HEMANTH PATEL

ACADEMIC PROFILE

Degree/Certificate	Institution	Percentage/CGPA	Year
B-Tech	Mechanical Engineering IIT (BHU), Varanasi	8.35	2025
TSBIE (XII)	SRI CHAITANYA JUNIOR KALASALA	98.60	2021
TSBSE (X)	NARAYANA E TECHNO SCHOOL	90.25	2019

SKILLS

- **Tech Stack:** Python, ROS, PyTorch, Matplotlib, OpenAI Gym, PyBullet, SQL, Pandas, Numpy, Dockers, Linux
- **Interests:** Data Science, Data Analysis, Reinforcement Learning, NLP, LLMs, Robotics, Computer Vision

INTERNSHIP/TRAINING

Software Developer – Systems Engineer | Drobot Inc. Jul'23- Present

- Migrated the codebase from **ROS1** to **ROS2**, shifting from **CMake** to **Python setup** and using **multiple Docker containers** to boost data throughput and scalability
- Replaced the **subscriber-publisher** architecture with a **service-client model**, improving data flow efficiency
- Applied **PCA** for dimensionality reduction followed by **DBSCAN clustering** to analyze **frequently executed gestures**
- Implemented a gesture control system for robots using **MoveNet** and **DepthAI**, achieving a processing rate of **25 Hz**

Artificial Intelligence and Robotics Laboratory | IISc Bangalore May'23 - July'23

Research Internship under Professor Dr. Suresh Sundaram | Report

- Developed **Physics Informed Neural Network** using **Leaky ReLU** and **10 lakh+ collocation** points to solve **PDEs**
- **Applied** the **PINN** to solve a complex **Hamilton-Jacobi-Bellman (HJB)** equation for optimal trajectory generation
- Enhanced **optical flow** estimation by solving PDEs with PINNs, achieving **89.5% accuracy** and surpassing **FlowNet**

PROJECTS

Enhancing Drone Flight with Meta-Learning and MPC Jan'24 - Mar'24

Robotics Research Project under the supervision of Dr. Shyam Kamal, IIT(BHU) Electrical Department GitHub | Report

- Lead a team to integrate the **Neural-Fly** model of **Domain Adversarially Invariant Meta-Learning** to enable wind-aware flight control using minimal data. Achieved precise control in challenging wind conditions.
- Implemented **MPC** algorithms to overcome actuation limits, ensuring accurate trajectory tracking and robust performance across different wind conditions.

Swing up for Acrobot and Pendubot using Reinforcement Learning Jun'23 - Jul'23

AI Olympics International competition - Simulation stage winner GitHub | Demo Video

- Designed and implemented control algorithms for vertical swing-up of acrobot and pendubot within OpenAI Gym.
- Utilized **Multi-Layer Perceptron (MLP)** policy and **Soft Actor-Critic (SAC)** algorithm to optimize the control policies.
- Developed a customized reward function based on energy shaping principles, incorporating **dual policies** for swing-up and stabilization at the top position to achieve effective swing-up behavior within **20 sec**.

Vision-Guided Voice-Controlled Robotic Arm for Precision Automation Jan'24 - Nov'24

B.Tech Project under supervision of Dr. Amit Tyagi, IIT(BHU) Mechanical Department GitHub|Report

- Development of a robotic arm system with **5 cm precision** in pick-and-place tasks, integrating **MoveIt** and ROS.
- **360 package inspection** using **YOLOv8** with 4 cameras and reoriented through a specially designed gripper.
- Implemented voice command functionality with **90% accuracy** using a speech recognition library.

PUBLICATIONS

- Rudrashis Majumder, **Hemanth Patel**, Sri Siddarth Chakaravarthy P, Samahith S A, Suresh Sundaram - *"OA-PINN: Efficient Obstacle Avoidance for Autonomous Vehicle Safety With **Physics-Informed Neural Networks**,"* accepted and presented at **IEEE CONECCT 2024**.

POSITION OF RESPONSIBILITY

Secretary, Robotics Club | Science and Technology Council, IIT BHU May'23 - May'24

- Led a **70+** core members towards common goals, organized **Mazex** and **LaRoboriga**, attracting **300+ participants**
- Managed inventories, designed the Robotics **Winter & Summer Camps** & **initiated** and **mentored** them in projects

Co-ordinator, Technex'23| IIT (BHU) Jan'23 - Mar'24

- Led a team of **4** to host the Dronetech - Drone competition, ensuring participation of **30+** teams, **24%** increment YOY.
- Formulated the problem statement and solicited **feedback** from *sponsors and the judging panel* on a regular basis

Core Member, RoboReG (Robotics Research Group), IIT(BHU) Jul'22 - May'23

- Collaborated with research-minded peers on robotics and AI projects, contributing to advancements in these fields.
- Participated in research pitches, presentations, and talks, showcasing innovations in robotics and AI.

HONOURS AND ACHIEVEMENTS

- **Represented IIT BHU in InterIIT Tech Meet 2023:** Presented engineering solutions at the Engineering Conclave, showcasing innovative projects and technical skills.
- **Simulation Stage Winner at AI Olympics 2023:** Secured **3rd** place in an **international Reinforcement Learning competition** held at IJCAI 2023, demonstrating advanced machine learning and data modeling skills.
- **2 x National Finalists in Flipkart Grid:** Ranked among the top 10 teams in a national robotics challenge aimed at developing cutting-edge solutions in robotics.
- **1st Place in Robotics Conclave at Technex '23:** Developed and presented an autonomous delivery system, demonstrating leadership and innovation in robotics engineering.
- **2nd Place in HardWired'22:** Excelled in a computer vision-based path-planning and detection event by applying data-driven approaches and machine learning algorithms.
- **2nd Place in DroneTech at Technex '22:** Secured a top position in a computer vision-based goal detection and UAV navigation event, utilizing advanced image processing techniques.

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