

# 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 Vacchani | 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<sup>nd</sup> 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 █████% 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** | Innervive '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<sup>th</sup> Inter IIT Tech Meet, [Source](#)

Mar 2021

*Autonomously navigate in complex static environments & land at target destination after its correct detection*

- Ranked **6<sup>th</sup> 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<sup>th</sup> 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

*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

<b>Programming &amp; Scripting</b>	Python, C, C++, Java, R, Javascript, x10, Bash, Sed, Awk, Perl
<b>Frameworks</b>	RegEx, Git, Vim, Docker, OpenCV, TensorFlow, Tesseract-OCR, L <sup>A</sup> T <sub>E</sub> X
<b>Optimization</b>	GNU MathProg, Gurobi, PuLP, Ipopt, OSQP
<b>Robotics tools</b>	ROS1, Gazebo, Webots, MRPT, Pinocchio, TSID, Crocoddyl
<b>Controllers &amp; Modules</b>	Arduino, Raspberry Pi, Tiva C, NodeMCU, MPU6050, Intel RealSense D435
<b>Software</b>	Matlab, Fusion360, AutoCAD, Solidworks, Octave

## KEY COURSES

<b>Computer Science</b>	Computer Vision, Reinforcement Learning, Data Structures and Algorithms, Design and Analysis of Algorithms, Digital Image Processing
<b>Robotics</b>	Advanced Topics in Mobile Robotics, Design of Mechatronic Systems, Microprocessors & Automatic Control, Kinematics & Dynamics of Machines, Machine Design, Robotics
<b>Optimization</b>	Optimization from Fundamentals, Optimization for Engineering Design, Industrial Engineering & Operations Research
<b>Certifications</b>	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

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