

# SADAIVAL SINGH

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## Education

Degree/Certificate	Institute/Board	CGPA/Percentage	Year
M. Eng Mechanical	McGill University	3.73/4	2025
B. Tech Major Mechanical, Minor ECE	Indian Institute of Technology, Guwahati	8.43/10	2021
Senior secondary	CBSE board	92.2%	2017
Secondary	CBSE board	9.4/10	2015

## Experience

### Research Associate — Polytechnique Montréal

June 2025 – Feb 2026

- Working with team on a novel elastic registration algorithm to accelerate CT image acquisition, reconstruction, and segmentation.
- Built a Python-based UI for the backend API of the Elastic Registration system.

### Research Intern — Comet Group (Dragonfly Division)

May 2024 – Apr 2025

- Improved deep learning model accuracy for industrial vision applications and quantified measurement repeatability.
- Automated code understanding and documentation by generating call graphs, type hints, and docstrings using LLM for RAG pipeline.

### Teaching Assistant — McGill University

Jan 2024 – Apr 2024

- Assisted in labs and grading for the course *MECH 383: Applied Electronics and Instrumentation*

### R&D Engineer — Ace Manufacturing Systems

Nov 2022 – Jun 2023

- Designed vision-based control systems for WAAM and PBF additive manufacturing.
- Built a low-cost 3D scanner for part inspection using line-laser triangulation.
- Developed a vision-driven tool measurement and breakage detection system in Python.
- Optimized mechanism using constraint-based analysis and optimisation tools for WAAM machine.

### Assistant Manager / GTE / Intern — Bajaj Auto Ltd.

Jun 2020 – Oct 2022

- Assisted component development for engine castings, improving process efficiency and cost.
- Designed tools, fixtures, and manufacturing processes ensuring quality and production targets.
- Optimized paint shop equipment layout and reduced packaging costs through stress-based pallet redesign.
- Analyzed critical wall thickness in blow-molded and rotomolded fuel tanks; designed universal handling fixtures.

## Publications

- Singh, Sadaival, Ambrish Singh, Sajan Kapil, and Manas Das. "**Utilization of a TSP solver for generating non-retractable, direction favoring toolpath for additive manufacturing.**" Additive Manufacturing (2022): 103126.
- Singh, Sadaival, Ambrish Singh, Sajan Kapil, and Manas Das. "**Generation of Continuous and Sparse Space Filling Toolpath with Tailored density for Additive Manufacturing of Biomimetics.**" Computer-Aided Design (CAD) (2024): 103718

## Projects

- Computer Vision in Additive Manufacturing** – IIT Guwahati, Prof. Sajan Kapil (Nov 2022 – Jun 2023): Implemented computer vision and deep learning algorithms for in-situ defect detection and melt-pool monitoring in WAAM and PBF processes.
- Morphing Wing Design Optimization** – McGill University (Jan 2024 – Apr 2024): Optimized aerodynamic, structural, and actuation subsystems of a morphing wing using XFOIL-coupled multi-objective optimization.
- Acoustic Tactile Sensor Mapping** – McGill University, Prof. Audrey Sedal (Sep 2024 – Apr 2025): Developed an acoustic-based tactile sensor and formulated the mapping problem as factor-graph SLAM using IMU and encoder data.

- **Area-Filling Method for 3D Printing** – *IIT Guwahati, Prof. Sajan Kapil (May 2019 – Present)*: Designed a TSP-based continuous toolpath algorithm and software for 2D geometry infill; results published at HI-AM 2021.
- **SAE Efficycle 2018** – *IIT Guwahati (Jun 2018 – Sep 2018)*: Built a three-wheeled hybrid vehicle with automatic electronic gear shifting; won Innovation Award (Rank 9/72).
- **Formula Student Vehicle** – *IIT Guwahati (Dec 2018 – Jan 2020)*: Led the design and manufacture of a Formula Bharat race car as team captain, overseeing suspension and electronics.
- **Hand Gesture Recognition** – *IIT Guwahati (Feb 2018)*: Implemented real-time gesture recognition using Python and OpenCV for camera-based interaction.

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## Technical skills

<b>Programming Language</b>	Python, C, C++, MATLAB
<b>Miscellaneous</b>	Machine Learning, Deep Learning, Computer Vision, ROS, PyTorch
<b>CAD software</b>	SolidWorks, Catia, NX, Solid Edge
<b>Simulation software</b>	Ansys, EDEM
<b>Operating System</b>	Windows, Linux

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## Key Courses Taken

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| <ul style="list-style-type: none"> <li>• Statistical Computer Vision</li> <li>• Applied Robotics</li> <li>• Control Systems</li> <li>• Optimization methods in Engineering</li> <li>• Industrial Engineering and Operations Research</li> </ul> | <ul style="list-style-type: none"> <li>• Probability, Statistics and Machine Learning</li> <li>• Fluid Mechanics</li> <li>• Machine Design</li> <li>• Soft computing in Engineering</li> <li>• Kinematics of Machinery</li> </ul> |
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## Leadership and Achievements

- **Team Captain, Formula Student IIT Guwahati (2018–2020)**: Led a 20-member team, managing design, manufacturing, and integration of a Formula Bharat race car; coordinated deadlines and ensured timely project delivery.
- **City Representative, Technothon 2018**: Organized Chandigarh exam center; secured 300+ student registrations and oversaw smooth event execution.
- **Best Innovation Award – SAE Efficycle 2018**: Designed and implemented an automatic electronic gear shifter, earning the prize money for Best Innovation Award and achieving 9th rank among 72 teams overall.
- **Group Mathematics Olympiad (2015)**: Selected among top 30 students in India for the Indian National Mathematics Olympiad (INMO).
- **Joint Entrance Examination (2017)**: Achieved All India Rank 2346 among 1.28 million candidates in JEE Advanced.