

# AMLAN SINHA

📍 297 Franklin Ave, Princeton, NJ    ✉ amlans@princeton.edu    ☎ (929) · 428 · 6138

## RESEARCH STATEMENT

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I am a Ph.D. candidate in Mechanical and Aerospace Engineering at Princeton University, specializing in dynamical systems, optimal control and astrodynamics. My research aims to harness knowledge from *dynamical systems* and *optimal control* to develop a theoretical and algorithmic framework to design robust trajectories for low-thrust spacecrafts under operational uncertainty such as partial or complete engine loss in complex multibody dynamical systems during the preliminary mission design phase.

**Research Interests:** Astrodynamics, Dynamical Systems, Optimal Control, Robust Control

## EDUCATION

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**Princeton University** *2020-Present*  
Doctoral Candidate in Mechanical Engineering  
Certificates: Computational Science and Engineering

**Princeton University** *May 2020*  
M.A. in Mechanical Engineering  
GPA: 3.61/4.00

**Cornell University** *May 2018*  
B.S. in Mechanical Engineering, Minor in Aerospace Engineering  
GPA: 3.52/4.00 (*Cum Laude*)

## RESEARCH EXPERIENCE

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**Beeson Lab** Jan 2022 - Present  
*Graduate Research Assistant, Adviser: Ryne Beeson* *Princeton, NJ*

- Quantitatively and qualitatively assess the role of dynamical structures on robust low-thrust spacecraft trajectories in complex multibody dynamical environments,
- Investigate the structure of optimal solutions for low-thrust non-robust spacecraft trajectories in complex multibody dynamical environments from a global optimization perspective

**Rowley Lab** Aug 2018 - Dec 2021  
*Graduate Research Assistant* *Princeton, NJ*

- Developed a Bayesian algorithm to determine optimal control strategies minimizing the worst-case regret for a linear dynamical system with an unknown system parameter with additive gaussian noise.

## CONFERENCE PUBLICATIONS

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Olson, A., **Sinha, A.**, Chhabra, A., Fry, S., Ahner, K., Beeson, R. (2024) “A Feasibility Study of Microsat Mission Architectures for Ring Science in the Uranian System” AAS/AIAA Space Flight Mechanics Conference, American Astronautical Society, Orlando, FL.

**Sinha, A.**, Beeson, R. (2023) “On Robust Low Thrust Trajectories and Invariant Manifolds” AAS/AIAA Space Flight Mechanics Conference, American Astronautical Society, Big Sky, MT.

**Sinha, A.**, Beeson, R. (2023) “Analysis of Robust Low Thrust Trajectories For The Lunar Gateway” AAS/AIAA Space Flight Mechanics Conference, American Astronautical Society, Big Sky, MT.

Li, A., **Sinha, A.**, Beeson, R. (2023) “Amortized Global Search for Efficient Preliminary Trajectory Design with Deep Generative Models” AAS/AIAA Space Flight Mechanics Conference, American Astronautical Society, Big Sky, MT.

Beeson, R., **Sinha, A.**, Jagannatha, B., Bunce, D., and Carroll, D. (2022) “Dynamically Leveraged Automated Multi-body (N) Trajectory Optimization,” AAS/AIAA Space Flight Mechanics Conference, American Astronautical Society, Charlotte, NC.

Soto, G., **Sinha, A.**, Savransky, D., Delacroix, C., Garrett, D. (2017) “Starshade orbital maneuver study for WFIRST.” SPIE Proc. Techniques and Instrumentation for Detection of Exoplanets VIII

Soto, G., Lloyd, J., Savransky, D., Grogan, K., **Sinha, A.** (2017) “Optimization of high-inclination orbits using planetary flybys for a zodiacal light-imaging mission.” SPIE Proc. Techniques and Instrumentation for Detection of Exoplanets VIII

## JOURNAL PUBLICATIONS

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**Sinha, A.**, Eggl, M., Fefferman, C., Rowley, C.W. (*in preparation*) “Optimal control for a scalar linear dynamical system with unknown parameter.”

## FELLOWSHIPS, AWARDS AND HONORS

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<b>C.V. Starr Fellowship</b> , <i>Merit Fellowship, Princeton University</i> (2020)	<b>\$95,000</b>
<b>Graduate Teaching Fellowship</b> , <i>Merit Fellowship, Princeton University</i> (2020)	<b>N/A</b>
<b>University Administrative Fellowship</b> , <i>Professional Development Fellowship, Princeton University</i> (2019)	<b>\$1,000</b>
<b>Engineering Learning Initiative</b> , <i>Summer Research Fellowship, Cornell University</i> (2015-17)	<b>\$12,000</b>
<b>Cornell University Scholarship</b> , <i>Full-Ride Undergraduate Scholarship, Cornell University</i> (2014-18)	<b>\$320,000</b>

## TEACHING EXPERIENCE

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<b>Graduate Teaching Assistant</b> <i>Princeton University</i>	2018-Present <i>Princeton, NJ</i>
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- MAE 206 (Engineering Dynamics)
- MAE 342 (Space Systems Design)
- MAE 433 (Automatic Control Systems)
- MAE 501 (Mathematical Methods of Engineering Analysis)

<b>Undergraduate Teaching Assistant</b> <i>Cornell University</i>	2014-2018 <i>Ithaca, NY</i>
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- ENGRG 1112 (Practical Computing in Engineering)
- MAE 2210 (Thermodynamics)
- MAE 2030 (Engineering Dynamics)
- MAE 3260 (System Dynamics)

## OUTREACH AND LEADERSHIP EXPERIENCE

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<b>Garden State Youth Correctional Facility, Crosswicks, NJ</b> <i>Instructor (Math): Developed a course for 15 incarcerated youth, arranged 2 workshops to discuss post-graduation career opportunities in STEM, designed multiple team-building activities in collaboration with 50+ volunteers</i>	Aug 2021-Present
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<b>McGraw Center For Teaching and Learning, Princeton, NJ</b> <i>Associate-in-Instruction Training Facilitator: Provided training to 25+ new graduate teaching assistants, led 3 teaching pedagogy workshops, and designed 10+ team-building activities to foster community and enhance teaching skills.</i>	Aug 2021-Present
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<b>Start Smart</b> (a summer program for low-income students from Bangladesh) <i>Co-Founder: Found a non-profit focused on educational advancement, provided college application support for 250+ low-income high school students from Bangladesh securing a cumulative total of \$1 million in financial aid, planned 10+ networking events with industry professionals</i>	May 2020-Present
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<b>Graduate Student Committe (MAE), Princeton, NJ</b> <i>Sustainability Chair: Served as liaison between department and graduate school advocating for environmentally conscious practices (reducing annual energy consumption by 5%), managed programming for 3 sustainability focused events, wrote bi-weekly newsletters to 250+ students and faculty members</i>	Jan 2020-July 2021
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## RELEVANT COURSEWORK

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Classical Mechanics, Dynamical Systems, Optimal Control, Numerical Analysis, Linear Programming, Convex Optimization, Machine Learning

## TECHNICAL STRENGTHS

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<b>Computer Languages</b>	Python, C, C++, Matlab
<b>Tools</b>	Bash, Git, Latex, Mathematica, Jira
<b>Design and Fabrication</b>	Solidworks, ANSYS, Arduino, Raspberry Pi
<b>Research Skills</b>	Classical Mechanics, Dynamical Systems, Optimal Control, Optimization, High Performance Computing, Model Reduction, Time-Series Analysis