Where to go? Predicting next location in IoT environment

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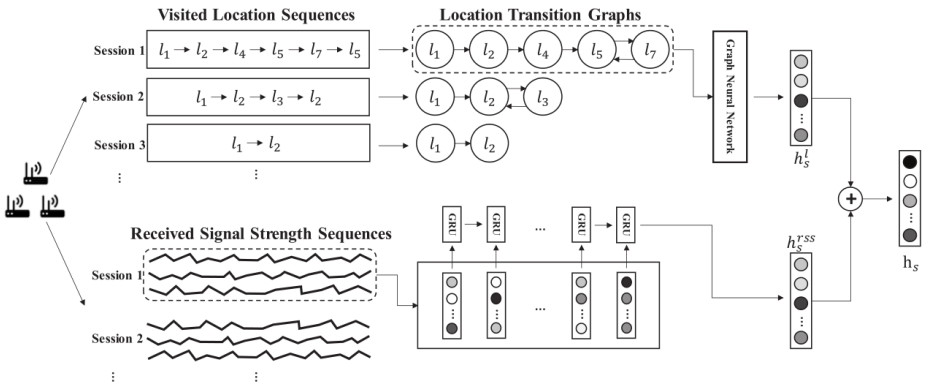
Problems & Ideas

- Problem: Next Location Prediction in IoT Environment
  - how to effectively and accurately capture user's moving regularities
  - signal strengths are crucial for next location prediction in IoT environment
- Ideas: Joint Modeling of Trajectory and Signal Sequence
  - Incorporating both trajectory and signal strengths for accurate next location prediction in IoT environment
  - Adapting gated Graph Neural Networks for explicitly capturing the transition regularities from trajectories and employing Gated Recurrent Unit for modeling temporal dynamics from signal strengths



The network architecture of our proposed TSIS model

Main Contributions

- **Extensive experiments on two real-world Wi-Fi datasets demonstrate the effectiveness of the proposed model in next location prediction.**

Table 2 Next location prediction performance on WTD dataset. The best results are in bold and the second best underlined.

Model	WTD							
	Recall@5	MRR@5	Recall@10	MRR@10	Recall@15	MRR@15	Recall@20	MRR@20
POP	0.2688	0.1102	0.5467	0.1450	0.7687	0.1653	0.8173	0.1659
S-POP	0.8073	0.6046	0.8673	0.6128	0.9280	0.6176	0.9353	0.6180
MC	0.7522	0.6787	0.8281	0.6887	0.9080	0.6951	0.9179	0.6957
FPMC	0.8492	0.6185	0.9042	0.6256	0.9236	0.6272	0.9455	0.6284
PRME	0.5979	0.2633	0.8287	0.2943	0.9309	0.3027	0.9558	0.3041
NextItNet	0.8764	0.7184	0.9290	0.7260	0.9442	0.7272	0.9525	0.7277
SR-GNN	0.9198	0.7649	0.9595	0.7706	0.9706	0.7715	0.9755	0.7717
TSIS	**0.9340**	**0.7913**	**0.9664**	**0.7959**	**0.9765**	**0.7967**	**0.9817**	**0.7970**

Table 3 Next location prediction performance on Store dataset. The best results are in bold and the second best underlined.

Model	Store							
	Recall@5	MRR@5	Recall@10	MRR@10	Recall@15	MRR@15	Recall@20	MRR@20
POP	0.6481	0.2747	0.6871	0.2799	0.8061	0.2886	0.8405	0.2907
S-POP	0.6592	0.3920	0.7304	0.4022	0.8170	0.4086	0.8556	0.4109
MC	0.6164	0.3373	0.6770	0.3457	0.7622	0.3520	0.8007	0.3542
FPMC	0.7357	0.4580	0.8441	0.4748	0.8944	0.4789	0.9206	0.4806
PRME	0.5959	0.4563	0.7139	0.4720	0.7795	0.4772	0.8252	0.4798
NextItNet	0.7254	0.4582	0.8338	0.4730	0.8861	0.4771	0.9152	0.4788
SR-GNN	0.7517	0.4942	0.8585	0.5088	0.9047	0.5124	0.9309	0.5140
TSIS	**0.7745**	**0.5129**	**0.8706**	**0.5259**	**0.9142**	**0.5293**	**0.9379**	**0.5307**

- **Ablation experiment empirically validates the signal strength and trajectories are both indispensible for next location prediction**

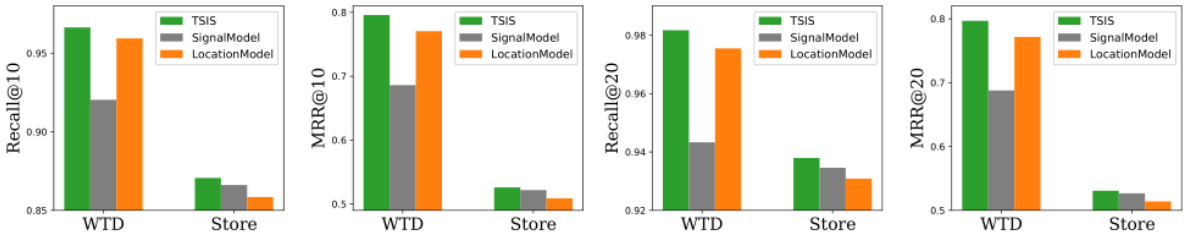


Fig. 4 Next location prediction performance of our proposed method compared with its two submodels.