Harsh Bhate

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Skills

Programming Languages: C++, Python, MATLAB
Tools/Software: Adaptive Autosar (Bosch VRTE, EB), SIMULINK, CUDA, OpenMPI
Machine Learning and CV: OpenVX (TIOVX, Khronos), OpenCV, Tensorflow, Keras, Caffe, PyTorch, Scikit-Learn
Edge AI: OpenVX (TIOVX), Texas Instruments Deep Learning Library (TIDL), Qualcomm AI Suite (QNN), Tensorflow Lite, Tensorflow for Microcontrollers (Tiny ML), TensorRT
Technologies: Machine Learning, Image Processing, Computer Vision, Deep Learning
Platform: Linux, NVIDIA JetPack, QNX
Protocols: DDS, SomeIP, COVESA Common SPI, I2C
Web: Bootstrap, Flask

Experience

Software Specialist (Assigned to Ford Motor Company)   ***October 2022 to Feb 2024***
Satyam Venture Engineering Services Private Limited, Mumbai, India

Augmented Reality (AR), Digital Cockpit Technologies
(Technologies: Python, C++, Flask, Bootstrap, Qualcomm AI Suite)
- Developed website (frontend and backend) using Bootstrap and Flask to auto-generate application software code in C++ to run on Qualcomm boards.
- Ported machine learning models to run on Qualcomm 8XXX series.

In-Vehicle Auto-labeling (Project continued from Ford Motor Company)
(Technologies: Python, C++, Generative AI, Edge AI, Tensorflow, Adaptive Autosar)
- Ported Tensorflow Lite with Flex Operations to QNX on TI TDA4 platform with python backend.
- Implemented generative AI algorithm on TI TDA4 processors as a feasibility study for vehicle deployment.
- Implement Adaptive Autosar based service to run auto-labeling. Service includes development of control algorithm to ensure that computationally heavy algorithms run during feasible times such as key-off scenarios, EV charging etc.

Research Engineer – Digital Cockpit Technologies   ***Jan 2020 to Sept 2022***
Ford Motor Company, Detroit, USA

SoC Agnostic Machine Learning Framework
(Technologies: C++, EdgeAI, OpenVX, OpenCV, TIDL, TensorFlow Lite, Tensorflow for Microcontrollers)
- Architected requirements for an OpenVX based heterogeneous compute framework to run computer vision and deep learning applications.
- Implemented custom computer vision kernels in C++ to pre-process images & tensors for Texas Instruments TDA4 series of processors utilizing TIOVX (TI's implementation of OpenVX framework)
- Implemented and ported various proprietary ADAS based deep learning applications to OpenVX platform alongside native deep learning libraries (for example, TIDL on TI TDA4VM, Tensorflow Lite for generic ARM hardware such as Raspberry Pi, NVIDIA TensorRT for NVIDIA Xavier etc.)

In-Vehicle Auto-labeling
(Technologies: Python, C++, PyTorch, Generative AI, Edge AI, TIOVX)
- Architect In-vehicle/embedded application of auto-labeling – a technique to annotate data within the vehicle with minimal human interaction.
- Developed a generative AI algorithm using GANs to generate synthetic rendering of objects in user defined positions and conditions such as day/night etc.
- Benchmarked the efficacy of synthetic data in AI training against regular data.

Federated Learning
(Technologies: Python, TensorFlow)
- Identify the business use-case and feasibility for federated learning – a decentralized machine learning technique.
- Benchmark various hardware platforms such as Raspberry Pi, NVIDIA Xavier for training & fine-tuning of neural networks. Parameters benchmarked included speed, memory utilization and power consumption.
- Develop reference federated learning application utilizing automotive dataset on NVIDIA Xavier.

DDS Based ROS-Like Framework
(Technologies: C++, DDS, SomeIP)
- Develop ROS-Like inter-SOC communication framework using RTI-DDS for AI and Computer Vision application.
- Demonstrate framework capability by developing demo AI application.

Graduate Assistant, Advanced Programming Techniques   *Aug 2019 to Dec 2019*
Georgia Institute of Technology, Atlanta, USA

> Class covers several advanced topics in programming methods, data management, distributed computing, and advanced engineering algorithms using C++. Technologies covered include OpenMPI, CUDA and OpenGL. Role involved hosting support hours for students (graduate and senior undergraduate), grading homework and coding ideal solutions.

Engineering Intern, Camera and Side Radar Team   *May 2019 to August 2019*
Daimler Trucks North America, Portland, USA

> *Driver Monitoring System*
> *(Technologies: Python, Tensorflow)*
> - Trained MTCNN network on custom dataset to conduct joint face detection and alignment for driver monitoring application.
> - Developed MobileNet based classifier to identify driver activity.
> - Demonstrate application on NVIDIA jetson nano board.

Conferences and Publication

Panel Speaker, 2021 Edge AI Summit (USA)
November 2021
Panel speaker on a discussion about deployment of models from prototype to embedded devices in production. Topics covered include model compression, model pruning, hardware trade-offs etc.

Realtime Dynamic Gaze Target Tracking and Depth-Level Estimation for Augmented Reality Windshields
[The 6th International Workshop on Gaze Estimation and Prediction in the Wild](), [CVPR 2024]()
[Status: Submitted]

Patents and Intellectual Property

Automatic labelling of data by an entity gathering the data
Status: Published
US: 2023/0376805 A1 (https://ppubs.uspto.gov/dirsearch-public/print/downloadPdf/20230376805)

Adaptive Model Pruning in federated learning
Status: Published
US: 17/544307 (Filed Dec 7, 2021)
Germany: DE 10 2022 132 540 A1 (https://depatisnet.dpma.de/DepatisNet/depatisnet?action=bibdat&docid=DE102022132540A1)
China: Application Number: 202211479025.5, Issue Serial Number: 2023060900220220

Monitoring Machine Learning Models in Resource Constraint Automotive Settings
Status: Published
US: 2023/0376801 A1 (https://ppubs.uspto.gov/dirsearch-public/print/downloadPdf/20230376801)]
Germany: DE 10 2023 112 198 A1 (https://tinyurl.com/29wbf6wk)
China: CN 117114125A

End-End AI/ML Framework for lifecycle management of AI/ML applications in-vehicle, edge and cloud
Status: Published
US: US 2023/0376803 (https://ppubs.uspto.gov/dirsearch-public/print/downloadPdf/20230376803)

Automatic Onboard validation of a newly trained vehicle machine learning model
Status: Published
US: 2023/0376804A1(https://ppubs.uspto.gov/dirsearch-public/print/downloadPdf/20230376804)

Work Authorization

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