Shivam Sood

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shivamsood2000@gmail.com to-the-abyss Shivam Sood

Education

Indian Institute of Technology Kharagpur — West Bengal, India
Mechanical Engineering - GPA : 8.59 — Jul 2019 - Present

Bhupendra International Public School — Patiala, India
High School : 91.8%, Secondary School - GPA : 10.0 — Apr 2019

Publications

[1] **Force control for Robust Quadruped Locomotion: A Linear Policy Approach**
by Aditya Shirwatkar, Vamshi Kumar Kurva, ..., **Shivam Sood**, ..., Shishir Kolathaya
Accepted at **ICRA 2023** [link]

[2] **Multiple Waypoint Navigation in Unknown Indoor Environments**
Shivam Sood, Jaskaran Singh Sodhi, Parv Maheshwari, Karan Uppal, Debashish Chakravarty
Accepted at **ICCR 2022** [link]

Experience

Multi-Agent Robotic Motion Laboratory — NUS, Singapore
Research Intern — Mar 2023 – Present

- Working on novel, end-to-end **torque** based deep-RL teacher-student framework for **scalable legged locomotion**
- Implemented **model-free position control** policy, trained using PPO in Isaac Gym, on a **hexapod** robot(Daisy)

Stochastic Robotics Lab — IISc Bangalore
Research Intern — May 2022 – Dec 2022

- Implemented a **motion imitation** based linear RL policy on an in-house quadruped(Stoch3) using PGPE
- Applied **Representation-Free MPC** for stable trajectory tracking of a quadruped achieving frequencies of **60Hz**
- Worked on **lower-level motor control** for swing and stance legs calculating the feedback and feedforward torques

Autonomous Ground Vehicle Research Group — IIT Kharagpur
Undergraduate Researcher — Mar 2020 – Present

- Benchmarked and tested Control algorithms like **Stanley, Pure Pursuit, Pole Placement, LQR** and **MPC**
- **Optimized** control algorithms for compute and performance utilizing **adaptive cost** and path **velocity profiling**

Vecros Technologies Private Limited — New Delhi, India
Robotics Software Development Intern — May 2021 – Jul 2021

- Implemented **Dijkstra**-based path planning algorithm for a **multi-agent** system of drones in a **3D weighted grid**
- Deployed **YOLO** algorithm on RealSense cameras with integrated Kalman Filtering for trajectory detection of a car

Projects and Competitions

DRDO UAV-Guided UGV Navigation Challenge — DRDO & IIT Kharagpur
Winner, Inter IIT Tech. Meet 10.0 [Presentation] — Mar 2022

- Secured first position representing IIT Kharagpur, outperforming 22 other IITs with more than a 10% margin
- Implemented **NMPC control** for an unmanned snow-clearing **ground vehicle** on mountains with steep slopes
- Used a UAV's vision data for state feedback along with automated **coordinated motion** of the UAV and the UGV

Navigation and Manipulation in Unknown Environments — Prague, Czech Republic
Winner, IROS-RSJ Navigation and Manipulation Challenge 2021 [Link] — Jul 2021 – Sep 2021

- Utilized LiDAR, GPS and IMU based **exploration and mapping** for real-time obstacle avoidance and control
- Implemented **MPC** algorithm with optimizations including **adaptive tuning** and an **adaptive path resolution**
- Integrated global and local planning modules for TiaGO Base bot to traverse multiple waypoints in shortest time

Unmanned Rover for Astronaut Assistance IIT Kharagpur
University Rover Challenge 2022 — Guide : Prof Debashish Chakravarty Mar 2020 – Dec 2021

- Developed a chassis and **rocker-bogie suspension** system for rover prototype for the University Rover Challenge
- Performed **static and dynamic simulations** of the rover to optimize for load carrying, gradeability, and handling

Achievements

COMPETITIONS

2023	**Winner**, in Inter IIT Tech Meet 11.0	Drona/IIT Kanpur
2022	**Quarter Finalist**, in ICRA F1Tenth Challenge [Results : Team AGV]	Philadelphia, PA
2022	**Winner**, in Inter IIT Tech Meet 10.0 [Certificate]	DRDO/IIT Kharagpur
2021	**Winner**, in IROS Navigation and Manipulation Challenge [Certificate]	Prague, Czech Republic

ACADEMIC ACHIEVEMENTS

2023	Recipient of the Technology **Alumni Cup**	IIT Kharagour
2019	**Ranked in Top 1.4%**, out of 0.2 million candidates	JEE (Advanced) 2019
2019	**Ranked in Top 0.2%**, out of 1.3 million candidates	JEE (Main) 2019

Technical Skills

Languages	C, C++, Python, MATLAB, AVR (Assembly), Arduino, LaTeX
Libraries	SciPy, NumPy, OpenAI/Gym, CasADi, qpSWIFT, Pytorch, Matplotlib
Frameworks/CAD	Git, ROS1, ROS2, Solidworks, Ansys, MavROS, ArduPilot, Mission Planner
Simulation/Miscellaneous	Gazebo, Rviz, Webots, LTSpice, Adobe Photoshop, Adobe Premiere Pro

Relevant Coursework

* indicates MOOC

Robotics	Control of Mobile Robots*, Reinforcement Learning*, Controls Bootcamp*, Robotics
Mechatronics	Kinematics and of Machines, Dynamics of Machines, Basic Electronics, Rapid Prototyping
Software	Deep Learning*, Intelligent Machines and Systems, Soft Computing, Programming and Data Structures

Position of Responsibility

Captain, Drona Aviation Pluto Swarm Drone Challenge IIT Kharagpur
Inter IIT Tech. Meet 11.0 Dec 2022 - Present

- Led a team of 15 undergraduate students with the aim of developing a vision based state feedback control for an indoor multi-drone system handling socket communication with the flight controller without the use of ROS

Tutor, Autonomous Robotics IIT Kharagpur
IEEE Winter School of Robotics [Certificate] Mar 2021

- Mentored a batch of 100+ students, focusing on various aspects of robotics including micro-controllers, AVR programming, sensor integration, basic algorithms for control of mobile robots, and Robot Operating System

Freshmen Mentor IIT Kharagpur
Student Welfare Group [Certificate] May 2021 – Present

- Mentoring 5 junior students of my department throughout their college life for their general and academic doubts

Extracurriculars

National Cadet Corps - Participated in parades, blood-donation camps, marathons, and arms training
Football - Represented my hall at the Inter-hall Football Championship 2022 among 21 participating halls
Digital Art - Avid digital artist interested in stylized portraits, with a following of more than 500 people