Soham Shirish Phanse | **19D170030**
Aerospace Engineering | **B.Tech.**
Indian Institute of Technology Bombay | **Gender: Male**
DOB: 26/11/2000

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2023	8.99
Intermediate	Maharashtra State Board	Mahila Samiti Jr. College	2018	92.46%
Matriculation	Maharashtra State Board	VidyaNiketan High School	2016	95.80%

Pursuing **honors** in **Aerospace Engineering** and a **minor** degree in **Artificial Intelligence** and **Data Science**

Scholastic Achievements

- Offered **MITACS Globalink Graduate Fellowship** of $15,000 for graduate studies in Canada *('21)*
- Awarded **MITACS Globalink Research Internship Award** of $8,900 for a Summer Research Internship in Canada *('21)*
- Selected among the **Top 23** finalists for the prestigious **Honda Y-E-S Award** from **345** applicants from **6 IITs** *('21)*
- Awarded **Undergraduate Research Award** for developing a System Dynamics framework to model India's energy use *('21)*
- Ranked **6th** among **70+** Final year BTech students in the Department of Aerospace Engineering *(Present)*
- Secured a merit-based **Branch Change** to Aerospace Engineering awarded to **10% among 1000+** students *('20)*

International Experience

Visiting Undergraduate Research Scholar
Toronto, Ontario, Canada

Prof. Hugh Liu, Institute of Aerospace Studies, University of Toronto *(May '22 - Jul '22)*

- Integrated **Octarotor T-15**, designed trajectories with **QGroundControl** and performed flight testing for verification
- Designed, manufactured and successfully tested an **innovative**, **repeatable**, **modular** and water sampling assembly
- Demonstrated autonomous and assisted flight and water sampling at Queen's University Biological Station

Technical Skills

Programming	Python (scipy, matplotlib, seaborn, pandas, sklearn, pytorch, FEniCS, control, pyPortfolioOpt), C++
Softwares	MATLAB, Vensim, QGroundControl, GitHub, Capella, LaTeX, Google-Office
Product Design	SolidWorks, ANSYS Workbench, AutoCAD, Mechanism design, 3D printing

Leadership

IIT Bombay Student Satellite Program
A 70-member student team dedicated to converting IIT Bombay into a center of excellence in Space Technology

- **Systems Engineer Lead** *(Dec '21 - Present)*
  - **Leading** an interdisciplinary 3-tier team of **60+** members across 5 subsystems to build Cubesat and allied subsystems
  - Designed a business proposal to acquire a fund of **$35k** for CubeSat development from **LnT Infotech** and **IIT Bombay**
  - Led a **3 step** recruitment process to select 60+ **students** for the team out of **250+ applicants**
- **Mechanical Subsystem Lead** *(Jul '21 - Present)*
  - Compiled rigorous **Quality Assurance** and **Version Control** practices for SolidWorks and ANSYS
  - Prototyped the module with 3D printing to analyse manufacturing defects and performed structural simulations and tests
  - Designed the star tracker structural configuration and a setup to calculate sun exclusion angle of the optical baffle

Department Academic Mentor | Student Mentorship Program, IIT Bombay *(Jul '21 - Aug '22)*

- Entrusted with the responsibility to monitor the academic performance of **6 second-year** undergraduate students
- Involved in bridging the student-faculty gap, enhancing the academic experience in a team of 23 student mentors

Manager, Control & Dynamical Systems Student Reading Group *(Jul '21 - Aug '22)*

- Arranged multiple talks, workshops by eminent speakers based on Control Theory, Optimization, Dynamical Systems by senior students, alumni and professors for knowledge sharing and fostering interest within the student community
- Created a **new website** for documenting past events and and building an online presence for interested students

Publications and Conferences

- Banzal N., **Phanse S.** et al, "AstrIS: An Astronomical Image Simulation framework for Star Tracker verification" poster accepted in **SmallSat 2022**, Utah State University, Logan, Utah, United States *('22)*
- Presented 'Star Tracker Design for Nano-Satellite Applications (Poster and Project Competition)' and was awarded **third prize** at the **International Conference on Small Satellites** (Jalandhar, India), Apr 28-30, 2022 *('22)*
- **Soham Phanse** (2021), "BIG Data Analysis of NASA's 5 Millennium Solar Eclipse Database (v1.0)" Zenodo. https://doi.org/10.5281/zenodo.5809996 *('21)*
- Katla V., **Phanse S.** et al, "An Approach to Star Tracker Design for Nano-Satellite Applications" (extended abstract) presented in **National Conference on Small Satellite Technology & Applications**, India, 2020 *('20)*

Key Technical Projects

Big Data Analysis of NASA's 5 Millennium Solar Eclipse Database *(Mar '21 - Nov '21)*
Course Project |Guides: Profs. Amuthan R., Prabhu R., Amit S., Sunita S., Manjesh H., Sudarshan S. - DS203 Data Analysis

- Visualized data effectively, computed **sampling distributions**, **confidence intervals** & performed **Hypothesis testing**
- Performed **Regression** on various parameters and implemented **K-means clustering** to analyse the data

Portfolio Optimization for Efficient Investment *(Jan '22 - Apr '22)*
Course Project | Guide: Prof. Abhijit Gogulapati - AE755 Optimization for Engineering Design

- Implemented **Markowitz's Critical Line Algorithm** to find the efficient investment frontier for minimum risk
- Benchmarked the results with help of **PyPortfolioOpt** library to find the Constrained Minimum Variance Frontier

System Dynamics Modelling Framework for Industrial Energy Use *(Jun '20 - Jul '21)*
Research Project | Guide: Prof. Rangan Banerjee, Director, IIT Delhi

- Constructed a **systems theory-based framework** to analyze industrial energy use trends across different sectors
- Implemented **Process Flow**, and **Sankey** diagrams to depict energy balances of steel, aluminium and paper industries
- Formulated discrete-time governing equations and created **Causal Loop Diagrams** for dynamic modelling of energy usage with a case of **Population Dynamics** and energy use trends of IIT Bombay campus

Control System Design *(Jul '21 - Nov '21)*
Course Project | Guide: Prof. Arnab Maity - AE308 Control Theory

- Designed multiple **Lead Compensators** to satisfy the system specifications like **overshoot** and **settling time**
- Designed and implemented a **PI** controller to produce a system output with **zero steady state error** for various inputs

Structural Design Optimization with FEniCS *(Oct '20 - Jun '21)*
Research Project | Guide: Prof. Amuthan Ramabathiran, Professor, IIT Bombay

- Implemented **Finite Difference**, **Euler**, **Finite Element** methods for ODE and PDEs in **Python**
- Explored **Calculus of Variations**, **Functional Optimization** with Euler-Lagrange equations and applied it to **Shape** and **Topology** Optimisation problems like compliance minimisation of a cantilever beam

Systems Engineering Analysis of Autonomous Surveillance System *(Jan '21 - May '21)*
Course Project | Guide: Prof. Hemendra A., Dr. Ramakrishnan R. (Honeywell) - AE759 Systems Engineering Principles

- Conceptualised multiple architectures for the system and finalised one with help of **Decision Matrices**
- Formulated exhaustive **functional** and **performance** requirements and a **testing plan** with bi-directional traceability
- Implemented Operational Capabilities, System Architecture and Operational Scenario Diagrams in **Capella**

Flight Dynamics Analysis of NAVION *(Jan '22 - Apr '22)*
Course Project | Guide: Prof. Shashi Ranjan Kumar - AE305 Flight Dynamics

- Calculated the lateral and longitudinal **dynamic modes** and **eigenvalues** of the aircraft
- Analyzed system response and designed a **PID** controller for stabilising the pitch attitude

PSLV Rocket Engine Analysis *(Aug '21 - Nov '21)*
Course Project | Guide: Prof. Hrishikesh Gadgil - AE330 Aerospace Propulsion

- Analysed the stage configuration of the **PSLV** and calculated mass ratios for each of the 4 stages
- Studied the Burn Profile, Propellent Grain Configuration of the motor and nozzle geometry of all stages
- Calculated performance parameters for Solid and Liquid Rocket Engine Thrust chambers & Feed systems

Spacecraft Trajectory Planning and Analysis *(Jan '21 - Apr '21)*
Course Project | Guide: Prof. Ashok Joshi - AE240 Spaceflight Mechanics

- Analyzed specifications of **Space Shuttle** Mission STS-51G and orbital parameters of payload **ArabSat-1B**
- Designed a burn profile and a constrained trajectory with **Constant Pitch Rate Gravity turn** trajectories
- Simulated Orbital Maneuvers like **Hoffman Transfers**, and **Plane Change** maneuvers for ArabSat-1B in Python

Extra-curricular Activities

Public Speaking

- Delivered a talk to 80+ students on '**Systems Engineering and Project Management**' and applications *('22)*
- Interviewed by the Editorial Team of Magazine '**Shaastra'** - the annual technical magazine of **IIT Madras** on **Emerging Space Technologies** and role of Student Satellite Teams in the current space scenario *('22)*
- Organised a day-long workshop and delivered a talk on '**Structural Design of Ground Station**' for equipping **150 participants** from **40+ universities** to set up a ground station for satellite reception *('21)*
- Guided 70+ freshman year undergraduates to evaluate career options and help select the engineering major *('21)*

Miscellaneous

- Developed a **blog on Systems Theory** to share experience and knowledge with community *(May '22 - Present)*
- Devoted **80** hrs of service towards **environment** and **sustainability** under **National Service Scheme**, IITB *('19 - '20)*
- Volunteered as a mentor for **Student Solar Workshop - 2019**, a program to train students to assemble solar study lamp and resulted in a **Guinness World Record** for lighting 6800+ solar lamps simultaneously *('19)*
- Volunteered as a Mentor for **Glider-Making** Workshop of Aeromodelling Club of IIT Bombay for freshmen *('20)*
- Learned playing acoustic **Guitar** in a 3-year long course and **Harmonium** via self study *('13 - '15, '20)*