Shubham Kishor Kalpande | **160010018**
Aerospace Engineering | **Dual Degree (B.Tech. + M.Tech.)**
Indian Institute of Technology, Bombay | **Gender: Male**
Specialization: Dynamics and Control | **DOB: 06-06-1998**

Examination	University	Institute	Year
Graduation	IIT Bombay	IIT Bombay	2021

- Pursuing a **Minor** degree in the **Electrical Engineering Department**, IIT Bombay

SCHOLASTIC ACHIEVEMENTS

- **Department Rank 2** in the Dual Degree batch
- Recipient of **AP** grade in **Spaceflight** & **Flight Mechanics** courses
- Awarded **Institute Academic Prize** for ranking $\mathbf{1^{st}}$ in the department with a CPI of **9.68** for the academic year 2018-19

PROFESSIONAL EXPERIENCE

Parameter Tuning for Control of Non-linear System | *TCS Research and Innovation* *(May'19 - Jul'19)*

- Designed a **Lyapunov**-based parameter tuning law for a controller to maintain the desired high amplitude oscillations
- Validated robustness of the model in **off-design conditions** (**up to 5%**) & proved limit-cycle's stability by simulations
- Exploited amplification properties of Hopf bifurcation in biological systems to identify parameter-range using **AUTO**

Localisation Aids for Inertial Navigation | *TCS Research and Innovation* *(May'20 - Jul'20)*

- Modelled an IMU Simulator to create repeatable test data for designing a sensor placement scheme along a trajectory
- Utilized **Extended Kalman filter** to remove noise from raw data & designed a **PI controller** for heading alignment
- Achieved a **100 order magnitude reduction** in the lateral deviation forming a baseline strategy for node placement

RESEARCH EXPOSURE

Navigation in GNSS denied regions | *Master's Thesis* *(Jul'20 - Present)*

- Modelling Ultra-wideband radios to incorporate time-based ranging protocols for position tracking of mobile nodes
- Designing an algorithm to deploy a local positioning sensor network having potential application in defence sector

Optimal Placement of Sensor nodes | *Supervised Learning Project* *(Jan'20 - May'20)*

- Implemented **Simulated Annealing algorithm** to optimally place sensors for trilateration based target localisation
- Proposed a novel methodology based on **Equilateral Triangle Tessellation** for sensor placement on square fields
- Demonstrated a **greedy algorithm** for serial sensor deployment in GPS-denied areas via simulations on **MATLAB**

Optogenetic Control of a Biological System | *Bachelor's Thesis Project 2* *(Jul'19 - Nov'19)*

- Modelled actuator dynamics by a 2^{nd} order system to account for the interaction of light with photosensitive proteins
- Formulated a **light-based feedback controller** by simplifying a non-linear control-law to a bang-bang formulation
- Exhibited the use of optogenetics for **regulating pathways** that can treat diseases like cancer via **Octave** simulations

KEY ACADEMIC PROJECTS

Trajectory Simulation of Sentinel-3A Satellite Launch | *Spaceflight Mechanics* *(Mar'18 - Apr'18)*

- Achieved precise mission parameters using **Maple** and proposed a model to **reduce** the fuel consumption by **45**%

Data Analysis of 2016 USA Presidential Elections | *Data Analysis and Interpretation* *(Apr'17 - May'17)*

- Worked in a team of 4 and analysed the vote distribution for different demographics using **Pandas** package of Python

POSITIONS OF RESPONSIBILITY

Core Team Member | *Manch 2.0: An initiative by Deutsche Bank & Gender Cell, IIT Bombay* *(Jul'18 - Apr'19)*

- Part of the inaugural core team; Implemented targeted publicity leading to over **75% y-o-y** increase in applications
- Executed operations of **7 workshops** & **networking events** by coordinating with IIT-B & Deutsche Bank's organisers

Graduate Teaching Assistant | *Modelling and Simulation* *(Aug'19 - Present)*

- Assisting the faculty in exam evaluation, and virtually conducting tests and tutorials to encourage problem-solving
- Responsible for guiding 60+ students to engage with and understand course material to perform academically well

EXTRA CURRICULAR ACTIVITIES

- Represented IIT Bombay as part of the institute's contingent at the $\mathbf{8^{th}}$ **Inter-IIT Tech Meet** held at IIT Roorkee *('19)*
- Volunteered to attend camps organized by the **Group for Rural Activities**, IIT Bombay to gain rural exposure *('18)*
- Secured $\mathbf{1^{st}}$ position in the Inter Hostel Cross Country General Championship as a part of the Hostel 7 team *('18)*
- Volunteered for the **National Service Scheme** and completed **80** hours of community service in Green Campus *('17)*

Scholastic achievements and extracurricular activities are not verified by the Placement Cell