Suryaprakash Senthil Kumar

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Technical Skills

Python | C++ | MATLAB | CUDA | OpenMP | ROS 1/2 | OpenCV | TensorFlow | PyTorch | NumPy | Docker | Linux | CMake | Git | SQL | Google Cloud | Solidworks | PySpark | Pandas | NetworkX | TensorRT

Experience

BRAINML Laboratory @ GT [Lab website] **Aug 2024 – Present**

Affiliate Researcher, Machine Learning under Dr.Anqi Wu | ***Skills:*** *Slurm, PyTorch* *Georgia Tech*

- Modeled undirected spatio-temporal graphs to analyze behavioral interactions among mice by predicting their motion.
- Setup a distributed framework for training sequential models, with *transformer-based* attention to estimate edge weights.
- Constructed a custom loss function to preserve mice anatomy, achieving **12%** improvement in final trajectory prediction.

CORE Robotics Laboratory [Lab website] **May 2023 – Aug 2024**

Research assistant under Dr.Matthew Gombolay | ***Skills:*** *Python, ROS, MuJoCo* *Georgia Tech*

- Designed a simulation environment in MuJoCo to test an autonomous wheeled robot for mobile navigation, focusing on various control strategies using **reinforcement learning**.
- Used off-policy learning & achieved around **98%** success rate on mobile navigation and reacher tasks with $<$ **1%** error.

Swaayatt Robots Private Limited **Oct 2021 – Mar 2022**

Deep Learning and Computer Vision Intern | ***Skills:*** *TensorFlow, C++, CARLA* *Bhopal, India*

- Researched CNN pruning techniques for object detection and tracking on image data from an L4 autonomous vehicle.
- Investigated & optimized various neural network architectures, leveraging Google TPUs for large-scale training.
- Employed Lottery Ticket Hypothesis and compressed VGG16 by **45%** & YOLOv3 by **30%** with **5%** accuracy drop.

Projects & Publications

Human Pose Prediction using Temporal Convolutions [Project website] **Jan 2023 – May 2023**

- Analyzed sequential models for human pose prediction on the AMASS ACCAD dataset with SO(3) representation.
- Implemented Temporal Convolutions (TCN) that surpassed vanilla Transformer by **53%** with $<$ **50%** parameters.
- Built TCGAN to generate multiple input-conditioned poses and achieved comparable performance to several sequential baselines in the fairmotion library

Enhancing Advantage Actor-Critic (A2C) with Distributed Training **Apr 2024 – May 2024**

- Created a multithreaded implementation of A2C to train models, serving as a baseline for distributed training.
- Enhanced data collection from environment instances across clusters using Remote Procedure Call (RPC), achieving a **1.5X** speedup in training convergence.

Autonomous Mobile Robot Navigation **Oct 2022 – Dec 2022**

- Engineered a mobile robot via state machines to classify signs and avoid obstacles by fusing LiDAR, Pi-Cam & odometry.
- Deployed motion planning algorithms, including A* and RRT* using ROS2 Nav-Stack for real-time autonomous navigation within a maze environment. Implemented pure pursuit controller for dynamic path following.
- Processed incoming stream of images using Canny Edge Detector and KNN classifier, with an accuracy of **90%**.

Humanoid navigation using 3D Point Cloud data **Jan 2023 – May 2023**

- Performed human detection and coordinate estimation using the onboard VLP-16 LiDAR of the Digit bipedal robot.
- Utilized PointPillars & PointNet architectures to enable the detection of 3D bounding boxes.
- Implemented algorithms for Social Navigation to generate safe trajectories for the bipedal robot around humans, leveraging the 3D point cloud map collected from the LiDAR.

Education

Georgia Institute of Technology, USA **Aug 2022 – May 2024**

Master of Science in Robotics (AI and Perception) GPA: 4.0/4.0

Relevant Coursework: Computer Vision | Multi-Robot Systems | Deep Learning | Operating Systems | High Performance Computing | Data Structures and Algorithms | Reinforcement Learning | Object-Oriented Programming | Multithreading

SSN College of Engineering, India **Aug 2018 – Jun 2022**

Bachelor of Engineering in Mechanical Engineering GPA: 9.3/10.0

Relevant Coursework: Algebra & Calculus | Differential Equations | Machine Learning | Industrial Robotics | Pattern Recognition for Machine Vision | Mechatronics | Probability | Statistics & Numerical Methods | Computer Aided Design

Awards and Positions of Responsibility

- **Winner** - Mega Chess SF Hackathon, Aug 2024 - Strong Compute
- **Teaching Assistant** - Introduction to Artificial Intelligence (CS 3600 / CS 6601) between Jan 2023 and May 2024
- **Organizer** - International Conference on Energy and Materials Technology'21 (ICEMT) @ SSN College of Engineering.