

Implementation of Hybrid Recommender System using Machine Learning Techniques - A Research

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Introduction:

Recommender systems are defined as a software tool that suggests the items and their features to the users. Earlier, the recommendations were made by the opinions of domain experts having vast amount of knowledge about the subject. As a result of immense growth in digital data in previous decades, the work of recommendation became stressful by using conventional knowledge base techniques. This enormous data lead to the development of software systems that recommend items precisely(Çano and Morisio, 2017).

The Recommender systems emerged as a necessary tool to assist users in accessing services from large sets of merchandise. Netflix provides movie recommendations, Amazon provides product recommendation services, Yahoo! recommends news, and Google gave recommendations of advertisements. Corporate organizations provide net services and recommendation ability together as functionality in the market(Song, Tekin and Van Der Schaar, 2016).

Machine Learning is considered as a sub domain of Artificial Intelligence that deals with the training skills of machine. The Algorithms of machine learning that typically used in the recommender systems are classified into two different categories namely Collaborative filtering and Content based filtering. The Collaborative method works on the interaction between the users and items. It mainly has an idea that people who agreed on previous interaction with the item are again going to like them in the future. The task of algorithms is to search out operation that predicts the utility of that past interaction. The various content- based strategies supports the similarities possess by things throughout their interactions(Isinkaye, Folajimi, & Ojokoh, 2015).

There are various problems mentioned by the researchers in using the recommendation system strategies. The common issues mentioned are the Cold Start problem, Data sparsity problems, Accuracy problems, Diversity, and Scalability. Various researches were conducted with the help of machine learning to reduce the effectiveness of these challenges. These techniques still have a scope of extensions and futuristic measures that used to develop a better recommendation system(Song, Tekin and Van Der Schaar, 2016).

The author in this research compares various algorithms that previously used to overcome the mentioned problems and find out the various changes by comparing more contexts of data. The system investigates the machine learning algorithm that is best fitted to a given data. For better evaluation of large-scale contextual data, a hybrid approach that consists of various machine learning methods is proposed to provide more accuracy than the previously designed system.

Literature Review:

The core operation of any recommender system is to predict an item that may be found helpful by a user. The basis for the recommendation, however, varies from one recommender system to another. There exist several taxonomies to distinguish between different approaches to make a recommender system. Previously, the recommender system follows three basic approaches based on characteristic information and User item interactions. These techniques are Content-based filtering, Collaborative based filtering, and Hybrid filtering.

Asim A, Skander E. & R. kohli (2000) developed a Hierarchical Bayesian Recommendation system. The products for a recommendation in this system were new release and old release movies. The system, with the help of statistical methods based on customer ratings on products, was developed. Customized recommendations to the customers given with the help of a regression-based approach. The results show a better recommendation for the movie having

higher ratings. The authors mentioned that for the recommendation of lower rating movies, this model was less desirable.

Gediminas Adomavicius, Bamshad Mobasher, Francesco Ricci & Alex Tuzhilin (2010) have given the concept of context in the recommender system. In their work, the authors mentioned the importance of contextual factors and change in them according to time. The authors also suggested the limitations of this system. The problem described in these systems was identifying which context is to be considered is still an area for studies. They also mentioned that the classification is only an initial and general high-level structure for characterizing the multi-faceted subject of contextual knowledge in recommendation systems. Linqi Song, Cem Tekin & Mihaela van der Schaar (2013) developed a recommender system algorithm based on the recommendation at the item cluster level. The authors mentioned various challenges like scalability, diversity, differential services, and cold start problems. This recommendation system worked on an associate algorithmic program that considers item preferences of users, which uses a square measure technique that supported their interaction with them. The authors in their system constructed an online item cluster tree and made a recommendation at the item-cluster level. They also introduced Adaptive Clustering Recommendation algorithm (ACR) for improving learning speed. This ACR technique is used to select adaptive cluster size giving balance to the recommendation and reducing cluster size. A comparison with another context-free algorithm has been made in this work. The limitations of this system occurred when this algorithm is used in a distributed manner.

Yao Lu, Sandy El Heou, Denis Gillet (2013) gave a hybrid recommender system for job seekers. They used a Content-based Similarity Computing and Ranking algorithm for the construction of the system. They used candidate, employer, and job fields and computed profile-based similarity and by using Personalized Multi-Relational Page Rank and indicated the importance of a particular page. The authors gave a better recommendation of this approach than previous approaches.

Negar Hariri, Bamshad Mobasher & Robin Burke (2014) have developed a system that adapts the contextual changes in interactive recommendations. The authors used the Multi-Arm Bandit algorithm and extended them to study the variation of the user's feedback due to contextual changes. If the change is noted, the algorithm based on Thompson sampling prioritizes the result. The algorithms prioritize the current context and depend on the user's feedback.

Maria R. Lee, Tsung Teng Chen & Ying Shun Chai (2016) have developed a Recommender System based on hybrid techniques using data from social networking sites for recommending Taiwan premiere movies. They have used Fb (API) to extract data from social media fan pages. The data preprocessing stage involves a collaborative filtering technique and applied multinomial logistic regression. They have evaluated results in two parts i.e., Cross-Validation and Online system questionnaire evaluation process. The accuracy is calculated for various genres, and the perception of users is rated by using the questionnaire evaluation process based online. This Recommender System is analyzed text only in traditional Chinese language, and experiments on other languages are not performed. Sufficient data on fan pages is required for the recommender system to work appropriately.

Agata Nawroka, Andrzej Kot & Marcin Nawrocki (2018) have studied various issues related to the application of Machine Learning in recommender systems. The study was conducted on data present in the Movie lens portal. The authors created algorithms that calculate prediction ratings. This algorithm was based on similarity of users and the objects. The errors that were considered in the prediction are RMSE and MAE, and the results show that these errors were less. The author mentioned that the system is effective only when a certain number of minimum ratings by users are considered.

Geetha G., Safa M., Fancy C., Saranya D. (2018) have developed a movie recommender system that was based on hybrid filtering for précised recommendation. The authors centered on the mix of the benefits of Content-based and collaborative based mostly filtering ways. The system allows the users to choose from the given set of attributes and then on the basis of the cumulative weight of attributes, and also, by using the k – mean algorithm, the system was able to recommend a list of movies. The system used only a small set of users that are based on an informal evaluation.

The work in the area of recommendation system based on the techniques of the Content base, Collaborative, and hybrid technologies. The algorithms used by authors commonly focused on the development of methods of more accuracy. More studies can achieve further exploration regarding overcoming the disadvantages like Cold – Start Problems, Scalability, sparsity problems, etc. These literature works give the base for experimentation with the help of Machine learning algorithms for achieving higher accuracy in recommender systems.

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