Restaurant Recommendation System

Amogh Rajesh Desai
Department of Computer Science and Engineering
PES University
Bangalore, India
amoghrajesh1999@gmail.com

Siddhant Samyak
Department of Computer Science and Engineering
PES University
Bangalore ,India
siddhantsamyak@gmail.com

Kavya Khatter
Department of Computer Science and Engineering
PES University
Bangalore ,India
kavyakhatter1999@gmail.com

***Abstract*—** Recommender systems are widely deployed to predict the preferences of users to items. They are popular in helping users find movies, books and products in general. In this work, we design a restaurant recommender system using KNN.

I. INTRODUCTION

Inspired by our recent experience searching for restaurant recommendations, we built a restaurant recommendation system. Recommendation systems provide personalized, relevant recommendations to users and have been used in various domains, such as retail, movie-going, etc. Currently, the leading publisher of reviews of local businesses in the world, does not provide recommendations. Instead, users have to filter, sort, then read reviews to determine whether a restaurant can provide them with what they want. A personalized recommendation system will provide a better user experience by incentivizing users to review and rate more in return for better restaurant recommendations; this in turn gives more data that can be used to further improve the recommendation system.[2]

II. RESEARCHES

Using Bayesian model

This model the preference of each user and AHP of multi-criteria decision making to integrate the preference of individual users, so that can be used to recommend information to group users. Implemented system has been applied to restaurant recommendation in mobile environment, and its' evaluation has been conducted successfully with recommendation experiment and usability test. Whole process is divided into four steps: context-log collection, preference modelling of individual users using Bayesian network, their integration using multicriteria decision making, and recommendation.[1]

- Assumption made is Naïve Bayes classifier assumes that the presence of a particular feature in a class is unrelated to the presence of any other feature.
- Limitation : It is almost impossible that we get a set of predictors which are completely independent.

Using Correlations and probabilistic linguistic term

This proposes a novel personalized restaurant recommendation approach that combines group correlations and customer preferences. Our model employs the unsupervised means and probabilistic linguistic term set (PLTS) to conduct the group correlations between customer group and restaurant group. The recommendation list is provided by looking for the most similar group that the target customer belongs to[3][4]

- Assumption : there is some correlation between a specific group of people and specific restaurant groups of an area.
- Limitation : if there is no correlation between a group of people and the restaurant it won't recommend the restaurants and also will not proceed for analysis process

.

Using visual information for prediction

Many customers review restaurants in blog articles where text-based subjective comments and various photos may be available. In this the influence of visual information, i.e., photos taken by customers and put on blogs, on predicting favourite restaurants for any given user. By considering visual information as the intermediate, integration of two common recommendation approaches,
i.e., content-based filtering and collaborative filtering, and show the effectiveness of considering visual information. More in addition to text information or metadata, restaurant attributes and user preference can both be represented by visual features. Heterogeneous items can thus be modelled in the same space, and thus two types of recommendation approaches can be linked.[5]

Using Regression models

The input to this system is a review corpus and a target user u. The output is a list of top-k restaurants recommended for u. The system consists of two main components: profile generator and rating predictor This method first explores topic modelling to discover hidden aspects from review text. Profiles are then created for users and restaurants separately based on aspects discovered in their reviews. Finally, utilization of regression models to detect the

user-restaurant relationship. Experiments demonstrate the advantages

- Assumption made is that variables x1,x2.... are independent of each other
- Limitation is it Only Looks at the Mean of the Dependent Variable However, sometimes there is a need to look at the extremes of the dependent variable

III. PROPOSED PROBLEM STATEMENT

- A recommender system using context information and a decision tree model for efficient recommendation
- . This system considers location context, personal context, environment context, and user preference. Restaurant lists are obtained from location context, personal context, and environment context using the decision tree model
- In addition, a weight value is used for reflecting user preferences. Finally, the system recommends appropriate restaurants to the mobile user. For this experiment, performance was verified using measurements such as k-fold cross-validation and Mean Absolute Error.

IV. APPROACH

The most two popular approaches are Content-based and Collaborative Filtering:

Content-based approach requires a good amount of information of items' own features, rather than using users' interactions and feedbacks. For example, it can be restaurant attributes such as cuisine, Reviews, location, rating etc., or textual content of articles that can extracted by applying Natural Language Processing. **Collaborative Filtering**, on the other hand, doesn't need anything else except users' historical preference on a set of items. Because it's based on historical data, the core assumption here is that the users who have agreed in the past tend to also agree in the future. In terms of user preference, it usually expressed by two categories. **Explicit Rating**, is a rate given by a user to an item on a sliding scale, like 5 stars for Barbeque Nation. This is the most direct feedback from users to show how much they like an item. **Implicit Rating**, suggests users preference indirectly, such as page views, clicks, order records, whether or not order from a particular restaurant and so on

- The standard method of Collaborative Filtering is known as **Nearest Neighbourhood** algorithm.[7] The nearest neighbour algorithm simply stores all of its training data, here textual descriptions of implicitly or explicitly labelled items, in memory. In order to classify a new, unlabelled item, the algorithm compares it to all stored items using a similarity function and determines the "nearest neighbour" or the k nearest neighbours. The class label or numeric score for a previously unseen item can then be derived from the class labels of the nearest neighbours. The similarity function used by the nearest neighbours algorithm depends on the type of data. For structured data, a Euclidean distance metric is often used. When using the vector space model, the cosine similarity measure is often used . In the Euclidean distance function, the same feature having a small value in two examples is treated the same as that feature having a large value in both examples. In contrast, the cosine similarity function will not have a large value if corresponding features of two examples have small values. As a consequence, it is appropriate for text when we want two documents to be similar when they are about the same topic, but not when they are both not about a topic.
- While different people may have different baselines when giving ratings, some people tend to give high scores generally, some are pretty strict even though they are satisfied with items. To avoid this bias, we can subtract each user's average rating of all items when computing weighted average, and add it back for target user
- Creating a model of the user's preference from the user history is a form of classification learning. The training data of a classification learner is divided into categories, e.g., the binary categories "Restaurants the user likes" and "Restaurants the user doesn't like." This is accomplished either through explicit feedback in which the user rates items via some interface for collecting feedback or implicitly by observing the user's interactions with the restaurants and the most preferred cuisine for that particular user.

V. IMPOROVEMENT

This recommendation systems recommend a restaurant to a A variety of learning algorithms have been adapted to learning user profiles.

In many other previous implementations only reviews and location were used to recommend the restaurant to the user but here we are using location ,rating, cuisine, reviews all under the KNN approach to make sure the best recommendations to the user in all ways.

VI. REFERENCES

[1] Park MH., Park HS., Cho SB. (2008) Restaurant Recommendation for Group of People in Mobile Environments Using Probabilistic Multicriteria Decision Making. In: Lee S., Choo H., Ha S., Shin I.C. (eds)
Computer-Human Interaction. APCHI 2008. Lecture Notes in Computer Science, vol 5068. Springer, Berlin, Heidelberg

[2] N. Nikzad–Khasmakhi, M.A. Balafar, M. Reza Feizi–Derakhshi, The state-of-the-art in expert recommendation systems, Engineering Applications of Artificial Intelligence, Volume 82, 2019, Pages 126-147,ISSN 0952-1976

[3] Chenbin Zhang, Hongyu Zhang, Jianqiang Wang, Personalized restaurant recommendation method combining group correlations and customer preferences,Information Sciences,Volumes 454–455,2018, Pages 128-143,ISSN 0020-0255

[4] Sarwar, B., Karypis, G., Konstan, J., Riedl, J.: Item-based Collaborative Filtering Recommendation Algorithms. In: Proc. of the Tenth International World Wide Web Conference on World Wide Web (2001)

[5] Chu, WT. & Tsai, YL. World Wide Web (2017) 20: 1313. https://doi.org/10.1007/s11280-017-0437-1M. Young, The Technical Writer's Handbook. Mill Valley, CA: University Science, 1989.

[6] Wang, Z., Liao, J., Cao, Q., Qi, H., Wang, Z.: Friendbook: A semanticbased friend recommendation system for social networks. IEEE Trans. Mob.(2015)

[7] Sarwar, B., Karypis, G., Konstan, J., Riedl, J.: Application of dimensionality reduction in recommender system: A case study. In: Proceedings of ACM WebKDD Workshop (2000)