Knowledge-aware Recommendation with Relation-Denoising Counterfactual Generators

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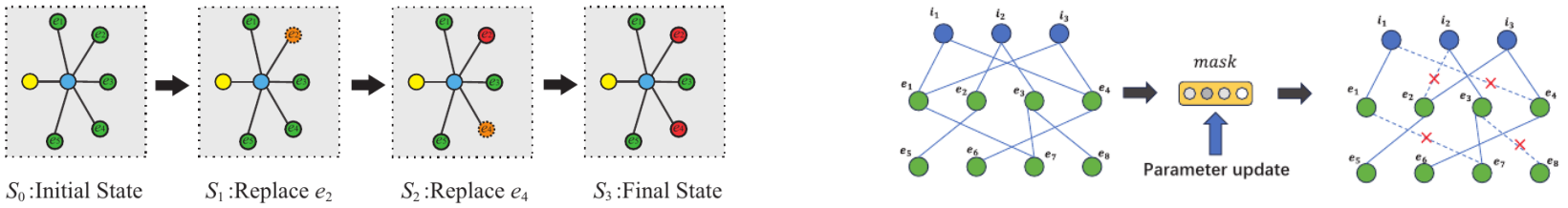
Problems & Ideas

- Problems of Knowledge Graphs (KGs) enhance recommender systems:
  - noisy relations and spurious correlations in both user–item interactions and KGs can reduce recommendation accuracy.
  - Existing knowledge-aware methods often fail to explicitly address noise in KG relations or to disentangle causal from non-causal signals.
- Ideas:
  - Two reinforcement-learning-based counterfactual generators reveal and mitigate false dependencies.
  - A relation-denoising module adaptively prunes irrelevant or noisy KG relations before aggregation.



Left: the generation process of the counterfactual generator. Right: the relation-denoising process.

Main Contributions

- Contributions:
  - Investigate noisy data problems in both nodes and relations in knowledge graph which affect the performance of knowledge-aware recommendations.
  - A novel model is proposed, which integrate denoising mechanisms for both the nodes and relations in knowledge-aware recommendation.
  - Extensive experiments on three public benchmark datasets are conducted.

	YELP			LFM-1B			ML-1M		
	hit@20	recall@20	ndcg@20	hit@20	recall@20	ndcg@20	hit@20	recall@20	ndcg@20
RippleNet	0.0864	0.0438	0.0203	0.2044	0.0543	0.0344	0.7704	0.1915	0.2015
KTUP	0.1184	0.0619	0.0297	0.3518	0.1258	0.0858	0.8255	0.236	0.2449
CFKG	0.1501	0.0817	0.039	0.376	0.1333	0.0899	0.8371	0.2405	0.2477
CKE	0.1583	0.0863	0.0422	0.4207	0.1524	0.1069	0.8396	0.2474	0.2563
MKR	0.1235	0.0648	0.0294	0.293	0.0956	0.0615	0.8315	0.2378	0.2422
KGNNLS	0.1427	0.0812	0.0414	0.3448	0.1293	0.0813	0.8205	0.2312	0.2394
KGIN	0.1693	0.0906	0.0453	0.4139	0.1657	0.1063	0.8435	0.2469	0.2558
KGAT	0.1552	0.0832	0.0411	0.4215	0.1544	0.1059	0.8421	0.2546	0.2662
LightKG	OOM	OOM	OOM	OOM	OOM	OOM	0.7749	**0.2981**	0.2365
CGKR	0.171	0.0925	0.0454	0.4649	0.1802	0.1256	0.8424	0.2528	0.2677
Ours	**0.1814**	**0.0992**	**0.0492**	**0.4694**	**0.1828**	**0.1281**	**0.8487**	0.2581	**0.269**

Result on three dataset over hit@20, recall@20 and ndcg@20.