

# **Main Project Proposal**

## **Restaurant Recommendation System**

### **Abstract**

A recommender system is a set of algorithms that combine techniques to suggest items similar to what the user has shown interest. The main objective of a recommendation system is to suggest relevant items to users. Recommender system has the ability to predict whether a particular user would prefer an item or not based on the user's profile. In a restaurant recommendation system the food preference of a user will be based on a variety of factors like customer's past purchases, browsing history, customer location, restaurant information and what other similar customers in the vicinity are ordering. Every user's ratings, viewing history and the purchasing are recorded. A restaurant recommendation system can improve the order conversion and click through rates of a food company. Here a collaborative filtering method is being adopted for the system. Collaborative filtering (CF) systems work by collecting user feedback in the form of ratings for items in a given domain and exploiting similarities in rating behavior

amongst several users in determining how to recommend an item. CF systems recommend an item to a user based on opinions of other users.

## Objective

The objective of recommender systems is to offer suggestions based on previously recorded information about the users' preferences. These systems process information using information filtering techniques to offer the user with potentially more relevant content.

## Literature Survey/Related Works

(1) Gao, Yifan, et al. "A restaurant recommendation system by analyzing ratings and aspects in reviews." *International Conference on Database Systems for Advanced Applications*. Springer, Cham, 2015.

- A restaurant recommender system is designed based on a novel model that captures correlations between hidden aspects in reviews and numeric ratings.
- It first explores topic modeling to discover hidden aspects from review text.
- Profiles are then created for users and restaurants separately based on aspects discovered in their reviews.
- Finally, regression models are utilized to detect the user-restaurant relationship.

(2) Zeng, Jun, et al. "A restaurant recommendation system based on user preference and location in a mobile environment." 2016 5th IIAI International Congress on Advanced Applied Informatics (IIAI-AAI). IEEE, 2016.

- This recommender system adopts a user preference model by using the features of user's visited restaurants.
- It also utilizes the location information of users and restaurants to dynamically generate the recommendation results.
- The proposed restaurant recommender system can effectively utilize user's preference and the location information to recommend the personalized and suitable restaurants for different users

(3) Fakhri, Alif Azhar, Z. K. A. Baizal, and Erwin Budi Setiawan. "Restaurant Recommender System Using User-Based Collaborative Filtering Approach: A Case Study at Bandung Raya Region." *Journal of Physics: Conference Series*. Vol. 1192. No. 1. IOP Publishing, 2019.

- A user-based collaborative filtering method is proposed for recommending a restaurant personally, based on ratings given by other users.
- A user rating similarity and user attribute similarity is used for finding the proximity between users.

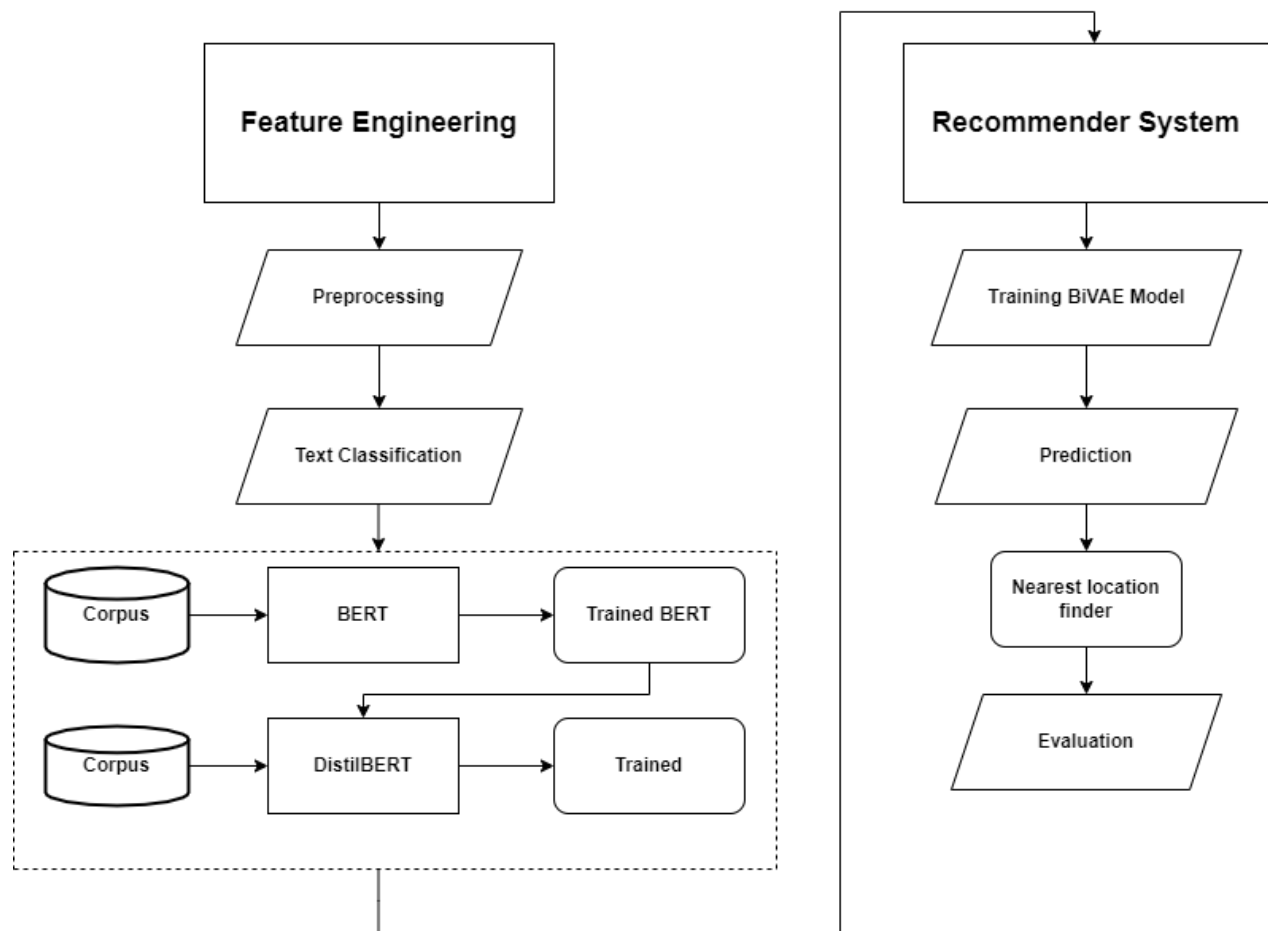
(4) Truong, Quoc-Tuan, Aghiles Salah, and Hady W. Lauw. "Bilateral Variational Autoencoder for Collaborative Filtering." *Proceedings of the 14th ACM International Conference on Web Search and Data Mining*. 2021.

- Here a variational autoencoder is tailored for dyadic data, where observations consist of measurements associated with two sets of objects, e.g., users, items and corresponding ratings.
- It combines a generative model of dyads with two inference models parameterized using neural networks, to autoencode users and items under a unified framework.

## Proposed Solution

The proposed solution involves a user based collaborative filtering approach for the recommendation system. By using this system the quality of the system depends on the highest rating item list. The system is also able to recommend user items outside their preferences. There is also an increase in the number of parameters used to increase the efficiency of the system.

## Design steps



## Steps

**1)Preprocessing:**This involves data cleaning which involves lower casing,removal of punctuations,stopwords and URLs,spelling corrections etc.

**2)Text Classification:**This involves the classification of reviews based on a quantitative scale

- First, the trained distilBERT is used to generate sentence embedding for the dataset.
- Then a basic NN Architecture (with Dense and Dropout layers) is used for the further classification task and the training.
- Finally, the evaluation of the model is performed.

### **3)Training the BiVAE Model**

- After text classification the data is split after which it is trained.
- It is trained using parameters like dimension ,learning rate,batch size,number of epochs,etc
- After the model is trained it is evaluated using various evaluation metrics.

#### **4)Nearest location finder**

- Based on the information on latitude/longitude the nearest location from source location is found out and recommended

## **Conclusion**

Recommendation engines serve as the key to the success of any online business. Good recommendation systems guide our decisions, helping us to filter through the huge amount of information online. Both the chosen techniques and data quality are important aspects for the quality of the system, and to measure the quality of these systems we can use metrics to measure both the behavior of the system and the engagement of users.