ANKIT CHOUDHARY	**160010034**
Aerospace Engineering	Dual Degree (B.Tech. + M.Tech.)
Indian Institute of Technology, Bombay	Gender: Male
Specialization: Aerospace Propulsion	DOB: 24-09-1998

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2021	
Intermediate	CBSE	Army Public School, Meerut	2015	91.60%
Matriculation	CBSE	Army Public School, Meerut	2013	9.8

SCHOLASTIC ACHIEVEMENTS

- Currently ranked **1st** in the dual degree batch of Aerospace engineering department, IIT Bombay   ['20]
- Grabbed **1st** position **among 11 teams** in ASME-SDC robot pentathlon & received **USD 500** prize money   ['17]
- Recipient of the **institute academic prize** for ranking **2nd** in the department for the academic year 2017-18
- Awarded **AP grade** for outstanding performance in **Spaceflight mechanics** course among **70** students   ['18]

INTERNSHIP

Bifurcation analysis of flapping wing kinematics
Research Internship

TCS research & innovation, Pune   May'19 - Jul'19

- Simulated **longitudinal dynamics** of the flapping wing with variable tail sizes for gliding trajectory on **OCTAVE**
- Demonstrated **period doubling cascade** (chaos) in longitudinal dynamics by bifurcation analysis on **Auto-07p**
- Achieved stable longitudinal dynamics by applying **Linear Quadratic Regulator** optimal control at trim conditions

TECHNICAL PROJECT

Robot pentathlon
Innovation Cell, IIT-B

American Society of Mechanical Engineers - Student Design Competition   Sep'16 - Mar'17

- Fabricated a bot in a **team of 22 members**, which can throw a ball, sprint, climb stairs, hit a golf ball & lift weight
- Designed complete **electrical** system - **PCB**'s (**Eagle**), routing, soldering, heat shielding & power management
- Implemented **closed loop PID** controls to stabilize the locomotion using digital **encoders** & motor **drivers**
- Applied **RC module** to control the locomotion using **Arduino** & also designed the prototype system in SolidWorks

RESEARCH EXPERIENCE

Dimensionality reduction algorithm - DMD
Supervised Learning Project

Guide : Prof. Vineeth Nair   Jan'20 - June'20

- Filtered moving objects from static background by **Dynamic Mode Decomposition** (DMD) on traffic footages
- Confirmed presence of **acoustic** & **hydrodynamic** instability by DMD of chemiluminescence images of combustor
- **Optimized** DMD code for handling matrix computation of large matrices (**48M entries**) on **MATLAB**

Pulsation Dynamics of Rocket Injector
Bachelor's Thesis Phase 2

Guide : Prof. Hrishikesh Gadgil   Aug'19 - Nov'19

- Conducted **experiments** on **rocket injector** with co-swirling, counter-swirling and non-swirling gas for pulsation
- Analyzed images from over **100 test** cases at **8000 FPS** using **ImajeJ** & MATLAB for characteristics analysis
- Determined dominant frequency of pulsation by performing **Fourier transform** on time series, near orifice jet width

Flow Regimes of Rocket Injector
Bachelor's Thesis Phase 1

Guide : Prof. Hrishikesh Gadgil   Jan'19 - April'19

- Designed on **SolidWorks** & fabricated industrially by **3D printing**, a **Gas Centered Swirl Coaxial** (GCSC) rocket injector to facilitate **swirling gas** motion for effective atomization & mixing characteristics of propellants.
- Executed **CFD** using Solidworks **flow simulation** on injector to check design for desired swirling gas motion
- Performed cold flow **experimental** studies to understand distinguished operational flow regimes of GCSC injector

ACADEMIC PROJECTS

Particle methods | *Guide: Prof. Prabhu Ramachandran*
Jan'20 - May'20

- **Python** to mimic **vortex sheet roll up** & **merging** problem using **Krasny's blob** to achieve smooth simulations
- Grid free **panel method** using **random vortex** technique to simulate **viscous flow** past a circular cylinder
- Applied **smooth particle hydrodynamics** approximation to simulate **Laney's** & **Sod's shock tube** problem

Computational aeroacoustics | *Guide: Prof. Aniruddh Sinha* Jan'20 - May'20

- Numerically animated **2-D Gaussian acoustic pulse** on base flow with **radiation & outflow** boundary conditions
- Calculated **power spectral density** of pressure fluctuations from a **Kirchhoff surface** at different observer location
- Deployed 7-point **DRP** for spatial and 4-step **optimized time** discretization stencil to solve **1D convection** problem

Numerical methods for conservation laws | *Guide: Prof. Avijit Chatterjee* Aug'19 - Nov'19

- Numerically solved **scalar advection** & **Traffic equation** using first & second-order central flux difference schemes
- Simulated system of **linear acoustic equation** for their characteristics of reflection & transmission at boundaries
- Mimicked **shallow water-dam break** & **inviscid Euler-shock tube** problem using flux difference schemes

Finite element method | *Guide: Prof. PJ Guruprasad* Aug'19 - Nov'19

- Computationally solved **2D Laplace** & **Poisson's problem** using square grid & cubic Hermite interpolation function
- Developed a numerical code to solve **2D truss** problem for nodal displacements & elemental forces in the system
- Calculated stiffness matrix, nodal displacement & element forces in MATLAB for system of spring elements in 1D

Controller design | *Guide: Prof. Ashok Joshi* Aug'18 - Nov'18

- Designed controller for rollers of steel mills using **root Locus** & **bode plots** by changing gain & pole placement
- Achieved constraint of desired damping ratios, peak overshoot, settling time, bandwidth & ramp error constants

Simulation of space Mission | *Guide: Prof. Ashok Joshi* Jan'18 - April'18

- Replicated **NASA's lunar prospector** mission with multi-stages, Hoffman transfer, orbit insertion on MATLAB
- Deployed constant pitch for ascent mission thereby reducing drag & achieved **99%** adjacency to actual mission

Visualisation of streamlines | *Guide: Prof. Aniruddha Sinha* Aug'17 - Nov'17

- Unfolded **stream function** & **velocity potential** governing equations of inviscid flow with Python **numPy** library
- Graphed streamlines, equipotential lines & stagnation point around infinitely long cylinders with **varying circulation**

Data-analysis | *Guide: Prof. Prabhu Ramachandran* Jan'17 - April'17

- Collaborated with a **team of 5** to analyse **human resource** data set from **kaggle** using Python **seaborn** package
- Formulated **28 correlation** among attributes of employees & also **expounded** the project in a class of **60** people

KEY COURSES

Mathematics :	Real analysis, Introduction to numerical analysis, Calculus, Linear algebra, Differential equations
Computational :	Particle methods for fluid flow simulation, Numerical methods for conservation laws, FEM
Fluids :	Aeroacoustics, Continuum mechanics, Introduction to interfacial Waves, Essentials of turbulence
Miscellaneous :	Introduction to Indian astronomy, Economics, Psychology, Environmental science

TECHNICAL STRENGTHS

Programming : Python, C++ **Softwares :** SolidWorks, AutoCAD, MATLAB, ImageJ, Eagle

POSITION OF RESPONSIBILITY

Teaching assistant | *Thermodynamics & Propulsion* Present

- Moderator for **live** interactive sessions among **70+** students on Microsoft Teams & troubleshooting technical issues

Team member | *UMIC - Innovation cell IITB* Sept '16 - May'17

- Showcased technical projects in **Tech & Rnd** exposition '17 & answered technical queries regarding projects
- Assisted in designing questions papers & conducting **recruitment exams** for the new batch to UMIC

Student representative | *Annual General Meeting (AGM) of Aeronautical Society of India (AeSI)* Oct'16

- Assisted the director of AEA (Aerospace engineering association) in movie screening, alumnus talks & guest lectures
- Awarded **certificate of appreciation** for volunteering as an AEA member in the successful conduct of the AGM

EXTRA CURRICULAR ACTIVITES

- Completed **positive thinker** course conducted by **Vedic Oasis for Inspiration Culture & Education** *('18)*
- Successfully completed workshop in application of classical control & engineering to robotics at IIT Kanpur *('17)*
- Participated in **cashless transaction drive** in slums of Powai & made people aware of internet banking *('17)*
- Volunteered for **NSS** to taught in NGO schools about sustainability development & renewable resources *('16)*