Trajectory Prediction

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Modern methods of information theory, optimization and control
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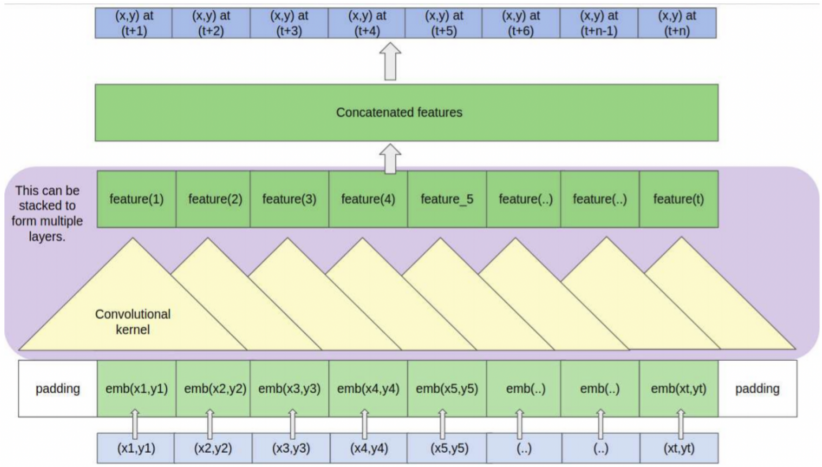
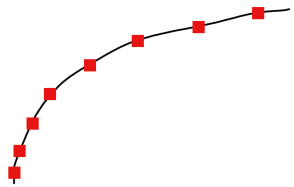
Baseline improvements

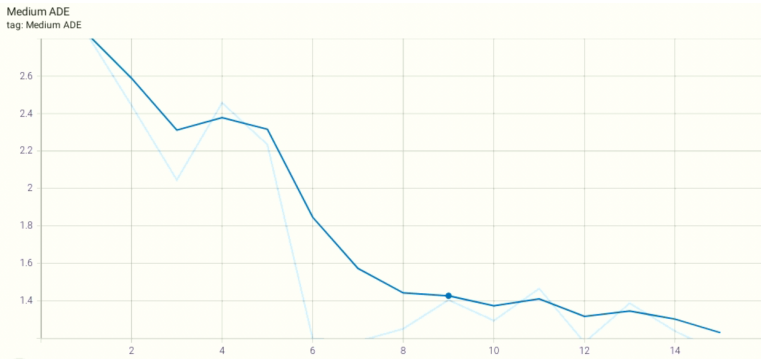
- As a baseline using CNN
- Increasing the number of coordinates for validation (gave an increase of 0.1)
- Counting the gradient at 20 nearest coordinates and getting the best quality for short ADE and short FDE (from 0.7 to 0.66);
- Experimenting with gradients;
  - Calculating gradients based on available frames only
  - Calculation of the gradient is mainly based on near points (so as not to learn at too far points as well as at close ones)
- Changed the order of drawing the trajectory to get more data for training
- Studying an article on planning and how it can be applied to this task https://arxiv.org/abs/2006.14911;

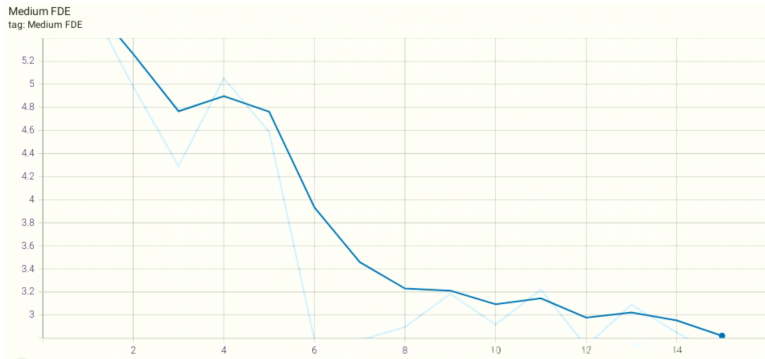
Rank	Participant team	Short ADE	Short FDE	Medium ADE	Medium FDE	Long ADE	Long FDE	Last submission at
1	ke1999	0.66	1.35	8.78	21.95	20.25	39.43	1 day ago
4	ke1999	0.70	1.37	1.54	3.50	4.23	10.61	4 hours ago

Visualization of experiments

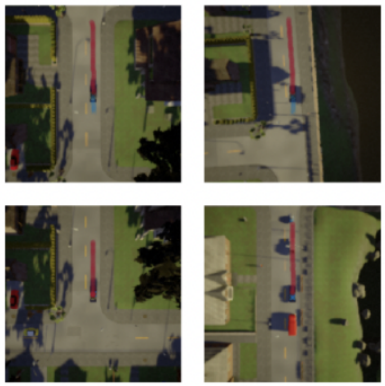






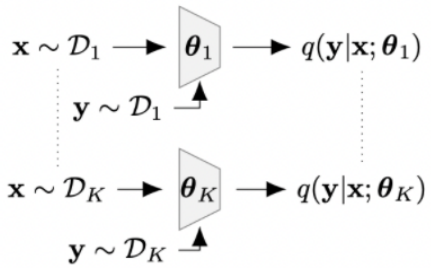


Adaptive Robust Imitative Planning

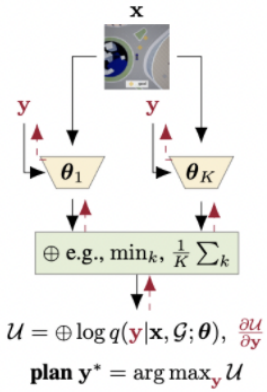


(a) Demonstrations

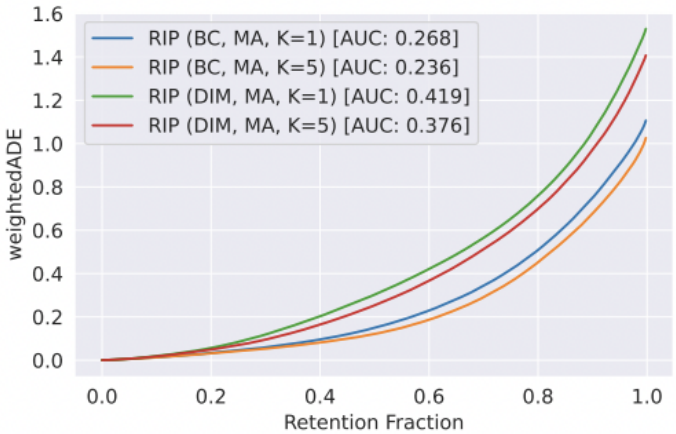
$$\mathcal{D} = \mathcal{D}_1 \cup \cdots \mathcal{D}_k \cdots \cup \mathcal{D}_K$$
$$\boldsymbol{\theta}_{k,\text{MLE}} = \arg\max_{\boldsymbol{\theta}} \mathbb{E}_{(\mathbf{x},\mathbf{y})\sim\mathcal{D}_k} [\log q(\mathbf{y}|\mathbf{x};\boldsymbol{\theta})]$$



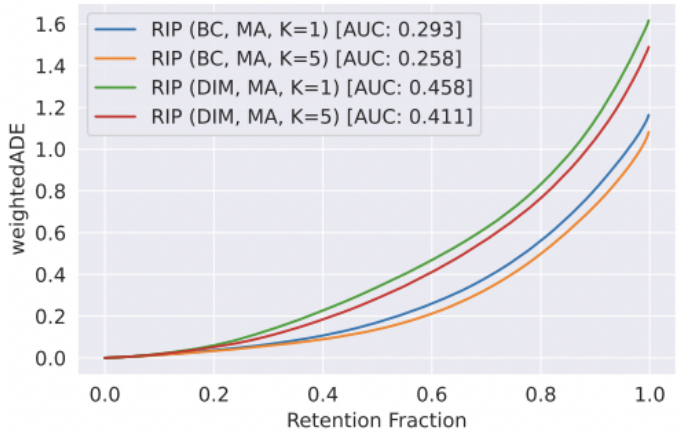
(b) Ensemble training



(c) Planning under uncertainty



(a) Full `dev` weightedADE retention.



(b) Full `eval` weightedADE retention.

Future work

- Using trajectory where not all coordinates are available;
  - Bilinear interpolation of surveyed coordinates
  - Constant continuation
- Train three models separately for predicting short, medium and long trajectories
- Use LSTM instead of CNN (this will help take into account the relationship between the trajectories.)
- Using Adaptive Robust Imitative Planning https://arxiv.org/abs/2006.14911;
- Participation in the competition https://yandex/vehicle-motion-prediction