

# YASH SANGHVI

## CURRICULUM VITAE

Mobile Number: +91 9167345410  
Email ID: sanghviyash7@gmail.com  
Date of Birth: 12<sup>th</sup> July 1995  
Nationality: Indian

Saibaba Nagar, Borivali (W),  
Mumbai - 400092, India.

<https://yash-sanghvi.github.io/>

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### RESEARCH INTERESTS

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Robotics, Human Robot / Computer Interaction, Internet of Things, Haptics, Teleoperation, Mechatronics, Automation

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### EDUCATION

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**B.Tech + M.Tech, Mechanical Engineering** | Indian Institute of Technology Bombay | GPA: 9.39/10 '13 - '18

- Ranked 2<sup>nd</sup> in the department Dual Degree (i.e. B. Tech + M. Tech) Batch, out of 48 students
- Awarded the highest AP grade in the course *Introduction to Numerical Analysis*
- Minor degree in Electrical Engineering
- M. Tech Specialization: **Computer Aided Design and Automation**

**Intermediate Examination** | K.C. College, University of Mumbai | Performance: 90.33% '13

**Matriculation** | Our Lady of Remedy High School | Performance: 92% '11

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### KEY AWARDS AND HONORS

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**Graduation Awards** | For performance throughout the stay at IIT Bombay

- **Dr. Shankar Dayal Sharma Gold Medal** | Awarded to 1 out of 2,500+ graduating students of IIT Bombay '18  
For being the most outstanding student in terms of general proficiency, excellence in academic performance, extra-curricular activities and social services; awarded by the Hon. Prime Minister of India, Shri Narendra Modi
- **Institute Organizational Roll of Honor** | Awarded to 1 out of 2,500+ graduating students of IIT Bombay '18  
For the demonstration of exceptional leadership skills and contributions to IIT Bombay (IITB) and India through National Service Scheme (NSS) and the Student Satellite Team
- **Institute Technical Citation** | Awarded to 9 out of 2,500+ graduating students of IIT Bombay '18  
For the role played in taking IITB into the space age and mentoring several universities in their satellite endeavors

**Yearly Awards** | For performance in a particular academic year

- **Institute Technical Color** | Awarded to 12 out of 10,000+ on-roll students of IIT Bombay '17  
For writing the flight code (>10,000 lines) for Pratham, IITB's 1<sup>st</sup> student satellite, launched in September 2016
- **Institute Academic Prize** | Awarded to the top 2 rank-holders in every department '16, '15  
For ranking 1<sup>st</sup> (2015-16) and 2<sup>nd</sup> (2014-15) in the Mechanical Engineering Department (Dual Degree Batch)

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### CONFERENCE PRESENTATIONS

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For all the upcoming presentations listed below, the abstracts have been ACCEPTED in the corresponding conferences

- Y. Sanghvi and S. Maiti, "Modeling and Detection of L and Inverted T Cracks in Laminated Composite Beams using Natural Frequencies" to be presented at 5<sup>th</sup> *International Conference on Mechanics of Composites* (Instituto Superior Técnico, Portugal), July 1-4, 2019
- A. Ranade, Y. Sanghvi et al., "Learnings from Pratham, First Student Satellite of IIT Bombay" to be presented at *International Conference on Small Satellites* (Hyderabad, India), February 7-9, 2019
- A. Sikka, Y. Sanghvi and A. Ranade, "Quality Assurance Practices for Student Satellite Teams" poster to be presented at *International Conference on Small Satellites* (Hyderabad, India), February 7-9, 2019
- Y. Sanghvi, A. Tewari et al., "Manufacturing Analytics: IoT based Overall Equipment Effectiveness (OEE) Measurement and Improvement" poster presented at *Applied Materials India Engineering and Technology Conference* (IIT Bombay, India), September 27, 2018

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## KEY RESEARCH / TECHNICAL PROJECTS

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### Electrical Subsystem Lead, Pratham | 1<sup>st</sup> Student Satellite, IIT Bombay

Sep '13 - Apr '17

Launched on-board PSLV-C35 in Sep '16, Pratham was designed and built exclusively by the students of IIT Bombay

- Spearheaded **Power system**; ensured detection of Pratham's separation from the PSLV and subsequent power-up, apt storage, distribution of solar power, battery charge management and health monitoring of critical components
- Devised and executed the functionality test plan for monitoring key parameters during environmental tests at ISRO
- Enacted SPI, I<sup>2</sup>C, UART protocols between **ATmega128  $\mu$ C** (On-board Computer) and sensors, actuators, peripherals
- Implemented the **AX.25** error detection protocol to packet the telemetry data sent and received by Pratham
- Reviewed 10,000+ pages of documentation; presented before ISRO Scientists in the **Critical Design Review** and Pre-Shipment Review to obtain a launch slot for Pratham
- Felicitated by the **Hon. Governor of Maharashtra**, Ch. Vidyasagar Rao for the contribution to Pratham

### Detection of L and Inverted T cracks in Composite Beams | Master's Thesis

Apr '17 - Jun '18

**Guide:** Prof. Surjya K. Maiti, Chair Professor, Mechanical Engineering Department, IIT Bombay

**Project:** Formulation of a vibration based model for the detection of L and inverted T cracks in composite Euler Bernoulli beams for predicting the life of composite aerospace and mechanical structures

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#### Forward Problem

- Analytically predicted (**>85% accuracy**), the natural frequencies of a damaged orthotropic symmetric cantilever composite beam given the location and size of the L or inverted T shaped crack
- Validated the frequencies using **ANSYS Composite PrepPost (ACP)**, achieved a match of 80%

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#### Inverse Problem

- Graphically predicted the **location** and **size** of cracks in a cantilever beam with more than 75% accuracy, given any four natural frequencies of the cracked and intact beams
  - Used **Genetic Algorithm** to solve the inverse problem with just the natural frequencies of the cracked beam as input and achieved similar accuracy as the graphical approach
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## PROFESSIONAL RESEARCH EXPERIENCE

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### Research Associate | National Centre for Aerospace Innovation and Research (NCAIR)

Sep '18 - Present

NCAIR is an industry-academia consortium founded in IIT Bombay in collaboration with Boeing and Hindustan Aeronautics Limited (HAL), with a vision to create a world-class aerospace manufacturing ecosystem in India

**Guide:** Prof. Asim Tewari, Chair Professor, Mechanical Engineering Department, IIT Bombay

**Project:** Industrial Internet of Things (IIoT) based monitoring of shop floor machines

- Determined the state of the shop floor machines (ON/ OFF/ Cutting) using current and vibration sensors
- Fabricated the **IoT device**; developed and tested the device software for optimal collection of sensor data, its subsequent conditioning and interface with the server side PHP script for the transfer of data
- Devised the test cases for training the **Machine Learning** back-end algorithm to identify the machine state
- Interfaced with the Machining Group, Analytics Group and Front-end team to understand their constraints and requirements pertaining to sensor locations, volume and type of data, and the transfer speed

### Mechanical R&D Intern | Hindustan Unilever Limited, Mumbai

May - Jul '16

Developed an Environmentally Sustainable Refrigeration System for Pureit Floor Standing RO Water Purifier

- Awarded **Pre-Placement Interview** based on output and leadership skills displayed during the internship
- Reduced **carbon footprint** by >40 kg CO<sub>2</sub> e/unit by modifying the system to replace HFC R-134a refrigerant with eco-friendly HC R-600a, satisfying Unilever Sustainable Living Plan (USLP)
- Dimensionally optimized the existing system design and reduced cooling time by **30%** (23 to 16 minutes)
- Consulted Western Refrigeration, Emerson etc. to obtain a practical viewpoint in design decisions

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## LEADERSHIP AND SOCIAL SERVICE

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### Project Manager, Advitiy | 2<sup>nd</sup> Student Satellite, IIT Bombay

May '17 - Apr '18

Advitiy is the next step after Pratham towards making IIT Bombay a Center of Excellence in Satellite Technology

- Took over leadership to improve reliability while ensuring a reduction in the project time-line by >50%
- Finalized the mission statement and **payload** for Advitiy, after evaluating 30 proposed payload ideas for feasibility, impact (both technical and social), alignment with long term goals of the project and resource availability
- Introduced kaizens like instituting **Quality Assurance (QA)** practices, setting up a detailed inventory, etc.
- Conceptualized, structured and launched a **Satellite 101 Wiki**, for institutes aiming to venture into satellite technology, acknowledged by **AMSAT-UK**, the world's largest organization for amateur satellites.
- Facilitated the *pro bono* establishment of a **Ham Radio club** in IIT Bombay; participation of 40+ students

### Overall Coordinator, National Service Scheme (NSS), IIT Bombay

Apr '16 - Mar '17

NSS is the largest student volunteer body of IIT Bombay, serving >100K people via public welfare activities

- Led a **3 tier team** of 400+ volunteers solving problems in sectors like education, sustainability, health-care etc.
- Facilitated the launch of **Voice For Purpose** for making quality audio content available to blind people
- Initiated **Adult Literacy Program** for providing basic English training to 50+ mess workers
- Organized a Cashless Transactions Awareness Drive post **demonetization** of Rs. 500 and 1000 notes; impacted over 80 fish vendors/ small shops around the campus
- Increased the online presence of NSS IIT Bombay by >200% through activities like
  - The Artistic Impact - A nationwide *Socio-Art* competition; participation from 15 cities of India
  - Letters of Love - Global Outreach program for Syrian kids; participation of 300+ campus residents

### Founder & Manager, Open Learning Initiative (OLI) | An initiative under NSS

Jan '15 - Jul '17

A YouTube channel breaking language barriers, OLI hosts 250+ educational videos in 8 regional languages of India

- Benefited **1000+ students** in Giridih (an insurgency affected district) in absence of permanent teachers
- Amassed >80,000 subscribers, >6 million views (highest in IIT Bombay) in 3.5 years, **4000% growth** in 2016-17
- Videos hosted on the educational portal of **Madhya Pradesh** state government
- Success story published by Business Insider and Indian Express
- Invited by the **Ministry of Human Resources Development, Government of India** to contribute to DIKSHA - National Teacher Platform, to enable, accelerate and amplify solutions in the realm of education

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## TEACHING AND MENTORING EXPERIENCE

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- Served as a **Teaching Assistant (TA)** for the following courses:

– MA 214: Introduction to Numerical Analysis   50 students	Summer '15 and '17
– ME 201: Strength of Materials, IIT Goa   30 students	Autumn '17
– ME 616: Fracture Mechanics   20 students	Spring '18
– SSWC101x: Soft Skills and Workplace Communication   MOOC on IIT BombayX	Spring '18

- Organized **Ground-station Workshop** for 50+ students from 15+ colleges of India; taught *Systems Engineering Principles* and *Useful Team Building Practices* Jun '17
- Mentored and guided **5 colleges** across India in starting their own student satellite projects

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## RELEVANT SKILLS

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Programming Languages	C, C++, Python, embedded C, Arduino, HTML, CSS, PHP
Softwares	MATLAB, ANSYS, SOLIDWORKS, Eagle, $\text{\LaTeX}$ , Audacity, MSC Adams, Atmel Studio, LT-Spice, Adobe Photoshop, MS Office, COMSOL Multiphysics, Advanced Excel

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## EXTRA-CURRICULAR ACTIVITIES

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### Public Speaking

- Delivered a speech representing the U.G. batch at the **Institute Valedictory Function**, 2018 Apr '18
- Delivered an **Institute Lecture** on Pratham on Tinkerer's Lab Inauguration Day Mar '17
- Delivered a '**Making of a Satellite**' talk in the Tech & RnD Expo 2017 (IIT Bombay) Oct '17
- Presented Pratham before 3500 students and parents in **VEDH** (Vocational Education, Direction and Harmony) organized by the Institute for Psychological Health Dec '16

### Miscellaneous

- Developed the prototype of an '**Autonomous Sweeper bot**' under Institute Technical Summer Projects, at one third of the price of commercial robotic vacuum cleaners Summer '14
- Taught 'General Knowledge' in **NGO Asha** to students of class 7-9 Autumn '17
- Successfully cleared the Elementary and Intermediate **Drawing Grade Examinations** conducted by the Art Examination Committee, Government of Maharashtra '07, '08
- Proficient in **4 languages**: English, Hindi, Gujarati and Marathi
- Hobby blogger, reader and pianist

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## REFERENCES

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### Prof. Surjya Kumar Maiti,

Chair Professor,  
Dual Degree Project Guide,  
Department of Mechanical Engineering,  
Indian Institute of Technology Bombay.  
**Email:** skmaiti@me.iitb.ac.in

### Prof. Asim Tewari,

Chair Professor,  
Professor In-charge, NCAIR,  
Department of Mechanical Engineering,  
Indian Institute of Technology Bombay.  
**Email:** asim.tewari@iitb.ac.in

### Prof. Anand Rao,

Faculty Advisor, National Service Scheme,  
Centre for Technology Alternatives for Rural Areas,  
Indian Institute of Technology Bombay.  
**Email:** a.b.rao@iitb.ac.in

### Prof. Prabhu Ramachandran,

Faculty Advisor, Student Satellite Project,  
Department of Aerospace Engineering,  
Indian Institute of Technology Bombay.  
**Email:** prabhu@aero.iitb.ac.in

### Prof. Varun Bhalerao,

Faculty Advisor, Student Satellite Project,  
Department of Physics,  
Indian Institute of Technology Bombay.  
**Email:** varunb@iitb.ac.in

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## RELEVANT LINKS

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- **Open Learning Initiative (OLI), NSS IITB:** <https://www.youtube.com/c/OLINSSIITB>
- **Satellite 101 Wiki:** [https://www.aero.iitb.ac.in/satelliteWiki/index.php/Satellite\\_101](https://www.aero.iitb.ac.in/satelliteWiki/index.php/Satellite_101)
- **Personal Website:** <https://yash-sanghvi.github.io/>
- **Personal blog:** <https://theiinaniitian.wordpress.com/>