# Chapter 27

# Augmented Context–Based Conceptual User Modeling for Personalized Recommendation System in Online Social Networks

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## ABSTRACT

*As the data on the online social networks is getting larger, it is important to build personalized recommendation systems that recommend suitable content to users, there has been much research in this field that uses conceptual representations of text to match user models with best content. This article presents a novel method to build a user model that depends on conceptual representation of text by using ConceptNet concepts that exceed the named entities to include the common-sense meaning of words and phrases. The model includes the contextual information of concepts as well, the authors also show a novel method to exploit the semantic relations of the knowledge base to extend user models, the experiment shows that the proposed model and associated recommendation algorithms outperform all previous methods as a detailed comparison shows in this article.*

## INTRODUCTION

Online social networks are getting more attention nowadays, they grew rapidly in the last few years, and attracted many users, as they can communicate, share and get more information by using these networks.

As more people are engaged to the online social networks, huge amount of data is posted every day, millions of tweets on Twitter and posts on Facebook are generated causing an overwhelming stream of data. Social networks are widely used to share news, updates and events, but as the data is getting larger; users are more likely to miss important items that may be interesting to them, this issue rise the importance of building personalization solutions that can guide users to interesting content of social web including posts, people or pages.

In this paper we present a personalized recommendation system that helps users of social networks find the best textual content that matches their interest using semantic analysis of the text with help of a knowledge base. To identify the user interest, a conceptual user modelling methodology that exploits the contextual relations of concepts is introduced. As well as a recommendation algorithm that matches the user model with the content representation. There has been a series of work in this area, to our knowledge all of previous works that introduced conceptual models of social web users use named-entities to represent the interest of the users, whereas in our work we propose to represent the text as a series of concepts that contains the representation of words, phrases and entities in text, we present conceptual user model where users are mapped to concepts, and contextual conceptual user model where users are represented as a graph of contextually connected concepts. We also try to exploit the semantic relations of the knowledge graph to expand the user model, so we propose a learning-based approach that finds the importance of each semantic relation type in the field of recommendation. Our results compared with the state-of-the-art methods show that the proposed model effectively out-perform all other models.

This paper is structured as follows, Section 2 contains a detailed view of related work, Section 3 presents the problem definition and contribution, text representation method is explained in Section 4, in Section 5 we show the experiment setup, Section 6 shows the conceptual user model and Section 7 shows the contextual conceptual user model, Section 8 elaborates the model expansion approach, Section 9 presents the comparison of our models with previous models, and Section 10 concludes the paper.

## RELATED WORK

Building recommendation systems for online social networks has attracted many researchers in the last few years, a few researchers aimed at studying content recommendation, but many user modelling techniques are used in other researches aiming at link, news or 'who to follow' recommendations. We can classify the researches in three different categories:

1.  **Collaborative filtering:** Where items are recommended to a user by considering users with similar interests, or by considering similar items to items already user interested in;
2.  **Statistical content based:** Where users are modelled according to the textual content of their items, the content is processed statistically like in IR systems, and items are recommended if its content is similar to the user model;

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