Environment-Aware Pedestrian Trajectory Prediction for Autonomous Driving

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Content

- ➢ Motivation
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- ➢ Problem
- ➢ My approach
  - ○ Data loader
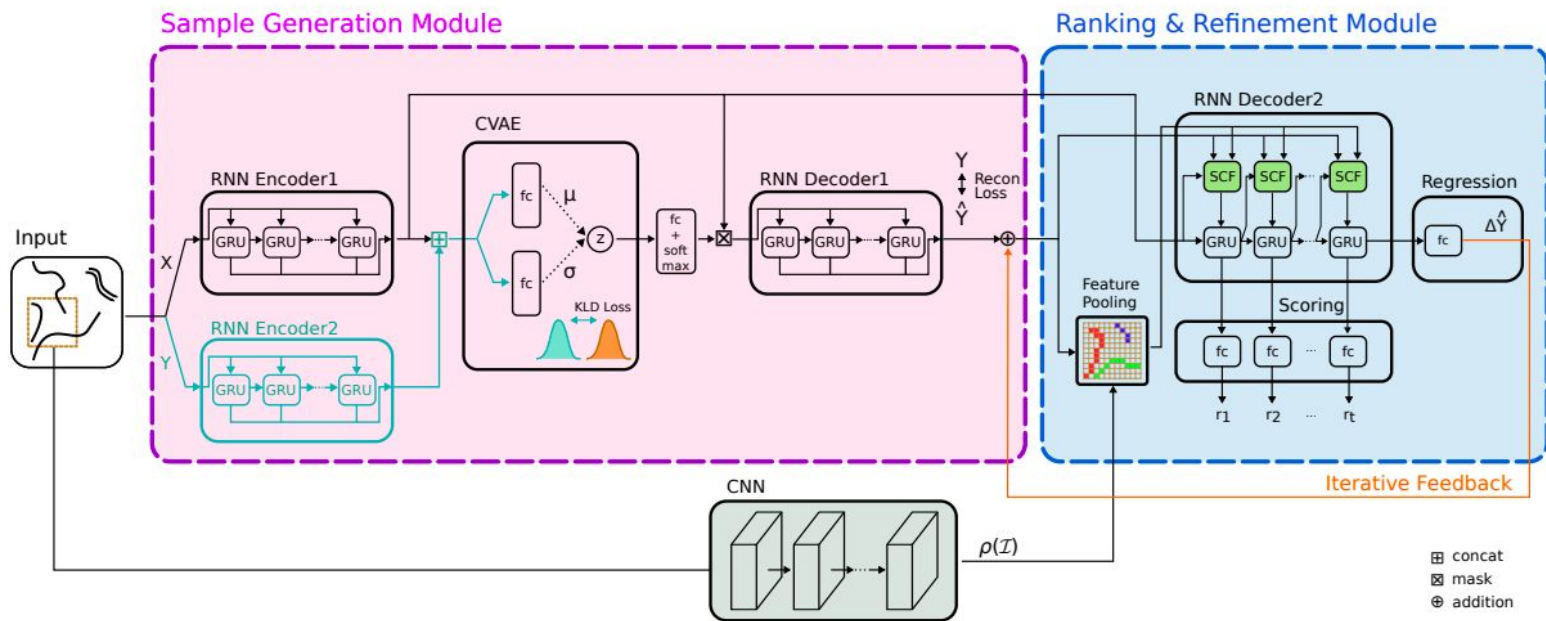 - ○ Network architecture
  - ○ Future work

Motivation

➢ Autonomous driving is growing!

➢ Concerns
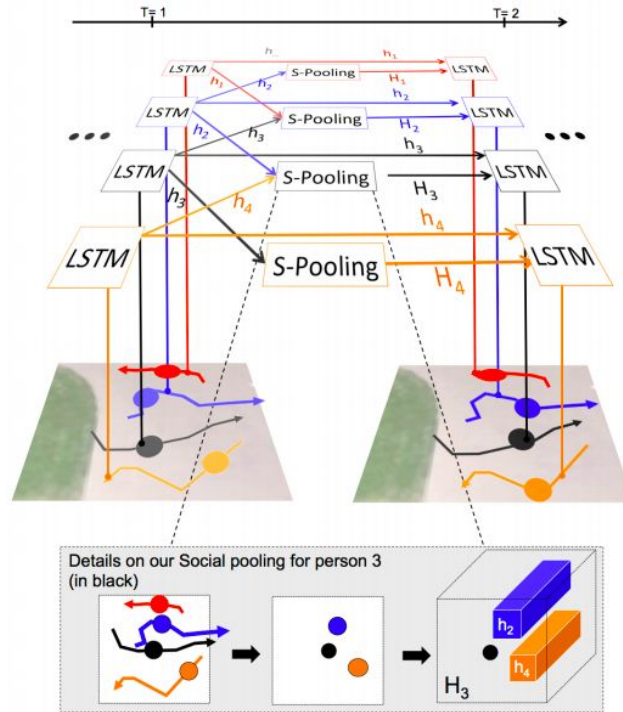 - ○ Pedestrian safety
  - ○ Efficient/safe driving

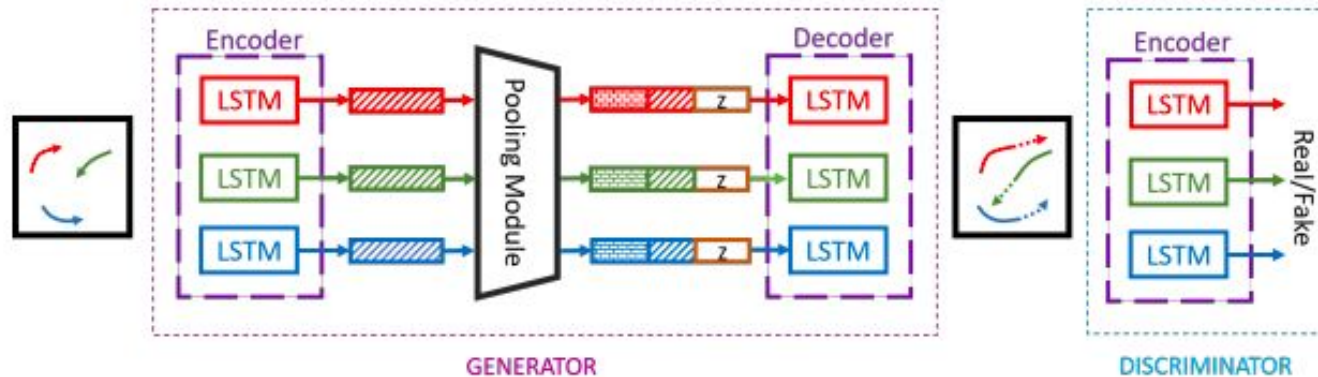# **Related Work: Multimodal Future Prediction**

[Overcoming Limitations of Mixture Density Networks: A Sampling and Fitting Framework for Multimodal Future Prediction; Osama Makansi, EddyIng, 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]

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Related Work (cont.): Social GAN

[Social GAN: Socially Acceptable Trajectories with Generative Adversarial Networks; Agrim Gupta, Justin Johnson, Li Fei-Fei, Silvio Savarese, Alexandre Alahi; 29 Mar 2018]

Problem

➢ Complex architectures
- ○ CNN/RNN

➢ Location-awareness
- ○ Location bias map

➢ Versatility
- ○ Multiple agents

32x32x3 image
5x5x3 filter

32

32

3

convolve (slide) over all
spatial locations

28

28

1
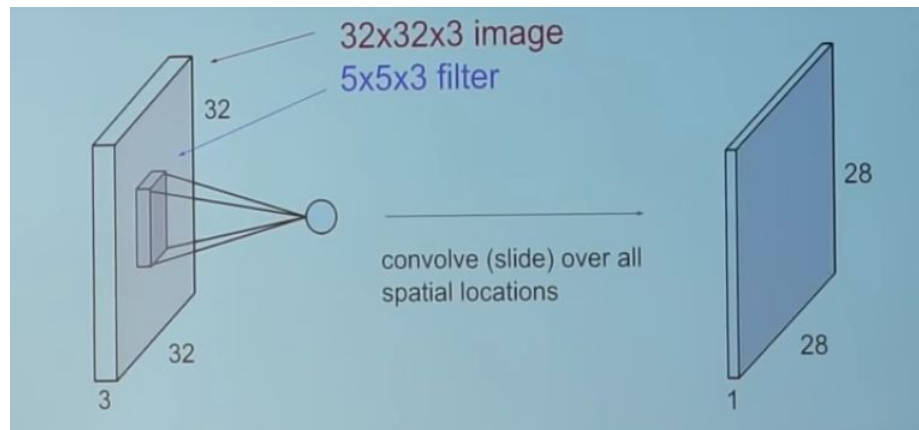
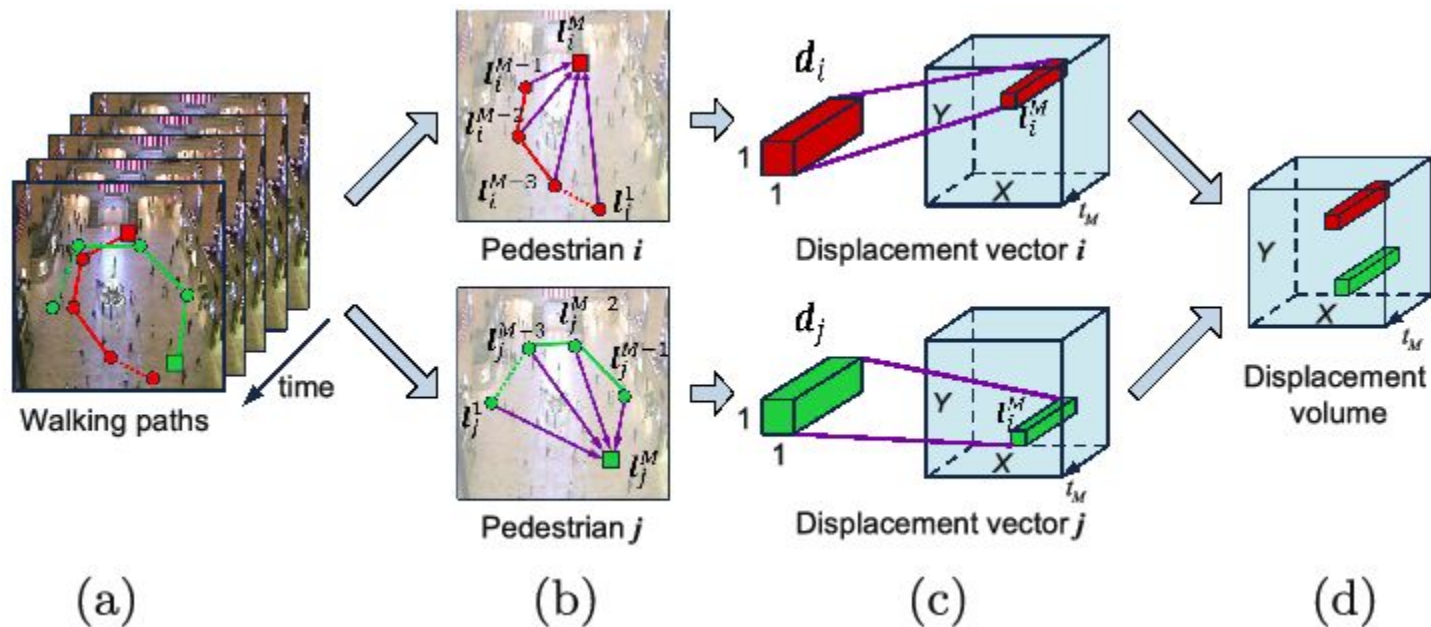# Our Datasets (2 environments)

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

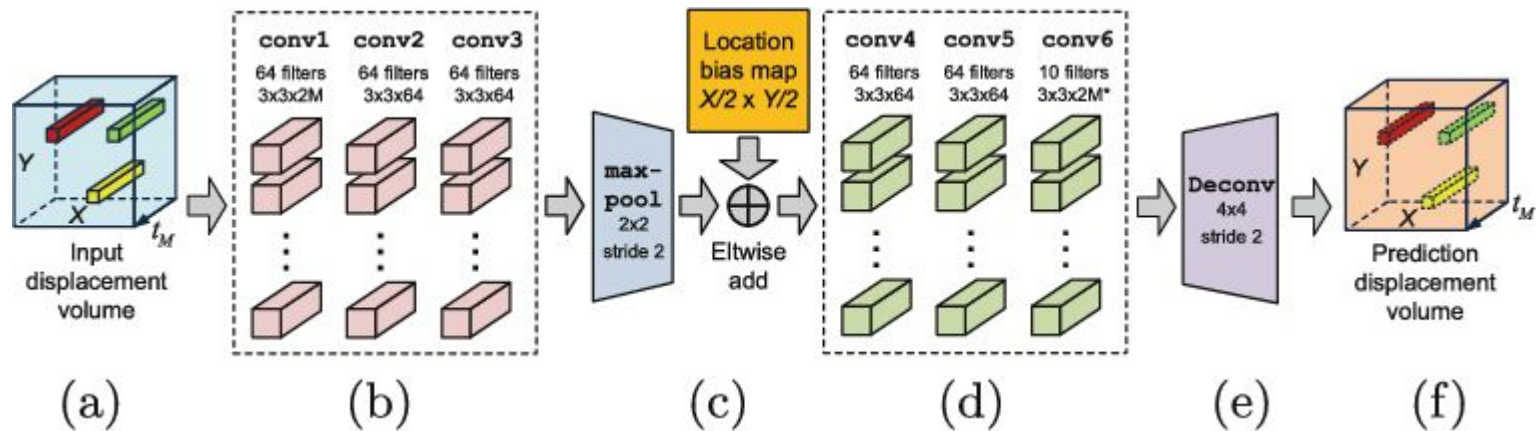[Collected from hotel in Bahnhofstr, Zurich, by Stefano Pellegrini and Andreas Ess in 2009]

Data Loader

Walking paths   time   Pedestrian i Pedestrian j Displacement vector i Displacement vector j Displacement volume

(a)   (b)   (c)   (d)

Architecture

Status/Future Work

➢ Location bias map improvements
   ○ Train on multiple locations

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

➢ Multimodal approach

Special thanks to...

- My mentor: Dr. Igor Gilitschenski

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- MIT PRIMES + CSAIL

Thank you for listening! Questions?