Exploiting Social Network Dynamics for Recommendation with SoNARS Algorithm

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ABSTRACT

Recommender systems try to solve the information overload problem by predicting and presenting the items users are likely to be interested in, based on the match between their profile and some reference characteristics, either from the information item (content-based approach) or from the user's social environment (collaborative filtering approach). However, even if collaborative filtering approaches consider the preferences of communities of similar users and social recommender systems (i.e., recommender systems which also include "social functions" like joining social networks, tagging, commenting or inserting content) allow users to browse the contents of their social network, network dynamics are not usually considered in the recommendation process.

On the contrary, theories in social psychology which describe influence processes among individuals (e.g., social conformity, social comparison, social facilitation) suggest that joining in a network with other people exposes individuals to social dynamics which can change their attitudes and behaviours. It can be therefore assumed that individuals become interested in topics that do not necessarily match their personal, pre-existing preferences, but that reflect those of their social network.

SoNARS is a social network-based algorithm which explicitly targets users as members of social networks and can be coupled with traditional collaborative filtering or content-based approaches in order to provide users with recommendations which reflect both the trend of their network and their personal interests.

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The work described in this abstract was conducted collaboratively within a small group and the author contributed significantly to the whole project.

Specifically, recommended contents are selected with SoNARS considering: i) $Score_{cy}$, the level of interest a certain content c has for each person y in the network of the target user x, and ii) R_{xy}, the strength of the relationship between the target user x and each user y.

In this context, a relationship is said to exist between individuals x and y if x performs an action which refers to or has an effect on user y. Considering that different actions may indicate a different degree of intimacy between two users, the strength of their relationship R_{xy} is calculated as a weighted sum of all the actions user x performed over user y. As for $Score_{cy}$, it is derived from the actions user y performed on content c, distinguishing among different types of actions (e.g., tagging, commenting, posting) with different weights. The total recommendation score for a certain content c ($Score_c$) is computed with respect to the target user x summing up the results of the product of $Score_{cy}$ and R_{xy}, calculated for each user y.

An experimental evaluation was conducted in order to assess SoNARS algorithm with respect to its capacity to provide users with interesting contents. A group of 45 subjects (20-50 years old, 21 females and 24 males) was selected among Facebook users, according to an availability sampling strategy. Facebook was chosen as a test-bed since it is a popular website where real social networks can be observed and Facebook groups were used as contents to recommend. All the selected subjects in turn were considered target users.

The social networks of the target users were reconstructed by parsing their personal pages in order to identify i) all the persons with whom they interacted and ii) all the actions they performed which refer to another user. Then, the complete list of the groups each individual in their network subscribed to was also retrieved and a partial score $Score_{cy}$ was computed for each group and for each user y. Notice that here only the action of subscribing was considered, as a special case of the proposed approach. The total score $Score_c$ was then calculated for each group, with respect to a certain target user. Recommendations were generated by sorting groups in descending order, according to their score. To evaluation purposes, the thirty groups with highest scores were considered the actually recommended ones. The complete group lists were then presented to the target users by means of a web interface, together with the names of the users who had already joined the various groups, and target users were asked to indicate the groups they would like to

subscribe to.

Precision, recall and accuracy were used to measure the performance of SoNARS. Precision (0.67) is quite satisfactory: its value suggests that network recommendations are actually interesting for users, so that they choose various groups among those with the highest scores. Accuracy (0.8) is definitely good, indicating that the algorithm tends to recommend groups that users actually choose and not to recommend groups that they do not choose. However, recall (0.5) is quite low.

Future work is aimed at investigating how network- and interest-based recommendations could be properly coupled in order to improve recommendations.