Prabin Kumar Rath

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EDUCATION

M.S. Robotics and Artificial Intelligence	**Graduating May 2024**
Arizona State University, Tempe, AZ	4.00 GPA
B.S. Computer Science	**May 2020**
National Institute of Technology, Rourkela, India	8.91 GPA

TECHNICAL SKILLS

Programming Languages: Python, MATLAB, C/C++, C#, TypeScript, Java, Shell
Simulators: Gazebo, Coppeliasim, PyBullet, Nvidia IsaacSim   **Cloud Technologies:** Azure, AWS, Kubernetes, Docker
Tools and Frameworks: PyTorch, TensorFlow, ROS/ROS2, OpenCV, Open3D, Angular, SQL, Spring, Git, Linux

WORK EXPERIENCE

Electric Vehicles and Transportation (EVSTS Lab), ASU: **Research Assistant**   **Sept 2022 - Present**
- Integrated PV-RCNN 3D object detection model with Hesai and Ouster LiDARs, achieved an impressive **83.6% mAP**.
- Employed Kalman filters for accurate object tracking that exhibited **87.4% MOTA**. Calculated Safety Envelope and Time to Collision metrics between vehicles and pedestrians, enabling in-depth analysis of accident scenarios. Paper-Link
- Developed a Graph Neural Network (GNN) model for object boundary prediction and a Pointnet model for 7-DOF bounding box regression on 3D LiDAR data, achieving **~10 fps** on Hesai Pandar128.

Language Grounding and Planning (Logos Lab), ASU: **AI Researcher**   **May 2023 - Present**
- Created RL environment for tabletop manipulation with Franka Panda robot in Coppeliasim. Developed multi-robot RL environments in Nvidia IsaacSim. Enabled real-time simulation of **1000+** robots with RGBD-segmented observations.
- Conceptualized a receding horizon Transformer-Diffusion policy for generative neural motion planning, enabling random DOF robotic manipulation in tabletop, kitchen shelf, and cubby drawer environments.

Wells Fargo - EGS, Hyderabad, India: **Software Engineer (Data Scientist)**   **Aug 2020 - July 2022**
- Architected and deployed robust, multi-threaded Rest API modules in Python to efficiently interface with Azure Cognitive Services. Optimized average response time by **75%**, while delivering **4x** throughput.
- Engineered OCR pipelines for table layout detection and extraction of customer data from scanned bonds and contracts, resulting in a remarkable **400-hour/week** reduction of manual labor.
- Designed configurable and robust C# Regular Expression modules for numerical data extraction from **2.4 M** handwritten forms and documents; utilized XUnit to ensure consistent backward compatibility over multiple release waves.

ACADEMIC PROJECTS

Masked Trainable Embeddings for Efficient Robot Learning | RLBench, Imitation Learning, Python   **Fall 2023**
Coursework Project, Worked in a team of three, Project-Link
- Incorporated maskable trainable embeddings into SOTA Transformer-based Behavior Cloning algorithms for task and skill generalization. Improved the few-shot learning performance of the baseline models by an average of **32%**.
- Utilized Wandb for visualization of learning metrics while training the model on ASU's supercomputing clusters.

Stacking Cubes with Turtlebot Robotic Arm | Gazebo, RL, Planning, Python   **Spring 2023**
Portfolio Project, Worked in a team of three, Project-Link
- Devised a highly effective control and planning ROS MoveIt (IKFast, RRT*) package for stacking cubes and rigorously validated it through Gazebo simulations. Demonstrated **95%** success rate in simulations and **78%** on real hardware.
- Trained a torque-controlled visual servoing Soft Actor-Critic (SAC) policy in Gazebo with 3D RGBD observations that resulted in a **73%** success rate at grabbing cubes placed at random locations.

Preference Learning from Automatic Ranked Demonstrations | MuJoCo, IRL, Python   **Spring 2023**
Coursework Project, Worked in a team of four, Project-Link
- Improved the D-REX Inverse Reinforcement Learning (IRL) algorithm to learn reward functions from sub-optimal demonstrations using preference modeling. Implemented the algorithm with OOP principles on top of the imitation library.
- Trained a PPO reinforcement learning policy using Stablebaselines3 that outperformed the demonstrator by **233%**.

Spatiotemporal Learning for Traffic Flow Prediction | PyTorch, CNN, Python   **Fall 2022**
Coursework Project, Worked in a team of four, Project-Link
- Experimented with **4** different CNN backbone architectures (ResNet, VGG, EfficientNet, InceptionNet) for improving the spatiotemporal learning performance in traffic flow prediction applications (Python, PyTorch, Tensorboard).
- Improved upon the STResNet baseline achieving an average grid **RMSE 17.9** on TaxiBJ and BikeNYC datasets.

Monte-Carlo Tree Search Pacman Agent | MCTS, Python   **Fall 2022**
Coursework Project, Worked in a team of four, Project-Link
- Developed an AI agent for the Pacman game using the MCTS algorithm in Python. Merged reflex behavior and greedy A* search to achieve a win rate of **80%** on standard layouts.
- Benchmarked the algorithm against **3** conventional game-theory agents using statistical ANOVA Tukey HSD tests.

EXTRACURRICULAR ACTIVITIES

- Mentoring undergraduate students for projects in the course "Connected and Automated Vehicles", ASU   **Fall 2023**
- Organized Line Following robotics competition at NIT Rourkela, managed 30 teams from colleges across India.   **Fall 2018**