

Learning Graph-based POI Embedding for Location-based Recommendation

基于深度学习的个性化位置推荐

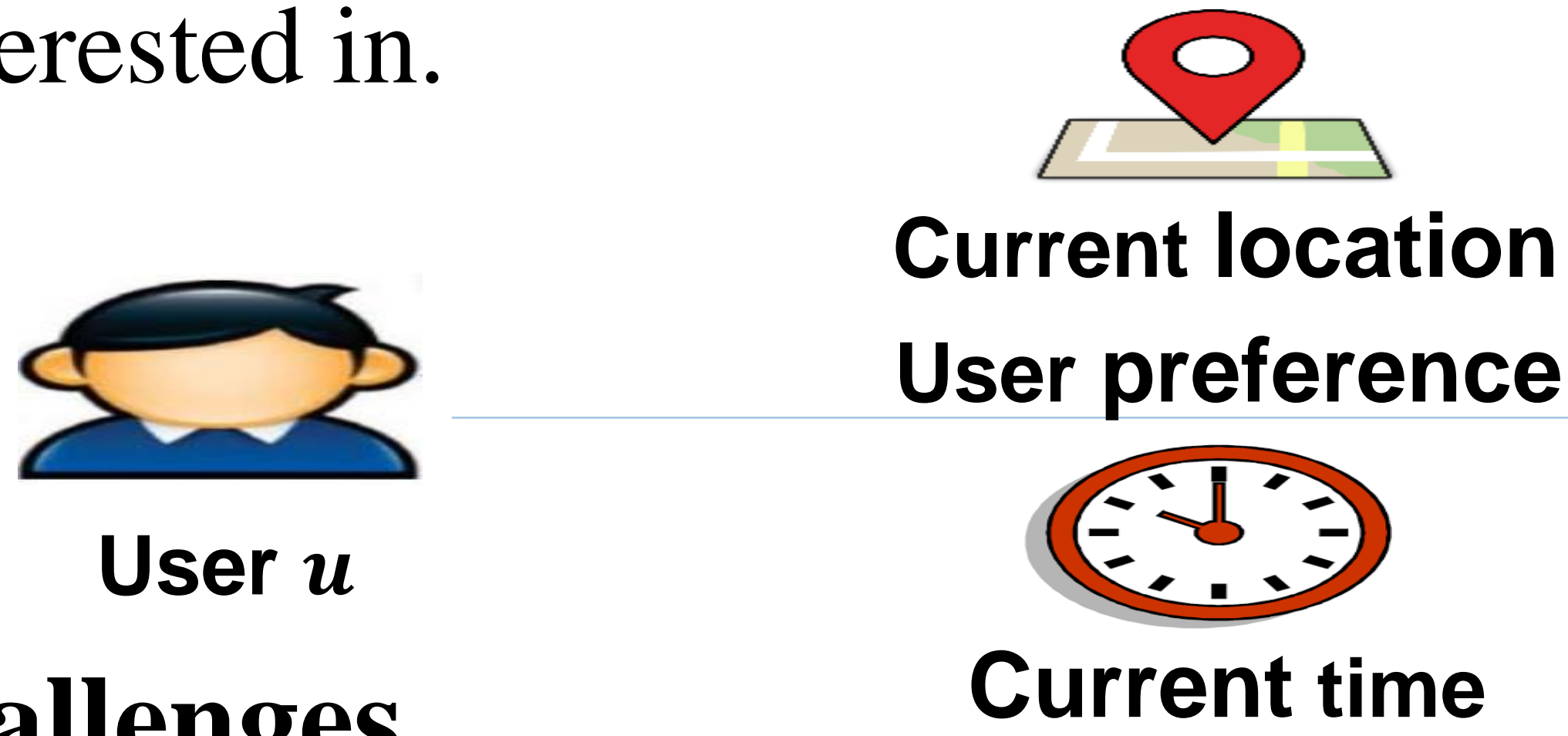
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Location-based Recommendation

To recommend points-of-interest (POIs) that a user is interested in but has not visited

Given a user u with his/her current location l and time τ , recommend top- k POIs that u would be interested in.



Challenges

Data Sparsity Context Awareness
Cold Start Dynamic of Personal Preferences

Graph-based POI Embedding

Exploit and integrate multi factors in a unified way

Sequential Effect Transition probabilities from one checked-in POI to other POIs is a non-uniform distribution.

Geographical Influence People tend to visit nearby POIs or explore POIs near the ones that they have visited before.

Temporal Cyclic Effect Users' mobility behaviors exhibit strong temporal cyclic patterns, and the daily pattern (hours of the day).

Semantic Effect Contents of POIs checked-in by the same user tend to be semantically similar.

Model description

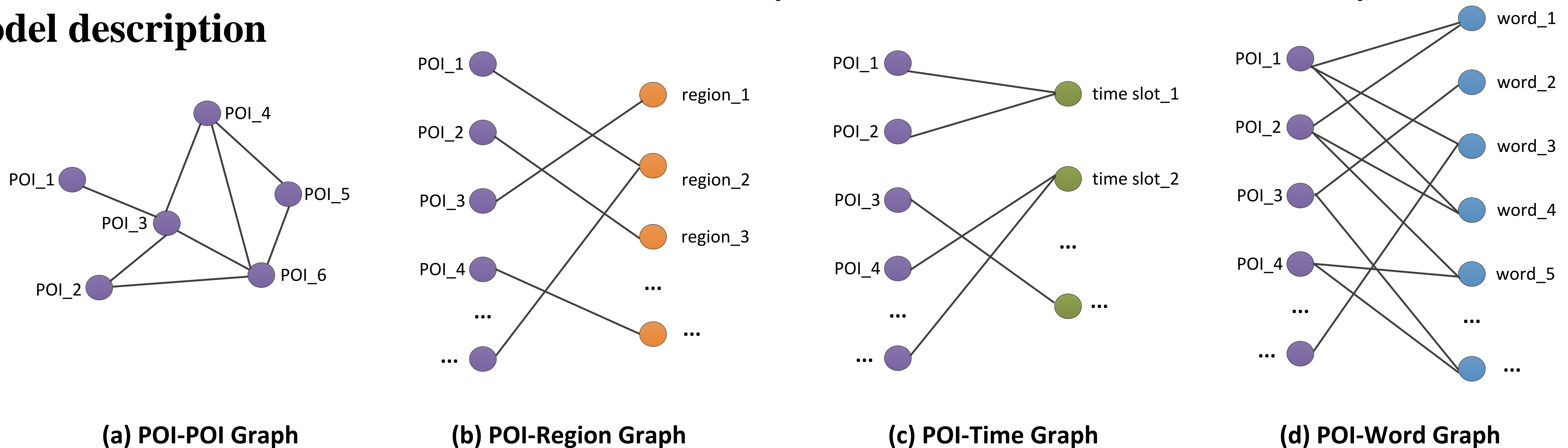
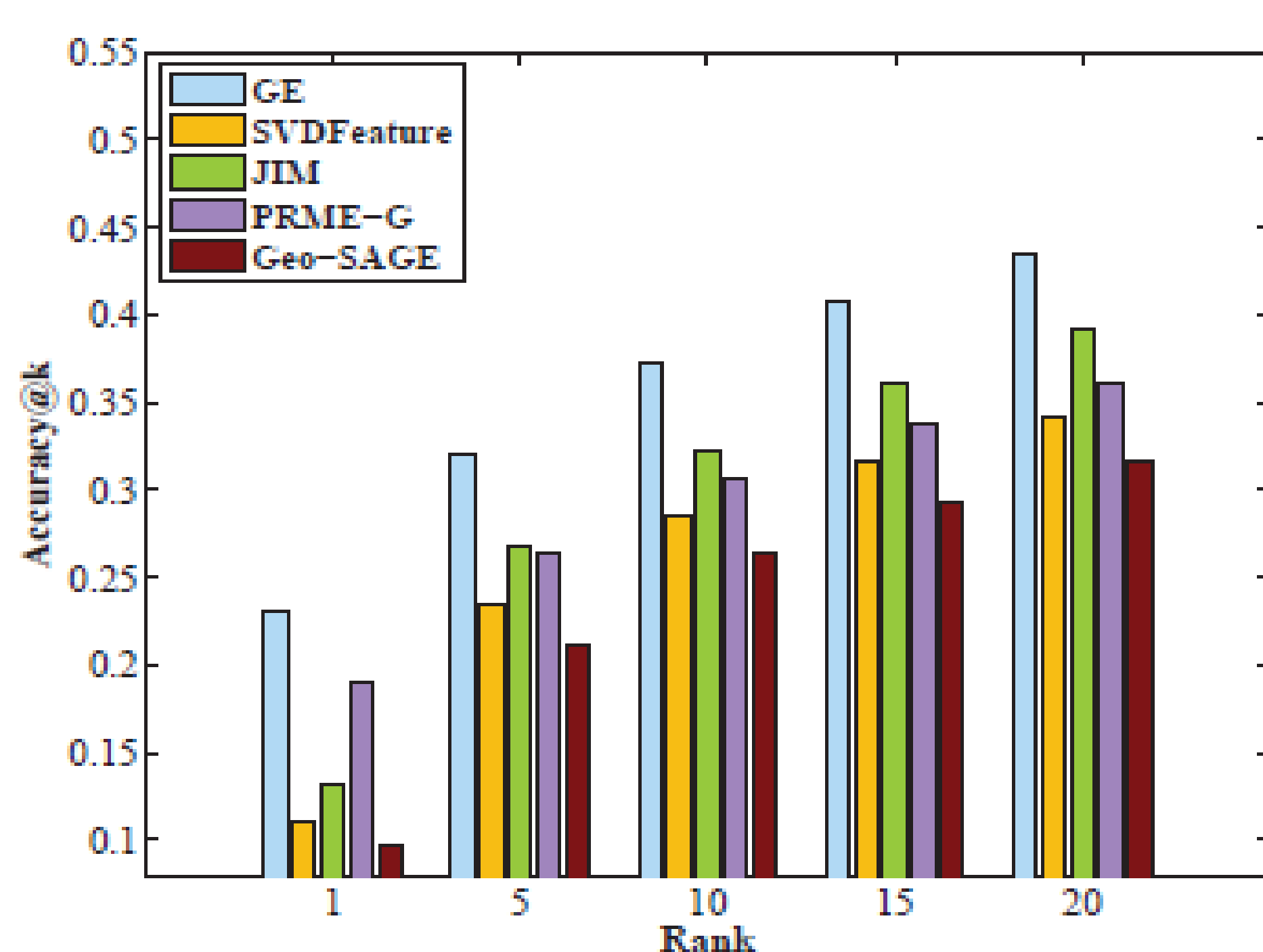
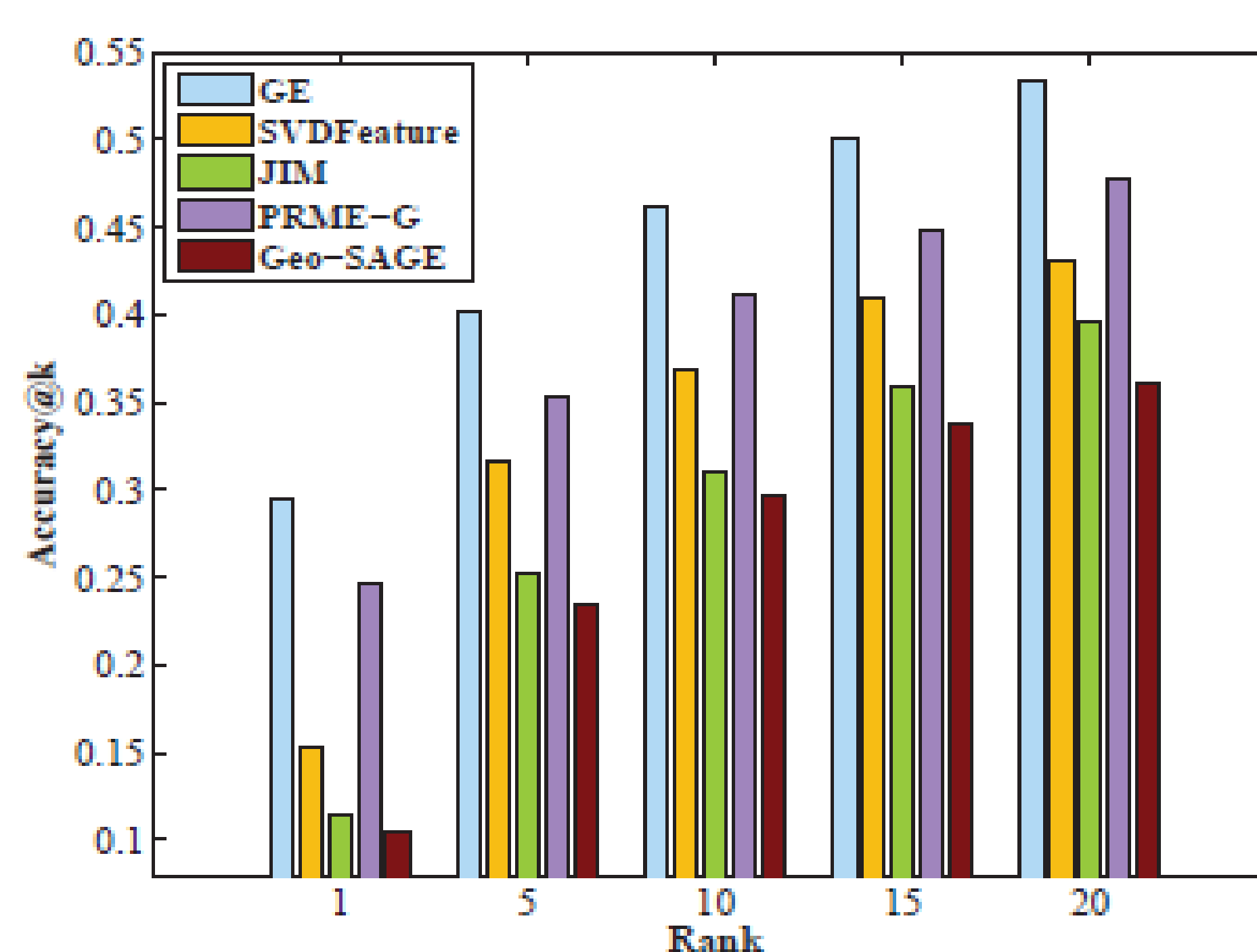


Illustration of encoding sequential effect, geographical influence, temporal cyclic effect and semantic effect into a low dimensional metric utilize graph-based method. POI-Region graph, POI-Time graph and POI-Word graph are all bipartite graphs, while POI-POI graph is a general graph which can also be treated as a bipartite graph when one POI is on one side and others are on the opposite side. Diverse factors can be connected through POIs.

Experiment result



(a) Performance on Foursquare Dataset



(b) Performance on Gowalla Dataset

Methods \ Acc@k	k = 1	k = 5	k = 10	k = 15	k = 20
GE-S1	0.183	0.252	0.293	0.322	0.347
GE-S2	0.225	0.296	0.339	0.370	0.396
GE-S3	0.214	0.278	0.323	0.348	0.368
GE-S4	0.224	0.288	0.333	0.366	0.394
GE	0.231	0.321	0.372	0.407	0.435

Sequential Effect > Temporal Effect
> Content Effect > Geographical Influence