Z-REx: Human-Interpretable GNN Explanations for Real Estate Recommendations

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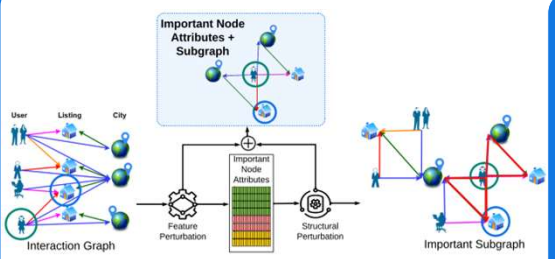
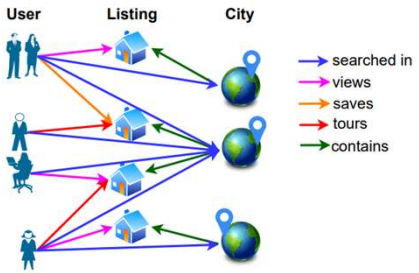


Z-REx Overview

Introduction

- Real estate recommendations are high-stakes decisions and gaining user's confidence is paramount, so transparency is crucial.
- GNNs offer strong recommendation performance but lack interpretability, especially for link prediction (LP).
- Existing explainers are tailored for node/graph classification, not LP tasks in heterogeneous graphs.



Interaction Graph from Real-estate Dataset

Z-REx Overview

1. **Feature Perturbation**: Zero out features → measure drop in nDCG@K.
2. **Structural Perturbation**: Remove edges in a k-hop subgraph → observe cosine similarity shift.

Insights

By leveraging real-estate domain knowledge and defining co-clicked cities:

- Reduce search space for structural perturbation
- Preserve fidelity and diversity in recommendations
- Deliver explanations that align with user intent

Contributions

- A GNN explanation framework designed for heterogeneous LP tasks.
- Combines feature and structural perturbations to explain similar region recommendations.
- Outperforms existing explainers (GNNExplainer, SubgraphX, PaGE-Link) in fidelity metrics.

	Date	City	Listing	User
3-days Training	5/17-5/20	449	55k	393k
30-days Training	4/20-5/20	456	97k	1.3M
Testing	5/27-5/30	452	53k	405k
Evaluation	5/31	448	45k	203k

	Date	views	saves	tours	contains
3-days Training	5/17-5/20	789k	169k	234k	55k
30-days Training	4/20-5/20	26M	2.2M	1.6M	97k
Testing	5/27-5/30	773k	138k	197k	53k
Evaluation	5/31	714k	41k	56k	45k

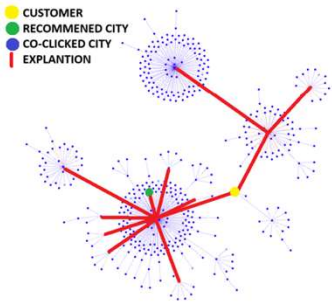
Dataset Entities and Relationship Statistics

Evaluation

Dataset: Zillow Group real-world logs (30-day, 3-day subsets)
Model: ZiGNN – A GNN-based recommendation system
Metrics: nDCG@K, cosine similarity

Case Study

Z-REx highlights **hub cities** in user interactions. These act as bridges, explaining why a specific city was recommended based on shared user behavior and co-click patterns.



[SCAN ME] Read Paper here!

Change in	Z-REx	PaGE-Link [4]	GNNExplainer [1]	SubgraphX [3]
3-days (Training)				
nDCG (% decr.)	**94%**	81% (*-13%*)	21% (*-73%*)	47% (*-47%*)
cosine similarity	**-0.10**	-0.07 (*-0.03*)	-0.02 (*-0.08*)	-0.04 (*-0.06*)
30-days (Training)				
nDCG (% decr.)	**92%**	63% (*-29%*)	9% (*-85%*)	22% (*-70%*)
cosine similarity	**-0.09**	-0.05 (*-0.04*)	-0.01 (*-0.08*)	-0.02 (*-0.07*)

Evaluation Results