Allied:
A Framework for Executing Linked Data-Based Recommendation Algorithms

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ABSTRACT

The increase in the amount of structured data published on the Web using the principles of Linked Data means that now it is more likely to find resources on the Web of Data that represent real life concepts. Discovering and recommending resources on the Web of Data related to a given resource is still an open research area. This work presents a framework to deploy and execute Linked Data based recommendation algorithms to measure their accuracy and performance in different contexts. Moreover, application developers can use this framework as the main component for recommendation in various domains. Finally, this paper describes a new recommendation algorithm that adapts its behavior dynamically based on the features of the Linked Data dataset used. The results of a user study show that the algorithm proposed in this paper has better accuracy and novelty than other state-of-the-art algorithms for Linked Data.

KEYWORDS
DBpedia, Evaluation Framework, Interlinked Data, Linked Data, Recommender Algorithm, Recommender System, Semantic Recommender, Web of Data

INTRODUCTION

Due to the increase in the amount of structured data published on the Web through the principles of Linked Data, it is more likely to find resources that describe or represent real life concepts. The information provided by these resources can be used in different domains. However, finding and recommending related resources is still an open research area (Ricci, Rokach & Shapira, 2011). A Systematic Literature Review (Figueroa, Vaglìano, Rodríguez Rocha & Morisio, 2015) stated that the problem of finding existing relationships between resources can be addressed by analyzing the categories they belong to, their explicit references to other resources and / or by combining both of
these approaches. Currently there are many works aimed at resolving this problem by focusing on specific application domains and datasets.

In this context, the present work aims to answer the following research questions:

- How can we choose the best existing algorithm for recommending resources from the Web of Data, which best suits the characteristics of a given application domain and a given dataset?
- How can we measure the performance and accuracy of the different existing algorithms to select the one that best suits specific recommendation needs?
- Is it possible to have an algorithm that is dynamically adaptable to the characteristics of the dataset and independent of the application domain?

To answer these research questions, the authors propose a framework for deploying and executing Linked Data based recommendation algorithms (implemented following some guidelines), to facilitate the conduction of studies to evaluate them in different application domains and without being bounded to a single dataset. Thus, the framework makes it possible to benchmark the algorithms to choose the one that best fits the recommendation requirements.

Additionally, the framework provides a set of APIs that enable application developers to use it as the main component for recommendation in various contexts. In this way, developers do not need to deal with the execution platform of the algorithms but only to focus their efforts either on selecting an existing algorithm or on writing a customized one.

By using the previously mentioned framework and after conducting a deep analysis of the behaviors and benchmark results of state-of-the-art recommendation algorithms, the authors created a new recommendation algorithm that adapts dynamically to the characteristics of the dataset and to the application domain on which it is used.

The remainder of this paper is structured as follows: section Related Work presents the state of the art about Linked Data based Recommender Systems (RS). Section Research Methodology describe the research approach and outlines the main steps undertook. Section The Framework introduces an evaluation framework for deploying recommendation algorithms. Section Implementation details the framework including the main modules for discovering, ranking and categorizing resources. Section A Dynamic Algorithm for Recommendation proposes a new algorithm: ReDyAl. Section Evaluation describes a user study conducted to evaluate ReDyAl in comparison with state-of-the-art algorithms based on Linked Data. Finally, section Conclusions and Future Work presents the conclusions and future work.

RELATED WORK

The research work presented in this paper is based on the results obtained from a systematic literature review (Figueroa, et al., 2015). Therefore, in this paper the RS were classified in the following types.

Graph-Based

This is the most common type of algorithms used in RS based on Linked Data. These algorithms exploit the graph structure of datasets for computing relevance scores for items represented as nodes in a graph. Algorithms in this category are classified into:
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