

RESTAURANT RECOMMENDATION SYSTEM

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ABSTRACT

The recommendation systems are the most effective ways for humans to make decisions based on the reviews of other people. The opinions, reviews and interests among the likeminded people are the best metrics that are used in the recommendation systems. One of the major needs of the society lies in culinary or just for the purpose of relaxation or entertainment, people tend to go to restaurants. However, people always prefer a restaurant with good reputation or a restaurant that fits their requirements/ tastes. Hence, we implement a technique that helps people choose the restaurant that have the facilities that they personally require, and to provide them with this information, the dataset of restaurants' ratings, its specialty, reviews, the menu, ambience etc., are considered and when people use this recommendation system, they could use simple keywords and get the filtered results that satisfy their conditions. Thus, the restaurant recommendation system - simply a list of restaurants sorted on the basis of the customers' ratings and when given the few interests of the users, the system brings up the filtered search results based on the Maximum Likelihood using these given attributes.

Keywords: Recommendation systems, ratings, reviews, Maximum Likelihood.

1. INTRODUCTION

Recommender Systems or Recommendation Systems are simple algorithms that aim to provide the most relevant and accurate items (products, movies, events, articles) to the user (customers, visitors, app users, readers) by filtering useful stuff from a huge pool of information base.

Recommendation engines discover data patterns in the data set by learning consumers' choices and produces the outcomes that co-relates to their needs and interests. Unlike offline stores, online stores have no sales people, they have huge number of products on their websites and users on other hand have limited time and patience to navigate to the items that they are looking for recommendation systems solve these kinds of problems by exploiting the user preferences and prioritize the items based on all other users past behavior.

II. LITERATURE SURVEY

Many recommended systems are developed so far but each one of them had few drawbacks within them. Restaurant Recommendation Using Clustering Techniques uses the algorithms such as canopy, hierarchical clustering, farthest first, filtered cluster, and simple k-means clustering Techniques are used and compared. The ultimate aim of the clustering is to separate instances based on similarities among them, but the algorithms used could not segregate the instances and hence the algorithms used are not optimal. Similarly Location Based Personalized Restaurant Recommendation System uses user's geo-location position, gets the coordinates and finds the restaurant around those coordinated. The drawback it has is only when the geo-location access is not given, the method fails in recommending the restaurants of users' choice.

III. PROPOSED METHODOLOGY

In this system, we develop a restaurant recommendation system using the Matrix Factorization or Latent Factor Collaborative Filtering Optimization. This system recommends restaurants for users based on their preferences such as beautiful ambience, good food, tasteful desserts and soon. This system provides personalized restaurant recommendations to users.

IV. Algorithm Used

Recommender Systems or Recommendation Systems are straightforward algorithms that aim to provide the foremost relevant and correct items (products, movies, events, articles) to the user.

There are two types of Recommendation Systems:

1. Content Based Filtering

Here the recommendations are done to the user based on the previous items that are highly rated by the user himself. But these don't work efficiently for large data.

2. Collaborative Based Filtering

Here the recommendations are based on the idea that people who share same interest in certain kind of items will also share the same interest in some other kind of items.

Matrix Factorization

- It is collaborative based filtering method where matrix $m \times n$ is decomposed into $m \times k$ and $k \times n$ which is utilized in recommender systems.
- In this model the initial user data matrix is broken down into two matrices P and Q where P represents of user id data frame and Q represents of business id data frame.
- In the next step Gradient Descent Optimization algorithm is applied on these two matrices P and Q to get the optimized data in recommending top restaurants.

Gradient Descent Optimization

- Gradient descent is an optimization algorithm that works iteratively to find the model parameters with minimal cost or error values.
- In this model the gradient descent optimization is used on the matrices P and Q which are broken down in the Matrix Factorization step.
- Once the algorithm is applied on both the matrices the optimized matrices P, Q and the vectorized data are stored in a local file using the library pickle.

V. DESIGNING SYSTEM

The most important requirement for completing this project is to use the Python programming language, as well as Machine learning and Python libraries. The backbone of the system is Mobile Net, which may be used for both high and low computation scenarios. In our proposed system, we use the matrix factorization and gradient decent algorithm.

Implementation: There are four modules in all.

- Data Preprocessing
We collected data from the yelp website. We consider two data sets for the project namely yelp_review_arizona.csv, yelp_business.csv. And preprocessing was done on them in order to remove all the stop words, punctuations etc.
- Extracting features
In order to use the text for the Matrix Factorization method we need to extract the features from the review text. So for this we are using the TFIDF Vectorizer.
- Applying Algorithm
Here we are going to use the algorithm in order to make the recommendation that satisfies the user
- Providing list of Recommendations
After performing all the above steps in this step we finally recommend a list of restaurants that best satisfies the user preference.

VI. LIBRARIES USED

- **NumPy:** NumPy is a python library used for working with arrays.
- **Pandas:** Pandas is a high-level data manipulation tool developed by Wes McKinney. It is built on the NumPy package and its key data structure is called the Data Frame. Data Frames allow you to store and manipulate tabular data in rows of observations and columns of variables.
- **Matplotlib:** Matplotlib is a plotting library for the Python programming language.
- **Sklearn:** In our code we used the shuffle module and model selection module. It is used to do random permutations of the collections.
- **Seaborn:** Seaborn is a library for creating applied mathematics graphics in Python. It builds on high of matplotlib and integrates closely with panda's information structures.
- **NLTK:** The Natural Language Toolkit (NLTK) platform used for building Python programs that employment with human language knowledge for applying in applied math natural language processing (NLP). It contains text process libraries for tokenization, parsing, classification, stemming, tagging and semantic reasoning.

VII. SYSTEM ARCHITECTURE

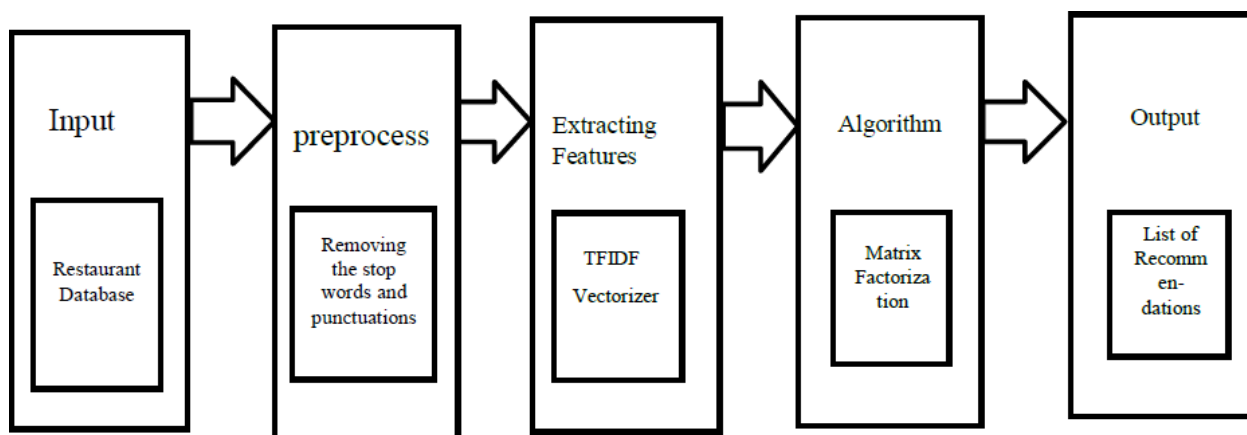


Fig : System architecture of a Restaurant Recommendation System.

Fig shows the entire architecture of the proposed model which includes taking input from the user It's a step by step process once our data is preprocessed it is ready for the building of recommendation system, from the preprocessed data we will extract the important features of the users and as well as the various business upon which algorithm is applied. At the end a list of recommendations based upon the preference given by the user is produced.

VIII. CONCLUSION

The restaurant recommendation system is a very flexible and highly interactive with the users, the users get to express their opinions and give the reviews for the restaurants they visit and the new users, in need of opinions and who are browsing for a place to have food at can look up at the recommender system. The users can just give their requirements and the system gives out the filtered-out results. So here we have successfully completed the project using latent factor collaborative filtering or matrix factorization. Hence, the use of the Restaurant Recommendation System is very useful, time saving while deciding about choosing a place to dine at, very simple and conventional.

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