SANIYA PATWARDHAN

Mechanical Engineering — Robotics — Indian Institute of Technology Gandhinagar
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RESEARCH INTERESTS

Robotic Manipulation, Object Recognition, Quadruped Robots, Control Systems, Robotics Simulation

EDUCATION

Indian Institute of Technology Gandhinagar, India — June 2024
B.Tech in Mechanical Engineering (Minor in Robotics) — CPI: 8.75/10

Dr. Kalmadi Shamarao Junior College, Maharashtra, India — 2020
Higher Secondary Certificate (HSC) — Percentage: 90%

Dr. Kalmadi Shamarao High School, Maharashtra, India — 2018
Secondary School Certificate (SSC) — Percentage: 93.8%

PUBLICATIONS

Publications in Review

- S. Patwardhan, S. Barat, and H. J. Palanthandalam-Madapusi, "Experiences from Experiments with Dynamic Sequential Multi-object Grasping for Cylindrical Objects," Submitted to the 2025 IEEE International Conference on Robotics and Automation, Atlanta, USA.
- V. K. Jonnalagadda, C. K. Mullapudi, S. Patwardhan, V. K. Knight, X. Yang, E. U. Samani, and A. G. Banerjee, "Extremum-Seeking Active Object Recognition in Clutter Using Topological Descriptors," Submitted to the 2025 IEEE International Conference on Robotics and Automation, Atlanta, USA.

Accepted Publications

- V. K. Jonnalagadda, C. K. Mullapudi, S. Patwardhan, E. U. Samani, and A. G. Banerjee, "Extremum-Seeking Active Object Recognition in Clutter Using Topological Descriptors," *Accepted at the 2024 IEEE International Conference on Robotics and Automation*, PACIFICO Yokohama: 2nd Workshop on Mobile Manipulation and Embodied Intelligence.
- A. Dan, S. Patwardhan, S. K. Saha, and K. RamaKrishna, "A Novel Control Strategy for Stance Stability of a Quadruped Robot against External Disturbance," *Presented at Advances in Robotics 2023, 6th International Conference of the Robotics Society.*
- S. Patwardhan, A. Dan, S. K. Saha, and K. Rama Krishna, "Simscape Modelling of Quadruped Robot under External Disturbance," *Poster presented at the 2nd International and 14th National Conference on Industrial Problems on Machines and Mechanisms (IPRoMM 2022).*

ACHIEVEMENTS

- **Student Travel Grant for ICRA 2024:** Received a total grant of USD 1000, sponsored by Mobile Manipulation TC and Robot Learning TC, for attending ICRA 2024 and participating in the 2nd Workshop on Mobile Manipulation and Embodied Intelligence.
- **Sabarmati Bridge Fellowship, IIT Gandhinagar:** Awarded a fellowship to conduct full-time research at the IITGN Robotics Lab as a Predoctoral Researcher for the academic year 2024-25.
- **Director's Silver Medal:** Awarded for outstanding overall performance at the 13th Convocation Ceremony of IIT Gandhinagar.
- **UW Mechanical Engineering Summer Research Grant:** Received a grant of USD 5700 to pursue a 10-week research program at the University of Washington.
- **MITACS Globalink Research Internship:** Selected for a fully funded summer research internship at Queen's University, Canada.
- **Dean's List, IIT Gandhinagar:** Recognized on the Dean's List for excellent academic performance.
- **Excellence Scholarship in Sports, IIT Gandhinagar:** Awarded for outstanding performance in both inter-college and intra-college sports leagues.

SELECTED PROJECTS

Multi-object Grasping with LEAP Hand — *Aug 2024 - Present*
Sabarmati Bridge Fellowship, IIT Gandhinagar
Developed a dynamic sequential grasping strategy utilizing the LEAP hand for effective pinch and power grasp transfer. Enhanced efficiency in multi-object manipulation tasks and implemented a dynamical systems controller with joint adaptive control.

Redundancy Optimization for Object Manipulation with LEAP Hand — *Sep 2024 - Present*
Sabarmati Bridge Fellowship, IIT Gandhinagar

Designed a framework for holding and erasing with a whiteboard duster. Focused on redundancy optimization for stable object manipulation, incorporating 6D object pose estimation using grasp theory concepts.

Autonomous Campus Shuttle *Jul 2023 - May 2024*
IIT Gandhinagar
Designed an autonomous vehicle for intra-campus transport with lane-following and object detection capabilities. Implemented a closed-loop feedback system using Pixhawk, RGBD cameras, and Lidar sensors to enhance navigation accuracy.

Active Robot Perception in Object Recognition *May 2023 - Sep 2023*
University of Washington
Implemented an extremum-seeking control strategy for next-best-view in object recognition. Integrated a mobile LoCoBot with an RGBD camera, improving recognition in cluttered environments and enhancing robustness.

Novel Control Law for Quadruped Robot Locomotion *Mar 2022 - Sep 2022*
IIT Delhi
Developed a control strategy using centroidal dynamics and Momentum Jacobian Matrix for stance stability on varied surfaces. Recognized with the best paper presentation award at Advances in Robotics 2023.

Robotic Heist: Autonomous Safe-cracking System *Jul 2022 - Dec 2022*
IIT Gandhinagar
Designed a 3P Gantry robot for autonomous safe-cracking tasks, utilizing computer vision, inverse kinematics, and force analysis for precision. Employed CAD modeling and 3D printing for fabrication.

Single Actuation, Six Motions: Mechanical Musical Band Project *Jan 2023 - May 2023*
IIT Gandhinagar
Engineered a musical band model with six distinct mechanical motions driven by a single crank, applying cam systems and four-bar mechanisms. Fabricated using laser-cut MDF sheets.

Basketball Rebound-taking Robot *Sep 2023 - Nov 2023*
IIT Gandhinagar
Controlled an SPS Stewart-Gough platform to rebound a ball to a desired position, conducting kinematic and dynamic analysis for precise positioning.

Motorized Printing System for Efficient Logo Stamping *Jan 2023 - May 2023*
IIT Gandhinagar
Developed a printing machine driven by a single-speed motor, optimizing for production speed and ensuring consistent logo impressions.

Cartpole Balance using Reinforcement Learning *Jan 2023 - May 2023*
IIT Gandhinagar
Designed a reinforcement learning model using Proximal Policy Optimization for balancing, employing the stable baselines library for visual simulations.

SKILLS

Programming: Python, C++, MATLAB, ROS 1 & 2, Arduino
Tools: Gazebo, Simulink, Fusion 360, ANSYS, OpenCV, Git
Prototyping: 3D Printing, Laser Cutting, CNC Machining, Lathe, Welding

RELEVANT COURSES

Robotics: Introduction to Robotics, Advanced Robotics, Introduction to Robot Grasping, Control Theory, Synthesis and Analysis of Mechanisms
Mechanical Engineering: Dynamics and Vibrations, Mechanics of Deformable Bodies, Manufacturing Processes and Systems, Solid Mechanics, Fluid Mechanics, Thermodynamics

EXTRA-CURRICULAR ACTIVITIES & POSITIONS OF RESPONSIBILITY

Captain, Women's Basketball Team, IIT Gandhinagar 2022 - 2024
Led the institute's basketball team at the 55th and 56th Inter-IIT Sports Meet, organizing training sessions and fostering team spirit.
Secretary, StepUp - The Dance Club of IIT Gandhinagar 2021 - 2022
Coordinated club events, choreographed performances, and managed rehearsals for inter-college competitions, building a vibrant dance community.
Core Committee Member, Marketing Head, Blithchron '22, Annual Cultural Festival 2022
Led a 120-member team to conduct IIT Gandhinagar's offline cultural fest, managing marketing strategies and sponsorships for successful event participation.
Core Team Member, Mean Mechanics - The Robotics Club 2021 - 2022
Organized workshops on Arduino IDE and OpenCV, and supported club projects, mentoring members on basic robotics and coding.