Nitin Joseph Madapally Abraham

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TECHNICAL SKILLS

Languages: Python, C++, MATLAB, Java
Tools/Frameworks: PyTorch, Pandas, ROS, OpenCV, Docker, Kubernetes, Jenkins, Groovy, Git, JIRA, CANoe
Databases & Cloud Platforms:MySQL, SQL, AWS, Azure

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. This technique builds on cortical learning in the brain.
- 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 latent mutual information at a particular information plane 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, CAN-FD, 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 lane keep assist (LKA) functions for the Visualization Filter in MEA Gen2.5 using OpenGL resulting in improvement of detection accuracy by **25%**.
- Designed a fully automated CI-CD setup 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 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

Audio Context based Music Recommendations | *PyTorch Lightning*

- Currently investigating sound based recommendation systems using transformers tested on Spotify dataset to suggest similar sounding songs based on user input context.
- Performing spectrogram analysis and employing multimodal contrastive learning against song labels to find overlapping regions that optimize recommendations based on tag based classification of songs.

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*

- Developed a Visual SLAM-based autonomous navigation system with stereo camera based path planning and obstacle detection enabling low-cost survey of construction layouts.
- Designed a communication channel between the FARO scanner and the ground vehicle to ensure 360 degree ROI for scanning. POC verified in a Gazebo environment prior to implementation.
- Utilized 3D point clouds obtained using ZED SDK functionalities to determine accurate perception of the test area and enabling LiDAR based collision avoidance using Adaptive Monte Carlo Localization with Extended Kalman Filtering.