Rodolfo Batista NEGRI

Curriculum Vitae

Contact Information
Satellite Control Center (CCS)
National Institute for Space Research (INPE)
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Updated: August 24, 2026

Current Position

GNC Researcher & Flight Dynamics Engineer *Sep 2025 – present*
National Institute for Space Research (INPE), Satellite Control Center

Current responsabilities:

- Elected Member, Advisory Committee for the General Coordination of Infrastructure and Applied Research, CGIP, (2025–2027): responsible for projects evaluation and S&T policy formulation
- Shared flight dynamics responsabilities over 5 satellites (SCD-1, SCD-2, CBERS-4, CBERS-4A, and AMZ-1), covering navigation, maneuver design, and calibration
- Resolved a 13-year-old LEO satellite anomaly in pass prediction by leading a deep-dive investigation
- Executed binary reverse-engineering to bridge legacy VAX/DEC systems with modern 64-bit GNU environments
- Architected automated toolchains in C++/Python to replace manual workflows
- Modernizing legacy software architectures by implementing CCSDS standards
- Transitioning mission-critical code to the GNU Compiler Collection (GCC) for enhanced portability and long-term sustainability
- Modernized legacy Fortran development by implementing CMake build systems and enforcing modern Coding Standards
- Standardized software documentation by introducing Doxygen-documented codebases
- Development of state-of-the-art methodologies for the computation of mean orbital elements
- Research in spacecraft autonomy, focusing on optical navigation and GNC algorithms for next-generation missions

Education

Ph.D. in Space Technology and Engineering *2018 – 2022*
National Institute for Space Research (INPE), Brazil

- Thesis: "Study on Dynamics, Guidance, Navigation, and Control Applied to Asteroid Deflection Missions."
- Advisor: Prof. A. F. B. A. Prado

M.S.E. in Space Technology and Engineering *2017 – 2018*
National Institute for Space Research (INPE), Brazil

- Thesis: "Swing-by Dynamics: Analysis of the Limitations of the Patched-conics Approximation."

B.S.E. in Mechanical and Aeronautical Engineering *2011 – 2016*
Federal University of Itajubá (UNIFEI), Brazil

- Exchange student in Aerospace Engineering, The George Washington University (2014 – 2015).

Positions Held

Postdoctoral Researcher *Apr 2022 – May 2025*
Federal University of São Paulo (UNIFESP), Brazil

- Supervisor: Dr. Rodolpho Vilhena de Moraes

- Project: Autonomous Spacecraft in Asteroid Missions
- Simulated 6-DOF spacecraft dynamics and control
- Developed integrated simulation software (Julia-Python-Blender) for optical camera images
- Integrated Fortran, C, C++, and Julia codes for dynamics and control
- Implemented vision-based navigation using OpenCV in C++

NASA JPL Visiting Student Researcher *Jun – Aug 2015*
JET PROPULSION LABORATORY, Pasadena, USA

- Astrobiology group, mentor: Steven Vance
- Project: Determining Ganymede Profile with a Thermal-orbital Model

RESEARCH INTERESTS

- Guidance, Navigation, and Control
- Astrodynamics
- Nonlinear Dynamics and Control
- Autonomous Vehicles
- Robotics
- Space Mission Design
- Flight Software
- Embedded Systems

FELLOWSHIPS

CNPq's Universal Call for Proposals *Sep 2025 – Aug 2027*
NATIONAL INSTITUTE FOR SPACE RESEARCH, Brazil

FAPESP's PostDoc Fellowship *Apr 2022 – Mar 2025*
FEDERAL UNIVERSITY OF SÃO PAULO, Brazil

- Prestigious fellowship (∼7% success rate, 2020). Tables 3 and 9, 2020 report: `https://fapesp.br/publicacoes/`.

FAPESP's Research Internships Abroad (BEPE) *2024 – 2025*
JET PROPULSION LAB, NASA, USA

- Supervisor: Shyam Bhaskaran.
- Not implemented due to FAPESP's mismanagement.

FAPESP's Ph.D. Fellowship *2018 – 2022*
NATIONAL INSTITUTE FOR SPACE RESEARCH (INPE), Brazil

- Prestigious PhD fellowship (∼23% success rate, 2018).

FAPESP's Research Internships Abroad (BEPE) *2020 – 2021*
UNIVERSITY OF COLORADO BOULDER, USA

- Supervisor: Daniel J. Scheeres.
- Not implemented due to COVID-19.

FAPESP's Master Fellowship *2017 – 2018*
NATIONAL INSTITUTE FOR SPACE RESEARCH (INPE), Brazil

Undergraduate Scientific Initiation (PIBIC) *2015 – 2016*
NATIONAL INSTITUTE FOR SPACE RESEARCH (INPE), Brazil

CAPES' Science Without Borders *2014 – 2015*
GEORGE WASHINGTON UNIVERSITY / NASA JPL, USA

CNPq's Undergraduate Scientific Initiation (PIBIC) *2012 – 2014*
FEDERAL UNIVERSITY OF ITAJUBÁ (UNIFEI), Brazil

Awards

- Wagner Sessin Prize, Astrodynamics, and Guidance, Navigation, and Control, 2024
- Seal of Excellence in the Marie Skłodowska-Curie actions (Project: Cubesats in Autonomy for Asteroid Exploration with an Orbital Rapid Assessment, Politecnico di Milano, Supervision: Prof. Francesco Topputo), 2023

Teaching & Service

Journal Referee:

- Acta Astronautica
- Advances in Space Research
- Anais da Academia Brasileira de Ciências
- Astrodynamics
- Astrophysics and Space Science
- Automatica
- Celestial Mechanics & Dynamical Astronomy
- European Physical Journal - Special Topics
- IEEE Transactions on Aerospace and Electronic Systems
- International J. of Mining, Reclamation and Env.
- Journal of the Brazilian Society of Mechanical Sciences and Engineering
- Journal of Guidance, Control, and Dynamics

Teaching:

Professor, Fundamentals of Astrodynamics *Aug – Dec 2023*
Federal University of São Paulo, São José dos Campos

Professor, Engineering of Space Missions *Aug – Oct 2021*
National Institute for Space Research, São José dos Campos

Teaching Assistant, Calculus II *Jan – Jun 2020*
São Paulo State University, Guaratinguetá

Mentoring

MS Students:

- Shyenne Pinheiro (exp. graduation Feb. 2026)

Invited Talks

INPE's Coordination of Satellite Tracking, Control and Reception *Feb 2026*
São Paulo State University, 31st Summer School on Orbital Mechanics and Planetary Sciences

Astrodynamics and GNC Research at INPE *Oct 2025*
São Paulo State University, IV Workshop of the Graduate Program in Physics & Astronomy

Preliminary Design of Trajectories for Rendezvous with 2001SN263 *Mar 2025*
São Paulo State University, Grupo de Dinâmica Orbital e Planetologia

Preliminary Design of Trajectories for Rendezvous with 2001SN263 *Dec 2024*
XXII Brazilian Colloquium On Orbital Dynamics, INPE

Guidance, Navigation, and Control in Deep Space *Sep 2023*
Winter Course, National Institute for Space Research

Autonomous Spacecraft in Asteroid Missions *Sep 2021*
São Paulo State University, Grupo de Dinâmica Orbital e Planetologia

Peer-Reviewed Journal Publications

1. **Negri, R. B.**, & Prado, A. F. (2024). Negri, R. B., & Prado, A. F. (2024). Shallow Encounters' Impact on Asteroid Deflection Prediction and Implications on Trajectory Design. Journal of Guidance, Control, and Dynamics, 47(7), 1341-1358.
2. **Negri, R. B.**, Prado, A. F., Chagas, R. A., & Moraes, R. V. (2024). Autonomous Rapid Exploration in Close-Proximity of Asteroids. Journal of Guidance, Control, and Dynamics, 47(5), 914-933.

3. **Negri, R. B.**, & de Prado, A. F. B. (2024). Robust path-following for Keplerian orbits. Journal of the Brazilian Society of Mechanical Sciences and Engineering, 46(8), 500.
4. **Negri, R. B.**, & Prado, A. F. B. A. (2022). Autonomous and Robust Orbit-Keeping for Small-Body Missions. Journal of Guidance, Control, and Dynamics, 45(3), 1357-1365.
5. **Negri, R. B.**, & Prado, A. F. B. A. (2022). Circular Restricted n-Body Problem. Journal of Guidance, Control, and Dynamics, 45(7), 587-598.
6. Aljbaae, S.; Sanchez, D. M.; PRADO, A. F. B. A.; Souchay, J.; Terra, M. O.; **Negri, R. B.**; Marchi, L. (2021). First Approximation for Spacecraft Motion Relative to (99942) Apophis. Romanian Astronomical Journal, 31, 241.
7. **Negri, R. B.**, & de Almeida Prado, A. F. B. (2020). A historical review of the theory of gravity-assists in the pre-spaceflight era. Journal of the Brazilian Society of Mechanical Sciences and Engineering, 42(8), 1-10.
8. **Negri, R. B.**, & Prado, A. F. (2020). Generalizing the Bicircular Restricted Four-Body Problem. Journal of Guidance, Control, and Dynamics, 43(6), 1173-1179.
9. **Negri, R. B.**, Sukhanov, A., & de Almeida Prado, A. F. B. (2019). Lunar gravity assists using patched-conics approximation, three and four-body problems. Advances in Space Research, 64(1), 42-63.
10. **Negri, R. B.**, de Almeida Prado, A. F. B., & Sukhanov, A. (2017). Studying the errors in the estimation of the variation of energy by the "patched-conics" model in the three-dimensional swing-by. Celestial Mechanics and Dynamical Astronomy, 129(3), 269-284.

Conference Papers

1. **Negri, R. B.**, Prado, A. F., Chagas, R. A. J., Moraes, R. V. Six DOF Analysis for Asteroid Autonomous Exploration, In: 73rd International Astronautical Congress, 2022, Paris.
2. **Negri, R. B.**, & Prado, A. F. Using Robust Control for a Fast Exploration of an Asteroid. In: AAS/AIAA Astrodynamics Specialist Conference, 2021, Virtual.
3. **Negri, R. B.**, & Prado, A. F. Orbit Keeping About the Martian Moons with a Robust Path Following Control. In: European Control Conference, 2021, Virtual. Proceedings of the E.C.C., 2021.
4. **Negri, R. B.**, & Prado, A. F. Study on Autonomous Gravity-assists with a Path Following Control. In: 31st AAS/AIAA Space Flight Mechanics Meeting, 2021, Virtual. Proceedings of AAS/AIAA Space Flight Mechanics Meeting, 2021.
5. **Negri, R. B.**, & Prado, A. F.. Hovering Control of a Spacecraft in a Binary Asteroid. In: 70th International Astronautical Congress (I.A.C.), 2019, Washington D.C.. Proceedings of the 70th International Astronautical Congress, 2019.
6. **Negri, R. B.**, Sarli, B., Prado, A. F. Mapping Trajectories of an Asteroid that is Deflected by a Collision. In: 69th International Astronautical Congress (I.A.C.), 2018, Bremen. Proceedings of the 69th International Astronautical Congress, 2018.
7. **Negri, R. B.**, & Prado, A. F. A Study of the Errors in Swing-by Design by the 'Patched-Conics' Approach Applied to the Galilean Moons. In: COBEM 2017, 2017, Curitiba. Proceedings of the 24th ABCM International Congress of Mechanical Engineering, 2017.

Conference Expanded Abstracts

1. **Negri, R. B.**; Sanchez Cuartielles, J. P. ; Prado, A. F. B. A.. Analysis of Jupiter's Third-Body Perturbation Effects on Optimal Asteroid Deflection Maneuvers. In: 6th I.A.A. Planetary Defense Conference - PDC 2019, 2019, Washington, DC. Proceedings, 2019.

Conference Abstracts

1. **Negri, R. B.**. Assessment of Relative Motion in Autonomous Spaceflight. In: XXII Brazilian Colloquium On Orbital Dynamics (CBDO), 2024, São José dos Campos. Livro de Resumos do XXII CBDO, 2024.
2. **Negri, R. B.**; Moraes, R. V.; Prado, A. F. B. A.. Preliminary Design of Trajectories for Rendezvous with 2001 SN263. In: XXII Brazilian Colloquium On Orbital Dynamics (CBDO), 2024, São José dos Campos. Livro de Resumos do XXII CBDO, 2024.

3. **Negri, R. B.**; Prado, A. F. B. A.. Analysis of the Effects of Jupiter in an Impulsive Asteroid Deflection. In: XIX Colóquio Brasileiro de Dinâmica Orbital (CBDO), 2018, São José dos Campos. Livro de Resumos do XIX CBDO, 2018.

4. **Negri, R. B.**; Sukhanov, A.; Prado, A. F. B. A.. A detailed study of Three-Dimensional Swing-Bys in the Galilean Moons of Jupiter. In: 3rd I.A.A. Conference on Dynamics and Control of Space Systems (DYCOSS), Moscow.