Bharath Raj Nagoor Kani

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EDUCATION

Sri Sivasubramaniya Nadar College of Engineering   Affiliated to **Anna University**
B.E. in Electronics and Communication Engineering (ECE) – CGPA: 8.4/10   *June 2015 – Apr 2019*

EXPERIENCE

Siemens Digital Industries Software

Associate ES Engineer, Intelligent Control Systems (ICS) Team   *May 2019 – Present*

Built models, algorithms and systems for myriad autonomous driving and general machine learning applications. A few highlights are elaborated below:

- **Ego-Lane Estimation and Tracking; ROS based Perception Toolchain:**
  - Lead the design and development of a fast and robust lane estimation system that can detect and track ego lane lines. Optimized it to handle several non-ideal scenarios.
  - Designed and implemented integral parts of a ROS based toolchain which contains several nodes that can perform various tasks related to perception for autonomous driving.
- **Maximum Entropy Inverse Reinforcement Learning:**
  - Researched and implemented algorithms based on maximum entropy inverse reinforcement learning to model highway driving styles given expert demonstrations.
- **Unsupervised Variable Length Multivariate Time Series Data Clustering:**
  - Researched and implemented feature extraction techniques and experimented with dimensionality reduction techniques and clustering algorithms to cluster together driver types given multivariate time series data.
- **Bird's Eye View (BEV) Representation Creation:**
  - Experimented with various feature extraction techniques and fusion strategies to extract lane information from LIDAR and multiple monocular cameras to be used for creating BEV representations of a scene.
  - Implemented code to create BEV representations given various elements of the scene. The created BEV representations were used for training various imitation learning algorithms.

PUBLICATIONS

Exploring Techniques to Improve Activity Recognition using Human Pose Skeletons

Bharath Raj N., Anand Subramanian, Kashyap Ravichandran, Venkateswaran N.

- Explored the efficacy of using hand crafted feature extraction techniques and some train-time techniques such as keypoint dropout on improving human pose skeleton based activity recognition performance.
- Published at the HADCV workshop at WACV 2020.

Single Image Haze Removal Using a Generative Adversarial Network

Bharath Raj N., Venkateswaran N.

- Created a conditional GAN (cGAN) based architecture to dehaze images. The generator of the cGAN used the 56 Layer Tiramisu model. A weighted loss function was used for the generator.
- Code and first version of the preprint were launched in 2018. Project currently has more than 70 stars on GitHub.
- Paper published at WiSPNET 2020.

PROJECTS

NeRF Implementation in TensorFlow 2 for 360-Degree Inward-Facing Scenes

- Created an implementation of NeRF from scratch in TensorFlow 2 for 360-degree inward-facing scenes.
- Includes implementation of components such as a least squares solver to find the nearest 3D point to N lines, inverse transform sampling and more.

Open Source Contributions to Kornia

- Made several contributions to Kornia, a popular open source differentiable computer vision library for PyTorch.
- Implemented a Direct Linear Transform (DLT) based Perspective-n-Point (PnP) solver using PyTorch.
- Contributed many other enhancements and fixes to various parts of the repository.

Deploying Tiny YOLOv2 on Jetson Nano using DeepStream
- Deployed a Tiny YOLOv2 ONNX model on NVIDIA Jetson Nano using the DeepStream SDK.
- Modified existing C++ code to enable it to parse the output of the TinyYOLOv2 model.
- Blog post is featured in the Jetson Community Resources page in the Deep Learning section. [✎ <u>article</u>]

Activity Recognition System based on Human Pose Estimation
- Used OpenPose to extract human pose skeletons. Implemented a custom BRIEF based multi object tracker.
- Enabled the use of multiple LSTMs in different CPU processes to enhance speed of the overall system.
- Created a pipelined system with functionality for stitching output from processed frames in order.

Technical Articles
- Authored technical articles on various topics in machine learning and computer vision. A select few articles are mentioned below:
  - *Advances in Generative Adversarial Networks.* [✎ <u>link</u>]
  - *An Overview of Human Pose Estimation with Deep Learning.* [✎ <u>link</u>]

TECHNICAL SKILLS

Languages: Python, C++, C, JavaScript, MATLAB
Frameworks & Libraries: ROS, RViz, TensorFlow, PyTorch, PCL, OpenCV, SciPy
Developer Tools: Git, Docker, GCP, AWS, PostgreSQL

MISCELLANEOUS

Google Code-In Mentor | *CloudCV*   *Oct 2018 – Dec 2018*
- Google Code-In is an event where students of the age group 13-17 contribute to open source organizations.
- As a mentor for the project Fabrik, I helped students complete their tasks and provided extensive code reviews and feedback.

Machine Learning Domain Head | *Tech Club SSN*
- Conducted technical classes for juniors, and organized events and hackathons as the machine learning domain head of Tech Club SSN during my final year of study.
- Created a website for Tech Club SSN.

ACHIEVEMENTS

People's Choice Award | *Yet Another Hackathon*   *August 2018*
- Presented a simple carry-on device created using a Raspberry Pi and an accelerometer sensor that can detect if a person has been assaulted and if so sends SMS alerts.

Runner Up | *Data Science Challenge, IIT Madras*   *April 2018*
- A 10 day contest involving a highly skewed dataset to detect debit card fraud.

Runner Up | *AWS Deep Learning Hackathon, IIT Madras*   *Jan 2018*
- Trained an object detection algorithm that could detect a few hand signs.

First Place | *Project Presentation, SSNCE*   *August 2017*
- Presented a live demonstration of a CNN that could break some simple captcha.