



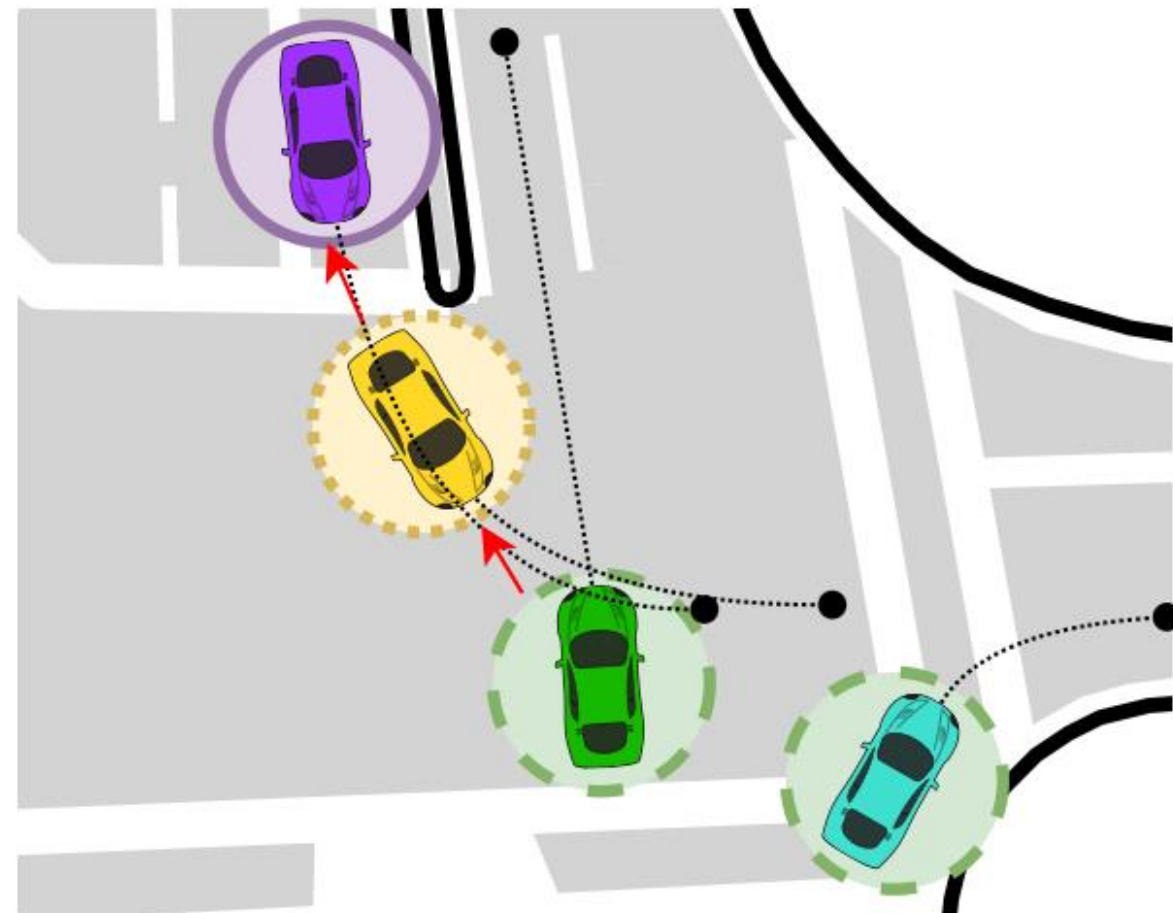
FJMP: Factorized Joint Multi-Agent Motion Prediction over Learned Directed Acyclic Interaction Graphs

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WED-PM-133



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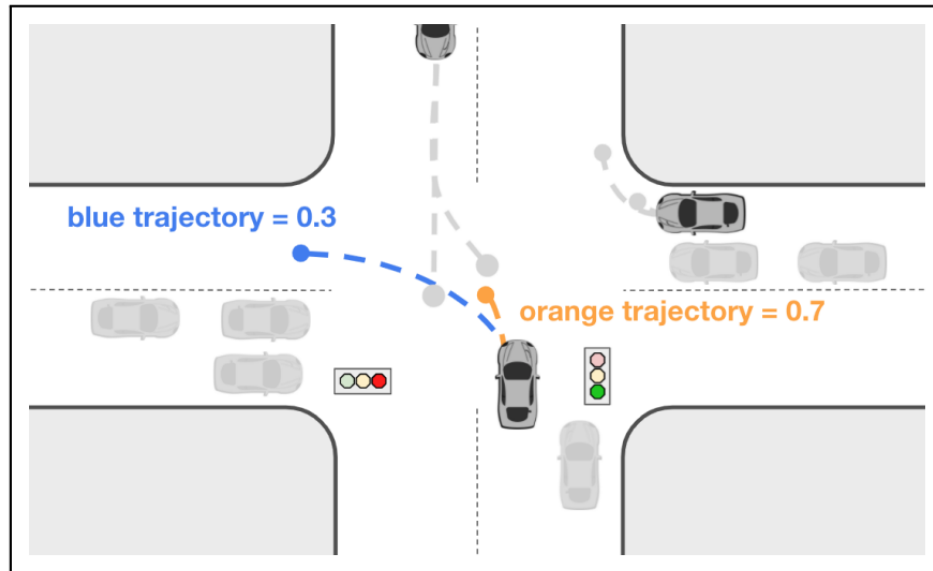


Joint (Scene-level) Trajectory Prediction

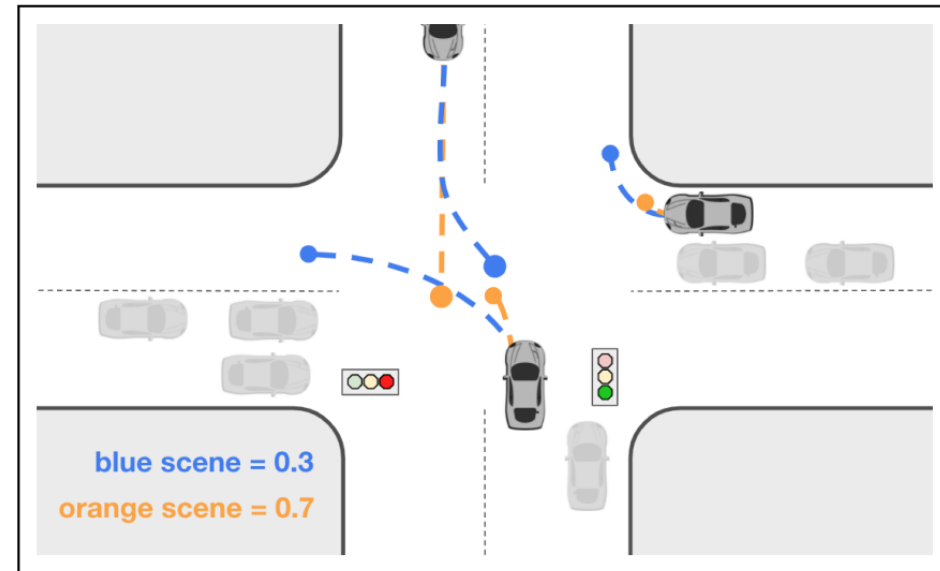


- Most existing work in vehicle trajectory prediction focuses on *marginal* trajectory prediction. In this work, we focus on *joint* trajectory prediction.

marginal prediction



joint prediction

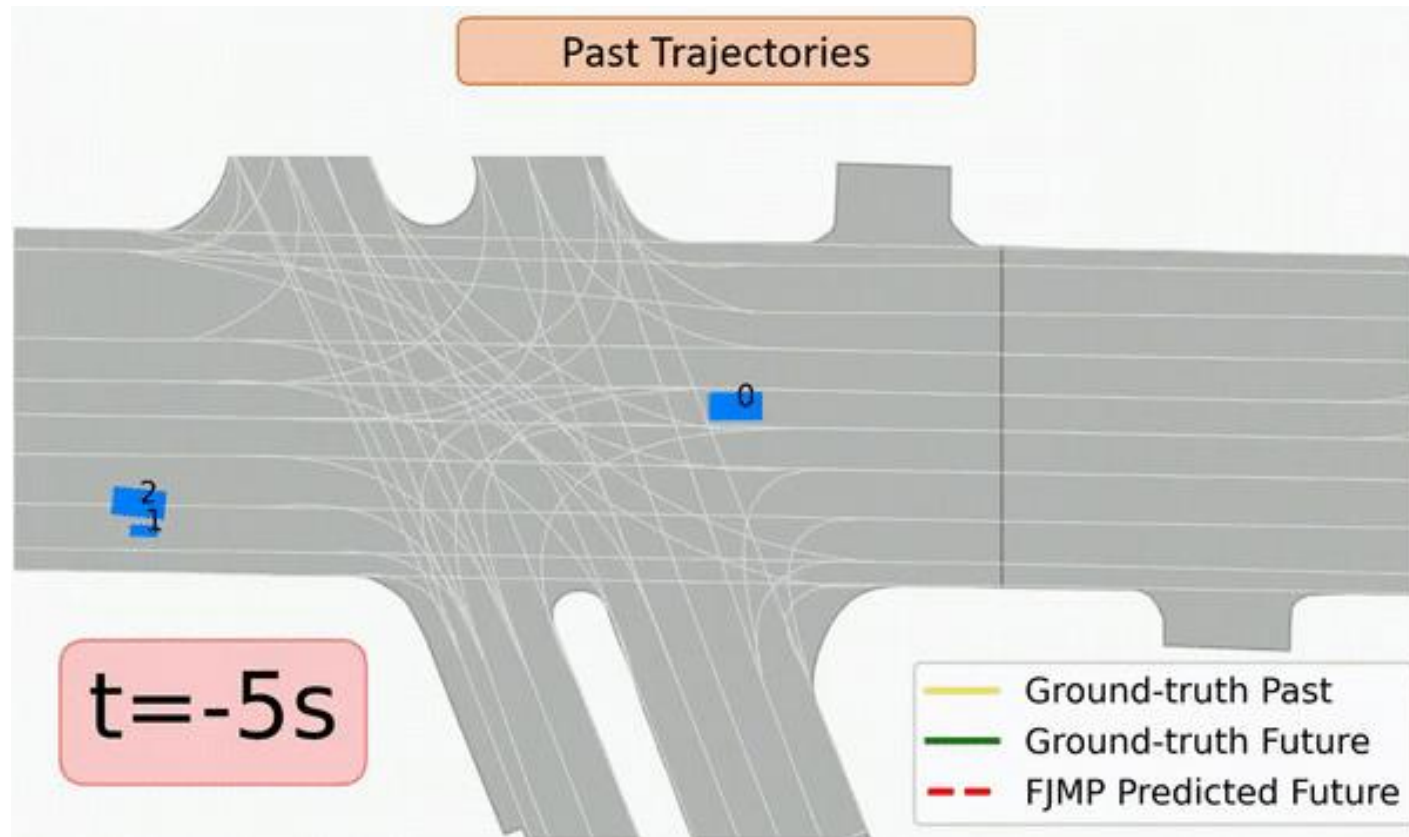


Taken from SceneTransformer, Ngiam et al. ICLR 2022

Our Contributions



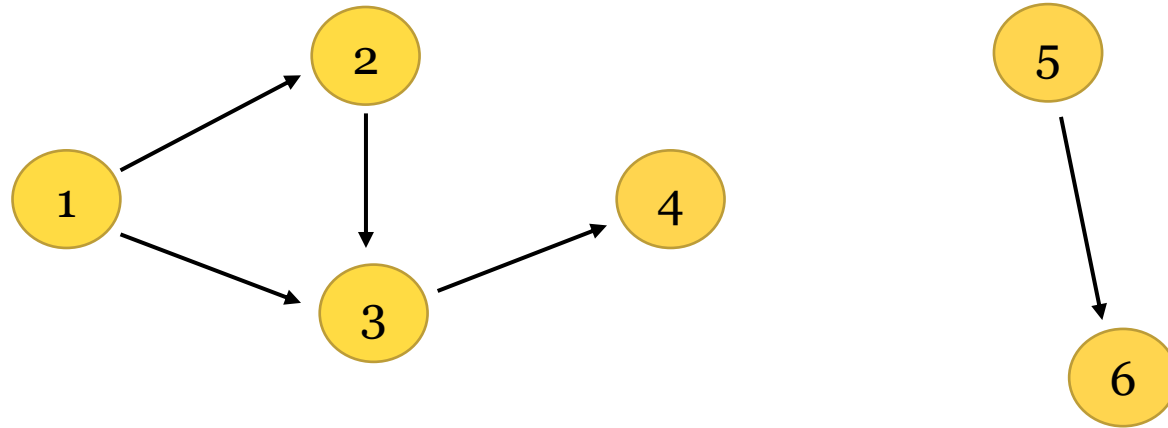
- We propose a **joint motion prediction** framework, FJMP, which **factorizes joint prediction** into a sequence of marginal and conditional predictions according to the partial order of a **learned directed acyclic interaction graph**.



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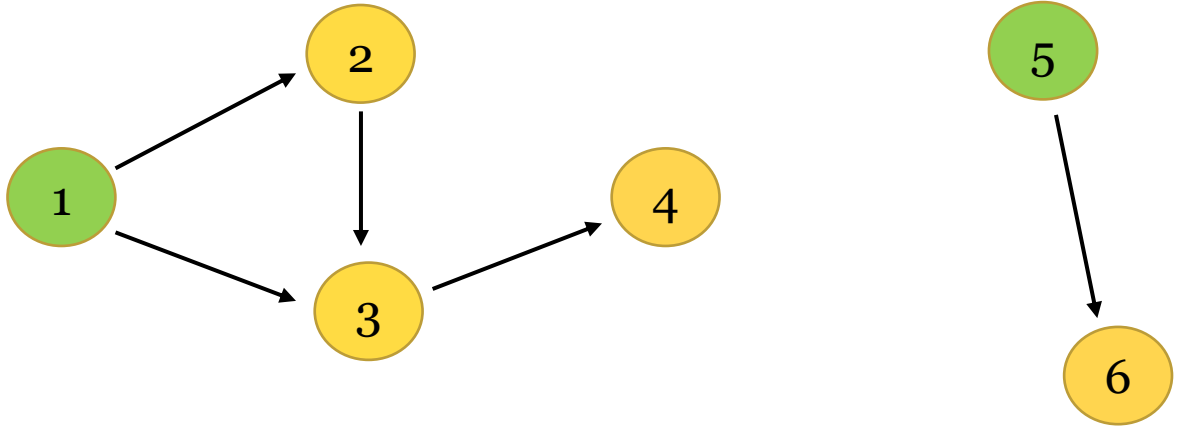
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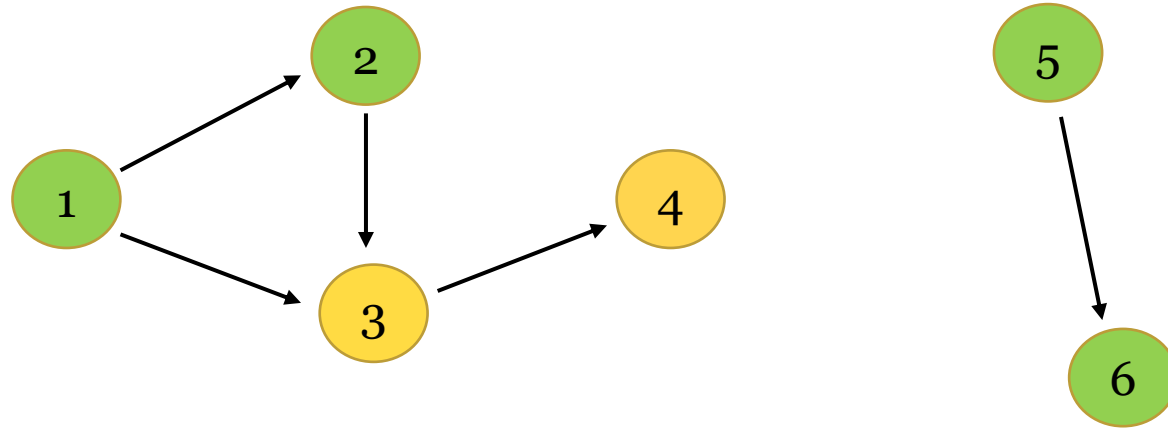
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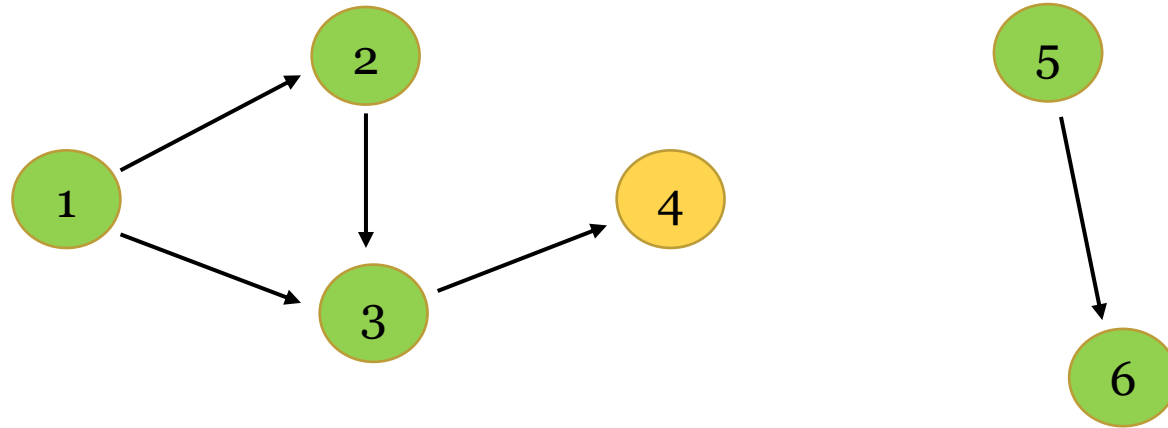
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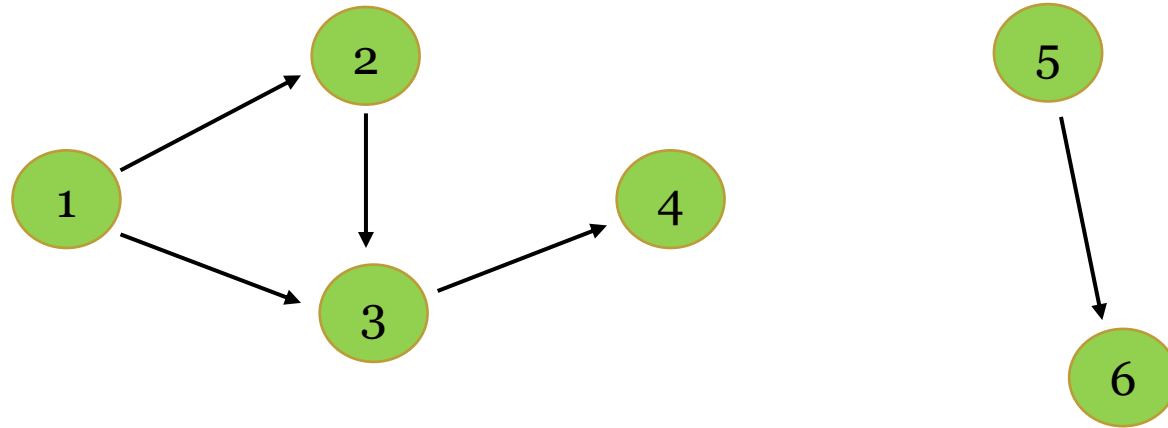
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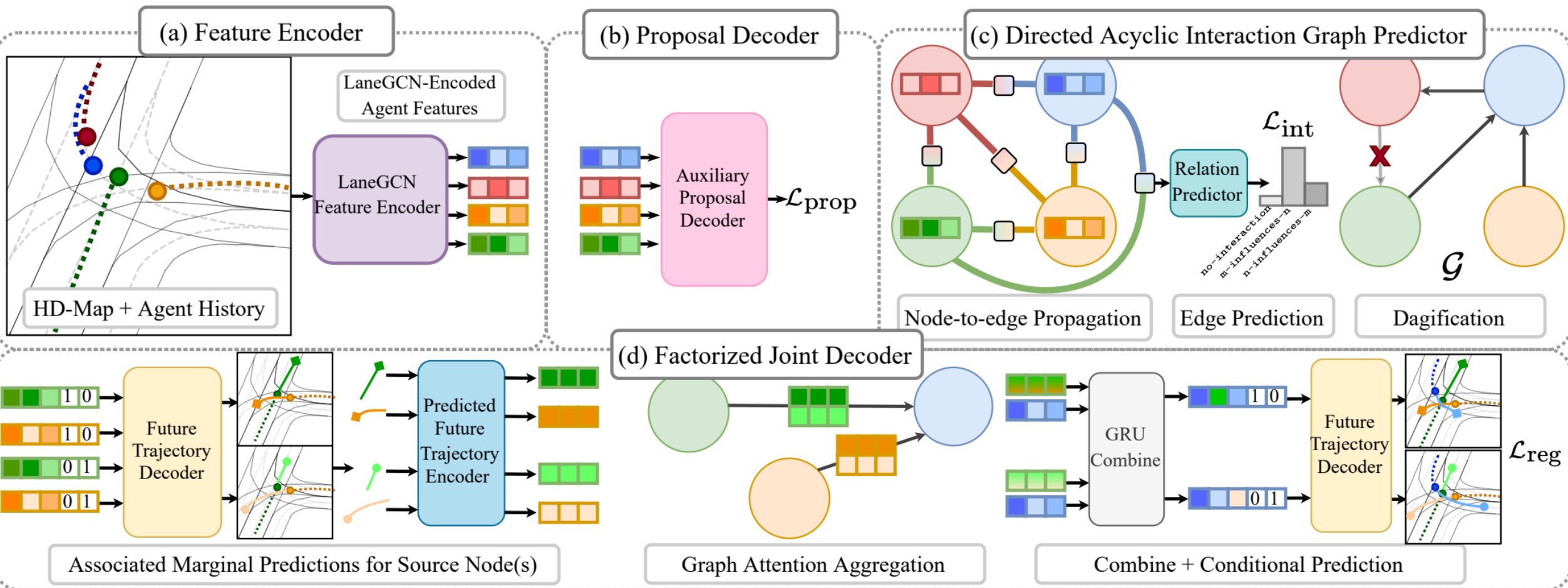
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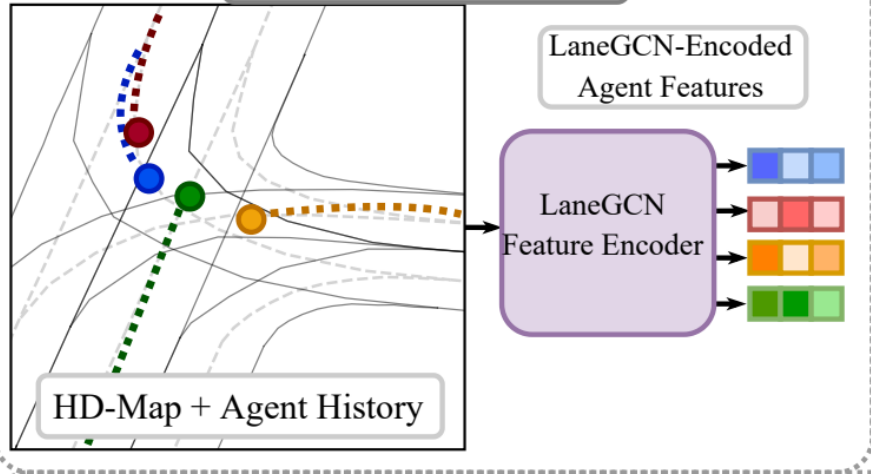
FJMP



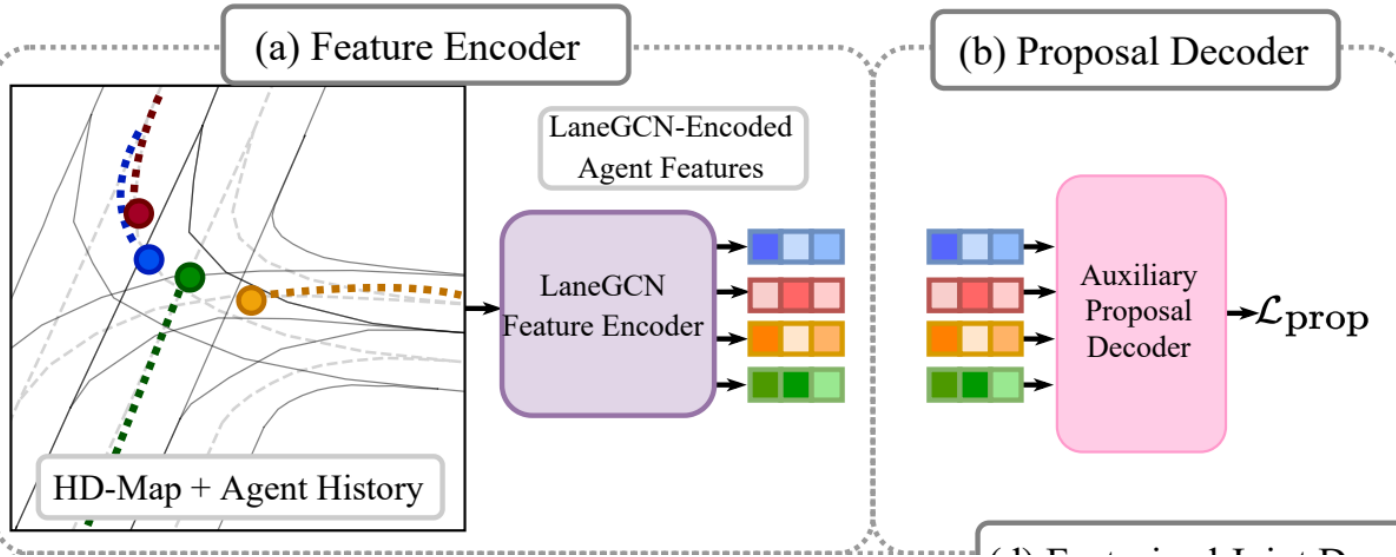
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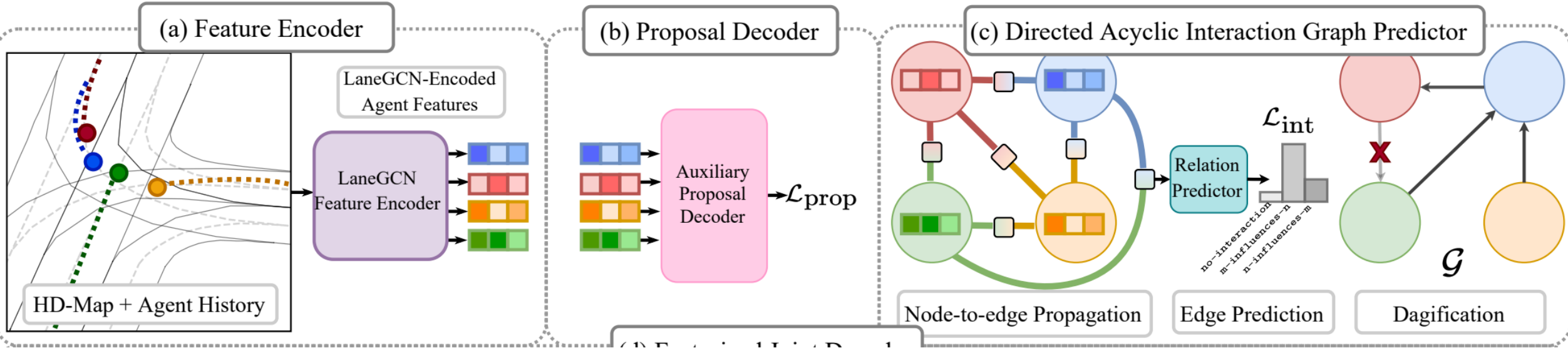
(a) Feature Encoder



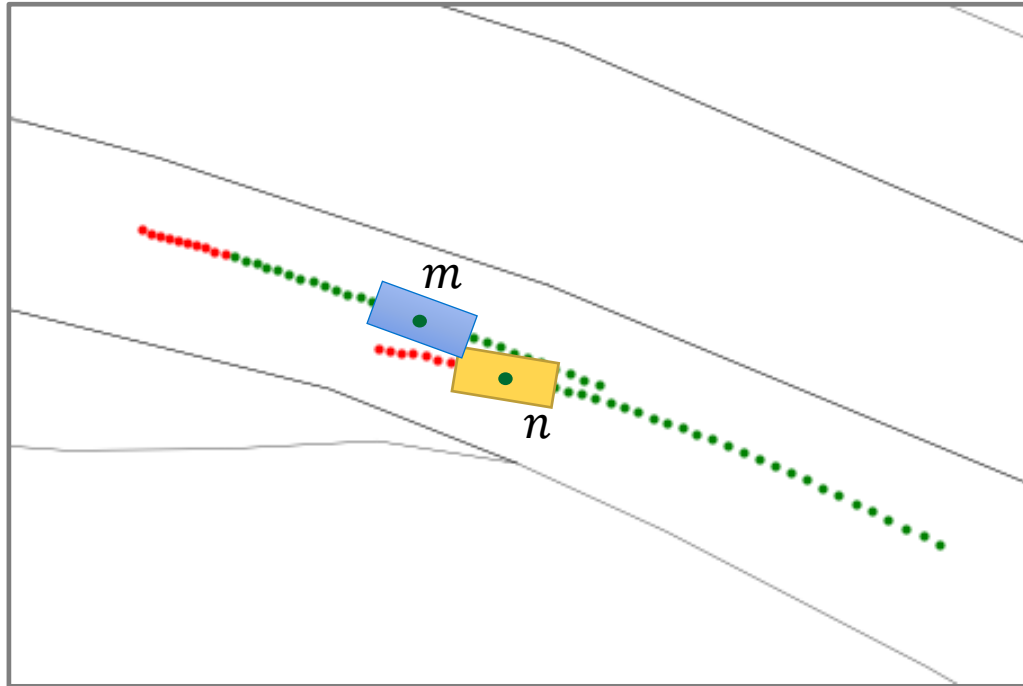
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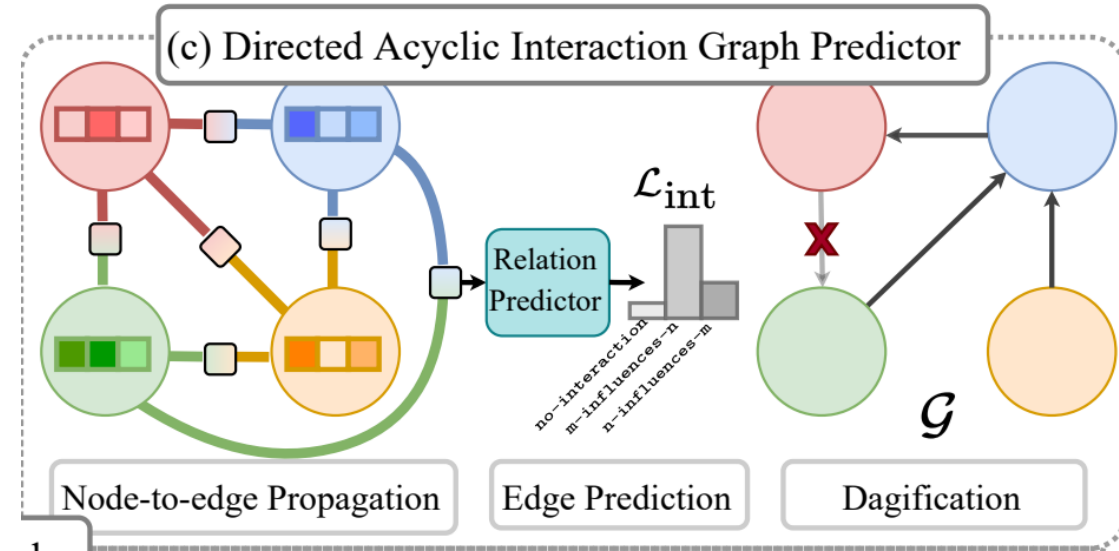
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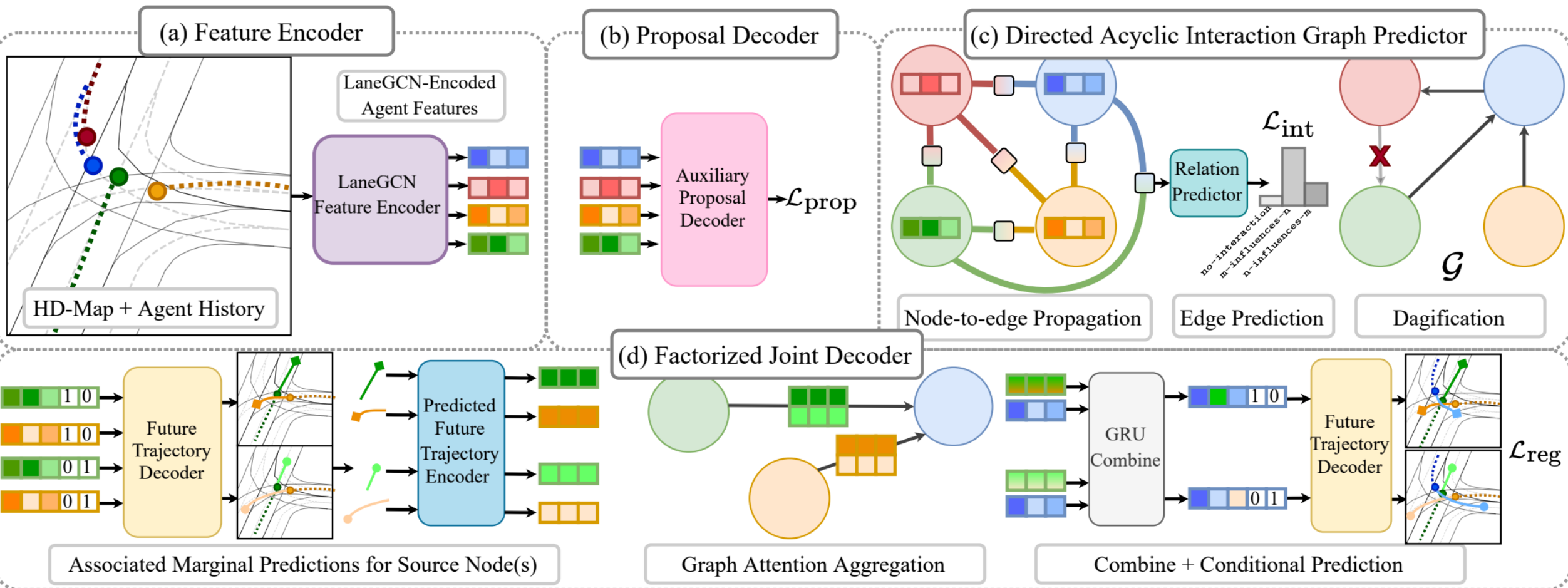
Interaction Labels: Conflict Areas



Heuristic label: n -influences- m



FJMP



Results: INTERACTION Multi-Agent Test Set



Model	Venue	minADE	minFDE	SMR	CrossCol	CMR
THOMAS [17]	ICLR 2022	0.416	0.968	0.179	0.128	0.252
HDGT [21]	-	<u>0.303</u>	<u>0.958</u>	0.194	0.163	0.236
DenseTNT [19]	ICCV 2021	0.420	1.130	0.224	0.000	0.224
AutoBot [18]	ICLR 2022	0.312	1.015	0.193	0.043	0.207
HGT-Joint	-	0.307	1.056	0.186	0.016	0.190
Traj-MAE	-	0.307	0.966	<u>0.183</u>	0.021	<u>0.188</u>
FJMP (Ours)	-	0.275	0.922	0.185	<u>0.005</u>	0.187

Ablation Study: Effect of Factorization



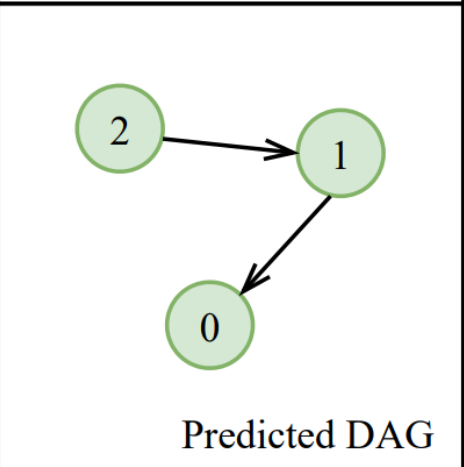
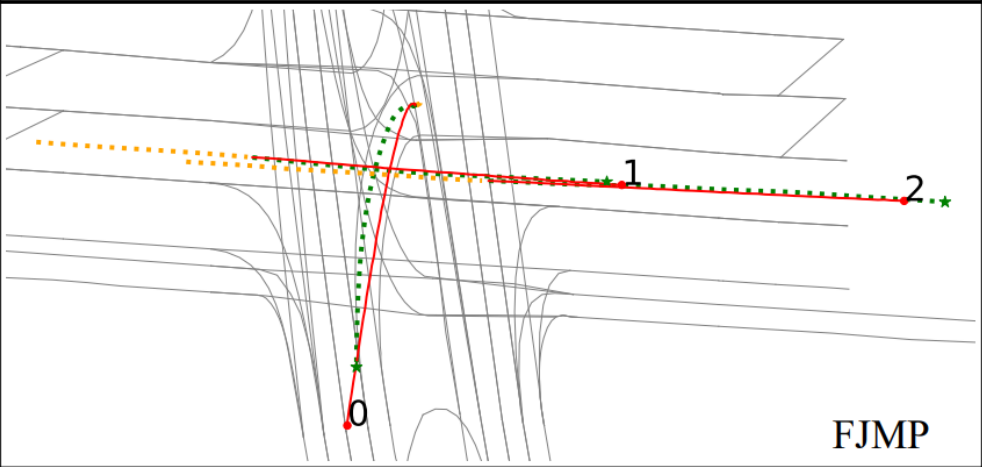
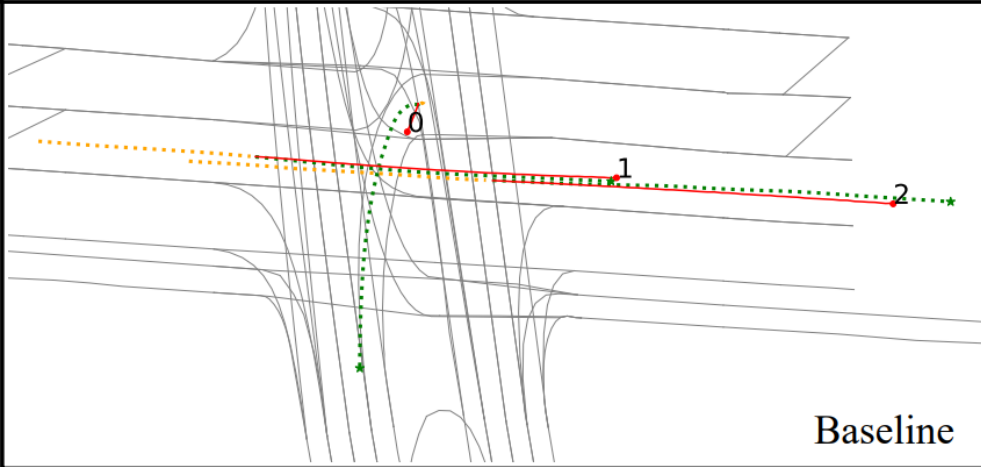
Dataset	Actors Evaluated	Model	minFDE	minADE	SCR	SMR	iminFDE	iminADE
Interaction	-	Non-Factorized	0.643	0.199	0.004	0.088	0.688	0.210
		FJMP	0.630	0.194	0.003	0.084	0.672	0.206
		Δ	0.013	0.005	0.001	0.004	0.016	0.004
Argoverse 2	Scored	Non-Factorized	1.965	0.834	-	0.349	2.957	1.223
		FJMP	1.921	0.819	-	0.343	2.893	1.204
		Δ	0.044	0.015	-	0.006	0.064	0.019
	All	Non-Factorized	1.995	0.825	-	0.340	3.302	1.309
		FJMP	1.963	0.812	-	0.337	3.204	1.273
		Δ	0.032	0.013	-	0.003	0.098	0.036

Qualitative Results



Left-turn Scenario

- Lane Boundary
- Predicted Future
- Predicted Endpoint
- Ground-truth Past
- Ground-truth Future
- ★ Ground-truth Endpoint



Thanks!



Project Page: <https://rluke22.github.io/FJMP>

Code: <https://github.com/RLuke22/FJMP>