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# The Prediction of Pedestrian Behavior from LiDAR Data

## SHAPE-IT ESR-3 project: Classifying and Predicting Interactions between AV and VRUs Using AI

### Motivations:

- **Background:** 1.35 million people are killed by road traffic accidents every year, and more than half involve VRUs.
- **Goals:** drive safely, help AVs make better decision
- **Challenges:** agile, less restrictions, vulnerable.

### Related work:

- **Model / rule based** – require priors and assumptions of the model
- **Data driven** - LSTM-based trajectory prediction networks
- Prediction from **LiDAR** data

### Dataset:

- **Waymo Open Dataset**: consisting 1,150 scenes, each spans for 20 seconds.
- The pedestrian labels:
  - 2.8 million 3D labels on point clouds with 23,000 tracking IDs
  - 2.1 million 2D labels on image with 45,000 tracking IDs


*Fig. 1. The example of data. Left: camera, right: LiDAR*

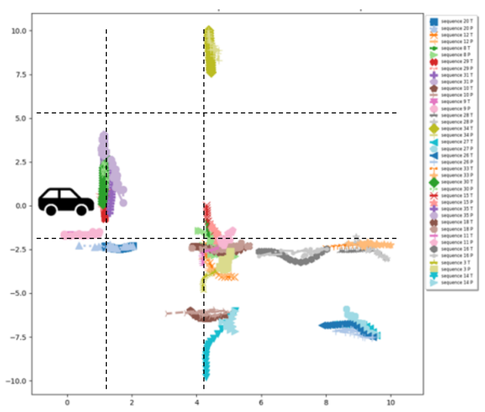

*Fig. 2. The results of pedestrian trajectory prediction at a crossroad*

### Methodology:

- Network structure: LSTM-based
  - History aware
  - Interaction aware
  - Context aware – Birdeye-View
  - Posture aware – Lidar data
- Output:
- - Trajectory
- - Crossing intention

### Results (Partial):

- Trajectory Prediction
  - Place: at a crossroad
  - AV heading: right
  - Frame duration: 0.4s
  - seq_length: 8s (20 frames)
- Algorithm used:
  - Social – LSTM (history & interaction aware)

### Future work:

- Finish the experiments & analysis
- Involve information of vehicles
- Apply on self-collected data in Europe

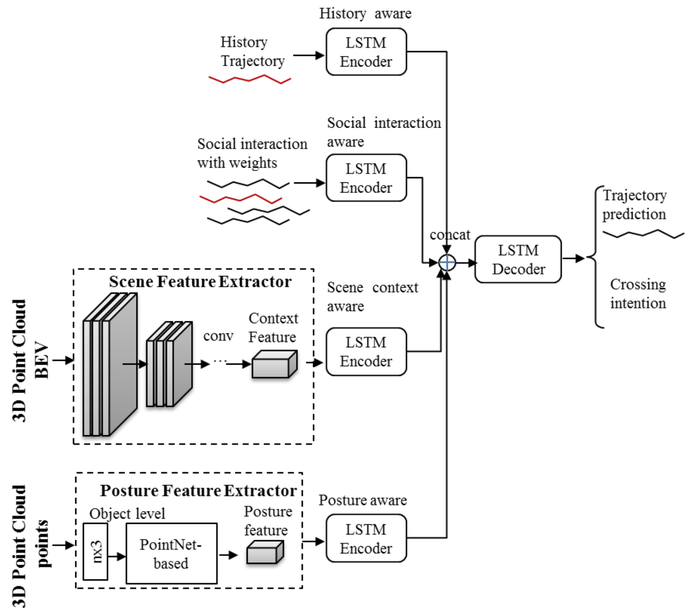


*Fig. 3. Our designed network structure*



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