Environment-Aware Pedestrian Trajectory Prediction for Autonomous Driving

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Motivation

➢ Autonomous driving is growing!

➢ Concerns
  ○ Pedestrian safety
  ○ Efficient/safe driving
Related Work: Multimodal Future Prediction

[Overcoming Limitations of Mixture Density Networks: A Sampling and Fitting Framework for Multimodal Future Prediction; Osama Makansi, Eddy Ing, Ozgun Cicek and Thomas Brox; University of Freiburg; 2019]
Related Work (cont.): DESIRE

[DESIRE: Distant Future Prediction in Dynamic Scenes with Interacting Agents; Namhoon Lee, Wongun Choi, Paul Vernaza, Christopher B. Choy, Philip H. S. Torr, Manmohan Chandraker; 14 Apr 2017]
Related Work (cont.): Social LSTM

[Social LSTM: Human Trajectory Prediction in Crowded Spaces; Alexandre Alahi, Kratarth Goel, Vignesh Ramanathan, Alexandre Robicquet, Li Fei-Fei, Silvio Savarese; Stanford University]
Related Work (cont.): Social GAN
Problem

➢ Complex architectures
  ○ CNN/RNN

➢ Location-awareness
  ○ Location bias map

➢ Versatility
  ○ Multiple agents
Our Datasets (2 environments)

[Collected from ETH main building, Zurich, by Stefano Pellegrini and Andreas Ess in 2009]

[Collected from hotel in Bahnhofstr, Zurich, by Stefano Pellegrini and Andreas Ess in 2009]
Data Loader

Walking paths → Annotated Video Footage → Displacement Vectors

(a) Walking paths
(b) Pedestrian i
(c) Displacement vector i
(d) Displacement volume

[Pedestrian Behavior Understanding and Prediction with Deep Neural Networks; Shuai Yi, Hongsheng Li, Xiaogang Wang; 2016]
Architecture

[Pedestrian Behavior Understanding and Prediction with Deep Neural Networks; Shuai Yi, Hongsheng Li, Xiaogang Wang; 2016]
Status/Future Work

➢ Location bias map improvements
  ○ Train on multiple locations

➢ Train on multiple agents
  ○ Pedestrians, cars, cyclists, scooters

➢ Multimodal approach
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Thank you for listening! Questions?