

DiffNet++: A Neural Influence and Interest Diffusion network for Social Recommendation

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ABSTRACT

Prediction layer models the predicted rating between user and item embeddings. Different prediction function, different dimensions for embedding are applied to the original diffnet++ architecture presented in the paper [1] and the outputs are analysed.

Index Terms— Recommendation system, graph neural network, Diffusion, Attention

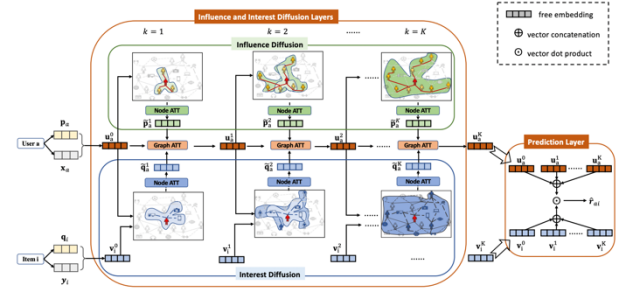


Fig 1. Diffnet++ Architecture

1. INTRODUCTION

Social Recommender systems utilize each user's local neighbour preferences to enhance user modelling. All the models discussed in this project are modifications of diffnet++ presented in the work [1].

2. TECHNICAL DETAILS

2.1. Dataset

Yelp dataset is used in all training experiments. Yelp is an online location based social network, where users could make friends and review restaurants. It contains 17,237 users and 38,342 items with 143,765 links.

2.2. Architecture Details

Diffnet++ architecture contains four main parts: an embedding layer, a fusion layer, the influence and interest diffusion layers, and a rating prediction layer.

Embedding layer encodes users and items with corresponding free vector representations. Fusion layer outputs an embedding that captures both free vector representation and associated feature vector. Influence and interest diffusion layers are multi-level attention structure could effectively diffuse higher-order social and interest networks. The rating prediction layer predicts the preference score of an unobserved user-item pair.

2.3. Loss function

All the models discussed in this project used a pair-wise ranking based loss function given by

$$L = \min_{\Theta} \sum_{(a,i) \in R^+ \cup (a,j) \in R^-} -\ln \sigma(\hat{r}_{ai} - \hat{r}_{aj}) + \lambda ||\Theta||^2$$

3.

RESULTS

Table.1. Results of different Dimensions

Dimension	N=5		N=10		N=15	
	HR	NDCG	HR	NDCG	HR	NDCG
8	0.0863	0.0611	0.1344	0.0783	0.1718	0.0896
16	0.0685	0.0490	0.1092	0.0635	0.1425	0.0735
32	0.1772	0.1278	0.2669	0.1599	0.3342	0.1803
64	0.2199	0.1614	0.3302	0.2010	0.4064	0.2239

Table.2. Results of Prediction function using only last layer

Dimension	N=5		N=10		N=15	
	HR	NDCG	HR	NDCG	HR	NDCG
8	0.0775	0.0545	0.1220	0.0705	0.1515	0.0794
16	0.0777	0.0561	0.1188	0.0708	0.1609	0.0834
32	0.1339	0.0961	0.2149	0.1253	0.2759	0.1437
64	0.2086	0.1318	0.3181	0.1914	0.3725	0.1876

Table.3. Results of different trails (D=64)

Trail No.	N=5		N=10		N=15	
	HR	NDCG	HR	NDCG	HR	NDCG
1	0.1229	0.0908	0.1988	0.1179	0.2551	0.1347
2	0.2199	0.1614	0.3302	0.2010	0.4064	0.2239
3	0.1984	0.1456	0.2985	0.1816	0.3681	0.2025
4	0.1372	0.1008	0.2176	0.1295	0.2737	0.1463

4. CONTRIBUTIONS

In this work, the performance of diffnet++ model with different dimensions is compared. I also proposed a modified diffnet++ model with a different prediction layer and compared its performance with the model proposed in the paper. This work also includes comparison of outputs the model with different trails.

5. RESOURCES

1. <https://github.com/PeiJieSun/diffnet>

6. REFERENCES

- [1] Wu, Le and Li, Junwei and Sun, Peijie and Ge, Yong and Wang, Meng, “DiffNet++: A Neural Influence and Interest Diffusion Network for Social Recommendation” 2020.
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- [3] [Shiwen Wu](#), [Fei Sun](#), [Wentao Zhang](#), [Bin Cui](#), “Graph Neural Networks in Recommender Systems: A Survey”