

RESEARCH INTERESTS

- Computer Vision, Robotic Perception, Machine Learning, Artificial Intelligence, Mobile Robotic Systems

EDUCATION

- **National Institute of Technology Karnataka** Surathkal, Mangaluru, India
B.Tech. in Information Technology, CGPA: 8.3/10 July 2012 - May 2016

EXPERIENCE

- **Ati Motors** Bengaluru, India
Research Associate in Autonomy Sep 2017 - current
 - 1) Implemented and successfully deployed an online algorithm for Lateral Pose Estimation of Camera with respect to Parallel Lane markings with the camera at a known height from ground. The algorithm involves lane segmentation using CNN, perspective transformation and RANSAC. The camera intrinsic parameters were estimated offline by using checkerboard camera calibration.
 - 2) Implemented and successfully deployed an offline algorithm for annotation of 2D Occupancy Grid Map with Lanes. This involves post-processing of Lateral Pose estimates of Camera with respect to Parallel Lane markings and Pose estimates of LiDAR from SLAM. This includes the relative transformation between Camera and LiDAR.
 - 3) Implemented and successfully deployed PointNet, a learning algorithm, for online detection of humans using LiDAR point cloud data in non-camera field of view to improve safety.
 - 4) Implemented and successfully deployed PointNet, a learning algorithm, for online Segmentation of Ground points for drivable area estimation using LiDAR point cloud data. The segmented ground points is used to create online occupancy grid map for drivable area.
 - 5) Implemented CNN models such as FCN, SegNet, UNet, LinkNet etc. for semantic segmentation. The goal was to quantify the performance of various models on Cityscapes, CamVid and custom dataset for Road Segmentation for drivable area estimation using Camera data.
 - 6) Successfully deployed Yolo_v2 implemented using DarkNet framework. This model was retrained on Berkeley Deep Drive dataset for detection of particular class of objects. The Yolo_v2 detection is further used to annotate obstacles detected with LiDAR point cloud data in camera field of view using relative transformation between Camera and LiDAR.
 - 7) Implemented a research paper, Denoising Autoencoders for Laser-Based Scan Registration, for improving initial pose estimation using ICP algorithm on LiDAR point cloud data. We observed a mere 3% improvement in initial pose estimates using ICP on denoised LiDAR point cloud data.
 - 8) Comparison of Grid Search based SLAM using range data for LiDAR point cloud data and RGBD camera depth data. The depth data from RGBD camera is transformed into point cloud data using camera intrinsic parameters.
 - 9) Developed various visualization tools for Camera and LiDAR data based solutions.
 - 10) Developed and successfully deployed, archived version of Ati's camera data capture pipeline.

- 11) Worked with Nvidia GTX GPUs and Jetson TX2 development board for benchmarking inference time of various Machine Learning models.
- 12) Represented Ati Motors at Poster Session held at Indian Institute of Science in July 2019.
- 13) Visited various Warehouses and Factories for data collection exercise.

Indian Institute of Science

Bengaluru, India

- *Project Assistant Intern at HPC Lab in SERC*

Jun 2016 - Dec 2016

Professor - Prof. R Govindarajan

Worked on Implementation and benchmarking of Data Parallel Algorithms to achieve high performance on hardware accelerators using Parallel Programming APIs such as CUDA C, OpenCL, OpenMP.

J P Morgan Chase

Mumbai, India

- *Technology Analyst Intern in Investment Banking*

May 2015 - July 2015

Worked on Data Analysis of real-time transaction data.

PROFILES

- LinkedIn - <https://in.linkedin.com/in/abhishek-r-s-862608a0/>
- Github - <https://github.com/AbhishekRS4/>
- Kaggle - <https://www.kaggle.com/abhishekr4/>

PROJECTS

- **Implementation of various Convolutional Neural Network models for Semantic Segmentation on Cityscapes and CamVid datasets:** Implemented various CNN models such as FCN, SegNet, UNet, LinkNet, PSPNet, DeepLab_v3, Tiramisu on custom classes. The experiment is to study the various ideas proposed in research papers and its effects on performance of the model on validation set.
- **Participated in TGS Salt Identification Challenge hosted on Kaggle:** Implemented custom CNN model using ideas from various research papers such as UNet, LinkNet, PSPNet, DeepLab_v3, DenseNet, Squeeze and Excitation network for salt segmentation in Kaggle competition. The model scored 0.811743 IoU on private test set. Our team finished in top 53% of the leaderboard.
- **Implementation of Convolutional Neural Network model based on Nvidia's research paper End to End Learning for Self-Driving Cars:** Implemented CNN model to predict steering angle from image on California Highway road dataset. The experiment is to reproduce the findings of the research paper that a CNN model can learn to predict steering angle from an image with reasonable performance.
- **Implementation of various CNN models trained on ImageNet dataset:** Implemented various CNN models such as VGG-16, VGG-19, ResNets, DenseNets, Xception, Inception_v3 models trained on ImageNet dataset using open source model parameters in TensorFlow which can be used for transfer learning.
- **Classification of traffic sign images using German Traffic Sign Recognition Benchmark dataset:** Implemented CNN model for classification of traffic sign images on GTSRB dataset with 43 classes. The model scored 97.7% accuracy on test set.
- **Classification of handwritten digit images using MNIST dataset:** Implemented CNN model for classification of handwritten digit images on MNIST dataset with 10 classes. The model scored 99.47% accuracy on test set.
- **Boston House Price Prediction:** Supervised Learning task of predicting the house median value for the Boston House dataset using various Regression techniques, Artificial Neural Network as part of mini project for Soft Computing Course. Tuning the hyper-parameters of ANN scored the best rmse among the various models.

- **Comparison of Artificial Neural Network, Support Vector Regression (SVR), Genetic Algorithm-SVR:** Studied and experimented an IEEE paper which compares the three models ANN, SVR and GA-SVR using open source R and its packages as part of mini project for Data Warehousing and Data Mining Course. Tuning the hyper-parameters of ANN proved to be the best among the three models.
- **Improvement of Leach Communication Protocol:** Studied and experimented an IEEE paper on the improved LEACH communication protocol in Wireless Sensor Network using Matlab as part of mini project for Wireless Sensor Networks Course.
- **Denial of Service attack identification based on Reputation based Trust in Wireless Sensor Networks:** Identification of DoS attack based on Reputation based Trust in WSN using three different models RFSN model (a mathematical approach), human behavior model and ant colony optimization algorithm. This research was my Major Project (final year). We demonstrated that RFSN model could outperform other models in identification of the DoS attack.
- **Data Parallel Algorithms:** Implementation of various Data Parallel Algorithms in OpenMP and CUDA C as part of Parallel Computing Course.
- **Implementation of Machine Learning Algorithms:** Implemented various Machine learning algorithms using Python and numpy.

PROGRAMMING LANGUAGES AND SKILLS

- **Programming Languages:** Python, C, C++, Java
- **Database:** SQLite, MySQL
- **Version Control:** Git
- **Open Source Python libraries:** numpy, scipy, pandas, matplotlib, scikit-learn, opencv, tensorflow, pytorch

SELF LEARNING COURSES

- Course Certificates - <https://drive.google.com/drive/folders/0Byk-dMy2pBxeX21IbmRIWFExNFk?usp=sharing>
- Machine Learning, Coursera (Certification)
- Mathematics for Machine Learning Specialization, Coursera (Certification)
- Deep Learning Specialization, Coursera (Certification)
- Applied Data Science Specialization, Coursera (Certification)
- Python for Everybody Specialization, Coursera (Certification)
- Robotics - Perception, Coursera (Certification)
- An Intuitive Introduction to Probability, Coursera (Certification)
- Data Science Math Skills, Coursera (Certification)
- Fibonacci Numbers and Golden Ration, Coursera (Certification)
- Parallel Programming and Optimization for Intel Architectures Webinar Series, Colfax Research (Certification)
- CS231n-Convolutional Neural Networks for Visual Recognition, Stanford University (Audit)
- Introduction to Computer Vision, Udacity (Audit)
- Artificial Intelligence for Robotics, Udacity (Audit)

ACHIEVEMENTS

- Won various prizes in Chess during 2005-2010 in School. This includes 3 Gold and 2 Silver medals.
- Won 1st prize in the Annual High School Quiz competition during 2008-2009.
- Won 2nd prize in the Annual High School Quiz competition during 2009-2010.
- Won 2nd prize in Bharath Ko Jano (Know India) Inter School Quiz competition during 2009-2010.
- Won 3rd Best Outgoing Student Award in High School during 2009-2010.
- Secured All India Rank of 6279 out of 1200000 candidates in All India Engineering Entrance Examination [AIEEE] during 2011-2012, now known as Joint Entrance Exam [JEE].
- Secured a Rank of 404 out of 80000 candidates in Karnataka Common Entrance Test [KCET] for Engineering during 2011-2012.

VOLUNTEER ACTIVITY

- Member of the team that conducted the event TECHeshis Castle as part of IEEE Tech Fest held during Dec 2012 - Jan 2013.
- Member of the team that conducted the Gaming Events of Incident16 (Cultural Festival of NITK) held during March 2016.