Nitin Joseph Madapally Abraham

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EDUCATION

NC State University Raleigh, NC
M.S. in Electrical Engineering, GPA: 3.90/4.0 Aug 2022 – May 2024
Relevant Coursework: Resource Dependent Neural Networks, Computer Vision, Object Oriented Design

VTU India
B.E. in Electrical & Telecommunications Engineering, GPA: 3.54/4.0 Aug 2015 – Jun 2019
Relevant Coursework: Digital Image Processing, Digital Signal Processing, Advanced DSP Algorithms

WORK EXPERIENCE

Systems Research Lab – Jung-Eun Kim Group, NC State University Raleigh, NC
Visiting Researcher Jun 2024 - Present

- 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, aiming to improve data acquisition techniques and prevent time lags in model tuning.
- Estimated the information at a particular information plane of latent embeddings using forward hooking mechanisms and Kernel Density Estimation in deep models, tested on distributed SLURM clusters.

Robert Bosch GmBH Remote, Germany
ADAS Software Engineer, Data Acquisition and Metrology, Video Tools Aug 2019 - Jul 2022

- Designed and optimized a multithreaded record and replay tool (Messtechnik Gen2.5 and 3.0) for software verification and validation on the ADTF framework using C++14, enhancing quality and performance for ADAS active safety systems under ISO26262 standards.
- Developed and implemented a robust system monitor plugin for Messtechnik Gen3.0, enabling real-time monitoring and health checks for CAN-FD, UART, and DINX protocols. This solution , built on the Kithara RealTime driver, provided advanced stability and increased fault detection by over 60%, directly impacting product reliability.
- Optimized object detection and video processing capabilities with OpenGL-based functions in C++, improving performance in low-light object detection, lane departure warnings, and road sign recognition (RSR) for EU and APAC regions. This resulted in a 25% increase in detection accuracy.
- Enhanced CI/CD pipeline efficiency for MEA Gen3 software on Jenkins, enabling parallel customer-specific builds (up to seven requests) to deploy in under two hours, reducing deployment time by 60% and supporting faster product cycles.
- Automated the MEA Gen2.5 release framework using Python and a custom TKinter-based tool, which led to a 300% increase in update release speed—improving software quality assurance across multiple releases.

TECHNICAL SKILLS

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

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.

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

- 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.