Giuliano Vinci

Personal details

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Goals

As a dedicated student in Space Engineering, particularly in the realm of space missions, I have developed a strong interest in mathematical methods and their computational applications. My passion extends to specialized topics such as the physics of space, Earth, and other planetary bodies. This intellectual curiosity has led me to pursue a PhD in Aerospace Sciences and Technologies at Alma Mater Studiorum University, where I aim to continue exploring the scientific insights the passion for which has always driven my academic journey.

Work and Research experience

Alma Mater Studiorum, Forlì (IT) Nov 2024 - present
PhD Student in Aerospace Sciences and Technologies

My PhD topic revolves around radio communication and navigation techniques. The objective will be to participate in the future design and planning activities concerning space missions to Uranus and to Saturn.

IRAP-CNRS, Toulouse (FR) Sept 2023 - Aug 2024
Research Fellow in Space Plasma Physics

Research fellowship on the data-driven mathematical modeling of the coupling between the neutral tori of Io, moon of Jupiter, and its ionized plasma torus. The objective of my job was to conceive and implement a newer model to be fitted to data from several space missions, in order to constrain the interplay of phenomena related to neutral and ionized particles.

Prizes and grants

Engineering faculty grant for thesis work abroad 2023

The dean of the Faculty of Civil Engineering of Sapienza University, in Rome, granted me additional funding for my research internship at IRAP, in Toulouse.

Space Missions and Systems Challenge: 3^{rd} **place** 2021

In the academic challenge proposed by professor Iess, I solved a problem in the field of Statistical Orbit Determination.

1^{st} **place victory in National *Certamen Velinum*** 2016

Selected winner in a national competition of translation from Latin and philosophical reasoning.

Education

Sapienza Università di Roma Nov 2020 - Mar 2024
Master's Degree in Space and Astronautical Engineering (Major in Space Missions)
Final Grade: ***110/110 cum laude***

- Dissertation: *Exploring the Plasma Torus of Io: A Journey from History to a New, Multi-Instrument Model of the Source Region in the Jovian Magnetosphere*
- Subjects: Rocket Propulsion, Space Structures, Spaceflight Mechanics, Space Missions and Systems, Space Robotic Systems, Artificial Intelligence.

ISAE Supaéro Sept 2022 - Mar 2023
Erasmus+ student in Diplôme d'Ingénieur 3A

- Major **SISY**: *Signals and Systems*
  Estimation, Advanced Automatics, Image Acquisition and Treatment
- Minor **MSXS**: *Modeling and Simulation of Complex Systems*
  Multidisciplinary Optimisation, Numerical Methods for Engineering, Multiphysics and Multiscale Modeling.

Sapienza Università di Roma Sept 2017 - Oct 2020
Bachelor's Degree in Aerospace Engineering
Final Grade: ***110/110 cum laude***

- Dissertation: *DESCARTES: An application of Computer Algebra to the analysis of dynamical systems.*
- Subjects: Mathematics (Real, Multivariate, Complex and Functional analysis, Linear Algebra and Geometry, 600+ hours), Physics (300+ hours), MATLAB Programming (150+ hours), Pure and Applied Thermodynamics, Aerospace Propulsion, Structural mechanics, Analytical and Applied Mechanics, Aerodynamics, Flight Mechanics, Space Environment.

Programming and Engineering Skills

- ***Systems Engineering*:** I am a certified INCOSE ASEP, that is an Associated Systems Engineering Professional.
- ***Python* (15k+ lines):** Professional knowledge: data analysis, Artificial Intelligence (PyTorch), data visualization, numerical simulation.
- ***MATLAB* (10k+ lines):** Orbit determination, robotics, optimization, numerical integration, symbolic calculus.
- ***C++* (2k+ lines):** General and advanced knowledge, OOP techniques.
- ***Other*:** Julia, Simulink, LaTeX, SolidWorks, NASTRAN/Patran, Ms Office.

Languages

- ***English*:** Bilingual knowledge, achieved a IELTS test score of 8.0 and a C2 level certificate with top marks (CPE graded A).
- ***French*:** Professional knowledge, C1+ level (lived, studied and worked 2 years in France).
- ***Italian*:** Native language.

Main projects

AuReVOIR 2021

***Au**tomatic **Re**moval **V**ehicle for **O**rbiting **I**nactive **R**ockets.*

This academic project, centered on Systems Engineering, aimed at the removal of a set of debris in LEO and consisted of a pre-phase A mission study. It was carried out in a 12-people team environment, in which I lead reasearch in the fields of orbital decay models, orbital transfer maneuvers, structural design and FEM simulation.

DESCARTES 2020

***D**ifferential **E**quation **S**olver with **C**omputer **A**lgebra, **R**unning **T**asks of **E**quilibrium and **S**tability*

Coded from zero a MATLAB tool capable of deriving system dynamics from the Lagrangian function of a dynamical system. The tool is also capable of integrating the dynamics and finding the equilibrium points.

Personality

- Autonomy with Perseverance: I am autonomous and I can follow my creativity with persistence and discipline to serve a project I believe in, committing to deadlines and achieving the prescribed goals.
- Innovation from Understanding: I am capable of devising creative solutions keeping an eye on the bigger picture, sustained by my deep understanding and scientific rigour.
- Cooperation and Openness: I can maintain good relationships with team members and make my point stand with assertivity and openness.

Interests

- Analog and digital photography;
- Darkroom printing;
- Trekking;
- Cooking;
- Searching for mushrooms;
- Reading history essays.

Conferences and Workshops attended

Juno Data Analysis Workshop Rome (IT), July 2023

As a prospective member of the Juno mission team, I attended the Juno Data Analysis Workshop for Science Capacity Building in Rome, in July 2023.

Programme National Soleil Terre Marseille (FR), January 2024

At this conference I presented a poster with the title *Preliminary results from a new model of the Io torus, fed by the two Juno flybys of Io.*

Outer Moon-Magnetosphere Interactions Workshop Dublin (IE), May 2024

I presented the poster *Structure and Dynamics of the Io Plasma Torus.*

Works

[1] Giuliano Vinci: *DESCARTES. An application of Computer Algebra to the analysis of dynamical systems*. Thesis defended publicly on October 23, 2020. Advisor: Professor Vittoria Bruni. Bachelor's Thesis. Rome: Sapienza University of Rome, Oct. 23, 2020. DOI: 10.13140/RG.2.2.18869.08169. URL: https://www.researchgate.net/publication/381293152_DESCARTES_An_application_of_Computer_Algebra_to_the_Analysis_of_Dynamical_Systems#fullTextFileContent

[2] Giuliano Vinci, Michel Blanc, Nicolas André, Marie Devinat, and Quentin Nénon: *Preliminary results from a new model of the Io torus, fed by the two Juno fly-bys of Io*. Conference poster presented at *Programme National Soleil Terre*. Marseille, Jan. 2024. DOI: 10.13140/RG.2.2.28096.55047. URL: https://www.researchgate.net/publication/381293251_Preliminary_results_from_a_new_model_of_the_Io_torus_fed_by_the_two_Juno_flybys_of_Io

[3] Giuliano Vinci: *Exploring the Plasma Torus of Io. A Journey from History to a New, Multi-Instrument Model of the Source Region in the Jovian Magnetosphere*. Advisors: Professor Antonio Genova and Professor Emeritus Michel Blanc. Master's Thesis. Rome: Sapienza University of Rome, Mar. 2024. DOI: 10.13140/RG.2.2.16352.49925. URL: https://www.researchgate.net/publication/381293329_Exploring_the_Plasma_Torus_of_Io_A_Journey_from_History_to_a_New_Multi-Instrument_Model_of_the_Source_Region_in_the_Jovian_Magnetosphere

[4] Giuliano Vinci, Michel Blanc, Howard Todd Smith, Quentin Nénon, Nicolas André, and Marie Devinat: *Structure and Dynamics of the Io Plasma Torus. From multi-spacecraft and multi-instrument observations to models*. Conference poster presented at the 3rd *Outer Moon Magnetosphere Interactions Workshop*. Dublin, May 2024. DOI: 10.13140/RG.2.2.18030.22082. URL: https://www.researchgate.net/publication/381293158_Structure_and_Dynamics_of_the_Io_Plasma_Torus_from_multi-spacecraft_and_multi-instrument_observations_to_models

[5] Giuliano Vinci, Michel Blanc, Quentin Nénon, Nicolas André, Marie Devinat, Howard Smith, Zhiyang Liu, and Yuxian Wang: *Structure and Dynamics of the Io Plasma Torus: from multi-spacecraft and multi-instrument observations to models*. Conference poster presented at *COSPAR*, the COmmittee on SPAce Research. Busan, South Korea, July 2024. URL: https://www.researchgate.net/publication/382297262_Structure_and_Dynamics_of_the_Io_Plasma_Torus_from_multi-spacecraft_and_multi-instrument_observations_to_models_COSPAR