

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

CONFERENCE TALKS

- Siddharth Saha, Leena Vachhani, **Dynamic OctoMap: Mapping Regions of Dynamic Activity & Building Dynamic-free 3D Occupancy Maps**, *Lightning Talk at ROS Conference 2021* [Video](#)
- Siddharth Saha, P. Vanjani, S. Gokhale, **Google Summer of Code '21: ROS2 RADI & pick-and-delivery warehouse exercise in web-based template**, *Lightning Talk at ROS Conference 2021* [Video](#)

SCHOLASTIC ACHIEVEMENTS

- Ranked **top 5** in batch of 150 students on merit of GPA | Secured **perfect 10.0 GPA** in 7th & 8th semesters [’21]
- Bagged the **Technical Citation**, 2nd highest award for excellence in technical activities at IIT Bombay [’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]

RESEARCH EXPERIENCE

Equilibrium states of Rotary Ultra-flexible Inverted Pendulum | IIT Bombay Jul’21 - Present

Guide: *Prasanna Gandhi*

- Applied the assumed modes method to mathematically model equations of motion for the flexible beam
- Conducted lab experimentations | Comparing experimentally observed shapes against predictions from simulation

Mapping Regions of Dynamic Activity & Building Dynamic-free 3D Occupancy Maps | [Demo](#)

Bachelor’s Thesis — Guides: *Prof. Leena Vacchani, Prof. Abhishek Gupta*

Jun’20 - Jul’21

- 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

PROFESSIONAL EXPERIENCE & INTERNATIONAL EXCHANGE

Goldman Sachs, Structuring Analyst | Bengaluru

Jul’21 - 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’21 - Aug’21

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’20 - Jun’20

- Ideated 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’19

- Assimilated ongoing research in the **Cybernetics Laboratory** under the *Sakura Research Exchange Programme*

KEY TECHNICAL PROJECTS

Quadruped Robot | RoboCup Rescue League Challenge

Dec’19 - May’21

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

Robot Vision Scene Understanding Challenge CVPR '21, Report & Source	Mar'21 - Apr'21
<i>Robot traversing environment to build an object-based semantic map using RGBD sensor & odometry measurements</i>	
<ul style="list-style-type: none"> • Trained & compared 3D object detection techniques using VoteNet, Group Free 3D, Votenet ensemble learning • Executed YOLOv4 in parallel with 3D detection techniques to achieve higher confidence through consensus • Applied 3D NMS algorithm to obtain semantic map of environment with bounding boxes around detected objects 	
F1/10th – Autonomous Grand Prix IROS '20, Las Vegas, Source	Oct'20
<i>International autonomous racing contest with standardized hardware simulated in ROS/Gazebo</i>	
<ul style="list-style-type: none"> • Used Bernstein polynomial based local trajectory planner & MPC for Ackermann steering in 4-membered team • Acquired global optimal path using OSQP solver Implemented obstacle detection Composed Docker submission 	
Hilti SLAM Challenge IROS '21, Prague	Sep'21
<i>Estimation of position from ROS bag files utilizing sensor combinations among images, IMU, and LIDAR</i>	
<ul style="list-style-type: none"> • Understood visual inertial odometry and applied <i>VINS-Fusion</i> on monocular camera and IMU sensor feed • Calibrated Kannala-brandt camera model using datasheet & IMU noise parameters using <i>imu_utils</i> on bag files 	
Multi-robot Capture of Non-adversarial Target Documentation & Source	Mar'21 - Apr'21
<i>Paper implementation of 'MILP Models for Multi-Robot Non-Adversarial Search' from the ground up</i>	
<ul style="list-style-type: none"> • Implemented graph-represented environment using <i>networkx</i> Modeled the optimization problem using <i>gurobipy</i> 	
Two-wheeled Self-Balancing Bot Documentation & Demo	Aug'20 - Nov'20
<ul style="list-style-type: none"> • Stabilized Arduino bot using PD control and applied complementary filter on gyroscope & accelerometer output 	
More projects...	

COMPETITION ACHIEVEMENTS

Winner International Micromouse Challenge Source & Demo	Dec'20
<i>Team Leader in Maze-solving challenge to program an autonomous bot simulated in ROS/Gazebo</i>	
<ul style="list-style-type: none"> • Implemented <i>online breadth-first planner</i> for optimal path & omni-wheel based drive to reduce steering latency 	
Winner Off-Track Bot Innervive '20, Delhi	Nov'20
<i>Autonomous bot simulated in Webots to produce given pattern on ground, minimizing number of blocks kept as cues</i>	
<ul style="list-style-type: none"> • 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'21
<ul style="list-style-type: none"> • 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'21
<i>Team Leader of IIT Bombay in Autonomous Navigation challenge across complex, static environments in ROS/Gazebo</i>	
<ul style="list-style-type: none"> • Ranked 6th across India Designed & implemented navigation pipeline with three-layered intelligence algorithms 	
RoboCon, Team IIT Bombay ABU RoboCon '19 Ulaanbaatar, Mongolia	Oct'18 - Apr'19
<i>Competition to construct a manual bot with throwing capability & an autonomous walking bot</i>	
<ul style="list-style-type: none"> • Bagged 9th position among 50+ national teams in stage-1 Designed Solidworks model of robotic gripper arm 	

POSITIONS OF RESPONSIBILITY

Teaching Assistant Student Mentorship Program, IIT Bombay	Apr-May'18 / Jan-Apr'19
<ul style="list-style-type: none"> • <i>Physical Chemistry</i>: Only student from freshmen year appointed to guide class of 15 students in tutorials • <i>Electricity & Magnetism</i>: Conducted tutorial sessions for 52 students focusing on the academically weak students 	
Summer of Science Mentor Maths and Physics Club, IIT Bombay	Apr'20 - Jun'20
<ul style="list-style-type: none"> • Guided 4 mentees to proficiency in <i>Data Structures & Algorithms</i> with conceptual aid and meticulous roadmap 	
Convener Electronics and Robotics Club, IIT Bombay	Apr'18 - Mar'19
<i>Part of a two-tiered team of 70 members constituting the Institute Technical Council of IIT Bombay</i>	
<ul style="list-style-type: none"> • Guided over 600 freshmen participants of XLR8 2018 to make their first remote-controlled wheeled robots • Organized bootcamps and delivered talks on Arduino and Image Processing, attended by 200+ enthusiasts 	

COMMUNITY SERVICE & VOLUNTEERING

<ul style="list-style-type: none"> • Open-source contributor at JdeRobot, a toolkit for developing robotics applications 	Mar'21 - Present
<ul style="list-style-type: none"> • Mentoring 4 female undergraduates from low-income backgrounds under iWE (Indian Women in Engineering), an initiative by Goldman Sachs 	Sep'21 - Present
<ul style="list-style-type: none"> • Tutored a high-school junior under Abhyasika, a student initiative at IIT Bombay for upliftment of economically disadvantaged children 	Nov'18 - May'19
<ul style="list-style-type: none"> • Facilitated Juhu Beach Cleanup Drive under IIT Bombay E-Cell's Swacch initiative 	Oct'17

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, L ^A T _E X
Optimization	GNU MathProg, GLPK, Gurobi, PuLP, Ipopt, OSQP
Robotics tools	ROS1, ROS2, Gazebo, Webots, MRPT, Pinocchio, TSID, Crocodyl
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]