# Sarthak Shirke

**Researcher • Developer • Robotics • Mechatronics• Systems & Controls**
Eindhoven University of Technology • 5612LW Eindhoven • Netherlands
+31 686383067 | sarthakshirketue@gmail.com
Website | LinkedIn | Github | G-Scholar

## About me

Result-oriented and innovative **Robotics/Mechatronics/Systems & Control Engineer** with a strong track record in prototyping and simulating robotic/mechatronics models. Eager to contribute and grow within the company, while expanding my expertise in the areas of **semiconductor, agricultural, warehouse, and healthcare sectors.** Demonstrated leadership by founding **robotics clubs, leading technical initiatives, teaching assistance and mentoring at TU/e.**

## Education

### Master of Science in Systems and Control
*Eindhoven University of Technology*
*09/2022-02/2025*

Specialisation: Mechatronics and *Robotics*
THESIS: *Utility-Based Frontier Exploration for Active Localization*

### Bachelor of Technology in Mechatronics
NMIMS MPSTME
*08/2016-06/2020*

Specialization: *Mechatronics and Robotics*
THESIS: *IoT-based LPG Cylinder monitoring*

## Work Experience

### Robot ARM Technical Assistance, RBT group
*RBT group TU/e*
*July 2024 – Feb 2025*

I worked on designing the Robot arm course for the upcoming academic year. My contributions focused on state flow and improving the vision system.
**[Python/c++/MATLAB/GitLab/Ubuntu/VScode/Raspberry pi/ML]**

### Robot ARM Teaching Assistant, RBT group
*RBT group TU/e*
*May 2024 – June 2024*

As a Teaching Assistant for the Robot Arm project, I guided students through their final projects, offering expert advice and hands-on assistance in designing inverse kinematics, control systems, and state flow diagrams.

### Starnus Technology, Eindhoven, The Netherlands
*Starnus Technology*
*May 2023 – June 2024*

- During my internship at Starnus Technology, I specialised in Feature-Based Localisation, implementing Normal Distribution Transform (NDT) Localisation to enhance navigation precision in autonomous systems. [3 months Internship]
- In addition to my core responsibilities, I led the development of a feature-based localisation framework, focusing on integrating advanced algorithms to improve system reliability and performance in dynamic environments. [Work in the Autonomy and Control Department]

### Neurapses Technologies Pvt. Ltd., Pune, India, Job - Robotics Engineer
*Neurapses Technologies*
*Nov 2020 – April 2021*

- Mentored students on building Arduino-based projects with a focus on improving C++ programming skills and taught Python programming.
- Designed courses on ROS1 and mechanical design to help strengthen foundations for robotic enthusiasts.

### Vidhika Automation, Mumbai, India, Intern- Product Development Intern
*Vidhika Automation*
*March 2020 - Sep 2020*

Collaborated with product designers, solution architects and other functional teams to design a shoe for kids suffering from clubfoot deformity and used IoT to collect data to improve the product.

### Dynomerk Controls, Pune, India, Intern- Manufacturing and Automation
*Dynomerk Controls*
*01st July 2018 - 31st July 2018*

- Programmed industrial drivers, calibrate and tune sensors such as a thermistor, RTD, and proximity.
- Learnt assembly work of "Inspection and Maintenance Dynamometer" and "Chassis Dynamometer"

# Projects

### Inverted Pendulum from design to control
*since June 2025*

The inverted pendulum is a well-known example in the study of dynamics and control theory, often introduced in high school and undergraduate-level physics or mathematics. As someone passionate about math and science, I was inspired to put theory into practice by building my inverted pendulum. Translating classroom concepts into a real-world project not only deepened my understanding but also introduced me to a new set of practical challenges and considerations—ones that theoretical exercises often overlook. (inverted_penfulum)

### Master's Thesis "Utility-Based Frontier Exploration for Active Localisation"
*July 2024 – Feb 2025*

Developed an active localisation approach using camera-based feature detection and point-cloud analysis to estimate a robot's global pose efficiently. Designed a utility-based framework that balances information gain and path cost, enabling the robot to explore informative frontiers and refine pose hypotheses. (master_thesis_github)
[ROS1,2/Python/c++/GitLab/Ubuntu/VScode/Worked on ROSbot 2 pro/ultarlytics Yolo detection/ArUco Marker detection]

### Ball and Plate control system
*April 2023 – July 2023*

Designed and implemented the modelling of the Ball and Plate control system driven by three linear actuators arranged in an equilateral triangle, addressing the system's challenging input-output coupling. Developed a Model Predictive Controller (MPC) to achieve precise ball positioning, and independently built a new computer vision system to replace the earlier black-box solution at TU Eindhoven. Ball and plate ,(2023)

### Robot software modules for a wheeled mobile robot
*April 2023 – July 2023*

Designed and implemented robot software modules for a wheeled mobile robot navigating in dynamic environments, contributing to localisation, path planning, motion control, and collision avoidance frameworks, while ensuring system modularisation and effective teamwork. (C++) (Mobile_robot_control), (2023)

### Maximized the performance of a fourth-order motion setup
*Sept 2022 – Oct 2022*

DMaximized the performance of a fourth-order motion setup by conducting system identification, designing a feedback controller, and implementing feedforward control to enhance tracking precision and dynamic response. (control_engg), (2022)

### IoT-based LPG Cylinder monitoring
*Sept 2019 – May 2020*

Designed IoT-based LPG Cylinder monitoring sensor circuitry to notify users of any leakage in the cylinder via SMS so that accidents can be avoided promptly. The research is **published in Innovative Research in Electronics & Communications**. IoT based LPG Gas Cyclinder , (2019-2020)

### Micro mouse
*Oct 2018 – March 2019*

Led a team of 10 members to implement a micro mouse, an end-to-end maze-solving robot using a predictive machine learning algorithm at Technoxian 2019 (World Robotics Competition), and got shortlisted for the final round of the competition. micromouse ,(2019)

### Automatic variable opening window ventilation system for warehouses
*Sept 2018 – Feb 2019*

Designed an automatic variable opening window ventilation system for warehouses, an Arduino-based sensor control system to regulate humidity levels in rural warehouses, which helped reduce grain degradation due to excessive moisture. The project was widely acclaimed by the All India Council for Technical Education at the regional level, helping it reach a broader audience. Warehouse ventelation system,(2018-2019)

### Wireless Animatronics Arm
*Sept 2019 – Feb 2020*

Presented Wireless Animatronics Arm in the exhibitions at NMIMS Shirpur, replicated hand movements signaled by flex sensors gloves and communicated via Bluetooth Animatronics Arm ,(2018)

# Petants

- Designed an **Activity Tracker for Club-foot Patients** so that the doctors can get real-time data for patient activities. Activity Tracker
  *Sept 2018 – Feb 2019*
- Engineered a **specialised water bottle tailored for the elderly**, incorporating a flow control mechanism to aid in safer drinking and a textured grip to enhance stability and usability.
  *March 2020 – Sep 2020*

# Management Roles

### Committee Member, Organising Committee for Systems & Control (TU/e)
*March 2020 – Sep 2020*

Contributed to curriculum development, reviewed education policies (OER, PER), and supported new educational initiatives to enhance academic standards.

### TU/e Ambassador and Student Mentor
*Dec 2023– Feb 2025 & June 2024- Feb 2025*

- As a TU/e Ambassador, I facilitated the transition of international students to TU Eindhoven, providing guidance and answering their queries via the Unibuddy app to ensure a smooth and welcoming integration experience
- As a student mentor helped students with all their practical issues that may arise when they start studying at the university (TU/e)

### Robcup 2024
*17th July 2024 – 21st July 2024*

Volunteer for Robcup 2024 for catering service.

### Robotics Club
*Founded in 2019*

Founded Robotics Club at NMIMS Shirpur to provide 60+ students with a platform to learn and grow robotics and IoT skills.

### Innovation Club
*2018 -2020*

Hosted informational sessions at Innovation Club, NMIMS Shirpur, in collaboration with Entrepreneurship Development Centre, and Micro, Small and Medium Enterprise Development Institute to create awareness amongst students on different funding options for startups.

### Protsahan– The Cultural Fest NMIMS
*2018 -2020*

Led technical committee at Protsahan– The Cultural Fest, NMIMS Shirpur: to create a cultural event website for students, investors and sponsors, attracting 1000+ students from across the country annually.

### Yoga events
*May 2017*

Volunteer for yoga events conducted by a non-profit spiritual organization to promote inner peace.

# Muscian

### Tabla (Indian Classical Instrument)
*Learning since age 4*

- **Qualified to perform and teach Tabla** (Indian Classical Instrument), and will be graduating soon with a Bachelor of Arts in Tabla from Akhil Bhartiya Gandharva Mahavidyalaya.
- Awarded **2nd prize in the inter-school music competition**, amongst 64 schools in North Mumbai.

# Skills

### Technical Skills

- **MATLAB & Simulink**(Proficient)
- **ROS2**(Advanced)
- **C/C++**(Proficient)
- **Python**(Advanced)
- **Linux**(Advanced)
- **Dockers** (Intermediate)
- **Autodesk CAD tools**(Advanced)
- **Hydraulic& Pneumatic Systems** (Proficent)
- **PLC** (Intermediate)
- **Arduino, PYNQ board, raspberry pi** (Proficent)
- **Website devlopment** (Intermediate)
- **CircuitMaker** (Intermediate)

### Soft Skills

- **Problem Solving & debugging**
- **Creative & Abstract Thinking**
- **Research & Analytical Thinking**
- **Organizational & Planning**
- **Leadership**
- **Team-Oriented**
- **Professional Listener**

# References

- **prof. dr. ir. René van de Molengraft**
  Professor René van de Molengraft is Chair of Robotics at the Mechanical Engineering Department at TU Eindhoven (TU/e)
  Email:- m.j.g.v.d.molengraft@tue.nl

- **dr. Elena Torta**
  Elena Torta is an Assistant Professor in the Robotics section of the Mechanical Engineering department of the TU Eindhoven (TU/e)
  Email:- e.torta@tue.nl

- **dr. ir. Jos Elfring**
  Jos Elfring is an Assistant Professor within the Robotics section at the Mechanical Engineering Department at TU Eindhoven (TU/e)
  Email:- j.elfring@tue.nl

- **dr. ir. Cesar Lopez**
  Assistant Professor (Former), TU Eindhoven (TU/e), and he is currently working on mobile robots in healthcare.
  Email:- cesar.lopez.mar@gmail.com