K T Prajwal **Prathiksh**

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"The future is not to be forecast, but created..."

Education

2018 - 2023* **Dual Degree (B Tech + M Tech)**, *Department of Aerospace Engineering, Indian Institute of Technology, Bombay, Mumbai, India - GPA 8.87/10.0*

2018 **Intermediate**, *JSS Public School, Bangalore, India - 95.60%*

2016 **Matriculation**, *Chinmaya Vidyalaya, Bangalore, India - 97.16%*

Internships

University of Waterloo

Waterloo, ON, Canada

MITACS Globalink Research Intern — *May 2022 - Jul 2022*

Objective: To investigate the abilities and limitations of **steering** in a bacterium-like microswimmer as a candidate for **biomedical microrobots**

- Performed a **parametric sweep analysis** of the body forces acting on various kinds of swimmer configurations in complex magnetic fields
- Decomposed the **propulsive forces** acting on a bi-flagellated swimmer using **DFT** to elucidate the process behind the super-helical trajectories
- Awarded a **fully funded** Research Internship opportunity among **8K+** international undergraduate applicants in a highly competitive program

Anheuser-Busch InBev

Bangalore, KA, India

Data Scientist - B.R.E.W Intern — *May 2021 - Jul 2021*

Objective: To reduce the **variable logistics costs** (VLC) for the **UK** and **Russian** markets, by linking underutilized shipments and creating optimum multi-load routes that adhere to business rules

- Designed **modular** python code using **open-source tools** to obtain optimized loads from underutilized shipments, and plan routes for using real-time geographical data
- Incorporated various **business and user constraints** such as vehicle capacity, geographical priorities, one-way/round-trip requirements, freight charge and maximum transport distance and time
- Achieved a **67%** improvement in load-linking efficiency, resulting in **8%** and **10%** reduction in the **number of trucks** and **VLC costs** respectively
- Packaged the code as a **stand-alone executable application**, along with an **interactive documentation** view for easy access to the end-user

Technical Projects

Turbulence Modelling for Smoothed Particle Hydrodynamics

Guide: *Prof. Prabhu Ramachandran, Department of Aerospace Engineering, IIT Bombay* — *Jul 2022 - Present*

Objective: To survey the current state of the art **turbulence models in SPH** and subsequently develop **general-purpose** turbulent models based on accurate SPH schemes and post-processing tools on an **open-source platform**

- Surveyed **75+** research papers on the topic of turbulence modelling in SPH, and **prepared** a classification involving **6 major groups**, while having documented the advantages and limitations of each models through a comparative analysis
- Identified key **benchmark problems**, and appropriate SPH schemes that are **accurate and convergent** in order to identify the drawbacks of each model while maintaining **reproducibility**
- Developing **post-processing** and **automation** tools for PySPH, Compyle, and Automan in order for SPH to be a competitive tool against CFD solvers

IIT Bombay Student Satellite Program

A 70-member student team dedicated to the vision of making IIT Bombay a centre of excellence in space technology — *Feb 2019 - Mar 2022*

System Head: Star-Tracker-based Attitude Determination System (STADS)

A CubeSat-compatible attitude determination system, to be tested onboard ISRO's PS4-OP

- Surveyed **star-matching** algorithms based on the performance and accuracy constraints of STADS, for the identification of guide stars from the centroids of stars on an image
- Implemented **4-Star Matching** Method with a novel verification step to reduce the number of false matches, resulting in a reduction by **85%**
- Contributed to the **quality-assured** Open Loop Simulation framework, which simulates space environmental conditions to test the flight code and algorithmic blocks of STADS

Controls Engineer: Advitiy

Advitiy is the 2^{nd} satellite by IITBSSP, a technically advanced and efficient version of the first, Pratham

- Compared the accuracy and robustness of **Cowel's method** against Simplified General Perturbations Model 4 for orbit-propagation of a **Low-Earth-Orbit Satellite** in Python
- Implemented Cowel's method with a drag model and verified the results against the data from GMAT, an open-source tool developed by NASA

Numerical study of SPH integrators for incompressible flow

Guide: *Prof. Prabhu Ramachandran, Department of Aerospace Engineering, IIT Bombay* *Dec 2020 - Present*

Objective: To study the effects of **numerical time-discretization schemes** on stability, accuracy and order of convergence (OOC) in **Smoothed Particle Hydrodynamics** (SPH)

- Studied various numerical time-integrators which comprised of the **Runge-Kutta**, the **Symplectic**, and the **Multi-step** classes of integrators
- Developed code to aid **reproducibility** and **multi-threaded automation** of all tests and comparison of their performance metrics for all the time-integrators against benchmark cases such as the Harmonic Oscillator, Lennard-Jones Oscillator and Taylor-Green Vortex (TGV) problems
- Studying the effects of **Courant–Friedrichs–Lewy** (CFL) number and spatial-discretization schemes of SPH on the OOC of the time-integrators

Path Optimization for Combinatorial Problems

Guide: *Prof. Abhijit Gogulapati, Department of Aerospace Engineering, IIT Bombay* *Jan 2021 - Apr 2021*

Objective: To develop multiple **optimization tools** in order to solve a modified variant of the **travelling-salesman problem** in the context of a tourist in the **Louvre Museum**

- Devised and coded **heuristic**, **evolutionary** and **exact** algorithms for the optimization of **integer programming problems**
- Performed comparative analysis of **Genetic**, **Ant Colony**, **Simulated Annealing** and **Branch & Bound** methods to find the most **holistic tour** considering the **satisfaction** of a tourist
- Compared the algorithms on metrics such as **efficiency**, **reliability** and **quality** of solution, after validating it against TSP library test cases

Positions of Responsibility

Manager, Controls & Dynamical Systems Student Reading Group (CDS-SRG)

Institute Technical Council, IIT Bombay *Mar 2020 - Mar 2021*

- Conceptualized and organized a **series of introductory lectures** and **research talks** by students and professors to introduce newcomers to key concepts in control theory such as PID control, Kalman filtering and their industrial applications
- Ideated and coordinated the **Summer Learning Projects-2020**, which provided a platform for **20+** students to work collaboratively on various fundamental topics of control theory, and their implementation on MATLAB for simple benchmark problems
- Managed and tailored content for the CDS-SRG FB page with a reach over 2500+ students

Institute Student Mentor

Student Mentor Program, IIT Bombay *Jul 2020 - Jun 2021*

- One of the only **12** third-year undergraduate students selected via a rigorous procedure comprising of **SOP**, **peer reviews** and **interviews**, to mentor a group of incoming first-year undergraduate students amongst a batch of **1000+**
- Mentored a group of **14** students to provide the necessary support, academic and otherwise

Prevention of Sexual Harassment (PoSH) Member

Gender Cell, IIT Bombay *Jun 2019 - Jul 2020*

- Attended a **two-day** training workshop conducted by PoSH at Work on understanding *Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013* and creating awareness about it
- Conducted sessions on **gender sensitization**, and the institute's policy on sexual harassment and its redressal on behalf of the Gender Cell for **100+** first-year undergraduate students

Publications

- Jan 2021 — Ranade, A.R., **Prathiksh, K.**, et al. *"Survey and Analysis of Payloads for Missions on PSLV's Orbital Platform."* presented in the AIAA SciTech Forum 2021, Nashville, TN
- Dec 2020 — Katla V., **Prathiksh, K.**, et al. *"An Approach to Star Tracker Design for Nano-Satellite Application"* presented in National Conference on Small Satellite Technology and Applications 2020, Trivandrum, India

Achievements

- 2016 — Recipient of National Talent Search Examination Scholarship (NTSE) given by NCERT, India
- Aug 2018 — Secured First place in EnB Buzz - 2018 Competition out of 100+ teams for exceptional performance in presenting a fictitious business idea and a corresponding Business Model Canvas (BMC)

Extracurricular Activities

- 2018 - 2019 — Conducted classes on interactive science experiments for underprivileged school students under NSS Prayog (Middle School) and NSS Asha initiative (High School) with NGO Asha
- Jun 2020 — Authored an article titled "**Biomimicry**" which was featured in the Airspace magazine - India's first national student magazine on aerospace engineering by the students of IIT Bombay
- Jan 2020 — Co-authored a **white paper** as a GGI Fellow 2021 titled "Internationalisation of Higher Education in India 2021"