SIDDHARTH SAHA

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Education

Examination	University	Institute	Year	CPI/%
Graduation	IIT Bombay	IIT Bombay	2021	9.43/10.00
Intermediate/+2	HSC	Pace Junior Science College	2017	89.54 %
Matriculation	ICSE	Lilavatibai Podar High School	2015	97.40 %

Major Degree: B.Tech. with Honors in Mechanical Engineering, IIT Bombay
Additional Degree: Minor in Computer Science and Engineering, IIT Bombay

Bachelor's Thesis

Mapping Regions of Dynamic Activity & Building Dynamic-free 3D Occupancy Maps | Demo
Guide: Prof. Leena Vachchani | Co-guide: Prof. Abhishek Gupta Jun 2020 - Jul 2021
- Proved the occupancy and dynamic activity probabilities in an octree map to be a field in the range (0,1)
- Designed & implemented novel clustering algorithm in ROS **OctoMap** to reject nodes with high dynamic activity

Scholastic Achievements

- Bagged **Technical Citation**, 2^{nd} highest award for excellence in technical activities among graduating batch ['21]
- Awarded **SSP scholarship** (among 15 students across India) by **Japan Science & Technology** Agency ['19]
- Conferred the **AP grade** (3/188 students) for exceptional performance in *Engineering Data Mining* course ['20]
- Endowed with the **Economic Times Campus Star Award** from over 49,000 candidates across India ['20]
- Achieved **national top 1%** of 41K+ students to qualify for **InChO** (Indian National Chemistry Olympiad) ['17]

Professional Experience & International Exchange

Google Summer of Code '21 Developer | RoboticsAcademy, JdeRobot Jun 2021 - Present
- Constructed RADI-4.0 (Robotics Academy Docker Image) for ROS2 Foxy, and VNC-based RViz2 web template
- Extending the Amazon warehouse exercises in the new web-based templates for ROS2

Quantitative Summer Analyst | Goldman Sachs, Bengaluru May 2020 - Jun 2020
Mortgage Structuring Strategies, Securities Division
- Innovated and implemented **payment structuring** ideas for mortgage-backed securities to **maximize arbitrage**
- Achieved **sharp improvement** of [redacted]% profits by optimizing cash-flows through different derivative instruments

Special Auditing Student | Hiroshima University, Japan Jun 2019
- Assimilated ongoing research in the **Cybernetics Laboratory** under the *Sakura Research Exchange Programme*

Competitions

Winner | International Micromouse Challenge | Source & Demo Dec 2020
Maze-solving challenge to program an autonomous bot simulated in ROS/Gazebo
- Implemented *online breadth-first planner* for optimal path & **omni-wheel** based drive to reduce steering latency

Winner | Off-Track Bot | Innerve '20, Delhi Nov 2020
Autonomous bot simulated in Webots to trace given pattern minimizing number of blocks kept as cues
- Innovated vision-based **object detection in C** to sharply prune required number of blocks

Team Leader | DRDO Obstacle Avoidance Drone | 9^{th} Inter IIT Tech Meet, Source Mar 2021
Autonomously navigate in complex static environments & land at target destination after its correct detection
- Ranked **6^{th} position** across India | Implemented navigation pipeline with three layers of intelligence algorithms

RoboCon, Team IIT Bombay | ABU RoboCon '19 Ulaanbaatar, Mongolia Jan 2019 - Apr 2019
Competition to construct a manual bot with throwing capability & an autonomous walking bot
- Bagged **9^{th} position** among 50+ national teams in stage-1 | Designed Solidworks model of **robotic gripper arm**

Key Projects

Quadruped Robot | RoboCupRescue League Challenge Dec 2019 - Present
Team Leader of two-tiered team with 15 members, overseeing a technical budget of over 10 lakhs INR
- Explored **impedance control** to create virtual leg compliance & tested *gait trajectories* in Gazebo environment
- Implemented fusion of *MPU6050* sensor data with *Intel RealSense D435* **PointCloud2** data to achieve SLAM

F1/10th — Autonomous Grand Prix | IROS '20, Las Vegas Oct 2020

International autonomous racing contest with standardized hardware simulated in ROS/Gazebo

- Used *Bernstein polynomial* based local trajectory planner and MPC for Ackermann steering in a team of 4
- Derived global optimal path using **OSQP solver** | Implemented obstacle detection | Compiled **Docker** submission

Two-wheeled Self-Balancing Bot | Documentation & Demo Aug 2020 - Nov 2020

- Stabilized Arduino bot using PD control and applied **complementary filter** on gyroscope & accelerometer input

Automated Graph Reader | Source & Demo Aug 2020 - Nov 2020

Deployed live on Heroku server, the web-app accepts queries for y-values in simple input graphs

- Implemented image processing & OCR using **Tesseract** to automatically extract values & line plot in input graph

Ricart-Agrawala Algorithm | Source Aug 2019 - Nov 2019

- Built Java implementation of **mutual exclusion** among nodes in distributed environment with no shared memory

Wifi De-auth Attacker Mar 2019

- Programmed *ESP8266* (Wi-Fi chip) to send de-authentication frames, **exploiting vulnerability** in IEEE 802.11

Sudoku Solver Using Block Printing | Source Apr 2018 - May 2018

- Implemented a **Raspbian** based machine to **physically imprint digits** into any given unsolved sudoku grid
- Leveraged **scikit-learn** & invoked **support vector machines** for recognition of handwritten digits in the sudoku

Gyro Brick Breaker Jul 2018

- **Led 5-membered** team to develop a **hand-gesture controlled** brick-breaking game coded in Processing IDE

Positions Of Responsibility

Teaching Assistant | Student Mentorship Program, IIT Bombay Apr-May 2018 / Jan-Apr 2019

- *Physical Chemistry*: **Only student from freshmen year** appointed to guide class of **15 students** in tutorials
- *Electricity & Magnetism*: Conducted tutorial sessions for **52 students** focusing on the academically weak students

Summer of Science Mentor | Maths and Physics Club, IIT Bombay Apr 2020 - Jun 2020

- Guided **4 mentees** to proficiency in *Data Structures & Algorithms* with **conceptual aid** and meticulous roadmap

Convener | Electronics and Robotics Club, IIT Bombay Apr 2018 - Mar 2019

Part of a two-tiered team of 70 members constituting the Institute Technical Council of IIT Bombay

- Organized bootcamps and **delivered talks** on Arduino and Image Processing, attended by **200+ enthusiasts**

Technical Skills

Programming & Scripting	Python, C, C++, Java, R, Javascript, x10, Bash, Sed, Awk, Perl
Frameworks	RegEx, Git, Vim, Docker, OpenCV, TensorFlow, Tesseract-OCR, LaTeX
Optimization	GNU MathProg, Gurobi, PuLP, Ipopt, OSQP
Robotics tools	ROS1, Gazebo, Webots, MRPT, Pinochhio, TSID, Crocoddyl
Controllers & Modules	Arduino, Raspberry Pi, Tiva C, NodeMCU, MPU6050, Intel RealSense D435
Software	Matlab, Fusion360, AutoCAD, Solidworks, Octave

Key Courses

Computer Science	Computer Vision, Reinforcement Learning, Data Structures and Algorithms, Design and Analysis of Algorithms, Digital Image Processing
Robotics	Advanced Topics in Mobile Robotics, Design of Mechatronic Systems, Microprocessors & Automatic Control, Kinematics & Dynamics of Machines, Machine Design, Robotics
Optimization	Optimization from Fundamentals, Optimization for Engineering Design, Industrial Engineering & Operations Research
Certifications	ROS for Beginners II: Localization, Navigation & SLAM, Using GPUs to Scale & Speed-up Deep Learning, Advanced Methods for Planning & Control of Legged Robots

Extra Curricular Activities

Competitions	• **1st** in Operations General Championship(GC) | **2nd** in Aerial Path-planning GC	['21]
Public Speaking	• Participated in **Model United Nations** by WeSpeak, IIT Bombay	['17]
	• Received **Special Mention among 35 participants** in English Debate, Freshiezza	['17]
Journalism	• **Curated article** in Mechanical Media Newsletter with a **reach of 700+** students	['17]
Social Service	• Volunteered at **Abhyasika** to tutor school children from underprivileged background	['18]
Sports	• Completed inter-hostel **Crossy** General Championship & the Cyclothon by TechFest	['17]
Leadership	• Headed **150+ students** as **House Captain** in 10^{th} & Vice-Captain in 9^{th} grade	['14,'15]