SARTHAK SAHOO

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EDUCATION

National Institute of Technology, Rourkela **June 2024**
Bachelor of Technology in Mechanical Engineering
- Grade: 8.87/10.00 *(Ranked 12th out of 144 students in the department)*
- Relevant coursework: Mechatronics, Engineering mathematics, Finite element method, System dynamics and control, Mechanical vibrations, Dynamics of machines

St. Paul's School, Rourkela **May 2019**
Intermediate, Science and Mathematics, ISC Board
- Grade: 93.20/100.00

St. Paul's School Rourkela **May 2017**
Matriculation, General Studies, ICSE Board
- Grade: 97.00/100.00

PROFESSIONAL EXPERIENCE

Indian Institute of Technology Bombay | Mumbai, India **Feb 2025 – Present**
Junior Research Fellow, Continuum Dynamics & Control Lab (website)
(Project: Trajectory Control of 1D Flexible Structures, Advisor: Prof. Vivek Natarajan)
- Conducted numerical modelling of a 1-D Euler Bernoulli beam, using FEM (Galerkin method with Hermite shape functions) in Python, followed by modal analysis estimating natural frequencies within **±0.1% error.**
- Integrated an industrial laser displacement sensor with LabVIEW environment for real-time vibration acquisition; conducted FFT analysis to identify dominant analog noise and implemented a 2nd-order Chebyshev low-pass filter for signal conditioning.
- Developed a multibody dynamics model in Simscape for a thin beam; performed phase–amplitude error analysis for vibrations of thin beams by comparing Simulink mathematical and Simscape Multibody physical models across varying discretization levels to investigate model accuracy.

Bajaj Auto Limited | Pune, India **Aug 2024 – Dec 2024**
Graduate Trainee Engineer, Manufacturing Engineering (Engine Team)
- Improved the tool life of a spring-plunger-inductive proximity sensor poka-yoke, used for woodruff key detection, **from 1 days to 4 days**, through spring stiffness calculations & GD&T tolerance analysis.
- Improved inspection **reliability** of valve collet press inspection **system by 20%**, through a comprehensive root-cause analysis, part function study, valve assembly GD&T tolerance analysis, a SPC on **200 samples,** and laser sensor re-calibration**.**
- Optimized fuel leak testing rigs by refining pneumatic control logic and pressure settling times, **reducing cycle time from 21s to 17s**
- Applied TPM, PQCDSME, and quality control tools to enhance mechatronic inspection systems and assembly-line robustness.

INTERNSHIP EXPERIENCE

Indian Institute of Technology Bombay | Mumbai, India **Jan 2024 – Jun 2024**
Project Research Intern, under the supervision of Prof. Vivek Natarajan, (website)
- Designed an underactuated Cable-Driven Parallel Robot (CDPR) experimental setup in SolidWorks, considering workspace constraints, DOFs, and actuator configuration; fabricated the prototype with closed-loop stepper motors, Dyneema cables, and 3D-printed mounts, achieving end-effector trajectory-tracking repeatability within ±5 mm.
- Simulated end-effector dynamics for an unplanned constant-velocity trajectory of 1 m/s in MATLAB/Simulink, analyzing open-loop system response and stability.
- Performed motor sizing analysis based on maximum cable tension and angular velocity constraints (2–300 RPM) to ensure smooth low-speed rotations; & programmed Arduino/Python DAQ to test step, ramp, and sinusoidal velocity profiles using rotary incremental encoder, to validate hardware control response.
- Presented an experimental abstract at the **10th Indian Control Conference 2024** held at IISER Bhopal and demonstrated the prototype at **TechConnect IIT Bombay 2024.**

Indian Institute of Technology Bhubaneswar | Bhubaneswar, India **Dec 2023 – Dec 2023**
Research Intern, under the supervision of Prof. Pandu Ranga V, (website)
- Modeled a 4-DOF dual-arm robot in MATLAB Simscape Multibody and SolidWorks; derived and validated forward kinematics using DH parameters and Python scripts, for collaborative control studies.

Bajaj Auto Limited | Pune, India **May 2023 – Jul 2023**
Summer Octane Intern (Manufacturing Engineering), under the guidance of Mr. Rajesh S Mangrule
- Evaluated **20+** Poka-yoke mechanisms & performed material and information flow mapping across 2 Pulsar assembly conveyors and documented inspection logic, to improve error-proofing traceability on the MES platform.
- Standardized **15+ UI dashboards** for digital production boards and line-stage displays, enabling real-time quality monitoring and reducing manual inspection delays
- Recognized with a Pre-Placement Offer (PPO) for outstanding performance and contributions to digital manufacturing initiatives

ACADEMIC RESEARCH

Machine Intelligence & Bio-Motion Research Lab | NIT Rourkela **Nov 2023 – Jun 2024**
Undergraduate Research Assistant, under the supervision of Dr. Anup Nandy
- Designed and prototyped a wheeled dual-arm mobile social robot in SolidWorks (3D-printed chassis, actuator–sensor integration for 2 DOF manipulation); contributions led to a filed and published Indian patent (2025) on assistive robotic systems for autism.

PROJECTS

Designing a LQR controller for a Cart - Inverted Pendulum System **Sept 2025 – Present**
Self-Project
- Derived the non-linear governing dynamic equations for a cart + inverted pendulum system using the Lagrangian mechanics, implemented pole-placement and optimal control (LQR) strategies to stabilize and control the above system.
- Currently working on flatness-based motion planning for a cart + non-inverted pendulum for rest-to-rest trajectory.

Design & fabrication of an Autonomous Underwater Vehicle (AUV) | (website) **Dec 2021 – Jun 2024**
Team Tiburon, AUV NIT Rourkela

- Designed a modular frame for an intelligent underwater vehicle using 3D CAD modeling software, considering strategic placement and orientation of 8 BlueRobotics T100 thrusters for **6-DoF maneuverability** and 20.28 kg payload.
- Performed static structural FEA of the bot chassis under hydrostatic pressure in ANSYS, verifying frame integrity and safety factors for submerged operation in the depths ranging from 0.5 m to 1 m.
- Conducted an extensive literature review and mathematical modeling of ROV hydrodynamics to study the effect of ambient water currents (0–1.2 m/s) on vehicle dynamics and control stability.

Design, analysis and fabrication of a e-human powered vehicle equipped with landing gear, rollover protection system and electric powertrain **May 2021 – Apr 2023**
Team BlueStreak, ASME NIT Rourkela Student Section

- Designed a semi-recumbent 2-wheeler chassis using CAD tools; performed ergonomic analysis in CATIA for 5th and 50th percentile manikins to optimize rider posture, vision window, and joint kinematics.
- Conducted static loading and modal analyses of the rollover protection structure in ANSYS; optimized triangulation geometry to decrease deformation from **0.10 mm to 0.07 mm (30% reduction)**, to meet with competition objectives.
- Developed and simulated an innovative landing-gear mechanism in Simscape Multibody, achieving controlled deployment within 8 s, improving vehicle stability during starts and stops.
- Computed motor traction parameters and conducted gear-ratio optimization in MATLAB/Simulink, finalizing a 450 W, 36 V DC motor and 36 V 10 Ah Li-ion battery pack.

PATENTS AND PUBLICATIONS

[1] Dhruv Sorathiya, **Sarthak Sahoo**, Vivek Natarajan (2024), Title: **Design, Fabrication and Control of a Cable Driven Parallel Robot**, In the Proceedings of the 10th Indian Control Conference (ICC), IISER Bhopal, India, December 9–11, 2024. DOI: https://doi.org/10.48550/arXiv.2506.18526, Published abstract: https://controlsociety.org/ICC24/files/0194.pdf.

[2] Anup Nandy, Sougatamoy Biswas, Asim Kumar Naskar and **Sarthak Sahoo**, Title: **Assistive Robotic System and Method for enhancing social skills in user with autism spectrum disorder**, Application No: 202531062319, Indian Patent Office, Filed: 30th June 2025.

HONOURS AND AWARDS

- Led team QO9D which secured **National Runners-Up & Campus Winner** in the OHM Challenge 2024, organized by Bajaj Auto & Chetak Technology, **among 1500+ teams** for proposing a “control algorithm enabling swappable EV battery packs”. **Mar 2024**
- Awarded a **6-month funded research internship** in the Department of Systems & Control Engineering, IIT Bombay, under the IRCC Research Fellowship (2023–24), granted to students in the **top 10 percentile** of their class. **Dec 2023**
- Team BlueStreak 10.0 secured **National Runners-Up** in Critical Design Report Presentation at the ASME e-HPVC India 2023 **Apr 2023**
- Qualified **POC stage** for proposing an “Active Torque Vectoring System using predictive error-based control” at L&T Techgium 2022 **Dec 2022**
- Team HACKOHOLICS secured **National Runners-Up among 100+ teams,** for an AI-based solution to prevent EV thermal runaway at the DecodEV Hackathon 2022 organized by WUElev8 & IIIT Delhi **Sept 2022**
- Team BLUESTREAK 9.0 **ranked 2nd in overall design and 3rd in innovation all over the world** in the E-HPVC competition organized by American Society of Mechanical Engineers (ASME) **Apr 2022**
- Awarded with **Excellent Grade** in the national-level experimental physics competition, National Anveshika Experimental Skill Test, conducted by CCE IIT Kanpur and Indian Association of Physics Teachers (IAPT), 2020. **Aug 2020**

LEADERSHIP & VOLUNTEERING EXPERIENCE

Training Co-ordinator | Career Development Center NIT Rourkela **Jan 2024 – Jun 2024**

- Conducted and coordinated resume-building workshops, alumni webinars, GDs, interviews, and online tests for **250+** Mechanical Engineering students (130 pre-final years, 120 sophomores) to ensure department’s placement preparedness.

Captain, Team BlueStreak | ASME NIT Rourkela Student Chapter **May 2022 – Apr 2023**

- Led and managed a 25-member interdisciplinary team for ASME e-HPVC India 2023, overseeing vehicle design, manufacturing, and parts procurement, while conducting training sessions for 30+ new recruits to ensure effective knowledge transfer and timely competition delivery.

Student Mentor, Mechanical Engineering | Institute Counselling Services, NIT Rourkela **May 2022 – Apr 2023**

- Responsible for addressing the academic, mental and socio-cultural issues of freshmen year students of NITR ensuring a seamless transition from home to hostel life.

CERTIFICATIONS AND MOOCS

- Model-based automotive systems – Chalmers University of Technology, edX
- Vibrations and Structural Dynamics - IIT Kharagpur, NPTEL
- Machine Dynamics with MATLAB - RWTH Aachen University, edX
- Certified SolidWorks Professional (CSWP) in Mechanical Design – Dassault Systemes
- Certified SolidWorks Associate (CSWA) in Mechanical Design – Dassault Systemes
- MATLAB Fundamentals – MathWorks
- Control System Design with MATLAB and Simulink - MathWorks
- Sangeet Bhushan part – II in Hindustani classical violin - Pracheen Kala Kendra
- Professional Diploma in Fine Arts – Odisha Lalit Kala Akademi

SKILLS

Programming Languages: Python, LabVIEW, Java, C++, MATLAB
Technical Tools: SolidWorks, ANSYS, Simulink, Arduino, AutoCAD, Siemens-NX, NI myRIO
Documentation Tools: LaTeX, Microsoft Office