

# Debajyoti Chakrabarti

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## EDUCATION

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<b>University of California, Los Angeles (UCLA)</b> <i>Graduate student in Aerospace Engineering (Major in Robotics and Control)</i>	2024 – 2029 GPA: 4.0/4.0
<b>Indian Institute of Space Science and Technology (IIST), Kerala (India)</b> <i>B.Tech in Electronics and Communication Engineering (Avionics)</i>	2015 – 2019 GPA: 9.20/10.0

## EXPERIENCE

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<b>Graduate Researcher</b> <i>Practice Lab, UCLA (Advisor: Prof. Anushri Dixit)</i>	Sept. 2024 – Present Los Angeles, CA
<ul style="list-style-type: none"><li>Developed a <b>hybrid multi-agent optimal control framework</b> with dynamic half-space corridor generation and VCG-based mechanism design, analyzing incentive compatibility under truthful and strategic cost misreporting</li><li>Working on <b>sim-to-real transfer</b> for deploying safe control policies on the Unitree GO2 quadruped, with extensions to multi-agent planning</li></ul>	
<b>Guidance, Navigation, and Control (GNC) Scientist</b> <i>U R Rao Satellite Centre (URSC), Indian Space Research Organisation (ISRO)</i>	Aug. 2019 – July 2024 Bangalore, India
<ul style="list-style-type: none"><li>Designed and developed attitude and orbit control system (AOCS) for 10+ space missions, including <b>Chandrayaan-3 Moon landing</b> (first soft landing at the lunar south pole), <b>Gaganyaan</b> (Indian human spaceflight), <b>LUPEX</b> (Lunar Polar Exploration mission, a collaboration between India and Japan), and <b>NISAR</b> (NASA-ISRO Synthetic Aperture Radar mission)</li><li>Served as Project Manager for AOCS development on <b>TRISHNA</b> (ISRO-CNES collaboration) and <b>INS-2B</b> (India-Bhutan nanosatellite mission)</li><li>Worked on real-time control, mission planning, and telemetry data analysis for operational spacecraft</li></ul>	
<b>Undergraduate Researcher</b> <i>IIST (Advisor: Prof. N. Selvanesan)</i>	Aug. 2018 – Apr. 2019 Kerala, India
<ul style="list-style-type: none"><li>Developed a <b>fractional-order robust sliding mode controller</b> for spacecraft attitude maneuvers</li><li>Proved <b>finite-time convergence and Lyapunov stability</b>, demonstrating improved robustness and reduced control effort</li></ul>	
<b>Summer Intern</b> <i>U R Rao Satellite Centre (URSC), ISRO</i>	June 2018 – Aug. 2018 Bangalore, India
<ul style="list-style-type: none"><li>Conducted <b>parametric sensitivity analysis</b> for the <b>Chandrayaan-2 lander</b> to study time-of-flight dependence on state vectors</li><li>Applied the <b>principal component analysis (PCA)</b> to identify dominant dynamics parameters and formulated a polynomial decision boundary for real-time guidance convergence checks</li></ul>	

## PROJECTS

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<b>VLM-Augmented Policy switching for Safe driving (VLAPS)</b> <i>(Fall 2025)</i>	
<ul style="list-style-type: none"><li>Developed a <b>VLM-gated policy switching framework</b> that replaces human supervision with automated trajectory preference queries.</li><li>Integrated an <b>RRT* + PD expert</b> with imitation and TD learning, achieving <b>86% success with zero crashes</b> in simulated urban environments</li></ul>	
<b>Optimization-based Collision Avoidance</b> <i>(Spring 2025)</i>	
<ul style="list-style-type: none"><li>Implemented <b>exact convex reformulations</b> of collision avoidance constraints using optimization duality for single-shot optimal control (OCP) and Model Predictive Control (MPC)</li><li>Demonstrated <b>collision-free reverse and parallel parking</b> trajectories</li></ul>	
<b>Design and Control of 4-DOF Robotic Manipulator for Light Painting Images</b> <i>(Fall 2024)</i>	
<ul style="list-style-type: none"><li>Derived forward and inverse kinematics and configured Dynamixel MX-28AR servo motors</li><li>Developed <b>image-based contour extraction and path planning</b>, validated via MATLAB simulation</li></ul>	

## Chandrayaan-3 Moon Landing Mission

(Sept. 2019 – Aug. 2023)

- Developed a **real-time retargeting algorithm** for autonomous landing feasibility detection and online landing site recomputation
- Designed an **engine thrust estimation algorithm** using Recursive Least Squares from accelerometer data
- Analyzed **propellant slosh–control interaction** via 6-DOF simulation and Monte Carlo studies, enabling a **successful lunar south pole landing**

## Gaganyaan Mission (Indian Human-space Flight)

(Jan. 2020 – Aug. 2024)

- Developed **GOMASS**, a high-fidelity multibody AOCs simulation tool for the orbital module
- Formulated an optimization framework to **minimize disturbance torque** via optimal engine canting

## PUBLICATIONS [SELECTED]

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### Journal

- Suraj Kumar\*, **Debajyoti Chakrabarti\***, Aditya Rallapalli, Bharat Kumar GVP (2026). “*Real-time Retargeting based Robust Polynomial Guidance for Chandrayaan-3 Lunar Landing Mission*”, Journal of Guidance, Control and Dynamics (2026) [Accepted]
- Rijesh MP, **Debajyoti Chakrabarti**, Chiranjib Mazumder, Aditya Rallapalli, Vidya V, Siva MS (2024). “*Design and Implementation of Closed Loop Guidance Algorithms for Powered Descent of Chandrayaan-3 with Thrust Continuity Constraint*”, Journal of Spacecraft Technology
- **Debajyoti Chakrabarti**, and N. Selvaganesan. “*PD and PD<sup>β</sup> based sliding mode control algorithms with modified reaching law for satellite attitude maneuver.*” Advances in Space Research 65.4 (2020): 1279-1295

### Conference

- Suraj Kumar\*, **Debajyoti Chakrabarti\***, Aditya Rallapalli, “*Real-Time Retargeting Using Controllability Boundary for Chandrayaan-3 Lunar Landing*”, American Control Conference (ACC 2026) [Accepted]
- **Debajyoti Chakrabarti**, Suraj Kumar, Aditya Rallapalli, MP Rijesh, GVP Bharat Kumar, “*Convex Decision Boundary Design for Guidance Feasibility Check During Powered Descent Phase of Chandrayaan-3 Lander*”, IFAC-PapersOnLine, Volume 57, 2024, Pages 119-124, ISSN 2405-8963
- Aditya Rallapalli, **Debajyoti Chakrabarti**, Nivriti Priyadarshini, MP Rijesh, GVP Bharat Kumar, “*Stability Analysis Using Describing Function For Non-Linear Attitude Control Loop with Slosh Dynamics of Chandrayaan-3 Landing Mission*”, in *Tenth Indian Control Conference*, Dec 2024
- Nivriti Priyadarshini, **Debajyoti Chakrabarti**, and Yajur Kumar, “*Modelling of Propellant Slosh Dynamics and Its Application in Control Stability Study of Lunar Landing Mission*” in *AAS/AIAA Astrodynamics Specialist Conference*, Sept 2022

## HONORS AND ACHIEVEMENTS

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- **Departmental Fellowship** to pursue PhD from the Mechanical & Aerospace Engineering department of UCLA (Sept. 2024)
- Certificate of merit from the Chief Minister of West Bengal, India for outstanding contribution as an ISRO scientist in India’s historic landing on the Lunar South pole (Aug 2023)
- **Outstanding Scientist** in the annual performance appraisal, for **all four consecutive years** of service at ISRO (Dec. 2019 - July 2024)
- **Finalist (in top 5)** among 120 candidates of B.Tech (batch 2015-2019) for **summer internship at NASA Jet Propulsion Laboratory (JPL)**, sponsored by IIST & ISRO (July 2018)
- **Merit-based full scholarship** for all four years of undergraduate study at IIST from the Department of Space, Govt. of India (Aug. 2015 - July 2019)

## TECHNICAL SKILLS

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**Programming Languages:** C/C++, MATLAB, Python, HTML

**Software Tools:** Simulink, Satellite Tool Kit (STK), L<sup>A</sup>T<sub>E</sub>X, OrCAD

**Machine Learning:** Regression, Classification, Neural network, Imitation Learning

**Other Tools:** Microsoft Office Suite (Word, Excel, PowerPoint, Outlook), Google Suite (Docs, Sheets)

**Relevant Courses:** **Neural Networks & Deep Learning, Interactive Robot Learning**, Kinematics; Dynamics & Control of Robots, Special Topics in Dynamic Systems Control, Control and Guidance Systems, Advanced Control Theory, Digital Control System, Nonlinear Dynamic Systems