Nitin Joseph Madapally Abraham

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TECHNICAL SKILLS

Languages: Python, C++, MATLAB, Java, R, SQL
Tools/Frameworks: PyTorch, NumPy, Pandas, scikit-learn, ROS, OpenCV, Docker, Jenkins, Git, JIRA, Tableau
Databases & Cloud Platforms:MySQL, AWS

WORK EXPERIENCE

NC State University, Jung-Eun Kim Group   Jun 2024 - Present
AI Researcher - Dept. Of Computer Science   *PyTorch Lightning, Python*

- Conducted an extensive literature survey on the usage of information bottlenecks in deep learning models to identify the layer of depth in a given model where a prediction stabilizes.
- Currently developing statistical models to predict difficulty of prediction in deep learning models thereby aiming to improve data acquisition techniques hence preventing time lags in model tuning.
- Estimating the information at a particular information plane of latent embeddings using forward hooking mechanisms and Kernel Density Estimation in deep models and testing their performance on distributed SLURM clusters.

Robert Bosch GmBH   Aug 2019 - Jul 2022
ADAS Software Engineer, Data Acquisition and Metrology, Video Tools   *Autosar C++, Python, Jenkins*

- Designed a multithreaded record and replay tool (Messtechnik Generations 2.5 and 3.0) for software verification and validation built on the ADTF Framework for video cameras in ADAS active safety according to ISO26262 standards.
- Developed a system monitor plugin filter for Messtechnik Gen3.0 for CAN-FD, UART and DINX message monitoring with health checks for camera systems and image frame counters. Improved system stability by over **60%** system faults caught, verified with on-device testing via Lauterbach JTAG.
- Implemented low light object preparation (LOP), lane departure warning (LDW), and road sign recognition (RSR) including traffic signs for EU and APac markets - functions for the Visualization Filter in MEA Gen2.5 using OpenGL resulting in improvement of detection accuracy by **25%**.
- Updated the CI/CD piepline for MEA Gen3 software on Jenkins, enabling customer specific builds of up to 7 parallel requests in less than 2 hours, and reducing deployment time by over **60%**.
- Achieved complete test automation of the MEA Gen2.5 Release framework in Python with a TKinter-based automation tool with PTC Integrity Client support in the backend, enhancing software update releases for MEA Gen2.5 by **300%**.

EDUCATION

NC State University, Raleigh, NC, MS Electrical Engineering GPA:3.90/4.0   **Aug 2022 – May 2024**
Relevant coursework: Resource Dependent Neural Networks, Computer Vision, Object Oriented Design

VTU, India, BE Electrical & Telecommunications Engineering GPA:3.54/4.0   **Aug 2015 – Jun 2019**
Relevant coursework: Digital Image Processing,Digital Signal Processing, Advanced DSP Algorithms

KEY PROJECTS

Unsupervised Representation Learning via Contrastive Methods | *PyTorch Lightning*

- Implemented SimCLR and Barlow Twins self-supervised contrastive learning methods with tailored data augmentations for learning representations from unlabeled images.
- Evaluated learned representations by training logistic regression classifiers, comparing against supervised baselines on the STL-10 dataset gaining an advantage of over **20%**
- Leveraged PyTorch Lightning for hardware agnostic efficiency of implementation on an NVIDIA RTX A6000 GPU cluster significantly reducing training time and improving model throughput.

Learning to Walk in Minutes using Parallel Efficient Deep Reinforcement Learning | *PyTorch*

- Simulated robot locomotion learning on the NVIDIA IsaacGym environment through an actor-critic based reinforcement learning setup on a massively parallel scheme to decrease training time while maintaining baseline accuracy.
- Achieved **48%** lesser training time (under 2 mins) by pruning a gated unit based architecture in place of the standard feed-forward network architecture for flat terrains measured using a custom defined conservative policy iteration loss.

Autonomous Navigation System with Clearpath Jackal using Visual SLAM | *Python, ROS2, Robotics*

- Led the development of a Visual SLAM-based autonomous navigation system with stereo camera based path planning, on an NVIDIA Jetson host, enabling low-cost survey of construction layouts
- Established and managed a Catkin workspace for ROS development. Built ROS packages for the robot including navigation stack, sensor drivers for 360 degree actuation of FARO Scanner with proof of concept verified on a gazebo environment followed by extensive testing before integration.
- Utilized 3D point clouds leveraging the ZED SDK to determine accurate perception of the test area and enabling LiDAR based collision avoidance using Adaptive Monte Carlo Localization with Extended Kalman Filtering.