

論文 / 著書情報
Article / Book Information

題目(和文)	利用者と項目間の影響を考慮した推薦アルゴリズムの研究
Title(English)	Study of Influence-Centric Recommendation Algorithms
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学位種別(和文)	博士論文
Category(English)	Doctoral Thesis
種別(和文)	論文要旨
Type(English)	Summary

論文要旨

THESIS SUMMARY

専攻:	知能システム科学	専攻
Department of		
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Student's Name		

申請学位(専攻分野):	博士	(工学)
Academic Degree Requested	Doctor of	
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要旨 (英文 800 語程度)

Thesis Summary (approx.800 English Words)

The thesis puts forward a novel and integrated influence-centric framework, which not only predicts users' preference based on neighbors' direct influence, but also takes into account the indirect influence by mining the latent attributes of neighborhood. The proposed framework extends traditional user-based/item-based collaborative filtering and influence-based recommendation algorithms based on social impact theory and linear threshold model, as well as related data mining/machine learning techniques. Depending on the prediction subjects, user influence-centric recommendation algorithm and item influence-centric recommendation algorithm are proposed respectively.

In each method, firstly, the proposed methods use unbalanced strategy to select several nearest neighbors for target user or item. Secondly, the methods measure each users' or items' influence coefficients on the other users or items, then distinguish the users' or items' influences into the two categories: persuasive influences and supportive influences. Next, the methods calculate the total influences of these two types of influences in the preference prediction process and take into account the effect of total influence. Third, the methods also cope with the indirect influences exerted by the structure of users' or items' neighborhoods. For instance, a target user may tend to take the opinion, or integrated preferences of a majority group. Based on these processes, the methods are applicable to mining and discovering meaningful and useful latent attributes of users' or items' neighborhoods. Thus, combined with suitable data mining and/or machine learning techniques, the methods are able to learn users' or items' preferences.

Using the proposed methods, the thesis conducts intensive experiments on two benchmark data sets: MovieLens and Netflix. The experimental results have suggested that (1) the un-balanced neighbor selection method not only improves both the performance and the accuracy of traditional user-based and item-based collaborative filtering methods in terms of Root Mean Squared Error (RMSE), and that (2) the methods have an advantage such that it just needs fewer nearest neighbors obtaining best performance. We also have investigated the performance of the direct influence model on the cases, which satisfy the closeness threshold. And we found that there is a tradeoff between the performance and the coverage. With respect to the indirect influence model, the results also have suggested that the tradeoff between the performance and the coverage requires some parameter tuning tasks. That is, the indirect influence model is able to give much better performance on the cases, which satisfy Group Size Difference (GSD) threshold, but the coverage of satisfied cases decreases with the performance improvements. Finally, we presented the final performance of the combination of the direct influence model and the indirect influence model. Compared with other conventional collaborative filtering algorithms, we found that the proposed methods give the better performance. Unfortunately, as collaborative filtering approaches, the proposed algorithms also confront sparsity problem like traditional user-based and item-based collaborative filtering methods through experiment. That is, the proposed methods show worse performance given a smaller value of the training/test ratio.

In summary, the thesis proposed user influence-centric recommendation algorithm and item influence-centric recommendation algorithm. In each method, users' preferences are predicted based on the direct influences of the neighborhood of users or item and the indirect influences by mining the latent attributes of neighborhood. Furthermore, the proposed influence-centric recommendation algorithms show the better performance than conventional collaborative filtering algorithms through experiments. Benefiting the advantage of collaborative filtering, the proposed influence-centric recommendation algorithms can be applied in many areas and also can be integrated with other recommendation algorithms.

備考: 論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。

Note: Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1 copy of 800 Words (English).

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