SIDDHARTH SAHA

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Education

Examination	University	Institute	Year	GPA
Graduation	IIT Bombay	Indian Institute of Technology Bombay	2017 - 2021	9.43/10.00

Undergraduate Degrees: B.Tech. with Honors in Mechanical Engineering, IIT Bombay
Minor in Computer Science and Engineering, IIT Bombay

Scholastic Achievements

- Bagged the **Technical Citation**, 2^{nd} highest award for excellence in technical activities at IIT Bombay ['21]
- Ranked **top 5** in batch of 150 students on merit of GPA | Secured **perfect 10.0** GPA in 7^{th} & 8^{th} semesters ['21]
- Conferred **AP grade** (3/188 students) in Statistical Machine Learning course for exceptional performance ['20]
- Endowed with the **Economic Times Campus Star Award** from over 49,000 candidates across India ['20]
- Awarded the SSP scholarship (among 15 students from India) by **Japan Science & Technology** Agency ['19]

Professional Experience & International Exchange

Goldman Sachs, Structuring Analyst | Bengaluru — Jul 2021 - Present
- Deriving critical insights into the upsides & downsides of structuring ideas vis-a-vis rating agency methodologies

Google Summer of Code – JdeRobot, Student Developer | Final Report — Jun 2021 - Aug 2021
JdeRobot develops framework based on ROS, Docker & Django to simplify learning robotics & computer vision
- Built the RADI-4.0 (Robotics Academy Docker Image) for **ROS2 Foxy**, and VNC-based RViz2 web template
- Implemented BT (**Behavior Tree**) Navigator | Extended pick-and-delivery exercise to ROS2 web-based template

Goldman Sachs, Quantitative Summer Analyst | Bengaluru — May 2020 - Jun 2020
- Innovated and implemented **payment structuring** ideas for mortgage-backed securities to **maximize arbitrage**
- Achieved **sharp improvement** of 1.62% profits by optimizing cash-flows through different derivative instruments

Hiroshima University, Special Auditing Student | 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
Team Leader in 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 produce given pattern on ground, minimizing number of blocks kept as cues
- Innovated vision-based **object detection in C** to sharply prune number of cues required by navigation algorithm

Winner | Operations GC | General Championship '21, IIT Bombay, Source — Feb 2021
- Devised optimization solutions in MathProg using the **GLPK Optimizer** | Solved machine learning challenges

Vision Based Obstacle Avoidance Drone | 9^{th} Inter IIT Tech Meet, Source — Mar 2021
Team Leader of IIT Bombay in Autonomous Navigation challenge across complex, static environments in ROS/Gazebo
- **Ranked 6^{th}** across India | Designed & implemented navigation pipeline with three-layered intelligence algorithms

RoboCon, Team IIT Bombay | ABU RoboCon '19 Ulaanbaatar, Mongolia — Oct 2018 - 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

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

Quadruped Robot | RoboCup Rescue League Challenge — Dec 2019 - May 2021
Founding member & Team Lead of two-tiered team with 15 members, overseeing technical budget of ~14K USD
- Explored **impedance control** to create virtual leg compliance | Simulated **gait trajectories** inside Gazebo
- Generated foot trajectory by modulating length and height of control points for a 11-order **Bézier curve**
- Implemented **sensor fusion** of *MPU6050* with *Intel RealSense D435* PointCloud2 data to demonstrate 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 & MPC for Ackermann steering in 4-membered team
- Attained global optimal path using **OSQP solver** | Implemented obstacle detection | Composed 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 output

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 & Demo 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

More projects...

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**

Community Service & Volunteering

- **Open-source contributor** at JdeRobot, a toolkit for developing robotics applications Mar 2021 - Present
- Mentoring 4 female undergraduates from low-income backgrounds under iWE (**Indian Women in Engineering**), an initiative by Goldman Sachs Sep 2021 - Present
- Tutored a high-school junior under **Abhyasika**, a student initiative at IIT Bombay for upliftment of economically disadvantaged children Nov 2018 - May 2019
- Facilitated **Juhu Beach Cleanup Drive** under IIT Bombay E-Cell's Swacch initiative Oct 2017

Technical Skills

Programming & Scripting	Python, C, C++, Java, R, x10, Bash, Sed, Awk, Perl, RegEx, CMake, SQLite
Frameworks	Git, Vim, Docker, OpenCV, PyTorch, TensorFlow, Tesseract-OCR, LaTeX
Optimization	GNU MathProg, GLPK, Gurobi, PuLP, Ipopt, OSQP
Robotics tools	ROS1, ROS2, Gazebo, Webots, MRPT, Pinochhio, TSID, Crocoddyl
Controllers & Modules	Arduino, Raspberry Pi, Tiva C, NodeMCU, MPU6050, Intel RealSense D435

Key Courses

Computer Science	Computer Vision, Reinforcement Learning, Data Structures and Algorithms, Design and Analysis of Algorithms, Digital Image Processing, Statistical Machine Learning
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, Operations Research
Certifications	Advanced Methods for Planning & Control of Legged Robots, ROS: Localization, Navigation & SLAM, Using GPUs to Scale & Speed-up Deep Learning

Extra Curricular Activities

Competition	• First runners-up in Aerial Path Planning GC, IIT Bombay (Source)	['21]
Public Speaking	• Participated in **Model United Nations** by WeSpeak, IIT Bombay	['17]
	• Received **Special Mention** among **35 participants** in English Debate, IIT Bombay	['17]
Journalism	• **Curated article** in Mechanical Media Newsletter with a **reach of 700+** students	['17]
Sports	• Completed inter-hostel Crossy General Championship and the Cyclothon by TechFest	['17]
Leadership	• Headed **150+ students** as **House Captain** in 10^{th} & Vice-Captain in 9^{th} grade	['14,'15]