Yash Kumar Sahu

Research Assistant, Indian Institute of Science

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Education

2023 – 2024 **Masters Thesis**, Indian Institute of Science (IISc)
Advisor: Prof. Pradipta Biswas and Prof. Sadagopan Narasimhan
Title: Comparative Study on Image Translation GANs for Object Detection in Low-Resource Domains (presented at ICVTTS 2024, see Publications)

2019 – 2024 **Bachelors & Masters in Computer Science,**
Indian Institute of Information Technology, Design and Manufacturing (IIITDM), Kancheepuram
Advisor: Prof. Sadagopan Narasimhan; **GPA**: **8.44**/10.0 (**3.65**/4.0) (**Top 5%** in class)

Selected Honors and Awards

ICRA 2024 **RoboMaster University Sim2Real Challenge** (by Tsinghua University) | Yokohama, Japan | [More Info.]
- Awarded 3^{rd} prize globally, competing among 30+ teams (1^{st} ever Indian team to reach finals).

RoboCup 2023 **Autonomous Robot Manipulation Challenge** (by MathWorks) | Bordeaux, France | [More Info.]
- Ranked 4^{th} globally and 3^{rd} in classification accuracy among 10+ countries in the finals.

RoboWars 2023 **IIITDM Technical Festival** (sponsored by IEEE) | Chennai, India | [More Info.]
- Awarded 2^{nd} prize inter-university in the finals competing in a physical battle against 12 robots.

ERC 2022 **European Rover Challenge** (by European Space Agency (ESA)) | Krakow, Poland | [More Info.]
- Ranked 6^{th} globally at the 2022 remote edition world finals featuring 50+ teams from 10+ countries.

Publications

NeurIPS 2025 **Synthetic Tools Dataset via Diffusion Models** [Dataset]
Yash Kumar Sahu*, Yashaswi Sinha*, Himanshu Vishwakarma, Arushi Khokhar, Pradipta Biswas
Advances in Neural Information Processing System (Under Review)

ICRA 2025 **Blind Tactile Exploration for Surface Reconstruction**
Yashaswi Sinha*, Soumojit Bhattacharya*, Yash Kumar Sahu, Pradipta Biswas
IEEE International Conference on Robotics and Automation

ACM IUI 2025 **Diffuse Your Data Blues: Augmenting Low-Resource Datasets via User-Assisted Diffusion**
Yashaswi Sinha, Yash Kumar Sahu*, Shravan Shanmugam*, Abhishek Mukhopadhyay, Pradipta Biswas
Proceedings of the 30th International Conference on Intelligent User Interfaces (Accept. Rate 25%)

ICVTTS 2024 **Comparative Study on Image Translation GANs for Object Detection in Low-Resource Domains**
Yash Kumar Sahu, Abhishek Mukhopadhyay, Gyanig Kumar, Pradipta Biswas
IEEE International Conference on Vehicular Technology and Transportation Systems (Accept. Rate 30%)

CICT 2023 **Vision-Based Object Sorting in Dynamic Environments using YOLO for RoboCup ARM Challenge**
Yash Kumar Sahu, Radhika Mittal, Deep Patel, Chayan Maiti, M Sreekumar
IEEE International Conference on Information Communication Technology (h5-index: 27)

* Denotes equal contribution

Research Experiences

2023 – Present **Intelligent Inclusive Interaction Design (I3D) Lab** [More Info.], **Indian Institute of Science**
Research Assistant | Advisor: Prof. Pradipta Biswas

Image Blending Diffusion
- Developed a diffusion model to compose user-provided object images onto a variety of backgrounds.
- Blended user images while preserving features to boost data diversity for an object class.
- Implemented novel loss functions using cross-attention with KL divergence and image latents.
- Improved classification by 11% with 67% less data compared to traditional augmentations.

3D Surface Reconstruction
- Performed surface reconstruction using actor-critic reinforcement learning for tactile exploration.
- Enhanced reconstruction by registering tactile & photogrammetry point clouds using RANSAC.
- Achieved 91% IoU with 1mm precision for surface coverage of convex objects with sharp edges.

Image Translation
- Compared GANs and Diffusion models in translating synthetic & simulated to realistic images.
- Utilized these translated images for data augmentation to increase dataset diversity.
- Achieved FID 50.0, with 14% F1 and 56% mAP@50 boost on datasets limited under 1000 images.

2023 - 2024 **Centre for AI, IoT and Robotics (CAIRO), IIITDM** | Research Intern | Advisor: Prof. Sreekumar M
- Implemented path planning, depth estimation for efficient searching and pick-place by a robotic arm.
- Developed software for autonomous pick and place of a 7-DoF Franka Emika Panda using MATLAB.
- Performed object detection and classification using custom trained YOLO on RGB and depth images.

2023 **Mobile Robotics Lab, Indian Institute of Science** | Research Intern | Advisor: Prof. Debasish Ghose
- Implemented 3D path planning for drones using Corridor-based planning (Corridrones).
- Designed layered architecture for navigation, incorporating A*, Dijkstra's, & RRT algorithms.
- Developed cloud server architecture that reduced memory usage by 37% and enabled scalability.

2022 **Smart Manufacturing Lab, IIITDM** | Research Intern | Advisor: Prof. Senthilkumaran K
- Developed a full-stack PyQt GUI for collaborative 3D printing using two 4-DoF robotic arms.
- Supported synchronized multi-arm motion with real-time pose and print progress display.
- Mapped G-code coordinates to robot extruder poses for alternate layer printing by each arm.

2021 **Department of Computer Science, IIITDM** | Research Intern | Advisor: Prof. Ram Prasad Padhy
- Simulated traffic scenarios for autonomous navigation of self-driving cars using Autoware.AI.
- Developed a ROS-Gazebo bridge for physics simulation integration with Autoware.AI.

Talks

2024 **Hands on Object Detection and CNNs**, Talent Sprint, Indian Institute of Science, Bengaluru

2024 **Paper Presentation**, *IEEE ICVTTS 2024*, Amrita Vishwa Vidyapeetam, Bengaluru

2023 **Paper Presentation**, *IEEE CICT 2023*, IIITDM Jabalpur

2022 **Practical Robotics with ROS**, *4 Lecture Series*, IIITDM Kancheepuram

Corporate Experiences

2022 – 2023 **Hyper Horizon** [More Info.] | Robotics Software Intern (Autonomous Undersea Systems Division)
- Crafted navigation software in C++ and Python for an Autonomous Underwater Vehicle (AUV).
- Depolyed the ROS integerated robot in Indian water bodies for stealth monitoring operations.
- Built a full-stack PyQt mission planner for sensor telemetry monitoring and mission deployment.
- Configured 3D localization with sensor fusion of IMU, underwater depth SONAR, and GPS.

Leadership

2020 – 2022 **Mars Research Station (MaRS), IIITDM** | Software Development Team Lead
- Co-founded the college's first rover club, winning the college's **Pioneering Spirit Award.**
- Club recognised by the **Director of Indian Space Research Organization (ISRO) Satellite Centre**.
- Spearheaded the software team to achieve top rankings in international rover competitions.

Skills

- **Languages, Libraries and APIs**
  Bash, C/C++, Keras, OpenAI Gym, OpenGL, OpenMP, PyBullet, PyQt, Python, Pytorch, Tensorflow
- **Tools and Platforms**
  Autodesk Fusion 360, Docker, Git, Linux, MATLAB, Nvidia Isaac Sim, ROS, ROS2

Volunteering

2021 – 2023 **National Cadet Corps (NCC)** | Senior Under Officer
- Led university NCC wing among 400+ students in training for the nation's second line of defense.
- Achieved best grades (**top 2%**) in the battalion for the second-highest level (B) training certification.

2022 – 2024 **Student Mentor** | Mars Research Station (MaRS), IIITDM
- Guided 100+ students over two years in robotics, bridging simulation and real-world implementation.
- Served as the official team mentor for ISRO's Rover Challenge, leading the team to secure 5^{th} place nationally, competing against industry professionals and postgraduate experts.
- Mentored team for a national competition, leading to team felicitation by the **Indian President**.