Abhishek Jha

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EDUCATION

Delhi Technological University   *Dec'20 - May'24*
Bachelor of Technology in Mechanical Engineering   *GPA: 8.98/10.00*
Relevant coursework: *Machine Learning, Computer Vision, Optimization Techniques, Introduction to Self-Driving Cars, Motion Planning in Self Driving Cars, Mathematical Thinking in Computer Science, Programming Fundamentals, Applied Mathematics I, Applied Mathematics II*

RESEARCH EXPERIENCES

Visual Navigation using Semantic Conditional Constraint | *University of Adelaide*   *Feb'24- Present*
Australian Institute of Machine Learning | Supervisor: Dr.Sourav Garg

- Working on a controller given current visual observation and conditional constraint to predict next actions.
- Using semantics for mapping with topological graphs with current and goal images for context-aware planning .
- Worked on replacing RGB observations with category masks to navigate in houses and reach the given textual goal.

Neural Integral Barrier Certificates Under Limited Actuation | *University of Virginia*   *Feb'24- Sep'24*
Chandra Robot Autonomy Lab | Supervisor: Prof.Rohan Chandra

- Worked on a decentralized approach to ensure safe and efficient navigation for multiple agents with high scalability, significantly enhancing their ability to operate in complex environments.
- Implemented multi-agent navigation system that guarantees collision-free movement and minimizes deadlock, while maintaining agility and satisfying input constraints.
- Achieved an 100% collision avoidance and a reduction upto 92% deadlocks in complex environments under limited actuation with scalability of up to 1024 agents.

Benchmarking Deadlock Resolution in Social Mini-Games | *University of Virginia*   *Apr'23- Feb'24*
Chandra Robot Autonomy Lab | Supervisor: Prof.Rohan Chandra

- Worked on detailed experiments to review the deadlock resolution capabilities for multi-agent navigation in social mini-games and compare the strength of existing path planners.
- Benchmarked deadlock resolution capabilities for motion planning in social mini-games and classified the research work under four broad categories.
- Created a comprehensive taxonomy to evaluate the efficiency of various algorithms in avoiding deadlocks during social navigation mini-games for multi-agent systems.

Cross-View Geo-Localization using Reinforcement Learning | *University of Central Florida*   *Nov'23- Present*
Center for Research in Computer Vision | Supervisor: Prof.Yogesh S Rawat

- Working on cross-view video Geo-localization for trajectory refinement to accurately localize in urban scenarios.
- Clustering and refining the trajectory with multi-object tracking using reinforcement learning.
- Voxelized depth frames are used to capture depth information for comprehension of 3D structure of environment.

Semi-Supervised Segmentation for Defect Detection | *University of Central Florida*   *Jan'23- Nov'23*
Center for Research in Computer Vision | Supervisor: Prof.Yogesh S Rawat

- Worked on defect detection in Photovoltaic (PV) cells using semantic segmentation and electrolumiscence images.
- Improved the performance on specific defects by incorporating positive and negative threshold in loss function.
- Implemented mean-teacher framework with merely 20% labeled samples, achieved an absolute improvement of 9.7% in IoU, 29.9% in Precision, 12.75% in Recall, and 20.42% in F1-Score over prior state-of-the-art supervised method.

Diagnosis support Model for Autism using Xception | *Delhi Technological University*   *June'22- May'23*
Big Data Analytics and Web Intelligence Laboratory | Supervisor: Prof.Rahul Katarya

- Worked on the classification of Autism using rs-fMRI brain scans for early diagnosis using vision models.
- Implemented Xception network to reduce computations and achieve high-performance measures on brain scans.
- Further experimented with semi and self-supervised learning frameworks to deal with reduced labeled data.

Accepted/Submitted Publications

- Zinage, V., **Jha, A.**, Chandra, R., Bakolas, E. (2024). Decentralized Safe and Scalable Multi-Agent Control under Limited Actuation. arXiv preprint arXiv:2409.09573. (Under Review: IEEE International Conference on Robotics and Automation 2025 (ICRA 2025) paper
- **Jha, A.**, Rawat, Y., Vyas, S. (2024). PV-S3: Advancing Automatic Photovoltaic Defect Detection using Semi-Supervised Semantic Segmentation of Electroluminescence Images. arXiv preprint arXiv:2404.13693. (Under Review-Solar Energy, Elsevier) paper
- **Jha, A.**, Gupta, T., Rawat, S.S. and Kumar, G., 2024, May. Strategic Pseudo-Goal Perturbation for Deadlock-Free Multi-Agent Navigation in Social Mini-Games. In 2024 9th International Conference on Control and Robotics Engineering (ICCRE) (pp. 264-269). IEEE. paper
- **Jha, A.**, Khan, K., Katarya, R. (2023, August). Diagnosis Support Model for Autism Spectrum Disorder Using Neuroimaging Data and Xception. In 2023 International Conference on Electrical, Electronics, Communication and Computers (ELEXCOM) (pp. 1-6). IEEE. paper
- **Jha, A.**, Kumar, B., Madan, A. K. (2022). Real Time Analysis of Material Removal Rate and Surface Roughness for Turning of Al-6061 using ANN and GA. International Journal of Research in Engineering, Science and Management, 5(3), 145-150. paper

Projects

Lane detection for autonomous vehicle using edge detectors | *Project Code*   *Aug'22- Oct'22*
- Used OpenCV for detecting the edges and straight lines on a highway for finding drivable area.
- Used Probabilistic Hough Transformation for detecting straight lines to detect lanes on highway
- Investigated different edge detection algorithms like Prewitt, Sobel, Marr-Hildreth, and Canny edge detector and studied their complexities for detecting lane boundaries.

Autonomous navigation of turtlebot using SLAM | *Project Code*   *Sep'22 - Nov'22*
- Used turtlebot3 for trajectory planning in a 3D environment using the Robot Operating System (ROS).
- Created a 3D maze environment in the gazebo for the robot to obtain optimal trajectory without collision, slam-gmapping is used for localization and mapping the maze environment.
- Adaptive Monte Carlo localization (AMCL) node is used for obtaining cost maps and trajectory in the maze.

Obstacle Avoidance of Unmanned Aerial Vehicle using LiDAR | *Project Code*   *Oct'22- Dec'22*
- Developed a quadrotor simulation for obtaining a collision-free path in a detailed, random virtual environment by implementing advanced algorithm in Robot Operating System (ROS) and Python.
- Developed algorithm to divide the environment into three regions for perceiving the obstacle in a specified area.
- LiDAR scans are used to detect obstacles in the environment, and the SONAR sensor is used to make the quadrotor fly to a certain height.

Extracurriculars

DelTech Baja | *Vice Captain*

Delhi Technological University | *Supervisor: Prof.Akhilesh Arora*
- Led Asia's oldest Baja Team of 35+ students to design and manufacture an All-Terrain Vehicle (ATV).
- Worked on the research and development on perception and control for the new autonomous off-road vehicle.
- Previously led a sub-team of 5+ members responsible for developing vehicle dynamics of the buggy, including designing and manufacturing the suspension and steering system of the vehicle.

Skills

Languages: C/C++, Python, Matlab, LaTeX
Technologies: Git/GitHub, MySQL, Linux (Familiar with Ubuntu), ROS, Rviz, Gazebo, Solidworks, Ansys
Frameworks: Pytorch, TensorFlow, Keras, OpenAI Gym
Libraries: Pandas, NumPy, Matplotlib, OpenCV

Awards and Achievements

- All India Rank 1 at Preliminary Round of BAJA SAE 2024.
- Second Runner-up in the CAE event at BAJA SAE India 2021 (highest level in Asia).
- Overall Runner-up in Static event at FMAE BAJA India 2022.
- Secured 97%ile JEE Mains 2020, among top 3% (1.1 Million+) participants across India.
- Awarded a meritorious trophy and certificate for achieving a 10 CGPA (93.8%) in Class X.