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DAN: a deep association neural network approach for personalization recommendation

Key words: Neural network; Deep learning; Deep association neural network (DAN); Recommendation

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Motivation

- The collaborative filtering technology used in traditional recommendation systems has a problem of data sparsity.
- The traditional matrix decomposition algorithm simply decomposes users and items into a linear model of potential factors.
- At present, some deep neural network recommendation algorithms always ignore the combined effects of different categories of data, which can have a potential impact on the effectiveness of the recommendation.

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Main idea

- We proposed a recommendation method based on deep neural networks—deep association neural network (DAN), and our work is concentrated on binary implicit feedback.
- This paper focuses on the alliance effect of different category features, and explores the influence of category feature alliance of the deep neural network on the model recommendation effect from a macro perspective.

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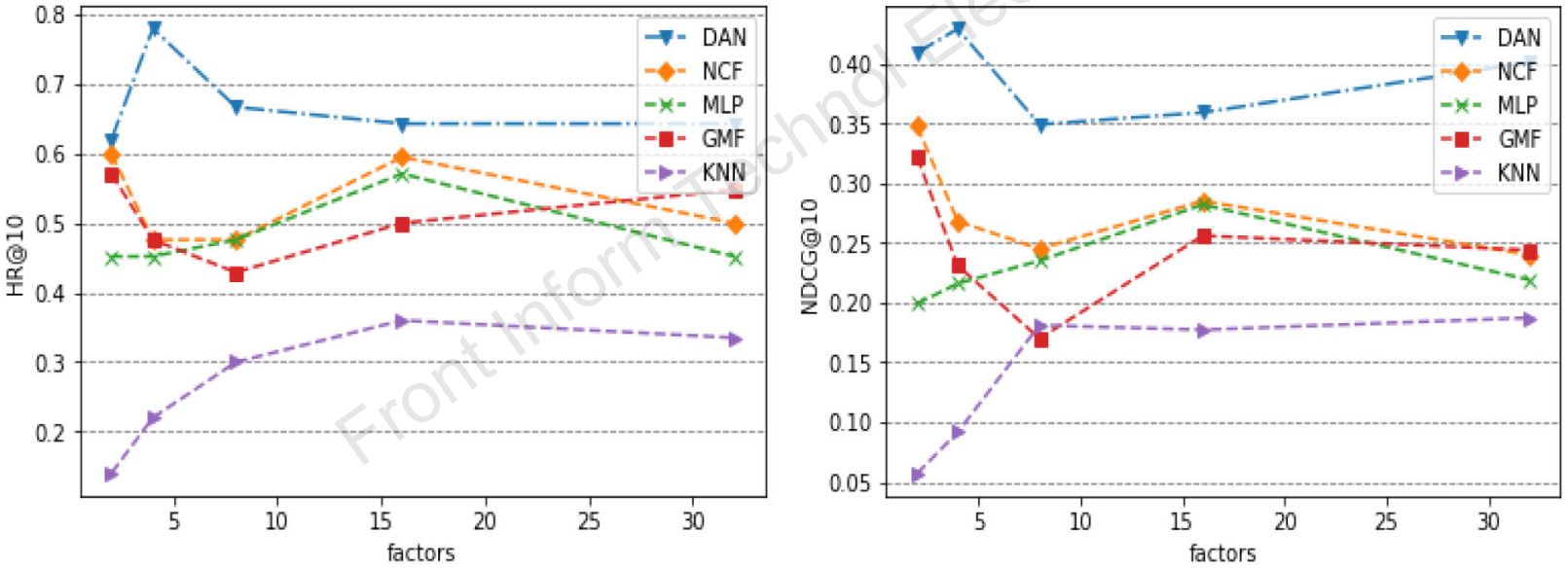
Method

- The proposed model's underlying input includes not only users and items, but also more auxiliary information.
- The impact of the joint action of different types of information on the recommendation is considered.
- When considering the influence of joint features on the result, the proposed model reconstructs the original feature projects from the perspective of feature vectors.
- Some experiments were carried out based on the proposed model.

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Major results

- Empirical evidence shows that DAN has better performance for recommendation .



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Fig.1 HR@10 and NDCG@10 w.r.t. the number of predictive factors

Major results

- Increasing the bottom width of the deep neural network (that is, enriching the feature categories of the bottom input) can improve the model performance based on the original deep neural network.

Table 1 HR@10 of MLP_2_*n* with different layers

Number of factors	HR@10				
	MLP_2_0	MLP_2_1	MLP_2_2	MLP_2_3	MLP_2_4
1	0.400	0.405	0.425	0.452	0.405
2	0.405	0.452	0.476	0.524	0.524
4	0.429	0.452	0.524	0.548	0.595
8	0.385	0.405	0.476	0.550	0.560
16	0.350	0.400	0.452	0.500	0.550
32	0.381	0.476	0.548	0.560	0.561
64	0.333	0.405	0.405	0.545	0.530
128	0.400	0.452	0.476	0.490	0.500
Average	0.385	0.431	0.473	0.521	0.528

Table 2 HR@10 of MLP_5_*n* with different layers

Number of factors	HR@10				
	MLP_5_0	MLP_5_1	MLP_5_2	MLP_5_3	MLP_5_4
1	0.400	0.524	0.571	0.571	0.570
2	0.405	0.595	0.619	0.643	0.640
4	0.405	0.518	0.524	0.590	0.650
8	0.476	0.500	0.500	0.500	0.595
16	0.476	0.452	0.476	0.548	0.550
32	0.476	0.480	0.500	0.548	0.561
64	0.524	0.500	0.500	0.548	0.619
128	0.571	0.571	0.619	0.640	0.643
Average	0.467	0.518	0.539	0.574	0.604

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Conclusions

- In this work, we explored deep association neural networks (DAN) for recommendation. We designed a common framework of DAN to simulate the user-item interaction.
- The framework of the proposed model is simple and universal. It can be used for personalized recommendations in large-scale e-commerce platforms, and in various Internet life service platforms.
- Through a series of experimental analyses, it is proved that our model can achieve good performance.

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