# UTILIZATION OF BEHAVIOR OF USERS FOR PERSONALIZED LINK RECOMMENDATION

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**Abstract.** Nowadays many websites are adopting personalization techniques. In order to achieve this we need to acquire the users' interests. Implicit feedback is the most suitable and unobtrusive way of doing so. We propose a method of link recommendation based analysis of users' actions. We use collaborative filtering to predict their interest of unvisited pages. Our results indicate that time actively spent on a web page is the best interest indicator. Moreover, by recording just three types of actions we were able to achieve 62 % accuracy of users' interest prediction.

## 1. Introduction

A lot of people browse the Web every day, but they have often difficulties finding interesting content among the plethora of available sites. This problem can be addressed using some kind of recommender system. In this paper we summarize the results of our previous research based on tracking of actions the users do while surfing through a website in order to provide recommendations of interesting links [1].

User's feedback was already used in recommendation and personalization tasks [2]. From the provided feedback the interest of a user in particular item (e.g. a restaurant, movie, article, product or any other primary entity displayed on a particular web page) is computed. Collaborative filtering is being widely used for the prediction of user's interest in unvisited items or web pages [4, 5].

The main problem is how to precisely determine if the user found the visited web page interesting. We observe actions like time spent on a web page, scrolling and text copying, from which we determine the amount of user's interest. Using collaborative filtering we predict and recommend exciting content on the website of our faculty. Particularly, we transform textual information about upcoming events into calendar entries and we display personalized calendar to every visitor of the website.

## 2. Experiments and evaluation

For the evaluation of our approach we proposed to use an adaptive proxy server [3] which we used to track actions and to alter the webpage by adding personalized calendar to it.

In the first experiment visitors to the web portal were asked to explicitly rate their interest in every page visited on the scale from 0 to 10 (10 means the highest interest). We observed the behavior of users on 55 web pages; the average accuracy of our prediction was 62 %. Results indicate that time actively spent on a web page is the best interest indicator.

We also did an offline experiment to prove the validity of the recommendations. We collected browsing activities from 24 users. We divided these data to testing and training sets (2 weeks each). Then, we computed users' interests for every page in sessions from the training set, computed the predicted interest in unvisited pages and observed if the user actually visited the page (i.e. if it was present in the testing set).

Across this experiment people visited 25 % of the pages recommended to them. In an analogous online experiment the users explicitly expressed their interest in visiting 55 % of the recommended links. Our goal was to provide additional links to those the user normally visits, therefore we consider the achieved results as success.

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## References

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