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Predictions of short-term driving intention using recurrent neural network on sequential data

A prediction of driver's intentions and their behaviors using the road is of great importance for planning and decision making processes of autonomous driving vehicles. In particular, relatively short-term driving intentions are the fundamental units that constitute more sophisticated driving goals, behaviors, such as overtaking the slow vehicle in front, exit or merge onto a high way, etc. While it is not uncommon that most of the time human driver can rationalize, in advance, various on-road behaviors, intentions, as well as the associated risks, aggressiveness, reciprocity characteristics, etc., such reasoning skills can be challenging and difficult for an autonomous driving system to learn. In this article, we present a disciplined methodology to build and train a predictive drive system, which includes various components such as traffic data, traffic scene generator, simulation and experimentation platform, supervised learning framework for sequential data using Recurrent Neural Network (RNN) approach, validation of the modeling using both quantitative and qualitative methods, etc. In particular, the simulation environment in which we can parameterize and configure relatively challenging traffic scenes customize different vehicle physics and control for various types of vehicles such as cars, SUV, trucks, test and utilize high definition map of the road model in algorithms, generate sensor data out of Light Detection and Ranging (LIDAR), optical wavelength cameras for training deep neural networks is crucial for driving intention, behavior, collision risk modeling since collecting statistically significant amount of such data as well as experimentation processes in the real world can be extremely time and resource consuming.

Biography

Zhou Xing has completed his PhD degree in Particle Physics with his thesis focusing on large scale statistical data analysis, utilizing neural network methodologies on various analysis projects at LHCb experiment at CERN. He has joined Stanford Linear Accelerator Center (SLAC) National Laboratory as Engineering Physicist/Faculty and Staff, working on data acquisition and analysis. He has also joined a leading China EV company, NIO, where he specializes on a few deep-learning driven fields related to applications of autonomous driving, including supervised learning for semantic segmentations/road segmentations, moving object detections, trajectory prediction using optical camera as well as LIDAR measurements, reinforcement learning of continuous control, policy-based semi-model controlled reinforcement learning methods, etc.

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