**Name :** Vineet Kumar Sejwal

**Supervisor :** Dr. Jahiruddin

**Co-Supervisor :** Dr. Muhammad Abulaish

**Title :** Towards the Design of a Context- and Trust-Aware Recommender System

**Department :** Department of Computer Science, Jamia Millia Islamia

The proposed *context- and trust-aware recommender system* in this thesis is a comprehensive study to analyze every aspect of items' contextual conditions along with users' trust values, such as extraction of items' contextual features using knowledge bases and deep-learning techniques, recommending items to users using items' con- textual features, recommending items to users using their trust values, and finally development of an effective hybrid recommender system which constitutes both con- textual features and trust values. In the existing literatures, a number of efforts have been made to understand the different aspects of context-aware and trust-aware recommender systems, with major emphasis on their development

**Objectives:** A summarized list of the objectives of this thesis is given below:

1. One of the objectives of this thesis is to present a comprehensive review of the literature related to various issues and challenges faced by the recommender systems, with a special focus on various issues and challenges with context and trust-aware recommender systems. The review aims to study the existing state- of-the-art approaches related to various aspects of recommender systems, including various existing recommendation techniques like content-based, collaborative filtering, and hybrid filtering. It also includes the incorporation of context into a 2-dimensional recommender system using various algorithms like pre-filtering, post-filtering, and contextual modeling. Finally, it contains various techniques for designing trust-aware recommender systems using trust statements. It also highlights the research gaps that existing literature misses in terms of approach, robustness, dataset, and so on.

2. Another objective of this thesis is to present efficient techniques to learn items' contextual features that utilize the structural and textual information. Later this is

used to propose an approach for item recommendation using the semantic similarities of items computed using the items' contextual features.

3. Another objective is to use users' social information like trust using some robust trust statements to compute the trust score for user pairs which are used for designing a trust-aware recommender system.

4. Finally, the main objective of this thesis is to develop a robust and efficient hybrid recommender system that incorporates both contextual information and trust values for the recommendations. Although several context-aware and trust-aware recommendation techniques exist in literature, no one has used both recommendation techniques on the same platform.

**Findings:** In the literature survey, it is found that researchers started working to design RSs in the last few decades. Existing literatures also have reported many recommendation techniques that have incorporated context as a third dimension in traditional recommender systems to improve rating prediction accuracy. However, most of these context-aware recommender systems only consider the user and user-decision context ignoring item contextual features. Existing literatures also have approaches to design trust-aware recommender systems for rating prediction improvements. How- ever, most of the trust-aware recommender systems only consider users' ratings to compute trust scores for user pairs. Moreover, there is no such approach exists that incorporates both contextual features and trust values together in a 2-dimensional recommender system. In contrast to existing approaches, the proposed approach uses items' contextual features to design a context-aware recommender system. Similarly, the proposed approach uses novel trust statements including rating-based deviations to design trust-aware recommender systems. Finally, the proposed approach incorporates both context- and trust-aware recommender systems to design a hybrid recommender system.

In the experimental evaluation of the proposed approaches on real-world datasets like Movie, Yelp, and Amazon, it is found that the proposed approaches perform better than existing state-of-the-art approaches in terms of standard error-based and decision- based evaluation metrics. On analysis of the proposed hybrid system, devised items' contextual features and trust statements are found to be robust, efficient, and statically significant.

**Value:** This thesis aims to tackle a pertinent, interesting, but difficult problem re- lated to information filtering and retrieval systems, mainly to tackle the *information overload* problem through providing more accurate recommendations that satisfy users' interests and

requirements. It presents the development of a context- and trust-aware recommender system which incorporates both contextual features and trust values of users and items into the collaborative filtering-based recommendation technique. The main objective behind this hybrid integration is to improvise the personalized rec- ommendations and accuracy of rating predictions for handling some of the existing challenges like *cold-start*, *limited content*, *data sparsity*, and *black-box recommendation*. Contextual features are generally categorized into three groups – *user context*, *item context*, and *user-decision context*. On analysis, we found that most of the existing context-aware recommendation systems use only *user-decision context* for recommendations, and ignore user and item related contextual features.

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