

TAHSIN KHAN

☎ +91-9359682353 | ✉ tahsinkhan.211me352@nitk.edu.in | 🔗 linkedin.com/in/TahsinKhan | 🌐 github.com/TahsinKhan

RESEARCH INTERESTS

Autonomous Navigation Systems, Robot Motion and Path-Planning, Soft Robotics, Mobile Manipulators, Systems and Control Theory, Robot Localization, Robotic Arm Manipulation

EDUCATION

National Institute of Technology Karnataka

Surathkal, India

Bachelor of Technology in Mechanical Engineering

Dec 2021 – Present

(with Minors in Electronics and Communication Engineering)

CGPA (Major): 8.22/10.00 CGPA (Minor): 8.25/10.00

RESEARCH EXPERIENCE

Soft Autonomous Mobile Manipulators in Agriculture : A Review

September 2024 – Present

Undergraduate Researcher - Mobile Manipulators , Soft Grippers

NITK Surathkal, India

- Conducting a comprehensive **literature review** under the guidance of **Prof. Mervin Joe Thomas**
- Analyzed various **soft gripping** and **actuator** technologies, exploring their effectiveness in *agricultural* tasks.
- Studied traditional and *state-of-the-art* **path-planning** and **localization** methods used in *mobile robots*
- Investigated the advancements in **mobile manipulators**, focusing on optimizing **efficiency** in *agriculture*

Autonomous Robots and Multi-Systems Lab - IIT Bombay

May 2024 – July 2024

Robotics Research Intern - Advancing Field Exploration using ROS-powered vehicles

IIT Bombay, India

- Crafted a **ROS2-controlled**, 4WD-ackermann vehicle under the guidance of **Prof. Arpita Sinha**
- Implemented a **Kalman filter** to fuse **IMU** data with **Vicon** velocity estimates for accurate *odometry*
- Utilized **Pure pursuit algorithm** based *motion-planner* for autonomous **waypoint navigation** effectively
- Performed **LiDAR-SLAM**, leveraged **Nav2 AMCL** for *localization*, custom motion-planner for *navigation*.

IITD-AIA Foundation For Smart Manufacturing

June 2023 – August 2023

Research Intern - UR5 robotic arm manipulation for pick and place operations

(Remote) IIT Delhi, India

- Configured a **UR5** robotic arm in **ROS Noetic** and showcased its capabilities through visualization in **Rviz**
- Designed a user-friendly **3D** world in **Gazebo** to test **pick** and **place** operations efficiently
- Crafted precise **motion control**, leveraging the **Moveit Python API** to ensure accurate **path-planning**
- Seamless transition to **hardware**, laying the foundation for future **industrial automation** advancements

COMPETITIONS

eYantra Robotics Competition - 2024

August 2023 – December 2023

Team Captain - Cosmo Logistic (Rank - 16)

IIT Bombay, India

- Utilized **ROS 2**, **Nav 2**, **Computer Vision** and **Moveit 2** to develop a **warehouse-automation** solution
- Developed algorithms for **SLAM-based navigation**, **Aruco detection**, and **robotic arm manipulation**
- Advanced through **Stage 2** and secured an impressive **16th** position among **500 teams** nationwide
- **Implemented** the simulation in real-time **remote hardware** at **IIT Bombay's** warehouse.

DD Robocon - 2023

July 2023

Mechanical Subsystem - Robot Chasis and Mechanism Design

Delhi, India

- **National** stage qualifier for **ABU Robocon 2023**, participated as a part of **CSD Robocon NITK**
- Secured **first-time** qualification and represented the **institution** among the top **50 teams** in the country
- Built two **semi-autonomous** robots for precise **ring throwing** into **poles** up to **12 metres**
- Incorporated **catapult** and **dual-roller** shooting mechanisms delivering optimum **range** and **velocity**

eYantra Robotics Competition - 2023

October 2022 – April 2023

Team Member - Sentinel Drone

IIT Bombay, India

- Developed a **PID control** algorithm for stabilizing a simulated drone in **Gazebo** environment
- Implemented *Computer vision* algorithms using **OpenCV** for suspicious object **color detection** in the Arena
- Integrated **QGIS** to determine the *geographical* location of suspicious objects using **Georeferencing**

PROJECTS

NITK Autonomous Campus Shuttle

Jan 2025 – Present

ROS2 Humble, Autoware, AWSIM

- Engaged in the development of a **L5 autonomous campus shuttle**, under the **Centre of System Design (CSD)**
- Integrated **Autoware** as the core *software* stack with **ROS2** as the *communication* middleware
- Utilizing the **Mahindra Reva** electric chassis and integrating *LiDAR*, *cameras*, and *radars* for **sensor fusion**
- Working on **algorithm** development for *localization*, *path planning*, and *control* in complex **campus** scenarios.

MuJoCo-ROS2 Quadruped Robot Navigation System

April 2025 - Present

ROS2 Humble, MuJoCo, Python

- Created a **ROS2 bridge** enabling communication between **MuJoCo** and **RViz** for robot visualization.
- Developed **2D** and **3D IK solvers** calculating *joint angles* from foot positions for **trajectory generation**
- Implemented a **trotting gait** based quadruped **locomotion** with configurable *stride parameters*
- Waypoint navigation** using *cubic spline* interpolation of RViz interactive markers with heading control

MEMS-Based Piezoelectric Flooring for Robot Localization

August 2024 - October 2024

MicroSystems, ANSYS, Robot Localization

- Conducted research on an innovative **piezoelectric smart floor system** as part of the **Microsystems** course
- Proposed a system using *bimorph PZT* cantilever beams for **energy-harvesting** in *warehouse environments*
- Developed a hybrid *localization* and *identification* approach combining **RFID** tracking with PZT-based vibration
- Explored *novel odometry* and sustainable **MEMS-based energy** generation systems for warehouse *mobile robots*

ROS2 Teleoperated Differential Drive Robot

March 2024 – April 2024

ROS2, Raspberry Pi, Arduino, Python

- Crafted a **ROS2-controlled Differential drive** robot for precise movement with keyboard **Teleoperation**
- Developed **nodes** for seamless **communication** between the local-machine and **Pi** over a **ROS-network**
- Enabled low-latency **UART-serial** communication between **Raspberry Pi** and **Arduino**
- Layed the foundation for future integration of **SLAM** and **Deep-RL** algorithms for **autonomous** navigation

IEEE Skye Expedition - Drone Delivery Design

February 2024 – March 2024

UAV, Fusion 360, ANSYS, ROS2, Raspberry Pi

- Designed a modular *drone Remote-payload* deployment system for complex **drone delivery** operations.
- Engineered a **CFRP** design with *2-bar* release and **electromagnetic attachment** for versatile *UAV* integration
- Introduced a **Raspberry Pi** and **Arduino**-based *control system* with **ROS2** for remote payload deployment.
- Performed **CFD** analysis in **ANSYS** for the *deployable* platform, optimizing various **design** parameters.

TECHNICAL PROFICIENCY

Technologies: ROS, ROS2, Autoware, Git, Github, Linux, OpenCV, Moveit

Softwares: Autodesk Fusion360, Siemens TIA, MATLAB, ANSYS Adobe Photoshop

Programming Languages: Python, Arduino C

Hardware Proficiency: Raspberry Pi, Arduino Uno, ESP32, Nvidia Jetson

Coursework: Basics Of Robotics and embedded systems, Control Engineering, Microsystem Technology, Mechatronic Systems, Signal and Systems, Digital Electronics, Deep Learning Specialization (MOOC)

POSITION OF RESPONSIBILITY

Electronics SIG Head | **SAE NITK**

March 2024 - Present

- * Managing year-long projects for academic **2024-25** in the domains of **autonomous vehicles** and **robotics**, aligned with the **SAE Autonomous Mobility** Theme.

Mechanical Design Engineer | **CSD Robocon NITK**

June 2022 - October 2023

- * Collaborated with a team of **robotics** enthusiasts from **NITK**, contributing to the *design* and *fabrication* of fully functional robots for the annual **ABU Robocon** competition.

AWARDS AND ACHIEVEMENTS

- Awarded the *eYantra Summer Internship Program* at **IIT Bombay**, among the top **80** participants across India
- Secured an All India Rank (AIR) of **6824** out of **1.4 lakh** students in **JEE Advanced 2021**
- Awarded **2nd Degree Black-Belt (Dan Two)** in Shotokon Karate