

Neural Network-based Sensor Fusion for Vehicle Perception

Centre for Mechatronics and Hybrid Technology
Software Engineering McMaster University
Ash(Chang) Liu

EECOMOBILITY (ORF) &
HEVPD&D CREATE

VEHICLE PERCEPTION

Vehicle perception system provides "vision" to the autonomous driving vehicle. The reliability and robustness of this system are crucial to the future of safe autonomous driving.



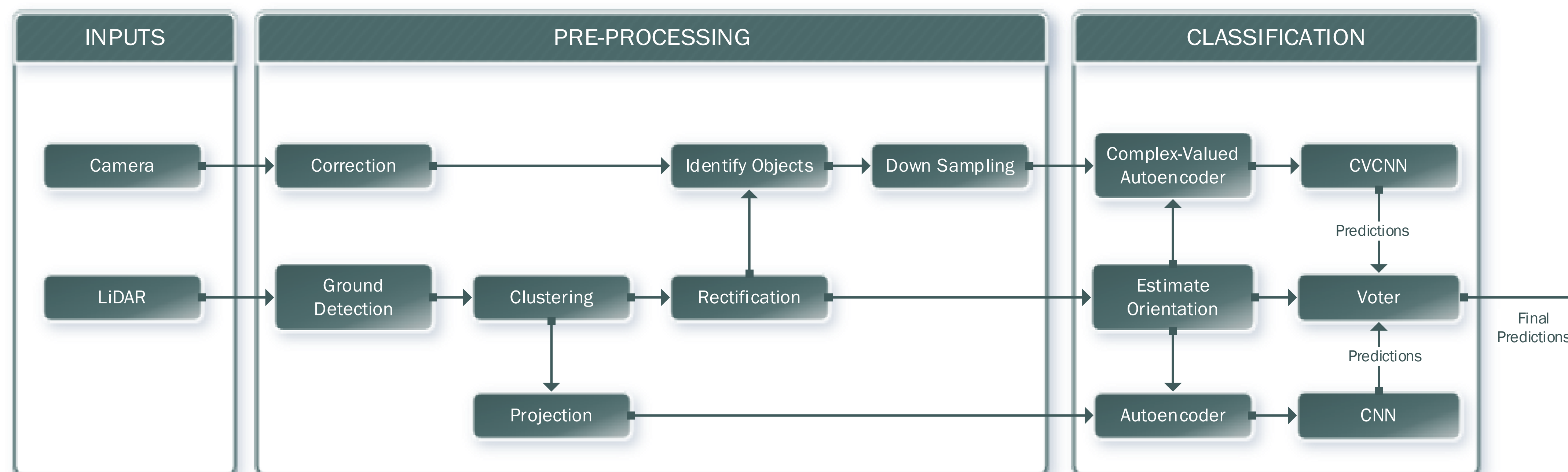
*Image is generated from KITTI data set

At McMaster University CMHT, we are researching a robust and reliable sensor fusion based vehicle perception system. The system in developing is capable of detecting surrounding vehicle-like objects and classify them into one of the five categories: SUV, van, sedan, Truck, or NaV(not a vehicle).



The testing vehicle at CMHT has equipped with a high-performance Velodyne HDL-32E LiDAR sensor, a 360 surrounding camera systems with two front/rear facing cameras, and four surrounding view cameras.

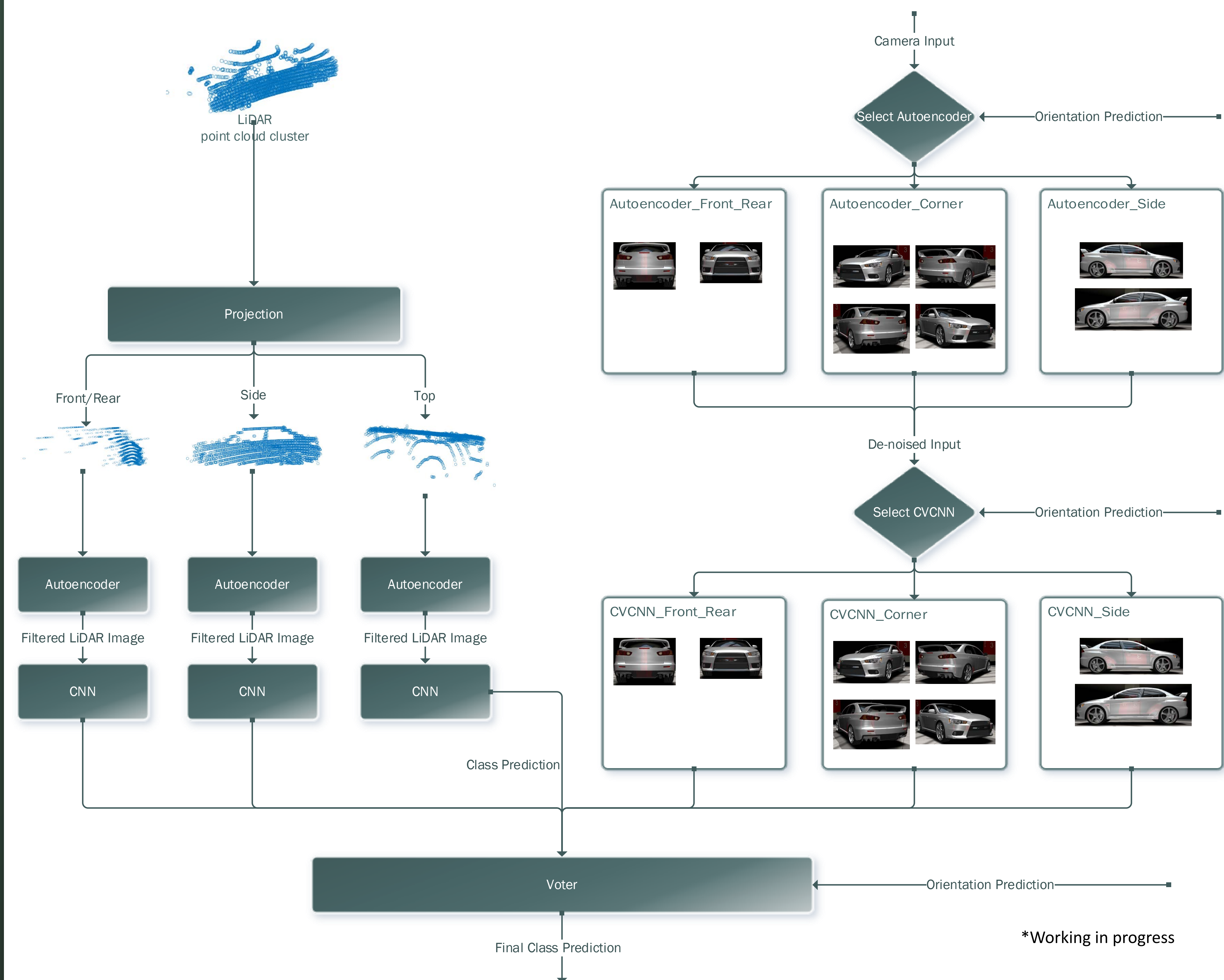
PROCESSING PIPELINE



Currently, we are focusing on LiDAR and camera decision-based sensor fusion.

- LiDAR is focusing on locating the objects.
- Camera provides features for better classification performance.
- Both inputs are feed into a heterogeneous neural network for classification.

HETEROGENEOUS NEURAL NETWORK



*Working in progress

- Multiple shallow neural networks activates less neurons than a conventional deep neural network approach.
- Specific trained sub neural network for specialized tasks.
- A different approach of accessing 3D input and utilize full 3D features.