

Position: Internship, BSc, MSc Thesis

Title: Machine learning - train classifiers for clustering in 3D lidar data.

**About Apex.AI:** Apex.AI is an autonomous vehicle company that provides software solutions for personal and commercial vehicles, last-mile solutions and ride hailing services across the globe. Our mission is to release software solutions that are robust, reliable, safe, secure and ISO 26262 certified.



We aim to develop a lightweight, high-speed classifier with reasonable accuracy. Intern would aggregate both open source and proprietary data sets to train a lightweight classifier. Intern will test and implement a wide variety of features and classifiers to determine:

1. Trade-off between accuracy and speed
2. Most informative features
3. Confusion Matrix
4. Additional metrics

A stretch goal would be for the intern to develop a system to make it easy to train and test classifiers given arbitrary data, possibly integrated with Continuous Integration server

**Bonus:** Intern would implement novel computational geometry algorithms for bounding box computation. The intern should define metrics by which bounding boxes can be compared, and create a system to evaluate various bounding box algorithms with respect to these metrics.

Position: Internship, BSc, MSc Thesis

Title: Machine Learning - EM algorithm for kalman filter parameter tuning

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We desire an automatic parameter tuning system for linear stochastic systems. Intern would implement a system that may be integrated with CI that automatically tunes Kalman Filters using new data. This system would be implemented using the EM algorithm, with trust region techniques, and should be scalable to IMM models. The intern would determine and provide metrics to prove performance benefits from the parameter tuning.

Bonus: Intern would implement square root information filtering.

Position: Internship, BSc, MSc Thesis

Title: Optimization/Machine Learning - Set up system to optimize parameters given a labelled dataset (e.g. ground filter)

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We desire an automated system to evaluate and improve algorithms given labeled datasets, in particular we are focusing on ground segmentation algorithms. Intern would implement a system that:

1. Generalizes a labeled point cloud to a format our algorithms can understand
2. Computes various metrics automatically (i.e. in a CI run)
3. Has generic interfaces to use high-dimensional optimization techniques to optimize parameters
4. Partitions labeled data according to machine learning best practice

Position: Internship, BSc, MSc Thesis

Title: Software Engineering: Implement and evaluate improved ground filter

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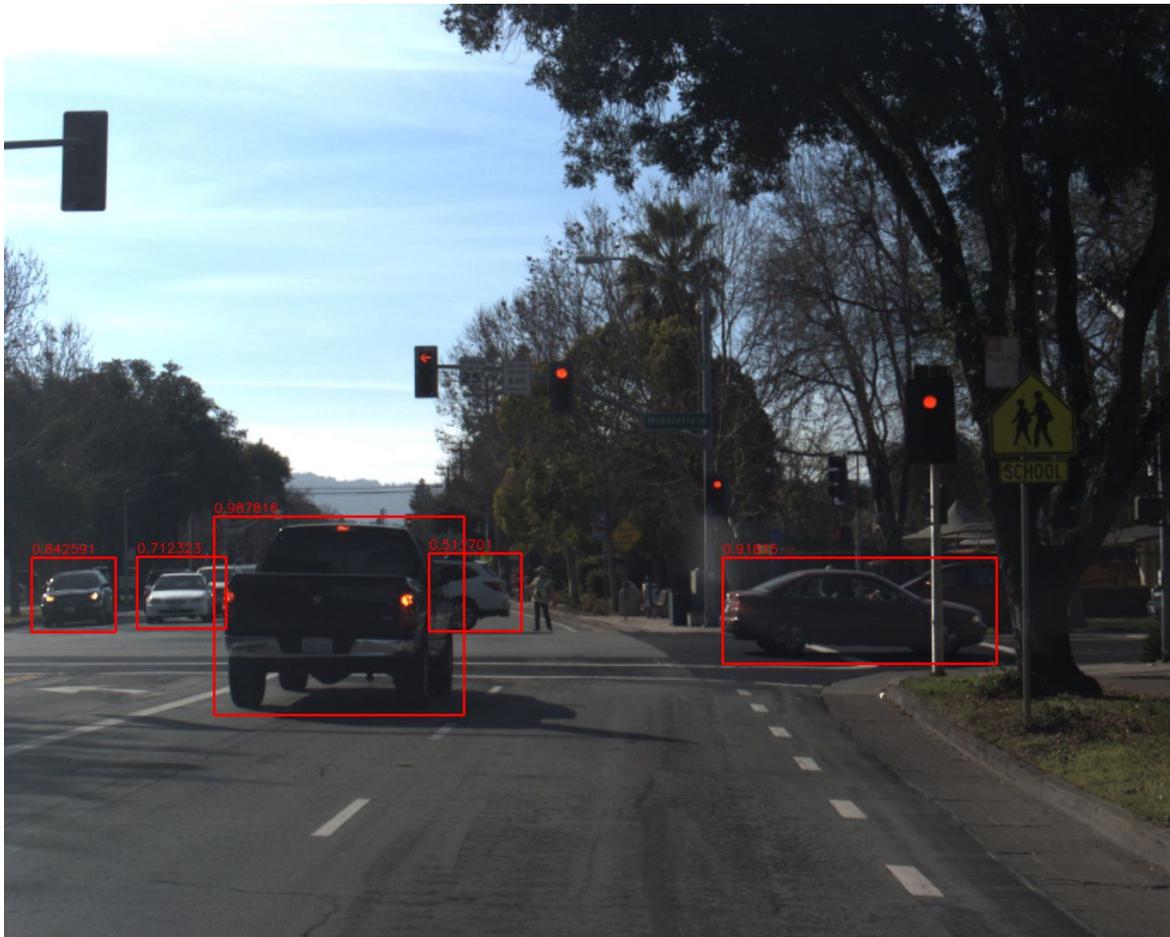


Intern would implement an improved version of ground-plane segmentation algorithms. This algorithm should then be evaluated against existing algorithms to prove/disprove performance gains. Failure cases of this algorithm should be investigated.

Position: Internship, BSc, MSc Thesis

Title: Deep Learning - Develop a classifier for pedestrians and cyclists detection and classification using the MXNet framework from RGB.

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The goal of the project is to implement a system that can reliably classify pedestrians and cyclists given images. Within the scope of the project, the tasks are:

- collect and assemble publicly available data to create a dataset for the task
- Implement and train a lightweight neural network aimed at the task using the MXNet framework
- Conduct appropriate tests and assist the process of integration on the car

Position: Internship, BSc, MSc Thesis

Title: Deep Learning - Train classifier for cars, pedestrians and cyclists detection and classification for night-time images.

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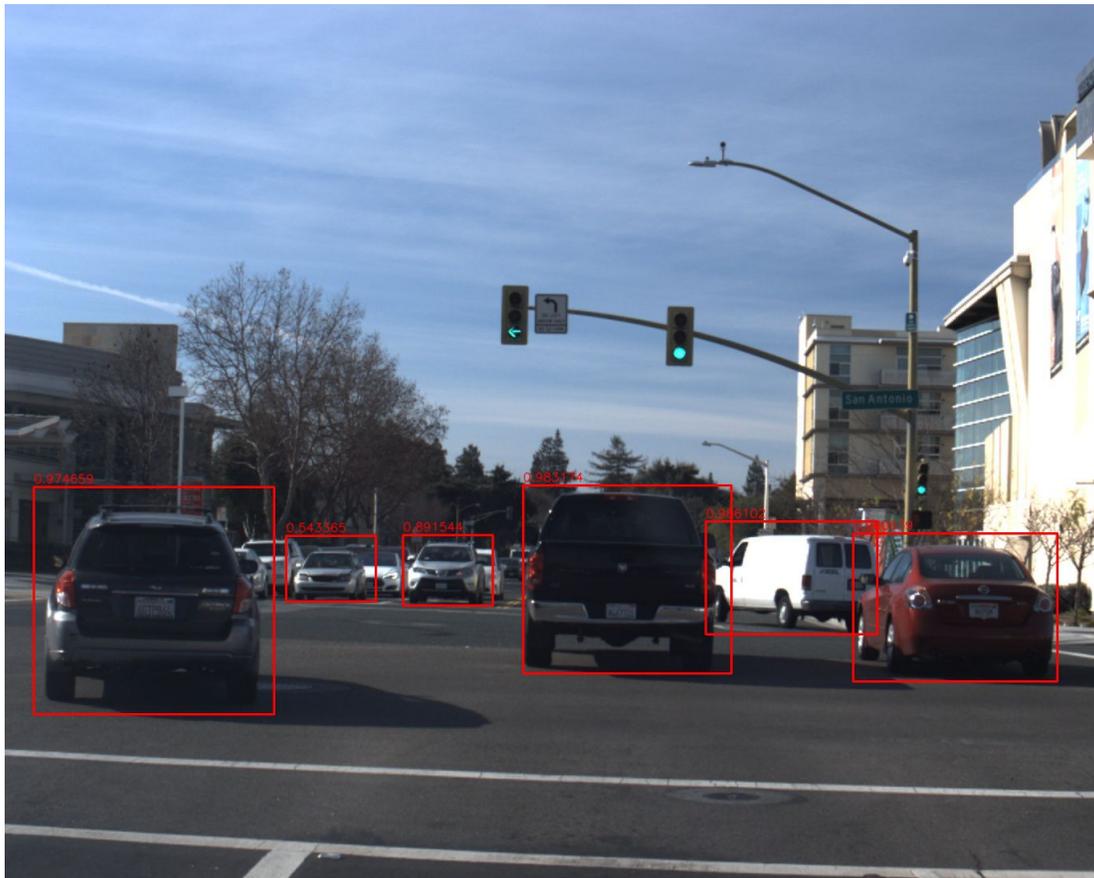
The goal of the project is to implement a system that can reliably detect cars, pedestrians and cyclists in low-light settings such as at night time. Within the scope of the project, the tasks are:

- collect and assemble publicly available data to create a dataset for the task
- Implement and train a lightweight neural network using the MXNet framework
- Conduct appropriate tests and assist the process of integration on the car

Position: Internship, BSc, MSc Thesis

Title: Deep Learning - Deep semantic segmentation from RGB.

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The goal of the project is to develop a system for semantic segmentation of RGB images taken from traffic scenes. Within the scope of the project, the tasks are:

- collect and assemble publicly available data to create a dataset for the task
- Implement and train a lightweight neural network using the MXNet framework
- Conduct appropriate tests and assist the process of integration on the car