Completed a Minor Degree in **Artificial Intelligence** and **Data Science** under the department of C-MInDS, IIT Bombay

PUBLICATIONS

- **Y. Bhake**, A. Anand and P. Rao, "Melodic And Metrical Elements of Expressiveness in Hindustani Vocal Music", Proc. of **ISMIR 2025**, Daejeon, **Korea**. For **generative modeling** in expressive classical music | Received **author grants**
- **Y. Bhake** and P. Rao, "Expressive Timing in Hindustani Vocal Music", Proc. of WIMAGA, **ICASSP 2025**, Hyderabad

SCHOLASTIC ACHIEVEMENTS

- Awarded with the **Undergraduate Research Award 1** for significant contribution in **MIR** and audio processing [*'25*]
- Secured **AIR 973** in **JEE Advanced**, **99.71** percentile in **JEE Mains**, and **99.99** percentile in **MHT-CET** exams [*'22*]

INTERNATIONAL EXPOSURE

Spaceport America Cup | **IITB Rocket Team** | *Design Engineer, Propulsion Subsystem* [*Dec'22 - Jul'24*]

World's largest rocket engineering conference & competition New Mexico, USA | ***150+*** *Institutions* | ***6k+*** *Global participants*

- Secured top-**20** finish among **156** global teams via **9,210** ft. AGL flight, lifting the team placement by **66%** YoY
- Presented our rocket to **1700+** rocketeers, judges and industry leaders including **Blue Origin** and **Virgin Galactic**

PROFESSIONAL EXPERIENCE

Deutsche Bank | **Cash and Securities Portfolio** | *Software Engineering Intern* [*May'25 - Jul'25*]

Received a ***Pre-Placement Offer*** *and* ***LoR*** *for exceptional performance, and consistent work during the internship*

- Engineered and delivered **production-ready end-to-end user-preferences functionality** refining user experience
- Developed full-stack features using **React.js**, **Java Spring Boot**, **GraphQL**, and **PostgreSQL** learning them on-site
- Slashed **GCP** elevated access request time from **1 hour** to **2 minutes** by automating the pipeline with **Python** utility

NanoSniff Technologies Pvt. Ltd. | *Design Intern* [*May'24 - Jul'24*]

MEMS *fabrication and product* ***R&D*** *organization developing smart electronics through innovative* ***product design***

- Designed a **device prototype** for generating vapor molecules over a **combustion sensor** for detecting explosives
- **Optimized** the heating coil **orientation** and **geometry** (nested helix) maximizing heating as per the specifications

TECHNICAL PROJECTS

iKshana: An Accessibility Product | **Summer Project** | *ITC, IIT Bombay* [*May'23 - Sep'23*]

Secured the ***2nd*** *prize among* ***110+*** *projects for successfully prototyping an accessibility product for the visually impaired*

- Prototyped a **foot harness** integrated with a **navigation module** and **haptic feedback** for the **visually impaired**
- Incorporated a **haptic feedback** system to relay proximity information via the **Tibial nerve**, aiding obstacle avoidance
- Developed an **Android app** extracting the user's location data for **long-range navigation** coupled with the device

IITB Rocket Team | **Design Engineer** | *Propulsion Subsystem* [*Dec'22 - Jul'2*]

IN-SPACe *recognized technical team of* ***50+*** *students working on the design and development of sounding rockets*

- Conceptualized the design of **11** solid rocket motor assemblies and created their detailed **CAD** models in SolidWorks
- Developed the **KNSB**-based solid propulsion system of the subscale-sounding rocket Agneya which flew over **3k** ft.
- Prototyped and fabricated **4+** iterations of a thrust vector control nozzle and a glass fiber motor casing for robustness
- Arrived at a high Isp of **103s** upon analysis over **NASA-CEA** and **OpenMotor** following **40+** Crawford-bomb tests

Portable Smartphone-Based Compound Microscope | *Microfactory, IIT Bombay* [*Nov'23 - Feb'24*]

Designed and manufactured a working prototype of a portable microscope completely from one ***acrylic*** *sheet*

- Conceptualized and manufactured a small-scale 2D-translational stage for specimen with a **0.8mm** pitch
- Built a **camera-to-lens** alignment system enabling optical measurements with a **sub-mm** accuracy primarily for **PCBs**
- Received a **LoR** and got selected as one of the top **5** projects out of **50+** teams for the Annual Makerspace Conclave

ACADEMIC PROJECTS

Aircraft Landing Impact Optimization | *ME 701: Optimization in Engineering Design* [*Mar'25 - May'25*]

*Modeled **magnetorheological** dynamic suspension coupled with model predictive control for minimizing landing impact*

- Implemented dynamic system equations in **Python** and simulated aircraft touchdown across varied initial conditions

Thumb Flexion at Metacarpophalangeal joint analysis | *ME 6114: Joint Biomechanics* [*Mar'25 - May'25*]

*Fabricated a prototype to measure **maximum thumb flexion force** patterns across subjects and within-subject trials*

- Constrained thumb force transmission using a vertical plunger with an **FSR** sensor at the base for even measurement

Aircraft Carriage Design | *ME 318: Machine Design Lab* [*Feb'25 - May'25*]

*Designed and Fabricated a functional model of aircraft carriage with **single actuated** deployment and **suspensions***

- Designed a **6**-bar linkage with a locking mechanism, with scrap cardboard, robust to a **1m drop test**, in a team of **6**

Biomimetic Linkage Design | *ME 232: Kinematics and Dynamics of Machines* [*Jan'24 - May'24*]

*Augmented the design of a sit-to-stand **7** bar linkage mechanism and conducted static force & dynamic motion analysis*

- Created a **Python** program to **simulate** the linkage motion and furnish kinematic and dynamic plots of the **hip joint**

Continuous Variable Transmission | *CS 218: Solid Mechanics Lab* [*Oct'23 - Nov'23*]

*Prototyped a continuous variable transmission model, offering continuously varying gear ratios between **0.4** and **2.5***

- Demonstrated the automation of the slider motion using servos and microcontroller, achieving **auto-transmission**

RESEARCH EXPERIENCE

Quantitative Modeling in Music Information Retrieval | **DAPLAB** | *Prof. Preeti Rao* [*May'24 - Present*]

Computational modeling of elements of expressiveness in Indian vocal music for generative applications and analysis

Data Processing	• Developed a semi-automatic **syllable annotation** pipeline using **Whisper**, **VAD** and a **Forced Alignment** model for a **self-curated dataset** of concert recordings of stalwarts in Indian Music • Devised spectral band-energy (**F1 - 0.80**) and △MFCC (**F1 - 0.73**) syllable **onset detection** models
Analysis and Generation	• Applied **Word2vec** & text match (**96% acc.**) to measure syllable misalignment for expression analysis • Modeled pitch expressiveness using **Levenshtein** substitution on quantized pitch representation • Generated **new variations** capturing expressive timing using **GMM sampling** on processed data

POSITIONS OF RESPONSIBILITY

Institute Student Mentor & Department Academic Mentor | *SMP, IIT Bombay* [*Jul'25 - Present*]

*Selected out of **350+** students as a part of a mentorship team through an extensive process of interviews & peer reviews*

- Mentoring **12** freshmen & **6** sophomores, providing counsel, ensuring academic well being and holding help sessions
- Contributing towards ideation, management and execution of **core** & **research** events to improve students' exposure

Cultural Summer Project Mentor | *RagaVerse - Computational musicology* [*Jul'25 - Aug'25*]

*Spearheaded a technical project on **clustering** ragas and classical songs by performing **ablative feature engineering***

- Developed robust **computational pipeline**, **documentation** and **open-source utilities** on GitHub for guiding students
- Taught computational musicology and **MIR** fundamentals to a group of IITB alumni, PhD scholars, and undergrads

Teaching Assistant | *MS 101: Makerspace* [*Jul'23 - Dec'23*]

*Provided mentorship to a group of **30+** freshmen in the development of **automated tensile testing machines***

- Aided freshers in **planning, design, fabrication, assembly**, and **debugging** in their first hands-on course project

TECHNICAL SKILLS

- **Languages/Modules** : Python, C++, Java, JavaScript, MySQL, MATLAB, PyTorch, TensorFlow, NLTK, Librosa, Kaldi
- **Softwares/Tools** : Git, GitHub, GCP, Docker, Jira, Praat, Audacity, FL Studio, SOLIDWORKS, Ansys, LLMs

EXTRA-CURRICULAR ACTIVITIES

Music	• Performed before an audience of **1400+** as **lead vocalist** in a **10**-member band at Surbahaar, IITB • Showcased dual skills as a **flautist** and a **vocalist** in an **8**-member band at the **Battle of the Bands** • Led a **Hindustani classical quintet** orchestrating performance structure and rehearsals, at Dharohar
Design	• Created animated educational content for **STEPapp**, engaging **2M+** students across **1500+** schools
Sports	• Completed a year-long training in **Basketball** under **National Sports Organisation**, IIT Bombay '23
Poetry	• Achieved the **1st** prize in Hindi poetry writing competition organized by the Rotary Club New Bombay