: Prof. B. Conway]

2020 Elected member of the Astrodynamics Technical Committee, American Institute of Aeronautics and Astronautics (AIAA), term 2020–2024 (January 2020) [Reference: Prof. R. Russell]

2018 Nominated Excellent Reviewer for the AIAA Journal of Guidance, Control, and Dynamics, American Institute of Aeronautics and Astronautics (1 Oct 2017–30 Sep 2018) [Reference: Prof. P. Lu]

2017 Appointed Associate Editor at Astrodynamics, co-published by Springer and Tsinghua University Press (February 2017) [Reference: Prof. H. Baoyin]

2016 Appointed Associate Editor at Advances in Space Research, the official journal of the Committee on Space Research (COSPAR), published by Elsevier (April 2016) [Reference: Dr. P. Willis]

2015 Elected member of the Space Flight Mechanics Committee, American Astronautical Society (AAS), term 2015–2019; he was the only non-US-affiliated member elected in 2015 (January 2015) [Reference: Dr. T. Starchville]

2014 Scientific American covered a story inspired by the work "Earth–Mars Transfers with Ballistic Capture", published on Celestial Mechanics and Dynamical Astronomy (December 2014) [1]

[1] See scientificamerican.com/article/a-new-way-to-reach-mars-safely-anytime-and-on-the-cheap/

2011 The work "Controlled Drug Delivery in Cancer Immunotherapy: Stability, Optimization, and Monte Carlo Analysis" was chosen as "research nuggets" from Society for Industrial and Applied Mathematics (SIAM) and was posted under the "public awareness" section (December 2011) [2]

7.3 Promotions

2021 Promoted to Full Professor. The position is permanent, and requires attaining the National Scientific Habilitation for Full Professor (June 2021)

2019 Promoted to Associate Professor. The position is permanent, and requires attaining the National Scientific Habilitation for Associate Professor (June 2019)

2017 National Scientific Habilitation for Full Professor, awarded by the Italian Ministry of University and Research, in the Scientific Area 09/A1 "Aeronautical, Aerospace, and Naval Engineering" (April 2017; application submitted on December 2016).

2016 Award of academic tenure at Politecnico di Milano and promotion to Senior Assistant Professor. The position lasts 3 years, pending the attainment of the National Scientific Habilitation for Associate Professor (June 2016)

2014 National Scientific Habilitation for Associate Professor, awarded by the Italian Ministry of University and Research, in the Scientific Area 09/A1 "Aeronautical, Aerospace, and Naval Engineering" (February 2014; application submitted on November 2012).

8 Memberships

8.1 Commissions of trust

2022– Member of ASI's working group on Artificial intelligence, robotics, and cybersecurity
2021– Vice-Chair of COSPAR's Panel on Satellite Dynamics
2021– Member of the Editorial Board of the journal Mathematics, Section "Functional Interpolation"
2020– Member of American Institute of Aeronautics and Astronautics' Astrodynamics Technical Committee
2020– Member of the Editorial Board of the Journal of Optimization Theory and Apllications
2019– Member of the Supervisory Board of Stardust Reloaded
2018–20 Member of Hera mission Working Groups #3 "Dynamics" and #4 "Data Analysis Exploitation"
2018 Member of the Review Panel of the Space Center at Skolkovo Institute of Sci and Tech, Moscow, Russia
2017– Member of the Editorial Board of the journal Astrodynamics
2016–20 Member of the Editorial Board of the journal Advances in Space Research
2015–19 Member of American Astronautical Society's Space Flight Mechanics Committee
2013–16 Member of the Supervisory Board of Stardust: The Asteroid and Space Debris Network
2008–14 Member of the Philae Long Term Science Working Group within the Rosetta/Philae space mission
2008–11 Member of the Organizing Committee of New Trends in Astrodynamics and Applications conference

8.2 Member of scientific societies

2017– Committee on Space Research (COSPAR), Associate Member
2014– American Astronautical Society (AAS)
2013– American Institute of Aeronautics and Astronautics (AIAA), Senior Member (from 2020)
2013– Society for Industrial and Applied Mathematics (SIAM)
2006– Italian Society of Celestial Mechanics and Astrodynamics (SIMCA)
2006– Italian Society of Chaos and Complexity (SICC)
2005– Italian Association of Aeronautics and Astronautics (AIDAA)

[2] See http://www.siam.org/publicawareness/drug.php

9 Service to the community

9.1 Editorial boards

2021– Associate Editor at the journal Mathematics, Section "Functional Interpolation", published by MDPI (ISSN: 2227-7390) IF(2019): 1.747 [no submission edited yet]

2020– Associate Editor at the Journal of Optimization Theory and Applications, published by Springer (ISSN: 1573-2878) IF(2019): 1.388 [edited 3 submissions]

2018– Associate Editor-in-Chief at Astrodynamics, a newly launched journal in the field, co-published by Springer and Tsinghua University Press (ISSN: 2522-0098); IF(2019): TBD [edited 4 submissions]

2016–20 Associate Editor at Advances in Space Research, the official journal of the Committee on Space Research (COSPAR), published by Elsevier, for the field "Satellite Dynamics, Space Dynamics, Space Debris" (ISSN: 0273-1177); IF(2019): 2.177 [edited 206 submissions with final disposition]

9.2 Conference chair

2019 Co-Chair and responsible for the local organization of the 8th Interplanetary CubeSat Workshop held in Milan, Italy, on 28–29 May 2019

2019 AAS Technical Chair of the 29th AAS/AIAA Space Flight Mechanics Meeting held in Maui, Hawaii, USA, on 13–17 January 2019

2011 Co-Chair of the conference New Trends in Astrodynamics and Applications VI, New York City, New York, USA, 6–8 June 2011

2008 Co-Chair and responsible for the local organization of the conference New Trends in Astrodynamics and Applications V, Milan, Italy, 30 June–2 July 2008

9.3 Conferences and workshops committees

He has contributed to the organization of conferences and workshop listed below.

2022 2nd International Stardust Conference, ESA/ESTEC, Noordwijk, The Netherlands, 7–11 November2022

2019 International Workshop on Satellite Constellations *&* Formation Flying, Glasgow, UK, 16–19 July 2019

2017 LUMIO Workshop, Milan, Italy, 11–12 September 2017

2016 Stardust Final Conference, ESA/ESTEC, Noordwijk, The Netherlands, 31 October–3 November 2016

2016 Stardust 2nd Local Training Workshop, Bremen, Germany, 20–22 April 2016

2015 Space Shepherd Workshop, Milan, Italy, 4 December 2015

9.4 Session chair

2021 Chairman of the session "Spacecraft Control I", 31st AAS/AIAA Space Flight Mechanics Meeting, Virtual, 1–4 February 2021

2018 Co-chaired the sessions "Low Earth Orbit – POD Techniques and Applications" and "Moon, Planets, and Beyond" at the Panel on Satellite Dynamics (PSD), COSPAR Scientific Assembly 2018, Pasadena, CA, USA, 14–22 July 2018

2016 Chairman of "Symposium on Active and Passive Debris Removal", Stardust Final Conference, ESA/ESTEC, Noordwijk, The Netherlands, 31 October–3 November 2016

2016 Chairman of the session "Spacecraft Dynamics", 26th AAS/AIAA Space Flight Mechanics Meeting, Napa Valley, CA, 14–18 February 2016

2015 Chairman of the sessions "Trajectory Design" and "Orbital Dynamics", 25th AAS/AIAA Space Flight Mechanics Meeting, Williamsburg, VA, 11–15 January 2015

9.5 Activity as reviewer

He regularly serves as reviewer for the major journals in the field: Journal of Guidance, Control, and Dynamics (AIAA), Celestial Mechanics and Dynamical Astronomy (Springer), Advances in Space Research (Elsevier), Acta Astronautica (Elsevier), Communication in Nonlinear Science and Numerical Simulation (Elsevier).

2008– He has performed over 142 reviews certified by Publons[3]

10 Academic service

He leads the Deep-space Astrodynamics Research and Technology (DART) group composed of 3 Post-Doc Fellows, 8 PhD Students, and 3 Research Assistants.

10.1 Supervision of PostDoc fellows

He is currently supervising 4 PostDoc fellows. Overall, he has been responsible for the activities of PostDoc fellows in 11 research projects (Table 2).

Year	PostDoc fellow	Project
2021–	A. Morselli	EXTREMA: Engineering Extremely Rare Events in Astrodynamics
2021–	P. Panicucci	EXTREMA: Engineering Extremely Rare Events in Astrodynamics
2021–	C. Giordano	EXTREMA: Engineering Extremely Rare Events in Astrodynamics
2021–	V. Franzese	EXTREMA: Engineering Extremely Rare Events in Astrodynamics
2017–18	D. Dei Tos	LUMIO: Lunar Meteoroid Impacts Observer
2016	M. Nakamiya	SpaceSHIP: Space Systems with Hybrid Propulsion
2014–16	K. Kumar	Stardust: The Asteroid and Space Debris Network
2014–15	R. Lombardi	Space Shepherd: Saving Human Lives trough Satellite Imagery
2014	R. Lombardi	Study of L- and P-band SAR Tomography Synergies
2014	G. Di Mauro	Preliminary Design of Low-Cost Spacecraft for Lunar Missions
2012	G. Mingotti	Hybrid Propulsion Transfer Strategies

Table 2: Post-doc research fellows supervised.

[3] See https://publons.com/author/528735/francesco-topputo

10.2 Supervision of PhD students

He has completed 5 PhD supervisions, and is currently supervising 10 PhD students (Table 3).

Year	PhD student	PhD Thesis
2022–	C. Buonagura	Autonomous guidance in lunar environment (provisional)
2021–	A. Mannocchi	Autonomous guidance in deep space with applications (provisional)
2021–	F. Piccolo	Autonomous navigation about uncooperative objects (provisional)
2021–	A. Rizza	Autonomous guidance about uncooperative objects (provisional)
2021–	E. Andreis	Autonomous optical navigation in deep space (provisional)
2021–	A. Morelli	Autonomous guidance of deep-space systems (provisional)
2021–	G. Di Domenico	CubeSat-environment interaction in deep space (provisional)
2019–	M. Pugliatti	Autonomous navigation about small bodies (provisional)
2019–	G. Merisio	Autonomous ballistic capture design and synthesis (provisional)
2018–	C. Hofmann	Autonomous guidance of deep-space systems (provisional)
2017–22	Y. Wang	Efficient Indirect Optimization of Low-Thrust Trajectories with Interior-Point Constraints
2018–21	V. Franzese	Autonomous navigation for interplanetary CubeSats at different scales
2017–20	C. Giordano	Analysis, design, and optimization of robust trajectories for limited-capability small satellites
2016–19	K. Mani	Combined chemical-electric propulsion design and hybrid trajectories for stand-alone deep-space CubeSats
2014–17	D. Dei Tos	Trajectory optimization of limited control authority spacecraft in high-fidelity models

Table 3: PhD students supervised.

10.3 Member in PhD committees

Member of the PhD committees for the evaluation of the candidates listed below.

2021 E. Blazquez, ISAE-SUPAERO, 25 June 2021; Thesis on "Rendezvous optimization and GNC design for proximity operations on cis-lunar near rectilinear halo orbits"

2021 Member of the committee for the PhD in Mechanical Enginering and Advanced Sciences (multiple candidates: A. Bau, R. Lasagni, G. Bocchieri, S. Piastra, J. Belcari), Alma Mater Studiorum – Università di Bologna, 28 May 2021.

2021 P. Panicucci, ISAE-SUPAERO, 30 March 2021; Thesis on "Autonomous vision-based navigation and shape reconstruction during approach and early characterization for asteroid exploration"

2018 L. Niccolai, Dipartimento di Ingegneria Civile e Industriale, Università di Pisa, 20 December 2018; Thesis on "Trajectory analysis of spacecraft with propellantless propulsion systems".

2018 M. Duering, Department of Mechanical and Aerospace Engineering, University of Strathclyde, 26 October 2018; Thesis on "Station-keeping and orbital transfers in the vicinity of the Moon exploiting quasi-periodic orbit dynamics".

2018 F. Maffione, Department of Mechanical and Aerospace Engineering, Politecnico di Torino, 10 July 2017; Thesis on "Analysis of low-thrust interplanetary missions".

2017 Member of the committee for the PhD in Industrial Engineering (multiple candidates: M. Chiatto, S. Boccardi, P. Pasolini, A. Scannapieco, M. Iuzzolino, R. Scognamiglio), Università di Napoli Federico II, 20 June 2017.

2016 Z. Chen, Laboratoire de Mathématiques d'Orsay, Université Paris-Saclay, 14 September 2016; Thesis on "L^1-Minimization for Space Mechanics"

2015 H. Urrutxua, Escuela Tecnica Superior de Ingenieros Aeronauticos, Universidad Politecnica de Madrid, 14 May 2015; thesis on "High Fidelity Models for Near-Earth Object Dynamics".

2013 G. Aliasi, Dipartimento di Ingegneria Aerospaziale, Università di Pisa, 18 March 2013; Thesis on "Mission Applications for Continuous-Thrust Spacecraft within a Three-Body Problem".

External examiner of the PhD Theses listed below.

2019 R. Tiwari, "Orbits around libration points in the Sun–Earth system", Department of Applied Mathematics, Indian Institute of Technology, June 2019

2019 S. Parvathi, "Iterative analytical techniques for the design of transfer trajectories for direct interplanetary orbiter mission", Department of Aerospace Engineering, Indian Institute of Space Science and Technology, May 2019

10.4 Supervision of visiting PhD students, co-supervision of PhD students

He has temporary supervised 17 visiting PhD students from international universities (Table 4, top). He has been co-supervisor in 2 PhD projects (Table 4, bottom).

10.5 Supervision of research assistants

He is currently supervising 1 Research Assistant. Overall, he has been responsible for the activities of Research Assistants in 8 projects (Table 5).

Year	PhD Student	Topic	Home Uni.
2022	J. Tyler	Lagrangian coherent structures in ballistic capture dynamics	University of Southampton (UK)
2022	A. Mitchell	Asteroid detection by interplanetary CubeSats	MIT (USA)
2021–22	S.-S. Pan	Design of three-impulse Earth–Moon transfers with primer vector theory	Nanjing University (China)
2021	S. Casini	Autonomous navigation for CubeSats in deep-space	TU Delft (The Netherlands)
2021	P. Peñarroya	Simulation of landing dynamics about small bodies	Uni Carlos III de Madrid (Spain)
2018–19	Y.-Y. Zhang	Autonomous trajectory planning and tracking for asteroid landing	Harbin Institute of Tech (China)
2018–19	Q. Chen	Computation and analysis of low-thrust reachable sets	Beijing Institute of Tech. (China)
2018–19	L. Barbosa	Optimal transfers to Lagrange point orbits in the Earth–Moon system	Inst. Nac. de Pesq. Espaciais (Brasil)
2018–19	H. Li	Closed-loop guidance of space trajectory via deep neural network	Tsinghua University (China)
2018–19	Z. Chi	Low-thrust, variable-specific-impulse trajectory optimization	Tsinghua University (China)
2017–18	A. Mohammadi	Space trajectory design though shape based methods	Iran Uni of Sci and Tech (Iran)
2016	J.-L. Gonzalo	End-of-life disposal of satellites in MEO orbits with low-thrust propulsion	Uni Politécnica de Madrid (Spain)
2015–16	K. Oshima	Dynamics of lunar collision orbits for medium-energy lunar transfers	Waseda University (Japan)
2014	H. Zhang	Unscented parameter estimation methods to solve two-point boundary value problems	Beihang University (China)
2013–14	C. Zhang	Direct and indirect optimization of low-thrust trajectories	Beihang University (China)
2013–14	Z. Luo	Ballistic capture analysis and design in the real n-body model	National Uni of Def&Tech (China)
2012–13	R. Zhang	Numerical approximations of invariant manifolds in the restricted 3-body problem	Northwestern Polyt Uni (China)
2016–18	M. Gomroki	Development of state dependent factorized optimal control methods with applications	Middle East Tech Univ (Turkey)
2008–11	G. Mingotti	Trajectory Design and Optimization in Highly Nonlinear Astrodynamics	Politecnico di Milano (Italy)

Table 4: Visiting PhD students supervised (top), PhD students co-supervised (bottom).

10.6 Supervision of MSc students

He has supervised 74 MSc students for their final thesis projects (average duration of 6–8 months.

2022 • T. Tsoulias, A Direct Collocation Approach for Trajectory Design in Cartesian Coordinates

• S. Raffa, Finding regions of bounded motion in binary asteroid environments using Lagrangian

Year	Researcher	Project
2021-22	C. Bottiglieri	Milani: Mission analysis and GNC
2021	A. Mannocchi	IMPRESA: Image Pattern Recognition for Situational Awareness
2021	C. Buonagura	IMPRESA: Image Pattern Recognition for Situational Awareness
2021	F. Piccolo	Milani: Mission analysis and GNC
2020–21	A. Rizza	Milani: Mission analysis and GNC
2018	S. Ceccherini	LUMIO: Lunar Meteoroid Impacts Observer
2017	S. Ceccherini	SpaceSHIP: Space systems with hybrid propulsion
2016–17	M. Rasotto	Navigation of ultra low thrust transfers to the saddle point
2016–17	K. Mani	SpaceSHIP: Space Systems with Hybrid Propulsion

Table 5: Research assistants supervised.

descriptors
• A. Quinci, Qualitative study of ballistic capture at Mars via Lagrangian descriptors
• G. Napoli, Design, Modelling, and Numerical Simulation of a CubeSat Attitude Control System
• G. Corsi, Design, prototyping and testing of a reaction wheel assembly for an air-bearing spacecraft attitude simulator
• S. Borgia, Hardware-in-the-Loop Simulation of Horizon- Based Optical Navigation in TransLunar Space
• L. Beccari, Image processing techniques for vision-based navigation around small bodies
• F. Ventre, Asteroid ejecta capture around binary systems
• A. Parisi, Design and development of an automated moveable-mass system for a CubeSat attitude simulator platform
• J. Lane, Calibration of lidar and infrared sensors for target pose estimation for the Clearspace-1 debris removal mission

2021
• S. Sirani, LUMIO orbit refinement in high fidelity model
• M. Rusconi, Modeling and Simulation of Milani CubeSat Contact Motion on the Surface of the Secondary Asteroid of Didymos Binary System
• A. Pizzetti, Autonomous Wheel Off-Loading Strategies for Deep-Space CubeSats
• L. Ghilardi, A Study on the Covector Mapping Principle for Low-Thrust Trajectory Optimisation
• A. Babato, Station keeping algorithm implementation for the simulation of a coupled GNC and ADCS model for the lunar CubeSat LUMIO
• V. Nateghi, Machine Learning-Based Thermospheric Density Modelling and Estimation for Space Operations
• F. Carrasso, A Convolutional Neural Network Model as Image Processing in Cislunar Environment
• I. Fontcuberta, Landing a CubeSat on an Asteroids' Moon: Guidance & Control design for asteroid landing using discrete firings of sliding mode control
• D. Morin, Optimization of Payload Operations for a CubeSat in a Double Asteroid Environment
• E. La Paglia, Ballistic Capture Sets and orbits evolution under variations of the capture epoch
• L. Apparenza, Design of low-thrust trajectories for asteroid exploration with CubeSat
• M. Agistri, Star Tracker Measurement Filtering via UF/EKF with Recursive Prefiltering of IMU Reading
• M. Laino, Design of landing trajectories on small bodies with application to Milani CubeSat in Didymos binary asteroid
• A. Laus, Autonomous Orbit Determination of a Formation of Nanosatellites with a Multi-Target Tracker
• E. Zulli, Understanding the 65803 Didymos dynamical environment applying Lagrangian Coherent Structures

• S. Bella, Line of Sight Extraction Algorithm for Stand-Alone CubeSats in Deep-Space
• S. Suriano, Space Logistics Optimisation: Asteroid Mining to Supply a Mars Colony
• M. De Francesco, Planet Image-Based Attitude Estimation and Control

2020
• J. Bueno, Real-time Optimal Guidance of Low-trust Transfers Based on Neural Networks
• G. Taiano, Dual orbit-attitude 6 DoF modeling and optimization
• M. Pavoni, Small Bodies Centroiding via Image Processing and Convolutional Neural Network
• E. Andreis, Deep-Space Autonomous Navigation for Stand-Alone CubeSats
• A. Mannocchi, A Homotopic Direct Collocation Approach for Operational-Compliant Trajectories Design
• A. Morelli, Robust Design of Low-Thrust Minimum-Fuel Space Trajectories by Combination of Sequential Convex Programming and Homotopic Approach
• M. Muñoz, Characterization of the transfer trajectory of LUMIO mission
• A. Perrino, Far Approach Detection of Small Bodies with Interplanetary CubeSats
• F. Piccolo, Numerical simulations for the design of a hardware-in-the-loop experiment for interplanetary CubeSats
• C. Buonagura, Image Processing Robustness Assessment with Procedural Generated Minor Bodies Shapes
• C. Bottiglieri, Proximity trajectory design for a CubeSat around binary asteroid Didymos
• G. Di Domenico, Development of a hardware-in-the-loop simulation framework for interplanetary transfers on smaller timescales
• L. Manca, Machine Learning for Thermal Simulation: Data-driven Thermal Models Applied to Euclid Spacecraft
• C. Moreno, Indirect Trajectory Optimization Including Third Body Perturbation
• S. Moro, Hybrid optical-radiometric navigation for CubeSats in deep space
• W. Boumchita, Rendezvous and Close Proximity Operations for an Interplanetary CubeSat around Small Bodies

2019
• D. Lupatini, User-friendly design of software optimization tools
• A. Degli Innocenti, Developement and test of an algorithm for detection and post-processing for LUMIO Mission
• L. Consoli, Operative-Compliant Trajectory Design for Stand-Alone Interplanetary CubeSats
• N. Vattai, Development and validation of a horizon-based optical navigation test facility
• L. Mariani, Design and development of a small satellites three axis attitude simulator platform
• A. Mastrantuono, Low-thrust transfers from the Moon to L2 halo orbits
• S. Cravedi, Orbit maintenance strategy for libration point orbits: Floquet Modes approach
• G. Merisio, Payload, orbit, and environment simulation for LUMIO mission coverage analysis

2018
• R. Barocco, Applications and optimization of Extreme Learning Machines for the realization of onboard, real-time guidance algorithms
• A. Mañero, A radiation model for power degradation estimation in Earth-centered satellites
• F. Soler, Low-thrust heliocentric transfer with ballistic capture and orbit circularization for a standalone Mars CubeSat
• A. Malgarini, Deep-Space Pulsar-Based Autonomous Navigation

2017
• A. Brugnoli, Orbit-attitude coupling for geostationary HAMR debris
• V. Franzese, Autonomous navigation for interplanetary CubeSats
• N. Ramos, Indirect optimization of electric propulsion orbit raising to GEO with homotopy
• A. Campolo, Safety analysis for near rectilinear orbit close approach rendezvous in the circular restricted three-body problem
• E. Veruari, Space trajectory optimisation in high-fidelity models
• C. Giordano, Modeling and optimisation of aero-ballistic capture
• P. Broggi, Impact of novel observation space assets on migrants monitoring in the Mediterranean Sea and on emergency and disaster management

2016 • F. Gaspari, Numerical and experimental characterization of Philae's photovoltaic balcony panel
• M. Caiazzo, Robustness analysis of ballistic capture orbits in the elliptic restricted three-body problem
• S. Ceccherini, Preliminary mission analysis and design for a hybrid transfer to the geostationary orbit
• L. Ferella, Indirect optimization of long-duration, multi-spiral low-thrust transfers with homotopy
• E. Dell'Aglio, Ballistic capture at Mars: Stability analysis with active control and energy criteria
• A. Zuanetti, Integrated monitoring of refugees in the Mediterranean Sea with small satellite constellations
• A. Cardozo, Low-thrust space trajectory optimization via direct transcription and collocation
2014 • U. Monti, Approximate solution methods for bounded nonlinear optimal control problems
• D. Dadamo and M. Petruzziello, Design of an experimental device to recreate LILT environment
• S. Tiwari, Phase change material as a heat sink device for small satellites
• D. Dei Tos,Automated trajectory refinement of three-body orbits in the real Solar System model

He has been the daily supervisor of 4 visiting MSc students from international universities (Table 6).

Year	MSc Student	MSc Thesis	Home Uni.
2017	A. Sanz	Preliminary systems design of a stand-alone interplanetary cubesat to Mars	Uni. Carlos III de Madrid
2015	A. Batet	Direct optimization of three-dimensional, low-thrust space trajectories with variable path constraints	Uni. Politecnica de Catalunya
2015	X. Ros Roca	Computation of Lagrangian coherent structures with application to weak stability boundaries	Uni. Politecnica de Catalunya
2015	M. Iglesias	Optimization of ballistic capture trajectories in the elliptic restricted three-body problem	Uni. Politécnica de Madrid

Table 6: Visiting MSc students supervised.

He has also been co-supervisor of 22 MSc students, listed below.
2019 • E. Bolognesi, A dagger approach for supervised imitation learning applied to autonomous lunar landing
2018 • I. Bloise, M. Orlandelli, A deep learning approach to autonomous lunar landing
• J. Ruiz, Flexible electrical power system for interplanetary and lunar CubeSats
2017 • G. Lanave, Waypoints ZEM/ZEV feedback space guidance for multi-spiral, long-duration low-thrust transfers
• R. Ruggiero, Waypoints-optimized ZEM/ZEV closed loop guidance for spacecraft rendezvous in relative motion frame
2014 • A. De Bernardi, Space trajectory optimization with solar electric propulsion models
• M. Cattafesta, Modeling and simulation of Rosetta lander Philae solar arrays
2013 • A. Binci, Simulazione hardware-in-the-loop dei pannelli solari del microsatellite Palamede
• G. Zgraggen, Design of an experimental device for the characterization of solar cells in LILT environment
• M. Miani, A combined dynamic-algebraic method to solve nonlinear optimal control problems with applications
2012 • G. Caputo, On-comet attitude determination of Rosetta lander Philae through nonlinear optimal system identification
• G. Pinzan, Landing site selection for Rosetta lander Philae through a multidisciplinary approach
2010 • M. Pasta, Station keeping di satelliti geostazionari mediante controllo ottimo nonlineare
• A. Minelli, Analogies between astrodynamics and cancer immunotherapy

2009 • F. Zuiani and D. Ricci, Gravity assist space pruning using Tisserand and shape-based methods
2008 • N. Hyeraci, Ballistic capture in the elliptic restricted three-body problem with applications to low-thrust interplanetary transfers
• S. Brambillasca, Celle solari per missioni verso corpi celesti lontani dal Sole
2006 • G. Mingotti, Progettazione di traiettorie per missioni spaziali nel modello dei tre corpi ristretto con propulsione a bassa spinta
• G. Ferri, Trasferimenti Terra-Luna per l'esplorazione lunare
2005 • F. Cremaschi, Trasferimenti interplanetari a bassa spinta tramite varietà invarianti e neurocontrollori evolutivi

10.7 Supervision of MSc students at TU Delft

As part of the activities performed at TU Delft, he has supervised 7 MSc students (Table 7).

Year	MSc student	MSc Thesis
2019	M. Manzi	Weak stability boundaries and Lagrangian coherent structures
2019	A. Parkash	Application of Lagrangian coherent structures to the computation and understanding of ballistic capture trajectories
2018	J. Gutierrez	End-to-end assessment of Earth-Mars transfers ending in ballistic capture
2017	G. Aguiar	Earth–Mars low-thrust transfers with ballistic capture
2017	A. Cipriano	Orbit design of a lunar meteoroid impact flashes observer
2017	S. Bonasera	On lunar collision orbits: New methodologies for Moon-to-Moon transfer design
2017	M. Aragay	Characterization of trajectories to collect samples from Europa's plume

Table 7: MSc students supervised at TU Delft.

10.8 Supervision of interns

He has supervised 11 BSc/MSc students for their internship activity (Table 8).

Year	MSc Student	Topic	Home Uni.
2019	P. Patole	Performance analysis of the station-keeping and reaction wheel desaturation maneuvers for the operational phase of the LUMIO mission	TU Delft
2017	A. Parkash	Implementation of efficient ballistic capture techniques in GRATIS	TU Delft
2016	A. Cipriano	Optimisation of low-thrust space trajectories with direct transcription and collocation	TU Delft
2016	G. Aguiar	Assessment of ultra low thrust transfer to saddle point	TU Delft
2016	Y. Mekkaoui	Challenges in sytem design for deep space cubesats	ISAE ENSMA
2015	E. Hekma	Development of a toolbox for trajectory optimization for multiple rendezvous debris removal satellite missions	TU Delft
2015	A. Agrawal	Development of multi-target active debris removal mission concepts	TU Delft
2009	S. Tiwari	Restricted three-body problem: Families of periodic orbits and their application	Bombay Uni.
2008	K. Kumar	Weak capture and the weak stability boundary	TU Delft
2007	A. Laird	Comparison of propulsion system masses for chemical and solar electric propulsion	Glasgow Uni.
2007	S. Hay	An investigation to define reference orbits for hydrocarbon detection	Glasgow Uni.

Table 8: BSc/MSc interns supervised.

10.9 Organization of internal seminars

He has organized the internal seminars listed below.

2018 K. Kumar, "Integrated Mission Design using Electronic Data Sheets", 21 November 2018

2017 G. Cataldo, "The James Webb Space Telescope: Challenges Addressed Through Model-Based Systems Engineering", 20 December 2017

2017 R. Furfaro, "Shallow and Deep Learning Models for Closed-Loop Space Guidance", 12 December 2017

2017 C. Trenkel, "LISA Pathfinder and Tests of Alternative Gravitational Theories", 13 October 2017

2017 L. Montabone, "The Atmosphere of Mars: What to observe with SmallSat missions?", 11 July 2017

2016 N. Baresi, "Numerical Computation of Quasi-Periodic Invariant Tori and Applications to Astrodynamics", 20 October 2016

2015 C. Bombardelli, "Fundamental Aspects of Ion-Beam Debris Mitigation and Asteroid Deflection", 26 March 2015

2015 E. Belbruno, "Ballistic Capture Transfers: Origins to Current Developments", 5 February 2015

2014 D. Scheeres, "Space Situational Awareness, Active Satellites and Optimal Control", 9 June 2014

10.10 Institutional roles

2019–22 Coordinator of the PhD sub-committee "Space Engineering" of the PhD in Aerospace Engineering

2018 Member of the committee for the admission to the PhD in Aerospace Engineering (XXXIV cycle)

2017– Member of the Scientific Committee at the Dept. of Aerospace Science and Technology, Polimi

2017– Member of the permanent PhD Committee in Aerospace Engineering, Polimi

2015–16 Social media co-manager (Twitter) of the Dept. of Aerospace Science and Technology, Polimi

11 Teaching activity

He is instructor of classes listed below at BSc, MSc, and PhD levels at the School of Industrial and Information Engineering, Politecnico di Milano (summary in Table 9).

2021– He has forged and taught the class "Spacecraft Guidance and Navigation" (8 ECTS) for MSc students in Space Engineering (designed and taught with P. Di Lizia)
- Given in AY 2021–2022

2018–21 Instructor of the class "Introduction to Space Mission Analysis" (3 ECTS) for BSc students in Aerospace Engineering (taught and designed with Italian)
- Given in AY 2017–2018, 2018–2019, 2019–2020, 2020–2021

2015– He has created from scratch and taught the class "Modeling and Simulation of Aerospace Systems" (8 ECTS) for MSc students in Space Engineering and Aeronautical Engineering
- Given in AY 2015–2016, 2016–2017, 2017–2018, 2018–2019, 2019–2020, 2020–2021, 2021–2022

2015– He has designed the class "Nonlinear Optimal Control with Applications" (5 ECTS) for PhD students in Aerospace Engineering
- Given in AY 2015–2016, 2016–2017, 2017–2018, 2018–2019, 2019–2020, 2020–2021

2013–15 Instructor of the class "Numerical Models of Aeronautical Systems" (8 ECTS) for MSc students in Aeronautical Engineering (taught in Italian)
- Given in AY 2013–2014, 2014–2015

AY	Class	ECTS	Level
2021–2022	Spacecraft Guidance and Navigation	8	MSc in Space Eng
2021–2022	Modeling and Simulation of Aerospace Systems	8	MSc in Aero, Space Eng
2020–2021	Nonlinear Optimal Control with Applications	5	PhD in Aerospace Eng
2020–2021	Modeling and Simulation of Aerospace Systems	8	MSc in Aero, Space Eng
2020–2021	Introduction to Space Mission Analysis	3	BSc in Aerospace Eng
2019–2020	Nonlinear Optimal Control with Applications	5	PhD in Aerospace Eng
2019–2020	Modeling and Simulation of Aerospace Systems	8	MSc in Aero, Space Eng
2019–2020	Introduction to Space Mission Analysis	3	BSc in Aerospace Eng
2018–2019	Nonlinear Optimal Control with Applications	5	PhD in Aerospace Eng
2018–2019	Modeling and Simulation of Aerospace Systems	8	MSc in Aero, Space Eng
2018–2019	Introduction to Space Mission Analysis	3	BSc in Aerospace Eng
2017–2018	Nonlinear Optimal Control with Applications	5	PhD in Aerospace Eng
2017–2018	Modeling and Simulation of Aerospace Systems	8	MSc in Aero, Space Eng
2017–2018	Introduction to Space Mission Analysis	3	BSc in Aerospace Eng
2016–2017	Nonlinear Optimal Control with Applications	5	PhD in Aerospace Eng
2016–2017	Modeling and Simulation of Aerospace Systems	8	MSc in Aero, Space Eng
2015–2016	Nonlinear Optimal Control with Applications	5	PhD in Aerospace Eng
2015–2016	Modeling and Simulation of Aerospace Systems	8	MSc in Aero, Space Eng
2014–2015	Numerical Models of Aeronautical Systems	8	MSc in Aero Eng
2013–2014	Numerical Models of Aeronautical Systems	8	MSc in Aero Eng

Table 9: Classes of which he has been instructor.

11.1 Activity as teaching assistant

He has served as Teaching Assistant in several classes at Politecnico di Milano (in Italian); Table 10.

AY	Class	Instructor	Level
2012–2013	Intr. to space mission analysis	M. Massari	BSc in Aerospace Eng
2012–2013	Intr. to space mission analysis	F. Bernelli-Zazzera	BSc in Aerospace Eng
2012–2013	Analytical mechanics	A. Frezzotti	BSc in Aerospace Eng
2011–2012	Atm. & space flight mechanics	M. Massari	BSc in Aerospace Eng
2011–2012	Atm. & space flight mechanics	F. Bernelli-Zazzera	BSc in Aerospace Eng
2011–2012	Analytical Mechanics A	C. Morosi	BSc in Biomedical Eng
2011–2012	Analytical Mechanics	A. Frezzotti	BSc in Aerospace Eng
2010–2011	Atm. & space flight mechanics	M. Massari	BSc in Aerospace Eng
2010–2011	Atm. & space flight mechanics	F. Bernelli-Zazzera	BSc in Aerospace Eng
2010–2011	Analytical Mechanics	A. Frezzotti	BSc in Aerospace Eng
2009–2010	Atm. & space flight mechanics	M. Massari	BSc in Aerospace Eng
2009–2010	Atm. & space flight mechanics	F. Bernelli-Zazzera	BSc in Aerospace Eng
2009–2010	Analytical Mechanics	A. Frezzotti	BSc in Aerospace Eng
2008–2009	Space systems design	M. Lavagna/F. Ongaro	MSc in Aerospace Eng
2008–2009	Aerospace mechanics	A. Frezzotti	BSc in Aerospace Eng
2007–2008	Space systems design	M. Lavagna/F. Ongaro	MSc in Aerospace Eng
2007–2008	Foundation of mechanics	L. Valdettaro	BSc in Mechanical Eng
2007–2008	Foundation of mechanics	C. Morosi	BSc in Mechanical Eng
2006–2007	Foundation of mechanics	L. Valdettaro	BSc in Mechanical Eng
2006–2007	Foundation of mechanics	C. Belli	BSc in Mechanical Eng
2005–2006	Analytical Mechanics	E. Alberti	MSc in Aerospace Eng
2004–2005	Analytical Mechanics	E. Alberti	MSc in Aerospace Eng

Table 10: Classes of which he has been Teaching Assistant.

12 Publications

Dr. Topputo has authored or coauthored 235 publications subdivided in: 67 articles published in international peer-reviewed journals, 8 book chapters, 1 PhD thesis, 130 papers published in proceedings of international congresses, 12 scientific reports, 4 article published on national journals, and 13 papers published in proceedings of national congresses.

12.1 Peer-reviewed journal articles

J67 T. Caleb, G. Merisio, P. Di Lizia, and *F. Topputo*, "Stable Sets Mapping with Taylor Differential Algebra with Application to Ballistic Capture Orbits around Mars", Celestial Mechanics and Dynamical Astronomy, in press, 2022

J66 A. Cervone, *F. Topputo*, S. Speretta, A. Menicucci, E. Turan, P. Di Lizia, M. Massari, V. Franzese, C. Giordano, G. Merisio, D. Labate, G. Pilato, E. Costa, E. Bertels, A. Thorvaldsen, A. Kukharenka, J. Vennekens, and R. Walker, "LUMIO: A CubeSat for Observing and Characterizing Micro-Meteoroid Impacts on the Lunar Far Side", Acta Astronautica, Vol. 195, pp. 309–317, 2022 DOI: 10.1016/j.actaastro.2022.03.032

J65 C. Giordano and *F. Topputo*, "Aero-Ballistic Capture at Mars: Modeling, Optimization, and Assessment", Journal of Spacecraft and Rockets, in press, 2022 DOI: 10.2514/1.A35176

J64 E. Andreis, V. Franzese, and *F. Topputo*, "On-board Orbit Determination for Deep-Space CubeSats", Journal of Guidance Control and Dynamics, in press, 2022 DOI: 10.2514/1.G006294

J63 Y. Wang and *F. Topputo*, "Indirect Optimization of Power-Limited Asteroid Rendezvous Trajectories", Journal of Guidance Control and Dynamics, Vol. 45, pp. 962–971, 2022 DOI: 10.2514/1.G006179

J62 V. Franzese and *F. Topputo*, "Deep-Space Optical Navigation Exploiting Multiple Beacons", The Journal of the Astronautical Sciences, Vol. 69, pp. 368–384, 2022 DOI: 10.1007/s40295-022-00303-5

J61 M. Pugliatti, V. Franzese, and *F. Topputo*, "Data-driven Image Processing for Onboard Optical Navigation Around a Binary Asteroid", Journal of Spacecraft and Rockets, Vol. 59, pp. 943–959, 2022 DOI: 10.2514/1.A35213

J60 M. Manzi and *F. Topputo*, "A Flow-Informed Strategy for Ballistic Capture Orbit Generation", Celestial Mechanics and Dynamical Astronomy, Vol. 133, pp. 1–16, 2021 DOI: 10.1007/s10569-021-10048-2

J59 A. Morelli, C. Hofmann, and *F. Topputo*, "Robust Low-Thrust Trajectory Optimization Using Convex Programming and a Homotopic Approach", IEEE Transactions on Aerospace and Electronic Systems, Vol. 58, pp. 2103–2106, 2022 DOI: 10.1109/TAES.2021.3128869

J58 V. Franzese, *F. Topputo*, F. Ankersen, and R. Walker, "Deep-Space Optical Navigation for M-ARGO Mission", The Journal of the Astronautical Sciences, Vol. 68, pp. 1034–1055, 2021 DOI: 10.1007/s40295-021-00286-9

J57 F. Ferrari, V. Franzese, M. Pugliatti, C. Giordano, and *F. Topputo*, "Trajectory Options for Hera's Milani CubeSat Around (65803) Didymos", The Journal of the Astronautical Sciences, Vol. 69, pp. 973–994, 2021 DOI: 10.1007/s40295-021-00282-z

J56 Y. Wang and *F. Topputo*, "A TFC-based Homotopy Continuation Algorithm with Application to Dynamics and Control Problems", Journal of Computational and Applied Mathematics, Vol. 401, pp. 113777, 2022 DOI: 10.1016/j.cam.2021.113777

J55 S. Ceccherini, K. Mani, and *F. Topputo*, "Combined System-Trajectory Design for Geostationary Orbit Platforms on Hybrid Transfer", Journal of Spacecraft and Rockets, Vol. 59, pp. 448–466, 2022 DOI: 10.2514/1.A35012

J54 C. Hofmann and *F. Topputo*, "Rapid Low-Thrust Trajectory Optimization in Deep Space Based On Convex Programming", Journal of Guidance Control and Dynamics, Vol. 44, pp. 1379–1388, 2021 DOI: 10.2514/1.G005839

J53 *F. Topputo*, Y. Wang, C. Giordano, V. Franzese, H. Goldberg, F. Perez-Lissi, and R. Walker, "Envelop of reachable asteroids by M-ARGO CubeSat", Advances in Space Research, Vol. 67, pp. 4193–4221, 2021 DOI: 10.1016/j.asr.2021.02.031

J52 F. Ferrari, V. Franzese, M. Pugliatti, C. Giordano, and *F. Topputo*, "Preliminary Mission Profile of Hera's Milani CubeSat", Advances in Space Research, Vol. 67, pp. 2010–2029, 2021 DOI: 10.1016/j.asr.2020.12.034

J51 M. Maestrini, P. Di Lizia, and *F. Topputo*, "An Analytical Impulsive-to-Continuous Thrust Conversion in Linearized Relative Dynamics", Journal of Guidance Control and Dynamics, Vol. 44, pp. 862–871, 2021 DOI: 10.2514/1.G005520

J50 Z.-F. Luo and *F. Topputo*, "Mars Orbit Insertion via Ballistic Capture and Aerobraking", Astrodynamics, Vol. 5, pp. 167–181, 2021 DOI: 10.1007/s42064-020-0095-4

J49 R. Furfaro, R. Barocco, R. Linares, *F. Topputo*, V. Reddy, J. Simo, and L. Le Corre, "Modeling Irregular Small Bodies Gravity Field Via Extreme Learning Machines and Bayesian Optimization", Advances in Space Research, Vol. 67, pp. 617–638, 2021 DOI: 10.1016/j.asr.2020.06.021

J48 V. Franzese and *F. Topputo*, "Optimal Beacons Selection for Deep-Space Optical Navigation", The Journal of the Astronautical Sciences, Vol. 67, pp. 1775–1792, 2020 DOI: 10.1007/s40295-020-00242-z

J47 Y. Wang and *F. Topputo*, "Robust Bang-Off-Bang Low-Thrust Guidance Using Model Predictive Static Programming", Acta Astronautica, Vol. 176, pp. 357–370, 2020 DOI: 10.1016/j.actaastro.2020.06.037

J46 H. Li, H. Baoyin, and *F. Topputo*, "Neural Networks in Time-Optimal Low-Thrust Interplanetary Transfers", IEEE Access, Vol. 7, pp. 156413–156419 DOI: 10.1109/ACCESS.2019.2946657

J45 K. Mani, A. Cervone, and *F. Topputo*, "Combined Chemical–Electric Propulsion for a Stand-Alone Mars CubeSat", Journal of Spacecraft and Rockets, Vol. 56, pp. 1816–1830, 2019 DOI: 10.2514/1.A34519

J44 D. Dei–Tos, M. Rasotto, F. Renk, and *F. Topputo*, "LISA Pathfinder Mission Extension: A Feasibility Analysis", Advances in Space Research, Vol. 63, pp. 3863–3883, 2019 DOI: 10.1016/j.asr.2019.02.035

J43 K. Oshima, *F. Topputo*, and T. Yanao, "Low-Energy Transfers to the Moon with Long Transfer Time", Celestial Mechanics and Dynamical Astronomy, Vol. 131, pp. 1–19, 2019 DOI: 10.1007/s10569-019-9883-7

J42 V. Franzese, P. Di Lizia, and *F. Topputo*, "Autonomous Optical Navigation for the Lunar Meteoroid Impacts Observer", Journal of Guidance Control and Dynamics, Vol. 42, pp. 1579–1586, 2019 DOI: 10.2514/1.G003999

J41 D. Dei–Tos and *F. Topputo*, "High-Fidelity Trajectory Optimization with Application to Saddle Point Transfers", Journal of Guidance Control and Dynamics, Vol. 42, pp. 1343–1352, 2019 DOI: 10.2514/1.G003838

J40 A. Cipriano, D. Dei–Tos, and *F. Topputo*, "Orbit Design for LUMIO: the Lunar Meteoroid Impacts Observer", Frontiers in Astronomy and Space Science, Vol. 5, pp. 1–23, 2018 DOI: 10.3389/fspas.2018.00029

J39 *F. Topputo*, D. Dei–Tos, M. Rasotto, and M. Nakamiya, "The Sun-Earth Saddle Point: Characterization and Opportunities to Test General Relativity", Celestial Mechanics and Dynamical Astronomy, Vol. 130, Article 33, 2018 DOI: 10.1007/s10569-018-9824-x

J38 D. Dei–Tos, R. Russel, and *F. Topputo*, "Survey of Mars Ballistic Capture Trajectories using Periodic Orbits as Generating Mechanisms", Journal of Guidance Control and Dynamics, Vol. 41, pp. 1227–1242, 2018 DOI: 10.2514/1.G003158

J37 M. Gomroki, *F. Topputo*, F. Bernelli–Zazzera, and O. Tekinalp, "Solving Constrained Optimal Control Problems Using State-Dependent Factorization and Chebyshev Polynomials", Journal of Guidance Control and Dynamics, Vol. 41, pp. 618–631, 2018 DOI: 10.2514/1.G002392

J36 D. Dei–Tos and *F. Topputo*, "On the Advantages of Exploiting the Hierarchical Structure of Astrodynamical Models", Acta Astronautica, Vol. 136, pp. 236–247, 2017 DOI: 10.1016/j.actaastro.2017.02.025

J35 D. Dei–Tos and *F. Topputo*, "Trajectory Refinement of Three-Body Orbits in the Real Solar System Model", Advances in Space Research, Vol. 59, pp. 2117–2132, 2017 DOI: 10.1016/j.asr.2017.01.039

J34 K. Kumar, E. Hekma, A. Agrawal, and *F. Topputo*, "Effect of Perturbations on Debris-to-Debris Orbital Transfers: A Quantitative Analysis", Advances in Space Research, Vol. 59, pp. 1289–1303, 2017 DOI: 10.1016/j.asr.2016.12.015

J33 Z.-F. Luo and *F. Topputo*, "Capability of Satellite-Aided Ballistic Capture", Communications in Nonlinear Science and Numerical Simulation, Vol. 48, pp. 211–223, 2017 DOI: 10.1016/j.cnsns.2016.12.021

J32 K. Oshima, *F. Topputo*, S. Campagnola, and T. Yanao, "Analysis of Medium Energy Transfers to the Moon", Celestial Mechanics and Dynamical Astronomy, Vol. 127, pp. 285–300, 2017 DOI: 10.1007/s10569-016-9727-7

J31 *F. Topputo*, "Fast Numerical Approximation of Invariant Manifolds in the Circular Restricted Three-Body Problem", Communications in Nonlinear Science and Numerical Simulation, Vol. 32, pp. 89–98, 2016 DOI: 10.1016/j.cnsns.2015.08.004

J30 Z.-F. Luo and *F. Topputo*, "Analysis of Ballistic Capture in Sun–Planet Models", Advances in Space Research, Vol. 56, pp. 1030–1041, 2015 DOI: 10.1016/j.asr.2015.05.042

J29 C. Zhang, *F. Topputo*, F. Bernelli–Zazzera, and Y.-S. Zhao, "Low-Thrust Minimum-Fuel Optimization in the Circular Restricted Three-Body Problem", Journal of Guidance Control and Dynamics, Vol. 38, pp. 1501–1510, 2015 DOI: 10.2514/1.G001080

J28 *F. Topputo* and E. Belbruno, "Earth–Mars Transfers with Ballistic Capture", Celestial Mechanics and Dynamical Astronomy, Vol. 121, pp. 329–346, 2015 DOI: 10.1007/s10569-015-9605-8

J27 *F. Topputo*, M. Miani, and F. Bernelli–Zazzera, "Optimal Selection of the Coefficient Matrix in State-Dependent Control Methods", Journal of Guidance Control and Dynamics, Vol. 38, pp. 861–873, 2015 DOI: 10.2514/1.G000136

J26 Z.-F. Luo, *F. Topputo*, F. Bernelli–Zazzera, and G.-J. Tang, "Constructing Ballistic Capture Orbits in the Real Solar System Model", Celestial Mechanics and Dynamical Astronomy, Vol. 120, pp. 433–450, 2014 DOI: 10.1007/s10569-014-9580-5

J25 *F. Topputo* and C. Zhang, "Survey of Direct Transcription for Low-Thrust Space Trajectory Optimization with Applications", Abstract and Applied Analysis, Vol. 2014, pp. 1–15, 2014 DOI: 10.1155/2014/851720

J24 F. Pappalardo, M. Pennisi, A. Ricupito, *F. Topputo*, and M. Bellone, "Induction of T Cell Memory by a Dendritic Cell Vaccine: A Computational Model", Bioinformatics, Vol. 30, pp. 1884–1891, 2014 DOI: 10.1093/bioinformatics/btu059

J23 *F. Topputo* and F. Bernelli–Zazzera, "Approximate Solutions to Nonlinear Optimal Control Problems in Astrodynamics", ISRN Aerospace Engineering, Vol. 2013, pp. 1–7, 2013 DOI: 10.1155/2013/950912

J22 *F. Topputo*, "On Optimal Two-Impulse Earth–Moon Transfers in a Four-Body Model", Celestial Mechanics and Dynamical Astronomy, Vol. 117, pp. 279–313, 2013 DOI: 10.1007/s10569-013-9513-8

J21 N. Hyeraci and *F. Topputo*, "The Role of True Anomaly in Ballistic Capture", Celestial Mechanics and Dynamical Astronomy, Vol. 116, pp. 175–193, 2013 DOI: 10.1007/s10569-013-9481-z

J20 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "Transfers to Distant Periodic Orbits around the Moon Via their Invariant Manifolds", Acta Astronautica, Vol. 79, pp. 20–32, 2012 DOI: 10.1016/j.actaastro.2012.04.022

J19 E. Belbruno, M. Gidea, and *F. Topputo*, "Geometry of Weak Stability Boundaries", Qualitative Theory of Dynamical Systems, Vol. 12, pp. 1–14, 2012 DOI: 10.1007/s12346-012-0069-x

J18 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "Efficient Invariant-Manifold, Low-Thrust Planar Trajectories to the Moon", Communications in Nonlinear Science and Numerical Simulation, Vol. 17, pp. 817–831, 2012 DOI: 10.1016/j.cnsns.2011.06.033

J17 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "Optimal Low-Thrust Invariant Manifold Trajectories Via Attainable Sets", Journal of Guidance Control and Dynamics, Vol. 34, pp. 1644–1655, 2011 DOI: 10.2514/1.52493

J16 A. Minelli, *F. Topputo*, and F. Bernelli–Zazzera,"Controlled Drug Delivery in Cancer Immunotherapy: Stability, Optimization, and Monte Carlo Analysis", SIAM Journal on Applied Mathematics, Vol. 71, pp. 2229–2245, 2011 DOI: 10.1137/100815190

J15 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "Earth–Mars Transfers with Ballistic Escape and Low-Thrust Capture", Celestial Mechanics and Dynamical Astronomy, Vol. 110, pp. 169–188, 2011 DOI: 10.1007/s10569-011-9343-5

J14 N. Hyeraci and *F. Topputo*, "Method to Design Ballistic Capture in the Elliptic Restricted Three-Body Problem", Journal of Guidance Control and Dynamics, Vol. 33, pp. 1814–1823, 2010 DOI: 10.2514/1.49263

J13 E. Belbruno, M. Gidea, and *F. Topputo*, "Weak Stability Boundary and Invariant Manifolds", SIAM Journal on Applied Dynamical Systems, Vol. 9, pp. 1061–1089, 2010 DOI: 10.1137/090780638

J12 R. Armellin, P. Di Lizia, *F. Topputo*, M. Lavagna, F. Bernelli–Zazzera, and M. Berz, "Gravity Assist Space Pruning Based on Differential Algebra", Celestial Mechanics and Dynamical Astronomy, Vol. 106, pp. 1–24, 2010 DOI: 10.1007/s10569-009-9235-0

J11 *F. Topputo* and E. Belbruno, "Computation of Weak Stability Boundaries: Sun–Jupiter System", Celestial Mechanics and Dynamical Astronomy, Vol. 105, pp. 3–17, 2009 DOI: 10.1007/s10569-009-9222-5

J10 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "Low-Energy, Low-Thrust Transfers to the Moon", Celestial Mechanics and Dynamical Astronomy, Vol. 105, pp. 61–74, 2009 DOI: 10.1007/s10569-009-9220-7

J9 A. Owis, *F. Topputo*, and F. Bernelli–Zazzera, "Radially Accelerated Optimal Feedback Orbits in Central Gravity Field with Linear Drag", Celestial Mechanics and Dynamical Astronomy, Vol. 103, pp. 1–16, 2009 DOI: 10.1007/s10569-008-9161-6

J8 *F. Topputo*, E. Belbruno, and M. Gidea, "Resonant Motion, Ballistic Escape, and their Applications in Astrodynamics", Advances in Space Research, Vol. 42, pp. 6–17, 2008 DOI: 10.1016/j.asr.2008.01.017

J7 *F. Topputo*, A. Owis, and F. Bernelli–Zazzera, "Analytical Solution of Optimal Feedback Control for Radially Accelerated Orbits", Journal of Guidance, Control and Dynamics, Vol. 31, pp. 1352–1359, 2008 DOI: 10.2514/1.33720

J6 E. Belbruno, *F. Topputo*, and M. Gidea, "Resonance Transition Associated to Weak Capture in the Restricted Three-Body Problem", Advances in Space Research, Vol. 42, pp. 18–39, 2008 DOI: 10.1016/j.asr.2008.01.018

J5 *F. Topputo*, A. Owis, and F. Bernelli–Zazzera, "Solution of a Class of Optimal Feedback Control Problems", Automatic Control in Aerospace, Vol. 1, pp. 1–7, 2008 ISSN: 1974-5168

J4 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "Combined Optimal Low-Thrust and Stable-Manifold Trajectories to the Earth–Moon Halo Orbits", American Institute of Physics, Vol. 886, pp. 100–112, 2007 DOI: 10.1063/1.2710047

J3 R. Armellin and *F. Topputo*, "A Sixth-Order Accurate Scheme for Solving Two-Point Boundary Value Problems in Astrodynamics", Celestial Mechanics and Dynamical Astronomy, Vol. 96, pp. 289–309, 2006 DOI: 10.1007/s10569-006-9047-4

J2 *F. Topputo*, M. Vasile, and F. Bernelli–Zazzera, "Earth-to-Moon Low Energy Transfers Targeting L_1 Hyperbolic Transit Orbits", Annals of the New York Academy of Sciences, Vol. 1065, pp. 55–76, 2005 DOI: 10.1196/annals.1370.025

J1 *F. Topputo*, M. Vasile, and F. Bernelli–Zazzera, "Low Energy Interplanetary Transfers Exploiting Invariant Manifolds of the Restricted Three-Body Problem", The Journal of the Astronautical Sciences, Vol. 53, pp. 353–372, 2005 ISSN: 0021-9142

12.2 Book chapters

B8 *F. Topputo* and S. Ceccherini, "A Catalogue of Parametric Time-Optimal Transfers for All-Electric GEO Satellites", in Modeling and Optimization in Space Engineering, G. Fasano and J. Pintèr Editors, Springer, New York, pp. 459-478, 2019 DOI: 10.1007/978-3-030-10501-3_17

B7 S. Speretta, A. Cervone, P. Sundaramoorthy, R. Noomen, S. Mestry, A. Cipriano, *F. Topputo*, J. Biggs, P. Di Lizia, M. Massari, K. Mani, D. Dei–Tos, S. Ceccherini, V. Franzese, A. Ivanov, D. Labate, L. Tommasi, A. Jochemsen, J. Gailis, R. Furfaro, V. Reddy, J. Vennekens, and R. Walker, "LUMIO: An Autonomous CubeSat for Lunar Exploration", in Space Operations: Inspiring Humankind's Future, H. Pasquier, C. Cruzen, M. Schmidhuber, Y. Lee Editors, Springer, New York, pp. 103–134, 2019 DOI: 10.1007/978-3-030-11536-4_6

B6 *F. Topputo* and M. Massari, "Modeling and Optimization of Hybrid Transfers to Near-Earth Objects", in Modeling and Optimization with Case Studies, G. Fasano and J. Pintèr Editors, Springer, New York, pp. 425–442, 2017 DOI: 10.1007/978-3-319-41508-6_16

B5 *F. Topputo*, P. Di Lizia, and C. Tardioli, "An Introduction to Optimal Control Problem and Space Trajectory Optimisation with some Applications", in Asteroid and Space Debris Manipulation: Advances from the Stardust Research Network, M. Vasile and E. Minisci Editors, AIAA, pp. 203–245, 2016, DOI: 10.2514/5.9781624103247.0203.0246

B4 M. Gomroki, *F. Topputo*, O. Tekinalp, and F. Bernelli–Zazzera, "Two ASRE Approaches with Application to Spacecraft Coulomb Formations", in Astrodynamics Network AstroNet-II, G. Gómez and J. Masdemont Editors, Springer, New York, pp. 109–120, 2016 DOI: 10.1007/978-3-319-23986-6_8

B3 P. Di Lizia, R. Armellin, *F. Topputo*, F. Bernelli–Zazzera, and M. Berz, "Global Optimization of Interplanetary Transfers with Deep Space Maneuvers using Differential Algebra", in Modeling and Optimization in Space Engineering, G. Fasano and J. Pintèr Editors, Springer, New York, pp. 187–213, 2012 DOI: 10.1007/978-1-4614-4469-5_8

B2 *F. Topputo* and E. Belbruno, "Optimization of Low-Energy Transfers", in Modeling and Optimization in Space Engineering, G. Fasano and J. Pintèr Editors, Springer, New York, pp. 389–404, 2012 DOI: 10.1007/978-1-4614-4469-5_16

B1 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "A Method to Design Efficient Low-Energy, Low-Thrust Transfers to the Moon", in Nonlinear Dynamics of Complex Systems: Applications

in Physical, Biological and Financial Systems, T. Machado, D. Baleanu, and A. Luo Editors, Springer, New York, pp. 15–38, 2011 DOI: 10.1007/978-1-4614-0231-2_2

12.3 PhD thesis

T1 *F. Topputo*, "Low-Thrust, Non-Keplerian Orbits: Analysis, Design, and Control", PhD Thesis, Politecnico di Milano, March 2007

12.4 Papers in conference proceedings

C130 C. Buonagura, M. Pugliatti, and *F. Topputo*, "Procedural Minor Body Generator Tool for Data-Driven Optical Navigation Methods", CEAS EuroGNC 2022, Berlin, Germany, 3–5 May 2022

C129 *F. Topputo*, C. Giordano, V. Franzese, Y. Wang, E. Cruz, F. Perez-Lissi, and R. Walker, "The Envelope of Reachable Asteroids of M-ARGO Interplanetary CubeSat", 4S Symposium, Vilamoura, Portugal, 16–20 May 2022

C128 C. Bottiglieri, F. Piccolo, A. Rizza, M. Pugliatti, V. Franzese, C. Giordano, F. Ferrari, and *F. Topputo*, "Mission Analysis and Navigation Assessment for Hera's Milani CubeSat", 4S Symposium, Vilamoura, Portugal, 16–20 May 2022

C127 A. Morselli, G. Di Domenico, E. Andreis, A. Morelli, G. Merisio, V. Franzese, C. Giordano, P. Panicucci, F. Ferrari, and F. Topputo, "The EXTREMA Orbital Simulation Hub: A Facility for GNC Testing of Autonomous Interplanetary CubeSat", 4S Symposium, Vilamoura, Portugal, 16–20 May 2022

C126 V. Franzese, G. Merisio, C. Giordano, *F. Topputo*, et al, "Current Status of LUMIO: A Lunar CubeSat Mission at Earth-Moon L2", 4S Symposium, Vilamoura, Portugal, 16–20 May 2022

C125 M. Rusconi, F. Ferrari, and *F. Topputo*, "Modeling and Simulation of Milani CubeSat Contact Motion on the Surface of the Secondary Asteroid of Didymos Binary System", XVII PEGASUS Student Conference, Pisa (Italy), April 20–22, 2022

C124 A. Pizzetti, A. Rizza, and *F. Topputo*, "Autonomous Wheel Off-Loading Strategies for Deep-Space CubeSats", XVII PEGASUS Student Conference, Pisa (Italy), April 20–22, 2022

C123 S. Speretta, E. Turan, A. Cervone, A. Menicucci, *F. Topputo*, et al, "LUMIO: A CubeSat to Monitor Micro-meteroid Impacts on the Lunar Farside", IEEE Aerospace Conference, Big Sky, MO, 5–12 March 2022

C122 P. Panicucci, M. Pugliatti, V. Franzese, and *F. Topputo*, "Improvements and Applications of the DART Vision-Based Navigation Test Bench TINYV3RSE", 44$^{\text{th}}$ Annual AAS Guidance, Navigation & Control Conference, Breckenridge, CO, February 4–9, 2022

C121 M. Pugliatti, V. Franzese, A. Rizza, F. Piccolo, C. Bottiglieri, C. Giordano, F. Ferrari, and *F. Topputo*, "Design of the On-Board Image Processing of the Milani Mission", 44$^{\text{th}}$ Annual AAS Guidance, Navigation & Control Conference, Breckenridge, CO, February 4–9, 2022

C120 E. Andreis, P. Panicucci, V. Franzese, and *F. Topputo*, "A Robust Image Processing Pipeline for Planets Line-of-Sign Extraction for Deep-Space Autonomous CubeSats Navigation", 44$^{\text{th}}$ Annual AAS Guidance, Navigation & Control Conference, Breckenridge, CO, February 4–9, 2022

C119 F. Piccolo, M. Pugliatti, P. Panicucci, and *F. Topputo*, "Toward Verification and Validation of the Milani Image Processing Pipeline in the Hardware-in-the-Loop Testbench Tinyv3rse", 44$^{\text{th}}$ Annual AAS Guidance, Navigation & Control Conference, Breckenridge, CO, February 4–9, 2022

C118 A. Morelli, G. Merisio, C. Hofmann, and *F. Topputo*, "A Convex Guidance Approach to Target Ballistic Capture Corridors at Mars", 44th Annual AAS Guidance, Navigation & Control Conference, Breckenridge, CO, February 4–9, 2022

C117 M. Pugliatti, P. Panicucci, V. Franzese, and *F. Topputo*, "TINYV3RSE: The DART Vision-Based Navigation Test-bench", AIAA SciTech Forum, San Diego, CA, January 3–7, 2022

C116 C. Hofmann, A. Morelli, and *F. Topputo*, "On the Performance of Discretization and Trust-Region Methods for On-Board Convex Low-Thrust Trajectory Optimization", AIAA SciTech Forum, San Diego, CA, January 3–7, 2022

C115 M. Pugliatti, A. Rizza, F. Piccolo, V. Franzese, C. Bottiglieri, C. Giordano, F. Ferrari, and *F. Topputo*, "The Milani Mission: Overview and Architecture of the Optical-Based GNC System", AIAA SciTech Forum, San Diego, CA, January 3–7, 2022

C114 A. Cervone, S. Speretta, A. Menicucci, E. Bertels, *F. Topputo*, and G. Merisio, "Selection of the Propulsion System for the LUMIO Mission: An Intricate Trade-Off Between Cost, Reliability and Performance", IAF Space Propulsion Symposium 2021, Held at the 72nd International Astronautical Congress (IAC 2021), Vol. 1, pp. 556–564, 2021

C113 A. Cervone. *F. Topputo*, et al, "Design Challenges and Opportunities Offered by the LUMIO Spacecraft: A CubeSat for Observing and Characterizing Micro-Meteoroid Impacts on the Lunar Far Side", 28th IAA Symposium on Small Satellite Missions 2021, Held at the 72nd International Astronautical Congress (IAC 2021), Vol. 1, pp. 143–150, 2021

C112 A. Morelli, C. Hofmann, and *F. Topputo*, "A Homotopic Approach for Robust Low-Thrust Trajectory Design through Convex Optimization", IAF Astrodynamics Symposium 2021, Held at the 72nd International Astronautical Congress (IAC 2021), Vol. 1, pp. 242–252, 2021

C111 E. Andreis, V. Franzese, and *F. Topputo*, "An Overview of Autonomous Optical Navigation for Deep-Space CubeSats", IAF Astrodynamics Symposium 2021, Held at the 72nd International Astronautical Congress (IAC 2021), Vol. 1, pp. 98–108, 2021

C110 G. Di Domenico, E. Andreis, A. Morelli, G. Merisio, V. Franzese, C. Giordano, A. Morselli, P. Panicucci, F. Ferrari, and *F. Topputo*, "Toward Self-Driving Interplanetary CubeSats: the ERC-Funded Project EXTREMA", 19th IAA Symposium on Visions and Strategies 2021, Held at the 72nd International Astronautical Congress (IAC 2021), Vol. 1, pp. 1–11, 2021

C109 S. Speretta, A. Cervone, A. Menicucci, E. Turan, E. Bertels, B. Bosman, and *F. Topputo*, "Designing the Radio Link for a Lunar CubeSat: the LUMIO Case", IAF Space Communications and Navigation Symposium 2021, Held at the 72nd International Astronautical Congress (IAC 2021), Vol. 1, pp. 128–136, 2021

C108 A. Menicucci, A. Cervone, S. Speretta, E. Bertels, and *F. Topputo*, "The Radiation Environment and Effects Analysis of the LUMIO Mission", IAF Materials and Structures Symposium 2021, Held at the 72nd International Astronautical Congress (IAC 2021), Vol. 1, pp. 399–405, 2021

C107 *F. Topputo* et al, "Current Status of LUMIO Mission: Characterizing Lunar Meteoroid Impacts with a CubeSat", IAF Space Exploration Symposium 2021, Held at the 72nd International Astronautical Congress (IAC 2021), Vol. 1, pp. 135–145, 2021

C106 C. Bottiglieri, F. Piccolo, A. Rizza, C. Giordano, M. Pugliatti, V. Franzese, F. Ferrari, and *F. Topputo*, "Trajectory Design and Orbit Determination of Hera's Milani CubeSat", 2021 AAS/AIAA Astrodynamics Specialist Conference, Virtual Conference, 9–11 August 2021

C105 G. Merisio and *F. Topputo*, "Characterization of Ballistic Capture Corridors Aiming at Autonomous Ballistic Capture at Mars", 2021 AAS/AIAA Astrodynamics Specialist Conference, Virtual Conference, 9–11 August 2021

C104 S. Bella, E. Andreis, V. Franzese, P. Panicucci, and *F. Topputo*, "Line-of-Sight Extraction Algorithm for Deep-Space Autonomous Navigation", 2021 AAS/AIAA Astrodynamics Specialist Conference, Virtual Conference, 9–11 August 2021

C103 C. Hofmann and *F. Topputo*, "Pseudospectral Convex Low-Thrust Trajectory Optimization in a High-Fidelity Model", 2021 AAS/AIAA Astrodynamics Specialist Conference, Virtual Conference, 9–11 August 2021

C102 C. Hofmann and *F. Topputo*, Closed-Loop Guidance for Low-Thrust Interplanetary Trajectories using Convex Programming, 11th International ESA Conference on Guidance, Navigation & Control Systems, Virtual Conference, 22–25 June 2021

C101 *F. Topputo* et al, "The Hera Milani CubeSat Mission", 7th IAA Planetary Defense Conference PDC 2021, Vienna, Austria, 26–30 April 2021

C100 *F. Topputo* et al, "LUMIO CubeSat: A Mission to Refine Meteoroid Population Knowledge", 7th IAA Planetary Defense Conference PDC 2021, Vienna, Austria, 26–30 April 2021

C99 Y. Wang and *F. Topputo*, "Indirect Optimization for Low-Thrust Transfers with Earth-Shadow Eclipses", Advances in the Astronautical Sciences, Vol. 176, pp. 857–874, 2022

C98 C. Hofmann and *F. Topputo*, "Toward On-Board Guidance of Low-Thrust Spacecraft in Deep Space Using Sequential Convex Programming", Advances in the Astronautical Sciences, Vol. 176, pp. 837–856, 2022

C97 M. Pugliatti and *F. Topputo*, "Navigation about Irregular Bodies through Segmentation Maps", Advances in the Astronautical Sciences, Vol. 176, pp. 1169–1188, 2022

C96 M. Pugliatti, M. Maestrini, P. Di Lizia, and *F. Topputo*, "On-board Small-Body Semantic Segmentation Based on Morphological Features with U-Net", Advances in the Astronautical Sciences, Vol. 176, pp. 603–622, 2022

C95 A. Cervone, *F. Topputo*, et al "Keynote: Consolidated Phase A Design of the LUMIO Spacecraft: a CubeSat for Observing and Characterizing Micro-Meteoroid Impacts on the Lunar Far Side", 27th IAA Symposium on Small Satellite Missions 2020, Held at the 71st International Astronautical Congress (IAC 2020), Vol. 1, pp. 513–521, 2020

C94 V. Franzese, C. Giordano, Y. Wang, *F. Topputo*, H. Goldberg, A. Gonzalez, and R. Walker, "Target Selection for M-ARGO Interplanetary CubeSat", IAF Astrodynamics Symposium 2020, Held at the 71st International Astronautical Congress (IAC 2020), Vol. 1, pp. 434–448, 2020

C93 G. Merisio, M. Massari, P. Di Lizia, J. Biggs, C. Giordano, V. Franzese, *F. Topputo*, D. Koschny, J. Vennekens, and R. Walker, "Predicting the Outcome of the LUMIO Lunar CubeSat", IAF Space Exploration Symposium 2020, Held at the 71st International Astronautical Congress (IAC 2020), Vol. 1, pp. 134–147, 2020

C92 M. Pugliatti and *F. Topputo*, "Small-Body Shape Recognition with Convolutional Neural Network and Comparison with Explicit Features Based Method", Advances in the Astronautical Sciences, Vol. 175, pp. 2539–2558, 2021

C91 Y. Wang and *F. Topputo*, "Model Predictive Static Programming for Bang-off-Bang Low-Thrust Neighboring Control Law Design", IAF Astrodynamics Symposium 2019, Held at the 70th International Astronautical Congress (IAC 2019), Vol. 2, pp. 1005–1017, 2019

C90 K. Mani, A. Sanz-Casado, V. Franzese, A. Cervone, and *F. Topputo*, "System Design of MARIO: Stand-Alone 16U CubeSat from Earth to Mars", 26th IAA Symposium on Small Satellite Missions 2019, Held at the 70th International Astronautical Congress (IAC 2019), Vol. 1, pp. 896–912, 2019

C89 A. Romero-Calvo, J. Biggs, and *F. Topputo*, "Attitude Control for the LUMIO CubeSat in Deep Space", IAF Astrodynamics Symposium 2019, Held at the 70th International Astronautical Congress (IAC 2019), Vol. 2, pp. 680–692, 2019

C88 G. Merisio, *F. Topputo*, V. Franzese, C. Giordano, A. Cervone, S. Speretta, and R. Walker, "LUMIO CubeSat: Toward a Lunar Situational Awareness", EPSC-DPS Joint Meeting 2019, Geneva, Switzerland, 15–20 September 2019

C87 K. Mani, S. Boccelli, *F. Topputo*, and A. Cervone, "Electric Propulsion Characterization for a Stand-Alone Mars CubeSat", 36th International Electric Propulsion Conference, Vienna, Austria, 15–20 September 2019

C86 J. Biggs, H. Fournier, S. Ceccherini, and *F. Topputo*, "Optimal De-Tumbling of Spacecraft with Four Thrusters", EuroGNC 2019: 5th CEAS Conference on Guidance, Navigation & Control, Milan, Italy, 3–5 April 2019

C85 D. Dei–Tos and *F. Topputo*, "Trajectory Design for LUMIO CubeSat in the Cislunar Space", Advances in the Astronautical Sciences, Vol. 168, pp. 2027–2044, 2019

C84 H. Li, *F. Topputo*, and H. Baoyin, "Deep Neural Networks for Optimal Low-Thrust Orbit Raising", Advances in the Astronautical Sciences, Vol. 168, pp. 1707–1720, 2019

C83 C. Giordano and *F. Topputo*, "Modeling and Optimization of Aero-Ballistic Capture", Advances in the Astronautical Sciences, Vol. 168, pp. 501–516, 2019

C82 C. Giordano, C. Trenkel, and *F. Topputo*, "Dedicated Mission to the Sun-Earth Saddle Point: A Feasibility Assessment", Advances in the Astronautical Sciences, Vol. 168, pp. 1135–1156, 2019

C81 R. Furfaro, I. Bloise, M. Orlandelli, P. Di Lizia, *F. Topputo*, and R. Linares, "A Recurrent Deep Architecture for Quasi-Optimal Feedback Guidance in Planetary Landing", IAA SciTech Forum on Space Flight Mechanics and Space Structures and Materials, Moscow, Russia, 13–15 November 2018

C80 G. Aguiar and *F. Topputo*, "A Technique for Designing Earth-Mars Low-Thrust Transfers Culminating in Ballistic Capture", 7th International Conference on Astrodynamics Tools and Techniques (ICATT), Oberpfaffenhofen, Germany, 6–9 November 2018

C79 *F. Topputo*, D. Dei Tos, K. Mani, S. Ceccherini, C. Giordano, V. Franzese, and Y. Wang, "Trajectory Design in High-Fidelity Models", 7th International Conference on Astrodynamics Tools and Techniques (ICATT), Oberpfaffenhofen, Germany, 6–9 November 2018

C78 P. Sundaramoorthy, *F. Topputo*, et al, "System Design of LUMIO: A CubeSat at Earth–Moon L_2 for Observing Lunar Meteoroid Impacts", 69th International Astronautical Congress (IAC 2018), Vol. 10, pp. 6875–6882, 2018

C77 V. Franzese, S. Ceccherini, K. Mani, P. Di Lizia, *F. Topputo*, "Feasibility Assessment of Autonomous Optical Navigation in LUMIO Mission", 69th International Astronautical Congress (IAC 2018), Vol. 11, pp. 8210–8215, 2018

C76 *F. Topputo* et al, "LUMIO: Charazterizing Lunar Meteoroid Impacts with a CubeSat", 69th International Astronautical Congress (IAC 2018), Vol. 3, pp. 1556–1566, 2018

C75 D. Dei Tos, *F. Topputo*, M. Massari, J. Biggs, A. Cipriano, "On the Sophisticated Orbit Design of the Lunar Meteoroid Impacts Observer CubeSat", 69th International Astronautical Congress (IAC 2018), Vol. 12, pp. 8327–8339, 2018

C74 K. Mani, *F. Topputo*, and A. Cervone, "Chemical Propulsion System Design for 16U Interplanetary CubeSat', 69th International Astronautical Congress (IAC 2018), Vol. 15, pp. 10661–10675, 2018

C73 R. Furfaro, I. Bloise, M. Orlandelli, P. Di Lizia, *F. Topputo*, and R. Linares, "Deep Learning for Autonomous Lunar Landing", Advances in the Astronautical Sciences, Vol. 167, pp. 3285–3306, 2018

C72 S. Speretta, A. Cervone, P. Sundaramoorthy, R. Noomen, S. Mestry, A. Cipriano, *F. Topputo*, et al, "LUMIO: Achieving Autonomous Operations for Lunar Exploration with a CubeSat", SpaceOps 2018 Conference and Exhibition, Marseille, France, 28 May–1 June 2018

C71 *F. Topputo* et al, "LUMIO: A CubeSat at Earth–Moon L2, The 4S Symposium 2018: Small Satellite Systems and Services, Sorrento, Italy 28 May–1 June 2018

C70 K. Mani, *F. Topputo*, and A. Cervone, "Dual Chemical-Electric Propulsion Systems Design for Interplanetary CubeSats", Space Propulsion Conference 2018, Seville, Spain, 14–18 May 2018

C69 V. Franzese, P. Di Lizia, and *F. Topputo*, "Autonomous Optical Navigation for LUMIO Mission", AIAA SciTech Forum, Kissimmee, Florida, January 8–12 2018

C68 *F. Topputo*, D. Dei–Tos, M. Rasotto, and F. Renk, "Design and Feasibility Assessment of Ultra Low Thrust Trajectories to the Sun–Earth Saddle Point", AIAA SciTech Forum, Kissimmee, Florida, January 8–12 2018

C67 K. Drozd, R. Furfaro, and *F. Topputo*, "Application of ZEM/ZEV Guidance for Closed-Loop Transfer in the Earth-Moon System", AIAA SciTech Forum, Kissimmee, Florida, January 8–12 2018

C66 S. Ceccherini and *F. Topputo*, "System-Trajectory Optimization of Hybrid Transfers to the Geostationary Orbit", AIAA SciTech Forum, Kissimmee, Florida, January 8–12 2018

C65 R. Furfaro, G. Lanave, *F. Topputo*, M. Lovera, and R. Linares, "Waypoint-Based ZEM/ZEV Feedback Guidance: Applications to Low-Thrust Interplanetary Transfer and Orbit Raising", Advances in the Astronautical Sciences, Vol. 162, pp. 333–348, 2017

C64 R. Furfaro, R. Ruggiero, *F. Topputo*, M. Lovera, and R. Linares, "Waypoint-Optimized Closed-Loop Guidance for Spacecraft Rendezvous in Relative Motion", Advances in the Astronautical Sciences, Vol. 162, pp. 2651–2666, 2017

C63 J.-L. Gonzalo, C. Bombardelli, and *F. Topputo*, "Unified Formulation for Element-Based Indirect Trajectory Optimization", 26th International Symposium on Space Flight Dynamics, Matsuyama, Japan, 3–9 June 2017

C62 J.-L. Gonzalo, *F. Topputo*, and R. Armellin, "Indirect Optimization of End-of-Life Disposal for Galileo Constellation Using Low Thrust Propulsion", 26th International Symposium on Space Flight Dynamics, Matsuyama, Japan, 3–9 June 2017

C61 *F. Topputo*, D. Dei–Tos, M. Rasotto, and F. Renk, "Design and Validation of Ultra Low Thrust Transfers to the Sun–Earth Saddle Point with Application to LISA PathFinder Mission Extension", 26th International Symposium on Space Flight Dynamics, Matsuyama, Japan, 3–9 June 2017

C60 D. Dei–Tos, R. Russel, and *F. Topputo*, "Survey of Mars ballistic Capture Trajectories Using Periodic Orbits", Advances in the Astronautical Sciences, Vol. 160, pp. 1625–1644, 2017

C59 K. Oshima, *F. Topputo*, and T. Yanao, "Global Search for Low-Energy Transfers to the Moon with Long Transfer Time", Advances in the Astronautical Sciences, Vol. 160, pp. 577–594, 2017

C58 K. Oshima, *F. Topputo*, and T. Yanao, "Pareto-Optimal, Low-Energy Transfers to the Moon Using Impulsive Delta-V", 26th Workshop on JAXA Astrodynamics and Flight Mechanics, Kamakura, Japan, 25–26 July 2016

C57 A. Zuanetti, *F. Topputo*, and M. Massari, "Integrated Monitoring of Refugees in the Mediterranean Sea with Small Satellite Constellations", 67th International Astronautical Congress (IAC 2016), Vol. 7, pp. 4486–4494, 2016

C56 R. Furfaro, *F. Topputo*, J. Mueting, S. Casotto, and J. Simo, "Analysis and Performance Evaluation of the ZEM/ZEV Guidance and its Sliding Robustification for Autonomous Rendezvous in Relative Motion", 67th International Astronautical Congress (IAC 2016), Vol. 8, pp. 5094–5102, 2016

C55 S. Ceccherini, L. Ferella, and *F. Topputo*, "Assessment of Hybrid Propulsion for Geostationary Transfer Orbit: A Mission Design Approach", 67th International Astronautical Congress (IAC 2016), Vol. 8, pp. 5190–5204, 2016

C54 M. Gianinetto, M. Aiello, A. Marchesi, *F. Topputo*, M. Massari, R. Lombardi, F. Banda, and S. Tebaldini, "OBIA Ship Detection with Multispectral and SAR Images: A Simulation for Copernicus Security Applications", Geoscience and Remote Sensing Symposium (IGARSS), 2016 IEEE International, pp. 1229–1232, 2016

C53 *F. Topputo*, D. Dei–Tos, D. Filippetto, M. Massari, P. Di Lizia, J.-L. Gonzalo, H. Urrutxua, C. Bombardelli, A. Colagrossi, V. Pesce, D. Pastor-Moreno, A. Rivolta, and A. Rocchi, "GTOC8: Results and Methods of Polimi-UPM", Advances in the Astronautical Sciences, Vol. 158, pp. 4301–4308, 2016

C52 K. Kumar, *F. Topputo*, A. Agrawal, and E. Hekma, "Initial Results for Preliminary Trajectory Design of Multi-Target Active Debris Removal Mission using the Atom Solver", Advances in the Astronautical Sciences, Vol. 158, pp. 1677–1694, 2016

C51 J. Mueting, R. Furfaro, *F. Topputo*, and J. Simo, "Optimal Sliding Guidance for Earth–Moon Halo Orbit Station-Keeping Transfer and Rendezvous", Advances in the Astronautical Sciences, Vol. 158, pp. 971–987, 2016

C50 K. Oshima, *F. Topputo*, S. Campagnola, and T. Yanao, "Medium-Energy, Retrograde, Ballistic Transfer to the Moon", Advances in the Astronautical Sciences, Vol. 158, pp. 745–763, 2016

C49 *F. Topputo*, M. Massari, R. Lombardi, M. Gianinetto, A. Marchesi, M. Aiello, S. Tebaldini, and F. Banda, "Space Shepherd: Using Space Assets to Monitor, Track, and Search-and-Rescue Illegal Immigrants in the Mediterranean Sea", 66th International Astronautical Congress (IAC 2015), Vol. 14, pp. 11422–11431, 2015

C48 K. Kumar, M. Jankovic, N. Ortiz–Gomez, J. Romero–Martin, *F. Topputo*, S. Walker, F. Kirchner, and M. Vasile, "Agora: Mission to demonstrate technologies to actively remove Ariane rocket bodies", 66$^{\text{th}}$ International Astronautical Congress (IAC 2015), Vol. 3, pp. 2280–2295, 2015

C47 D. Dei–Tos and *F. Topputo*, "On the advantages of using a strict hierarchy to model astrodynamical problems", 66$^{\text{th}}$ International Astronautical Congress (IAC 2015), Vol. 7, pp. 5479–5490, 2015

C46 M. Jankovic, K. Kumar, N. Ortiz–Gomez, J. Romero–Martin, F. Kirchner, *F. Topputo*, S. Walker, and M. Vasile, "Robotic Systems for Active Debris Removal: Equipments, State-of-the-Art, and Concept Architecture of the Rendez Vous and Capture (RVC) Control System", 5$^{\text{th}}$ CEAS Air & Space Conference, Delft, The Netherlands, 7–11 September 2015

C45 *F. Topputo*, M. Massari, R. Lombardi, M. Gianinetto, A. Marchesi, M. Aiello, S. Tebaldini, and F. Banda, "Space Shepherd: Search and Rescue of Illegal Immigrants in the Mediterranean Sea through Satellite Imagery", Geoscience and Remote Sensing Symposium (IGARSS), 2015 IEEE International, pp. 4852–4855, 2015

C44 *F. Topputo*, "Advances in Ballistic Capture Orbits Computation with Applications", Advances in the Astronautical Sciences, Vol. 155, pp. 3087–3098, 2015

C43 H. Zhang, *F. Topputo*, R. Zhang, C. Zhang, and C. Han, "A Modified UPE Method to Design Two-Impulse Earth-Moon Transfers in a Four-Body Model", Advances in the Astronautical Sciences, Vol. 155, pp. 2377–2392, 2015

C42 C. Zhang and *F. Topputo*, "Earth-to-Halo Low-Thrust Minimum Fuel Optimization with Optimized Launch Conditions", Advances in the Astronautical Sciences, Vol. 155, pp. 1271–1286, 2015

C41 *F. Topputo* and R.-Y. Zhang, "Approximation of Invariant Manifolds by Cubic Convolution Interpolation", Advances in the Astronautical Sciences, Vol. 155, pp. 283–292, 2015

C40 E. Belbruno and *F. Topputo*, "Ballistic Capture Transfers from the Earth to Mars", Advances in the Astronautical Sciences, Vol. 155, pp. 293–310, 2015

C39 D. Dei–Tos and *F. Topputo*, "Automated Trajectory Refinement of Three-Body Orbits in the Real Solar System Model", Advances in the Astronautical Sciences, Vol. 155, pp. 263–282, 2015

C38 Z.-F. Luo, *F. Topputo*, F. Bernelli–Zazzera, and G.-J. Tang, "The Role of Dynamical Models in Ballistic Capture: The Perturbed Sun-Planet Case", Advances in the Astronautical Sciences, Vol. 153, pp. 1–21, 2015

C37 C. Zhang, *F. Topputo*, F. Bernelli–Zazzera, and Y.-S. Zhao, "Low-Thrust Minimum Fuel Optimization in the Circular Restricted Three-Body Model", Advances in the Astronautical Sciences, Vol. 153, pp. 1–20, 2015

C36 J. Dinius, R. Furfaro, *F. Topputo*, and S. Selnick, "Near Optimal Feedback Guidance Design and the Planar Restricted Three-Body Problem", Advances in the Astronautical Sciences, Vol. 152, pp. 575–584, 2014

C35 *F. Topputo*, "Trade-Off between Cost and Time in Lunar Transfers: A Quantitative Analysis", Advances in the Astronautical Sciences, Vol. 152, pp. 3705–3719, 2014

C34 G. Pinzan, *F. Topputo*, and F. Bernelli–Zazzera, "A Multidisciplinary Approach to Landing Site Selection for Small Body Missions", 64$^{\text{th}}$ International Astronautical Congress (IAC 2013), Vol. 2, pp. 1511–1533, 2013

C33 C. Zhang, *F. Topputo*, F. Bernelli–Zazzera, and Y.S. Zhao, "An Exploration of Numerical Methods for Low-Thrust Trajectory Optimization in n-Body Models", 64^{th} International Astronautical Congress (IAC 2013), Vol. 7, pp. 4971–4977, 2013

C32 *F. Topputo*, R. Zhang, F. Bernelli–Zazzera, and J. Luo, "Numerical Approximation of Invariant Manifolds in the Restricted Three-Body Problem", 64^{th} International Astronautical Congress (IAC 2013), Vol. 7, pp. 5635–5640, 2013

C31 G. Mingotti, *F. Topputo*, and M. Massari, "Hybrid Propulsion Transfers for Mars Science Missions Advances", Advances in the Astronautical Sciences, Vol. 148, pp. 2859–2874, 2013

C30 M. Massari, *F. Topputo*, and G. Mingotti, "Alternative Hybrid Propulsion Transfers for MarcoPolo NEO Sample Return Mission", Advances in the Astronautical Sciences, Vol. 148, No. 4, pp. 3353–3367, 2013

C29 *F. Topputo*, G. Mingotti, and F. Bernelli–Zazzera, "Enhancing Planetary Exploration by Using Hybrid Propulsion Transfers", 63^{rd} International Astronautical Congress (IAC 2012), Vol. 7, pp. 5483–5491, 2012

C28 K. Post, E. Belbruno, and *F. Topputo*, "Efficient Cis-Lunar Trajectories", Global Space Exploration Conference, Washington, DC, USA, 22–24 May 2012

C27 *F. Topputo* and F. Bernelli–Zazzera, "A Method to Solve Nonlinear Optimal Control Problems in Astrodynamics", 1^{st} IAA Conference on Dynamics and Control of Space Systems, Porto, Portugal, 19–21 March 2012

C26 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "Hybrid Propulsion Transfers to the Moon", 1^{st} IAA Conference on Dynamics and Control of Space Systems, Porto, Portugal, 19–21 March 2012

C25 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "Attainable Sets in Space Mission Design: A Method to Define Low-Thrust, Invariant Manifold Trajectories", Advances in the Astronautical Sciences, Vol. 143, pp. 1–16, 2012

C24 *F. Topputo* and F. Bernelli–Zazzera, "Optimal Low-Thrust Station Keeping of Geostationary Satellites", Proceedings of the 3^{rd} CEAS Air&Space Conference, pp. 1917-1925, 2011

C23 *F. Topputo*, F. Bernelli–Zazzera, A. Ercoli–Finzi, and F. Lazzari, "Solar Array Simulators for Low Power Space Missions", Proceedings of the 3^{rd} CEAS Air&Space Conference, pp. 243–250, 2011

C22 *F. Topputo*, F. Bernelli–Zazzera, and A. Ercoli-Finzi, "Power Production for Small Body Landers: Post Launch Activities On Philae Power Subsystem", 62^{nd} International Astronautical Congress, Vol. 2, pp. 1333–1340, 2011

C21 *F. Topputo* and A. Ercoli-Finzi, "Optimal Bi-Impulsive Earth-Moon Transfers", 62^{nd} International Astronautical Congress, Vol. 6, pp. 4621–4629, 2011

C20 N. Hyeraci and *F. Topputo*, "Ballistic Capture in the Elliptic Restricted Three-Body Problem with Applications", New Trends in Astrodynamics and Applications VI, New York City, USA, 6–8 June 2011

C19 G. Mingotti and *F. Topputo*, "Ways to the Moon: A Survey", Advances in the Astronautical Sciences, Vol. 140, pp. 2531–2548, 2011

C18 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "Invariant-Manifold, Low-Thrust Transfers to Low Mars Orbits", 61^{st} International Astronautical Congress, Vol. 13, pp. 10784–10796, 2010

C17 *F. Topputo*, F. Bernelli–Zazzera, and A. Ercoli-Finzi, "On-Comet Power Production: the Case of Rosetta Lander Philae", Proceedings of the European Planetary Science Congress 2010, Rome, Italy, 19–24 September 2010

C16 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "Efficient Invariant-Manifold, Low-Thrust Planar Trajectories to the Moon", 3^{rd} Conference on Nonlinear Science and Complexity, Ankara, Turkey, 28–31 July 2010

C15 R. Armellin, P. Di Lizia, M. Lavagna, M. Massari, *F. Topputo*, N. Felipe, and G. Ortega, "Tools for Trajectory Statistical Analysis", 4^{th} International Conference on Astrodynamics Tools and Techniques, Madrid, Spain, 3–6 May 2010

C14 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "Exploiting Distant Periodic Orbits and Their Invariant Manifolds to Design Novel Space Trajectories to the Moon", Advances in the Astronautical Sciences, Vol. 136, pp. 265–284, 2010

C13 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "Dynamical Systems, Optimal Control and Space Trajectory Design", CelMec V: A Meeting on Celestial Mechanics, Viterbo, Italy, 6–12 September 2009

C12 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "Numerical Methods to Design Low-Energy, Low-Thrust Sun-Perturbed Transfers to the Moon", 49^{th} Israel Annual Conference on Aerospace Sciences, Tel Aviv/Haifa, Israel, 4–5 March 2009

C11 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "A Hybrid Propulsion Approach to Design Earth-to-Moon Transfers with Ballistic Capture", New Trends in Astrodynamics and Applications V, Milano, Italy, 30 June–2 July 2008

C10 *F. Topputo*, E. Belbruno, and M. Gidea, "Resonance and Escape Dynamics Associated with Weak Capture in the Restricted Three-Body Problem", New Trends in Astrodynamics and Applications IV, Princeton University, Princeton, NJ, USA, 27–29 June 2007

C9 A. Owis, *F. Topputo*, and F. Bernelli–Zazzera, "Feedback Optimal Control in Low-Thrust Interplanetary Trajectory Design", 12^{th} International Conference on Aerospace Science and Aviation Technology, Cairo, Egypt, 29–31 May 2007

C8 A. Owis, *F. Topputo*, and F. Bernelli–Zazzera, "Feedback Optimal Control in Low-Thrust Interplanetary Trajectory Design with Drag", 38^{th} Annual AAS Meeting of the Division on Dynamical Astronomy, Ann Arbor, MI, USA, 6–10 May 2007

C7 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "Optimal Low-Thrust, Stable Manifolds Trajectories to the Earth–Moon Halo Orbits", New Trends in Astrodynamics and Applications III, Princeton University, Princeton, NJ, USA, 16–18 August 2006

C6 R. Armellin and *F. Topputo*, "An Optimal $h6$ Scheme for Solving TPBVP in Astrodynamics", Celmec IV, A Meeting on Celestial Mechanics, Viterbo, Italy, 11–16 September 2005

C5 *F. Topputo*, M. Vasile, and F. Bernelli–Zazzera, "Earth-to-Moon Low Energy Transfers Targeting L_1 Hyperbolic Transit Orbits", New Trends in Astrodynamics and Applications II, Princeton University, Princeton, NJ, USA, 3–5 June 2005

C4 *F. Topputo*, M. Vasile, and F. Bernelli Zazzera, "Interplanetary and Lunar Transfers Using Libration Points", Proceeding of the 18^{th} International Symposium on Space Flight Dynamics, pp. 583–588, 2004

C3 *F. Topputo*, M. Vasile, and A. Ercoli-Finzi, "Combining Two and Three-Body Dynamics for Low Energy Transfer Trajectories of Practical Interest", 55^{th} International Astronautical Congress, Vol. 1, pp. 584–596, 2004

C2 *F. Topputo*, M. Vasile, and F. Bernelli–Zazzera, "A Hybrid Optimization of the Low Energy Interplanetary Transfers associated to the Invariant Manifolds of the Restricted Three-Body Problem", 55^{th} International Astronautical Congress, Vol. 1, pp. 524–535, 2004

C1 *F. Topputo*, M. Vasile, and A. Ercoli-Finzi, "An Approach to the Design of Low Energy Interplanetary Transfers Exploiting Invariant Manifolds of the Restricted Three-Body Problem", Advances in the Astronautical Sciences, Vol. 119, pp. 2229–2248, 2004

12.5 Scientific reports

R12 S. Ceccherini and *F. Topputo*, "Methodology for System-Trajectory Optimization of Hybrid Transfers to the Geostationary Orbit", Space SHIP Final Report, Regione Lombardia Grant 5744-2015, January 2018

R11 *F. Topputo*, M. Massari, J. Biggs, D. Dei–Tos, S. Ceccherini, K. Mani, V. Franzese, A. Cervone, P. Sundaramoorthy, S. Mestry, S. Speretta, A. Cipriano, A. Ivanov, D. Labate, A. Jochemsen, Q. Leroy, R. Furfaro, K. Jacquinot, "LUMIO: Lunar Meteoroid Impacts Observer", Final Report, ESA/ESTEC Contract No. 4000120225/17/NL/GLC/as, November 2017

R10 *F. Topputo*, D. Dei–Tos, and M. Rasotto, "Feasibility of Ultra Low Thrust Transfers in L_1/L_2 Sun–Earth–Moon Systems", Final Report, ESA/ESOC Contract No. 4000118201/16/F/MOS, August 2017

R9 *F. Topputo*, M. Massari, R. Lombardi, M. Gianinetto, A. Marchesi, M. Aiello, S. Tebaldini, and F. Banda, "Space Shepherd: Using Space Systems to Save Human Lives", Politecnico di Milano, Department of Aerospace Science and Technology, Scientific Report DSTA-SR 16-01, January 2016

R8 C. Zhang and *F. Topputo*, "Space Trajectory Optimization via Direct Transcription and Collocation: A Note for Practical Implementation", Department of Aerospace Science and Technology, Politecnico di Milano, Report DSTA-SR 13-02, September 2013

R7 *F. Topputo*, R. Long, G. Mingotti, and M. Massari, "Hybrid Propulsion Transfer Strategies", Final Report, ESA/ESTEC Contract No. 105465/12/NL/AF, April 2013

R6 *F. Topputo* and P. Di Lizia, "Predictive Control of Industrial Plants", Final Report, Sanofi-Aventis Contract ET.SER 127/09MP, October 2011

R5 *F. Topputo*, "Remote Monitoring of Migrants Vessels in the Mediterranean Sea", Final Report, Ce.Mi.S.S. (Ministry of Defence) Contract, December 2009

R4 F. Bernelli–Zazzera, M. Lavagna, R. Armellin, P. Di Lizia, *F. Topputo*, M. Berz, K. Makino, and R. Jagasia, "Orbital Prediction via Differential Algebra and Taylor Models", Final Report, ESA/ESTEC Contract No. 20271/06/NL/HI, March 2009

R3 F. Bernelli–Zazzera, M. Berz, M. Lavagna, R. Armellin, P. Di Lizia, and *F. Topputo*, "Global Trajectory Optimization: Can we Prune the Solution space when Considering Deep Space Maneuvers?", Final Report, ESA/ESTEC Contract No. 20271/06/NL/HI, December 2007

R2 R. Armellin, F. Bernelli–Zazzera, A. Brambilla, A. Davighi, P. Di Lizia, A. Ercoli–Finzi, G. Giardini, M. Grasso, M. Lavagna, M. Massari, G. Sangiovanni, *F. Topputo*, "Nuclear Multimodule ISRU Mission, Lunar Exploration Architecture", Final Report, Alcatel–Alenia Space Contract, May 2006

R1 F. Bernelli–Zazzera, *F. Topputo*, and M. Massari, "Assessment of Mission Design Including Utilization of Libration Points and Weak Stability Boundaries", Final Report, ESA/ESTEC Contract No. 18147/04/NL/MV, June 2004

12.6 Articles in national journals

NJ4 G. Infantolino, P. Di Lizia, *F. Topputo*, and F. Bernelli–Zazzera, "On-Board Telemetry Monitoring via Support Vector Machine with Application to Philae Solar Generator", Aerotecnica Missili & Spazio, Vol. 97, pp. 183–188, 2018

NJ3 *F. Topputo*, G. Caputo, and F. Bernelli–Zazzera, and G.-J. Tang, "Philae Attitude Determination through Nonlinear Optimal Identification of Solar Arrays Telemetry", Aerotecnica Missili & Spazio, Vol. 93, pp. 68–74, 2014

NJ2 *F. Topputo* and F. Bernelli–Zazzera, "Simulation of Low-Intensity, Low-Temperature Solar Arrays with Software and Hardware Tools", Aerotecnica Missili & Spazio, Vol. 92, pp. 94–100, 2013

NJ1 *F. Topputo*, A. Owis, and F. Bernelli–Zazzera, "Analytical Solution of the Feedback Optimal Control in Low-Thrust Transfers", Aerotecnica, Missili e Spazio, Vol. 86, pp. 185–194, 2007

12.7 Papers in national conference proceedings

NC13 *F. Topputo*, K. Mani, V. Franzese, C. Giordano, J. Biggs, M. Massari, P. Di Lizia, "LUMIO CubeSat: Toward a Lunar Situational Awareness", AIDAA XXV International Congress, Rome, Italy, 9–12 September 2019

NC12 G. Infantolino, P. Di Lizia, *F. Topputo*, and F. Bernelli–Zazzera, "On-Board Telemetry Monitoring via Support Vector Machine with Application to Philae Solar Generator", 24$^{\text{th}}$ Conference of the Italian Association of Aeronautics and Astronautics (AIDAA 2017), Palermo–Enna, Italy, 18–22 September 2017

NC11 V. Franzese, K. Mani, and *F. Topputo*, "Autonomous Optical Navigation for Interplanetary CubeSats", 24$^{\text{th}}$ Conference of the Italian Association of Aeronautics and Astronautics (AIDAA 2017), Palermo–Enna, Italy, 18–22 September 2017

NC10 R. Lombardi, M. Massari, and *F. Topputo*, "Scheduling Satellite Observations to Monitor Illegal Immigration in the Mediterranean Sea", 23$^{\text{rd}}$ Conference of the Italian Association of Aeronautics and Astronautics, Torino, Italy, 17–19 November 2015

NC9 Z.-F. Luo, *F. Topputo*, F. Bernelli–Zazzera, and G.-J. Tang, "Analysis of Ballistic Capture Orbits in the Real n-Body Problem", AIDAA XXII Conference, Napoli, Italy, 9–12 September 2013

NC8 G. Caputo, *F. Topputo*, and F. Bernelli–Zazzera, "On-Comet Attitude Reconstruction of Rosetta Lander Philae through Solar Arrays Telemetry", AIDAA XXII Conference, Napoli, Italy, 9–12 September 2013

NC7 *F. Topputo* and F. Bernelli–Zazzera, "Simulation of Low-Intensity, Low-Temperature Solar Arrays with Software and Hardware Tools", AIDAA XXII Conference, Napoli, Italy, 9–12 September 2013

NC6 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "Low-Thrust and Invariant-Manifold Trajectories to the Earth–Moon Halo Orbits", XX Congresso Nazionale AIDAA, Milano, Italy, 29 June–3 July 2009

NC5 S. Brambillasca, *F. Topputo*, A. Ercoli-Finzi, and R. Campesato, "LILT Measurements on Silicon Solar Cells of Rosetta Lander Philae", XX Congresso Nazionale AIDAA, Milano, Italy, 29 June–3 July 2009

NC4 M. Massari, R. Armellin, P. Di Lizia, and *F. Topputo*, "Reaching NEOs: Solution for the Second Global Trajectory Optimization Competition", XIX Congresso Nazionale AIDAA, Forlì, Italy, 17–21 September 2007

NC3 G. Mingotti, *F. Topputo*, and F. Bernelli–Zazzera, "A Method to Design Sun-Perturbed Earth-to-Moon Low-Thurst Transfxers with Ballistic Capture", XIX Congresso Nazionale AIDAA, Forlì, Italy, 17–21 September 2007

NC2 *F. Topputo*, A. Owis, and F. Bernelli–Zazzera, "Analytical Solution of the Feedback Optimal Control in Low-Thrust Transfers", XIX Congresso Nazionale AIDAA, Forlì, Italy, 17–21 September 2007

NC1 F. Cremaschi, *F. Topputo*, G. Sangiovanni, and M. Vasile, "Low-Thrust Interplanetary Transfers through Invariant Manifolds and an Evolutionary Neurocontrol", XVIII Congresso Nazionale AIDAA, Volterra, Italy, 19–22 September 2005

13 Invited talks, seminars, and lectures

13.1 Plenary talks

He has been invited to international conferences to give the plenary talks listed below.

2018 Plenary talk on "LUMIO: A CubeSat at Earth–Moon L_2", 4S Symposium, Sorrento, Italy, 29 May 2018 [Invited by Prof. P. Tortora]

2016 Plenary talk on "Engineering Solutions in Stardust" given at the Global Networking Forum event on "Stardust: A Fresh Look at Planetary Defense and Space Debris Removal", held at the 67^{th} International Astronautical Congress, Guadalajara, Mexico, 30 September 2016 [Invited by Prof. M. Vasile]

2014 Plenary talk on "Recent Advances in Ballistic Capture", Brazilian Colloquium on Orbital Dynamics, Aguas de Lindoia, Brazil, 3 December 2014 [Invited by Dr. E. Macau]

13.2 Invited talks

He has been invited to international conferences to give the talks listed below.

2021 Invited talk on "The Hera Milani CubeSat Mission", the 7^{th} IAA Planetary Defense Conference, 26 April 2021, Vienna (talk given online) [Invited by Dr. R. Moissl]

2020 Invited talk on "Current Status of LUMIO: A CubeSat Mission at Earth–Moon L2", 2^{nd} China Microsatellite Symposium, Northwestern Polytechnical University, Xi'an, China, 15 Nov 2020 (talk given online) [Invited by Dr. Z. Tong]

2020 Invited talk on "A Homotopy Method based on Theory of Functional Connections", Theory of Functional Connections Conference (virtual), hosted by Texas A&M University, College Station, TX, USA, 22 May 2020 [Invited by Prof. D. Mortari]

2018 Invited talk on "Orbit Design of LUMIO, A Lunar Meteoroid Impacts Observer", Panel on Satellite Dynamics (PSD.1), COSPAR Scientific Assembly 2018, Pasadena, CA, USA, 14–22 July 2018 [Invited

by Dr. H. Peter and Dr. J. Van Den IJssel]

2016 Invited talk on "Space Shepherd: Monitoring Refugees in the Mediterranean Sea", SpaceUp Milan, Milan, Italy, 6 November 2016 [Invited by Dr. E. Carpanelli]

2015 Invited talk on "Space Shepherd: Monitoring Immigration in the Mediterranean Sea through Satellite Imageries" given at the European Aerospace Students Meeting for Experimental Rocketry, Milan, Italy, 23 October 2015 [Invited by R. Di Battista]

2015 Invited talk on "Computation of Ballistic Capture Orbits and Applications", Astronet–II International Final Conference, Tossa de Mar, Spain, 16 June 2015 [Invited by Prof. F. Bernelli]

2009 Invited talk on "Dynamical Systems, Optimal Control, and Space Trajectory Design", CelMec V: An International Meeting on Celestial Mechanics, Viterbo, Italy, 8 September 2009 [Invited by Prof. A. Celletti]

13.3 Seminars

He has been invited to give the seminars listed below.

2022 Invited seminar on "One way ticket to hell (and back!): The path toward your next ERC grant", Challenges and opportunities for the aerospace frontier research offered by the ERC and the MSCA programme, Politecnico di Torino, 25 March 2022 (talk given online) [Invited by Pr. A. Pagani]

2022 Invited seminar on "The EXTREMA Project: Achieving Self-Driving Interplanetary CubeSats", JPL Autonomy Seminar, 16 March 2022 (talk given online) [Invited by Dr. I. Nesnas]

2021 Invited seminar on "The LUMIO CubeSat Mission to the Moon", given within the Mini-Moon Seminar Series No. 9, National Central University, Taiwan, 17 May 2021 (talk given online) [Invited by Prof. W.-H. Ip]

2021 Invited seminar on "Challenges and opportunities for the aerospace frontier research offered by the ERC and the MSCA programme", within the AIDAA Educational Series and Academy, 22 February 2021 (talk given online) [Invited by Prof. A. Pagani]

2021 Invited seminar on "Challenges in Guidance, Navigation, and Control of Interplanetary CubeSats", given at the ISAS/JAXA Space Science Colloquium, Tokyo, Japan, 17 February 2021 (talk given online) [Invited by Dr. D. Dei Tos]

2019 Invited seminar on "Ballistic Capture Dynamics and Applications" given at the workshop "Recent Advances in the Three-Body Problem" organized by the COMmunity of ExperTs in ORBital mechanics (COMET-ORB), ISAE-SUPAERO, Toulouse, France 3 June 2019 [Invited by Prof. S. Lizy-Destrez]

2017 Invited seminar on "Ballistic Capture and Application", Tsinghua University, Beijing, 2 November 2017 [Invited by Prof. H. Baoyin]

2017 Invited seminar on "LUMIO: Lunar Meteoroid Impacts Observer", given during a short course on Space Mission Analysis held at Dong Fang Hong Satellite Co., Ltd., Beijing, Beijing, 31 October 2017 [Invited by Dr. H. Huang]

2015 Invited seminar on "Ballistic Capture of Asteroids in Earth Orbit", Stardust 3rd Training School on Science and Technology Challenges of Space Debris Removal and Asteroid Deflection, Universidad Internacional Menéndez Pelayo, Santander, Spain, 10 July 2015 [Invited by Dr. C. Bombardelli]

2015 Invited seminar on "Ballistic Capture Dynamics and Applications", Augsburger Mathematisches Kolloquium, Institut für Mathematik, Universität Augsburg, Augsburg, Germany, 21 April 2015 [Invited by Prof. U. Frauenfelder]

2014 Invited seminar on "Past and Current Research Activities", Astrodynamics Workshop, IEEC, Barcelona, Spain, 4 February 2014 [Invited by Prof. G. Gómez]

2013 Invited seminar on "Overview of Optimal Control Methods with Applications", Stardust Opening Training School, University of Strathclyde, Glasgow, UK, 21 November 2013 [Invited by Prof. M.

Vasile]

2010 Invited seminar on "Optimal Control Problems and Local Optimization", Cairo University, Cairo, Egypt, 17 June 2010 [Invited by Dr. A. Owis]

2007 Invited seminar on "The Restricted Three-Body Problem in Space Missions", Seminari di Cultura Matematica, Department of Mathematics, Politecnico di Milano, Milan, Italy, 18 April 2007 [Invited by Prof. G. Magli]

13.4 Lectures

He has been invited to give the lectures listed below.

2017, 18 Invited guest lecture on "Advanced Three-Body Dynamics" within the MSc class Astrodynamics-II, TU Delft, Aerospace Engineering Faculty, 9 March 2017 and 19 March 2018 [Invited by Dr. E. Doornbos]

2018 Invited guest lecture on "Orbit Design of LUMIO, a Lunar Meteoroid Impact Observer", MSc class on Spacecraft Orbital Dynamics and Control, University of Bologna, Forlì, 6 June 2018 [Invited by Dr. M. Zannoni]

2017 Invited lectures on "Launch dynamics and launch windows", "Low-thrust trajectories", and "n-body dynamics", Training course for HIWING Technology Academy, Politecnico di Milano, Milano, Italy, 20 November–1 December 2017 [Invited by Prof. F. Bernelli]

2008 Invited lecture on "Low Energy Interplanetary Transfers Combining Dynamical Systems and Optimal Control", Roundtable AMEBA: Advanced Mathematical Efficiency in Biology and Astrodynamics, Science and Technology Department, French Embassy, London, 1 December 2008 [Invited by Dr. A. Tsygvintsev]

2007 Lecture on "n-Body Dynamics with Applications to the Design of Low Energy Transfers", Introductory Course on Astrodynamics, Thales–Alenia Space, Turin, Italy, 22 February 2007 [Invited by Dr. G. Fasano]

14 Media mentions, Outreach

14.1 Media mentions

2020 Featured interviews on the awarding of the ERC Consolidator Grant and on the project EXTREMA for the magazine Focus and for the newspaper Corriere della Sera.

2019 Interviewed by TG3 Lombardia on the technological transfer from the space to civil field.

2016 Featured interview on the Space Shepherd project within the show "Tutta colpa di Galileo" broadcasted on Italia 1; Link to the interview. The show was also listed on Netflix (E3S2).

2016 Featured interview on the Space Shepherd project for the radio show "Si può fare" on Radio 24 (moderators: Alessio Maurizi, Carlo Gabardini); Link to the interview (min 26–40).

2016 Interviewed by the newspapers La Repubblica, Il Corriere della Sera, and Il Sole 24 Ore on the monitoring of refugees in the Mediterranean Sea.

2016 Interviewed as "Expert of the week" on the monitoring of refugees via satellite imageries, Politecnico di Milano; Link.

2015

Interviewed by La Stampa on the cost and time frame for the first human mission to Mars.

2015 Interviewed as "Expert of the week" on the European mini-shuttle, Politecnico di Milano; Link 1, Link2.

2015 Interviewed by ilsussidiario.net on new ways to reach Mars exploiting ballistic capture.

2014 Interviewed by Scientific American for the story "A New Way to Reach Mars Safely, Anytime and on the Cheap". Italian translation on Le Scienze.

14.2 Outreach

2021 Interviewed for the "Space Engineering Podcast" on "Lunar CubeSats Mission Design", by A. Gonzalez; Link.

2021 Invited to give the talk "Piccoli satelliti, grandi risultati - Il caso del CubeSat LUMIO" within the event "Spazio alla conoscenza 3.0"; Link.

2020 Invited to live comment the historical launch of Crew Dragon on Focus TV (moderator: Luigi Bignami); Link.

2020 Invited to produce a short video to celebrate the International Day of Human Space Flight for the Italian Commissioner's Office for Expo 2020; Link.

2020 Interviewed for the "Stardust Podcast # 1", by M. Manzi; Link.

2019 Invited to give a talk within the conference "La Luna in pillole" at the Festival della Scienza Verona; Link.

2019 Invited to give the talk "Lo sbarco sulla Luna. Un piccolo passo per l'uomo ...Una grande eredità per l'umanità!", organized in collaboration with the magazine Focus Junior; Link.

2019 Invited to give the talk "LUMIO mission: Thinking inside the box" within the Polimi events for the 50^{th} anniversary of the lunar landing; Link.

2015 Invited guest at "Festival della Scienza" (Genova) for the talk "Marte, l'ultima frontiera" (moderator: Fabio Pagan); Link.

2015 Invited guest at "Meet Me Tonight" with a talk on "Biglietto di sola andata per Marte", Civico Planetario di Milano Ulrico Hoepli; Link.

2015 Invited talk at Museo Nazionale di Scienza e Tecnologia Leonardo Da Vinci on "La sonda Rosetta, primi risultati scientifici" (moderator: Luca Reduzzi); Link.

2015 Invited guest at "Wired Next Fest" with a talk on "Vado a vivere su Marte" (moderator: Andrea Gentile); Link.

2014 Invited guest at "Open Night: Notte Europea dei Ricercatori" with a talk on "Il futuro dello spazio tra scienza e fantascienza" at Museo Nazionale di Scienza e Tecnologia Leonardo Da Vinci (moderator: Silvia Rosa Brusin); Link.

2012 Teacher of the class "Learning Week: Esplorare l'universo" organized by Fondazione Clerici and funded by Regione Lombardia.

2011 Has edited the entry "Space Manifold Dynamics" on scholarpedia.org.

2010 Teacher of the class "Learning Week: Esplorare l'universo" organized by Fondazione Clerici and funded by Regione Lombardia.

2006–12 Has created from scratch and has been responsible of the website astrodynamics.eu.

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