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# Trust aware Recommender System using Swarm Intelligence

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## Highlights

- Weighted Trust metrics have been used to generate personalized recommendations.
- Swarm Intelligent technique (Bat algorithm) was employed to find the weights.
- Problems of sparsity and Malicious attacks have been addressed.
- Results indicate resultant reduced MAE and more accurate recommendations.

## **Abstract**

Due to limitations and challenges faced by traditional collaborative filtering-based recommender systems, researchers have been shifting their attention towards using trust information among users while generating recommendations. It is observed that one trust metric may work better for some user and fails to do so in the case of another user. This paper proposes to favor that metric which provides high-quality recommendations for a particular user. For this purpose, weights have been assigned to various trust metrics for each pair of users and optimized iteratively to generate more accurate and personalized recommendations. We have used swarm intelligent techniques namely Bat algorithm and Particle Swarm Optimization for the same. The performance of the approach proposed in this work is evaluated using MovieLens, Epinions, CiaoDVD, and Filmtrust data sets and compared to earlier works generating recommendations using an individual metric. The results indicate that the MAE while using a combination of weighted trust is 0.59 (with PSO) and 0.55 (with Bat), which is much better compared to using a single metric. Bat also generates better recommendations with an accuracy of 85.45% than PSO (81.85%). Also, the MAE found using Bat was 3.84% better when utilizing denser datasets (MovieLens and FilmTrust) as compared to sparse datasets (CiaoDVD and Epinions).

**Keywords:** Recommender systems, collaborative filtering, swarm intelligence, trust, Bat algorithm, Particle swarm Optimisation

## **1. Introduction**

In the 21st century, data has grown to such a huge level (Information Overload) that finding the right information has become a major problem. Recommender systems (RSs) have been deployed in a wide variety of services, often in e-commerce domains, as intelligent virtual assistants. By combining information filtering and user profiling, these have proven to be an effective way of providing concrete product or service recommendations that are similar to users' tastes. (For example, Spotify recommends songs according to what kind of music users have listened to in the past).

Recommender Systems come in many flavors. Main among them are Content-based RSs and Collaborative Filtering RSs. Content-based(CBF) recommender systems [20] compare features of items and recommend similar items to users while Collaborative filtering (CF) based recommender systems [6] use similarity of users calculated based on ratings, to recommend items. These systems are based on the belief that users agreeing in the past have a high chance of agreeing in the future. Apart from these, there are other types of recommender systems as well- namely

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