Gagandeep **Thapar**

Aerospace Engineer · Software Engineer · Graduate Student

Dublin, CA | San Luis Obispo, CA

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"Get your mass to Mars!"

Summary

Scrappy and detail-oriented Aerospace Engineering Graduate student and former Mission Lead and Lab Manager with 4+ years of aerospace experience and a passion for tackling complex problems. Experienced in both hardware and software development seeking to leverage leadership and technical background to further develop control systems and flight software on launch vehicles. Extremely interested in spacecraft EDL and GNC, software development, and puzzle-solving.

Education

California Polytechnic State University - San Luis Obispo (Cal Poly SLO)

San Luis Obispo, CA

M.S. in Aerospace Engineering w/ Minor in Computer Science; 3.94 GPA; continuing to PhD — *Jun. 2023*

- **Thesis:** Development of the Measurement Process Model for Star Trackers and Characterization of Error Propagation and Extended Kalman Filtering for LEO Spacecraft
- Proficient in: **MATLAB**, Simulink, **Python**, **C**, C++, Java, **Control Theory and Application**, **Orbital Mechanics**, Spacecraft Dynamics, SQL, JavaScript, Hardware-in-the-loop testing, Microcontrollers, Systems Engineering

Work and Research Experience

Star Tracker Project Lead | Software Engineer

San Luis Obispo, CA

Cal Poly CubeSat Laboratory — *Apr. 2022 - Current*

- Project Lead for R&D project to design and develop **low-cost, low-volume, open-source star tracker** for CubeSats
- Managed team of **5+ students** to determine schedule, requirements, end goals, and work through system design and development phase of the star tracker project
- Wrote ground support equipment in **Python** to robustly generate simulated images of the celestial sphere given system properties
- Wrote ground support equipment in **Python** to generate guide star catalogs for identification algorithms
- Wrote centroiding algorithms in **Python and C** to determine star centers in simulated and night-sky testing images
- Analyzed error propagation given centroiding algorithms, identification algorithms, probablistic environment, and hardware selection via **Monte Carlo Analysis** to generate estimated accuracy of a given system
- Designed **unit-testing** for all low-level functions used for centroiding and identification algorithms
- Directed high-level **hardware testing processes** to analyze and minimize hot spots, noise, distortion, and dark current within hardware suite
- Led system-level integration to run **hardware-in-the-loop testing** in lab-based and night-sky conditions

Software Engineering/Process Development Associate Engineer

Hawthorne, CA

SpaceX — *Jun. 2022 - Sept. 2022*

- Associate Engineering Intern working to develop and optimize internal tools for the Build and Reliability Engineering and Production teams
- Created a tool in **Python/JavaScript/SQL** to track **10,000+ alternate part qualifications and performance life measures** to analyze and determine flight-ready components; this was previously untraceable and eventually kicked off a major qualification campaign
- Worked to integrate new data-viewing/analysis tool for the company **in Python** to replace the original model; included porting existing functionality, analyzing potential use cases, developing maintainable code, and writing new features and test cases
- Created feature in **Python/JavaScript/SQL** to run containment analysis on non-serialized parts through manufacturer barcodes allowing a **10x+** increase in search space and **60x decrease** in time required to run an analysis
- Updated critical backend calls to optimize performance resulting in a **90% time** reduction to return results

Systems Architecture and Analysis Intern [Top Secret]

Redondo Beach, CA

Northrop Grumman — *Jun. 2021 - Sept. 2021*

- Highly autonomous Top Secret intern developing internal tools after studying the System Engineering team workflow to identify key needs
- Developed modular internal tool with **10,000+ lines of code** in **MATLAB** to dictate ECR Approval Process depending on classification, relevant documentation, appropriate threads, and hundreds of various interdependencies **cutting identification time by 97%**
- Wrote **700+ lines of code** to develop internal tool in a **C-based language** to streamline ECR (Engineering Change Request) Board approvals and automate metric tracking
- Wrote **500+ lines of Python code** to create an internal tool to track TBX entries and automate TBX metric tracking and visualization for management and customer consumption

Cal Poly CubeSat Lab Manager

San Luis Obispo, CA

Cal Poly CubeSat Laboratory

Apr. 2020 - Jun. 2022

- Manager for Cal Poly CubeSat Laboratory with **100+ active members** and **10+ industry partners**
- Led restructuring efforts in Lab to group satellite development based on subsystems rather than major focus
- Fostered greater interest research and development programs to supplement student education and develop CubeSat technologies e.g., low-cost reaction wheels and star trackers
- Point of Contact for any external communications with other students, different schools, and other companies
- Point of contact for **15+ Mission and Team Leads** to gather updates, give direction, and represent staff updates
- Manage and supervise lab-wide events such as Leads Meetings, Lab-Wide Meetings, recruitment efforts, and CubeSat Developer's Workshop

XCube Mission Lead | Lead Systems Engineer

San Luis Obispo, CA

Cal Poly CubeSat Laboratory

Sep. 2019 - Jun. 2021

- Mission Lead for joint project with USRA and NASA to design and create a new platform for airborne science experiments and intra-orbital CubeSat testing on ER-2 and other high-altitude aircraft
- Managed team of **10+ students for the $100,000+ project** through requirements development, design, review, manufacturing, assembly, integration, test, and delivery phases during the COVID pandemic
- Regularly reported to NASA and USRA the progress of the project with an emphasis on reviewing past work and presenting future work and rationale
- Aided structures team in modeling the system in coordinance with the requirements and given specifications
- Wrote and ran **40+ procedures** as I directed go/no-go gates and led the assembly, integration, delivery efforts
- Acted as main point of contact for any design-based decisions regarding the structure, operations, and top-level electrical functions
- Ran testing with the electronics team on high-power board (up to 500W), multi-channel communications board (SPI, I2C, SERIAL, ETHERNET), and actuator deployment board
- Developed and managed system level requirements for the XCube System

Aerospace Engineer

San Luis Obispo, CA

Cal Poly CubeSat Laboratory

May 2019 - Current

- Developed spacecraft pose (position and attitude) analysis and visualization tools for potential flight missions in MATLAB
- Developed spacecraft deorbit analysis and visualization tools for potential flight missions in MATLAB
- Directed various test procedures such as vibration testing, thermal vacuum testing, and thermal bakeout testing for CubeSats in preparation for launch and operations
- Assemble delicate and mission critical flight hardware in clean rooms in preparation for launch

IRAD Systems Engineering Intern

Torrance, CA

Moog Inc

Jun. 2020 - Aug. 2020

- Systems Engineering Intern on IRAD (Independent Research and Development) program with Moog Aircraft Group developing new product in an unsaturated market for military use
- Developed generic and customer-specific system-level architecture for brand new product line using programs such as Visio, Microsoft Office, etc.
- Leveraged IBM DOORS to develop, track, and manage 1000+ requirements
- Reviewed, cross-referenced, and validated 1000+ requirements to ensure consistency and intent across the multiple designs
- Utilized Subversion (Tortoise SVN) to store, track, and share relevant material
- Independently researched 10+ MIL-spec standards and ICDs (Interface Control Documents) to develop valid and useful requirements

Projects

Pinpoint Rocket Landing

Software Development | Simulation

- Followed direction laid out in *Convex Optimization for Trajectory Generation*, Malyuta et al., to simulate pinpoint rocket landings with variable mass and initial conditions
- Presented work to graduate spacecraft controls class and gave brief introduction/lecture on Convex Optimization (LCvx) and application

Star Tracker Centroiding

Software Development

- Developed multiple approaches to determine star centroids in a given star tracker image capture e.g., center-of-mass approach and subpixel analysis as seen in *A Novel Systematic Error Compensation Algorithm Based on Least Squares Support Vector Regression for Star Sensor Image Centroid Estimation*, Yang et al.
- Developing Convolutional Neural Network (CNN) to determine center of stars with extreme accuracy and precision given ground truth data
- Surveying multiple centroiding algorithms to analyze optimal approach to implement onboard CubeSat flight stack while balancing accuracy, memory, and computation constraints

CubeSat/Spacecraft Dynamics Simulator

Software Development | Simulation

- Simulated control of spacecraft attitude in orbit in **MATLAB and Simulink**
- Implemented different control strategies using different actuators e.g., reaction wheels, control moment gyros, and bang-bang thruster control
- Implemented quaternion-based attitude determination knowledge via **Norm-Constrained Extended Kalman Filter** as described in *Spacecraft Dynamics and Control*, De Ruiter et al.