TEST Engineering & Management

May – June 2020
ISSN: 0193-4120 Page No. 2589 - 2594

Recommender System for Favourite Dish in Best Restaurant

[1]K.Michael Sadgun Rao, [2]V.Lakshmi Harika, [3]K.Venkateswarrao, [4]P.Tirupathirao

[1]Assistant Professor, Department of Information Technology, Lakireddy Bali Reddy College of Engineering (Autonomous),Mylavaram, Krishna D.T, Andhra Pradesh, India
michael.kona@gmail.com

[2,3,4] B.Tech, Department of Information Technology, Lakireddy Bali Reddy College of Engineering (Autonomous),Mylavaram, Krishna D.T, Andhra Pradesh, India

Article Info
Volume 83
Page Number: 2589 - 2594
Publication Issue:
May - June 2020

Article History
Article Received*: 11August 2019*
Revised*: 18November 2019*
Accepted*: 23January 2020*
Publication*:10May2020*

Abstract:

Recommender system is the best method to provide suggestions for the users. At present recommendation systems are gaining more importance in different fields. They are generally used to recommend movies, hotels, restaurants to the users. They generally give recommendations based on the users search history. In this paper restaurant recommendation system is developed. Generally restaurant recommendation suggests best restaurants based on the rating, but now we are going to develop a recommendation engine that suggests restaurants for the user's favourite dish. In this process number of votes and rating are the selected criteria for giving recommendations. Based on these criteria the restaurants are ranked. Multinomial logistic regression is used for predicting the probabilities of the restaurants. The restaurant with highest probability is recommended to the user.

Keywords:*Recommender system, restaurants, Machine learning, logistic regression*

I. INTRODUCTION

Recommendation systems are developed to remedy the statistics overload problem with the aid of imparting personalized hints of offerings to specific clients according to their options. RS is broadly utilized by diverse domains such as purchasing (Amazon), tune (Pandora), movies (Netflix), tour (TripAdvisor), eating place (Yelp), human beings (Facebook). It is a tool to mine gadgets and accumulate users' critiques to help users in their search technique and shows items related to their preferences. The user item matrix is used to determine the users' preference in the conventional recommendation systems.

A restaurant recommender system is proposed in this paper. The availability of internet, mobile applications, Cloud [6-10] together brought this society closer. Now-a-days the importance and popularity for recommendation system are increasing because they are making users easy to select the things they wanted from the group of available. This paper focuses on recommending the restaurants to the users according to his or her preference.The data of the restaurants used for recommending is collected from kaggle.com website. In the restaurants dataset everything related to restaurant is stored. For example the general details like reviews, ratings, dishes liked and number of votes etc are stored. From those only required attributes are selected. The user will search for a dish and the top restaurants in which the dish is good are ranked and displayed to the user.

Machine learning [15-21] algorithms' main objective is to develop a program that takes data as the input and learn themselves from the data and from its learning it predicts the outputs to the user. These algorithms are classified into four types namely supervised, semi supervised, unsupervised and reinforcement algorithms. For labelled data supervised algorithms are used. Among those the

May – June 2020
ISSN: 0193-4120 Page No. 2589 - 2594

algorithm that suits for our recommendation is Multi nominal logistic regression. Generally logistic regression algorithms [11-14] are used to solve two types of problems binary classification and multi-classification problems. In multi-classification problems the trained data is used to predict more than one possible outputs. So this algorithm is used for our recommendation system.

The algorithm predicts the probabilities of each restaurant based on the rating and number of votes.Then these probabilities are sorted and the top restaurants are displayed to the user.

II. Related Work

In [1],a restaurant recommendation system in mobile environment is proposed. This recommender system implemented a consumer preferred version with the aid of using the functions of the eating places visited by the person, and additionally used the individual and restaurant location statistics to dynamically produce the implications of the advice. The proposed program had been brought into effect using BMCS and BWCS.

In [2], for building personalized restaurant recommendation system machine learning algorithms are used.For analysing and classifying all the previous users' feedback NLP tool is used.They classify the result as either positive or negative or neutral.In the process of restaurant recommendation, the user first selects the features of the hotel based on his or her interest and the suitable hotels are displayed.

In [3], a FML-based recommender system for restaurants is proposed.They first showed eight food groups based on the FEL norm, and from the guidebook included food calories. The aim is to let people know about different kinds of food calories. They then suggested a restaurant to have ontology recommended for this method. As RL gets higher a restaurant's recommended level often gets high. The results of the simulation show that the food calories are significant and the distance to the restaurants.

In [4],a restaurant recommendation system is developed specifically for data that is collected from chat messages typed in Turkish. The program aims to recommend the best matching locations for a group of users to evaluate their interactions in a chat environment. A rule-based methodology composed of steps of standardization, review, and evaluation was developed and implemented to achieve this aim. In addition, an overview module was introduced which was used to explain why the program recommends selected locations.

In [5], a restaurant recommendation method using the real time data of the users is proposed. Initially, the past details of users visiting hotels was formulated in a matrix format bya logistic function. The visiting habits of users and popularity of restaurants are discovered using the computed matrix. Then, the running time of the restaurants was based on knowing a restaurant's activities.

III. Proposed System:

The proposed system uses multinomial logistic regression algorithm for recommending restaurants to the user. The basic flow of this algorithm is as shown in Fig1.

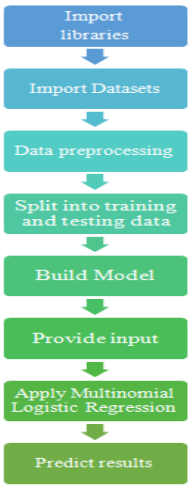

Fig1.Implementation

- Import required python packages
- Load the datasets
- Data pre-processing
- Splitting the datasets
- Building the model for logistic regression
- Implementing the model
- Predicting the outputs.

TEST Engineering & Management

May – June 2020
ISSN: 0193-4120 Page No. 2589 - 2594

Importing required packages:

Pandasis manipulation framework that is simplistic, efficient, modular and easy to use, designed on the top of Python programming language.

Label encoder is used for converting labels to categorical values.This is one of the step in the pre-processing.

train_test_split is a function in sklearn model selection for splitting the data arrays into two subsets.One is for training data and other is for testing data.

Logistic Regression computes the probability of an event occurrence. It is a special case of linear regression where the target variable is categorical in nature. It uses a log of odds as the dependent variable.

In multilabel classification, **Metrics** computes the accuracy of the subset that is the set of labels predicted for a sample must *exactly* match the corresponding set of labels in y_true.

Matplotlib is a comprehensive library for creating static, animated, and interactive visualizations in Python.

Importing datasets:

The dataset used for this restaurant recommendation is downloaded from kaggle.com. We collected Zomato Bangalore restaurants datasets. Out of those only five attributes are selected. The data set taken after feature extraction is as shown in Fig2.

Data pre-processing:

Multinomial logistic regression takes the categorical values as a input. But our input will be in label format.so we need to convert this values into categorical values. For this purpose label encoder is used. In machine learning, typically we are dealing with datasets that contain multiple labels in one or more columns. Such marks may be in word or number type. The training data are also labelled in words to make the data comprehensible or readable in human language.

Label Encoding refers to translating the labels into numerical form in order to transform them into a machine-readable form. Machine learning algorithms will then make a better choice about how to operate certain labels. It's an important pre-processing phase in supervised learning for the structured dataset.

Name	Online order	Votes	Rating	Dish
Jalsa	Y	775	4	Masalapapad
Spice Elephant	Y	787	3.2	Pasta
San churro cafe	Y	918	4.2	Lunch
Addhuri Udipi Bhojana	Y	88	4.5	MasalaDosa
Jalsa	Y	775	4	Masalapappad
Grand Village	Y	166	4.5	Panipuri
Timepass Dinner	Y	286	3.4	Hot Chocolate
Onesta	N	2556	4	Coffee
Penthouse Cafe	Y	324	4.1	Pasta
Jalsa	Y	88	3.875	Masalapappad
Spice Elephant	Y	166	3.87	pasta

Fig2.Restaurants dataset

Split into training and testing datasets:

Features and Corresponding targets are required for training the multinomial regression model. Data set is divided into four sets which are

- training_x
- testing_x
- training_y
- testing_y

Training_x and training_y are used to design the multinomial paradigm of logistical regression, and testing_x and testing_y are used to accurately measure the consistency of the tested model of logistics regression.

Building the logistic regression for multi classification:

- For building the multinomial logistic regression classifier, from scikit learn package logistic regression is imported.
- In the scikit learn linear model system,the Logistic Regression feature is used to construct an instance of the logistic regression model.

May – June 2020
ISSN: 0193-4120 Page No. 2589 - 2594

- The next, fit approach of training_x and training_y is used to suit the Learning Dataset Logistic Regression System.

Implementing the multinomial logistic regression:

For implementing multinomial logistic regression firstly we need to create an object and pass a parameter before fitting the model with tarin_x, test_x. After implementing we need to calculate accuracy. For this scikit learn metrics method is used. Accuracy score is calculated by sending the actual targets and predicted targets to the accuracy_score function.

Predicting the results:

The algorithm takes the input as categorical values and the probabilities are provided as the output. The restaurant with highest probability is recommended to the user.

IV Results:

The probabilities are sorted and the restaurants with highest probabilities are displayed first. It is shown in the following figure.

```
In [29]: n=[]
         n2=[]
         print("....Recommended Restaurants.....")
         for i in sort :
             h=res.get(i,"")
             print(h)
             n.append(h)
             j=sort.get(i,"")
             n2.append(j)

....Recommended Restaurants.....
Jalsa
Timepass Dinner
Onesta
Addhuri Udupi Bhojana
Spice Elephant
Penthouse Cafe
Grand Village
Rosewood International Hotel - Bar & Restaurant
San Churro Cafe
```

Fig3. Snapshot of the Recommended Restaurants

If the user searches for a dish, the restaurants which are best for that dish are displayed in order which have highest probabilities. The results are shown in the fig4.

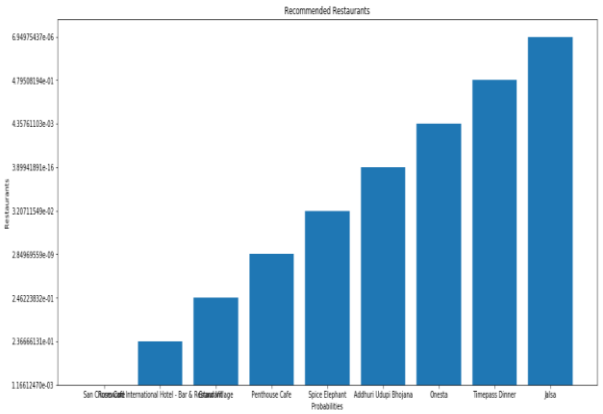

Fig 4. Recommended Restaurants

Conclusion:

This paper build a recommendation system for restaurants based on the customers' favourite dish. This model is designed using best regression techniques. The performance of the recommendation model is tested and the results are also acceptable. This work would be extended by using neural networks to improve the performance.

References:

1. J. Zeng, F. Li, H. Liu, J. Wen and S. Hirokawa, "A Restaurant Recommender System Based on User Preference and Location in Mobile Environment," 2016 5th IIAI International Congress on Advanced Applied Informatics (IIAI-AAI), Kumamoto,2016, pp. 55-60 .Doi: 10.1109/IIAI-AAI.2016.126 URL:http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7557575&isnumber=7557554
2. R. M. Gomathi, P. Ajitha, G. H. S. Krishna and I. H. Pranay, "Restaurant Recommendation System for User Preference and Services Based on Rating and Amenities" 2019 International Conference on Computational Intelligence in Data Science (ICCIDS), Chennai, India, 2019, pp. 1-6. doi: 10.1109/ICCIDS.2019.8862048

May – June 2020
ISSN: 0193-4120 Page No. 2589 - 2594

URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8862048&isnumber=8862005

3. W. Lin, M. Wang, C. Lee, K. Kurozumi and Y. Majima"FML-Based Recommender System for Restaurants" 2013 Conference on Technologies and Applications of Artificial Intelligence, Taipei, 2013, pp. 234-239. doi: 10.1109/TAAI.2013.54 URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6783873&isnumber=6783819
4. M. Elıfoğlu and T. Güngör, "A restaurant recommendation system for Turkish based on user conversations" 2018 26th Signal Processing and Communications Applications Conference (SIU), Izmir, 2018, pp. 1-4. doi: 10.1109/SIU.2018.8404153 URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8404153&isnumber=8404147
5. M. A. Habib, M. A. Rakib and M. A. Hasan, "Location, time, and preference aware restaurant recommendation method" 2016 19th International Conference on Computer and Information Technology (ICCIT), Dhaka, 2016, pp. 315-320. doi: 10.1109/ICCITECHN.2016.7860216 URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7860216&isnumber=7860155
6. A. Koneru and M. S. Latha, "Three tier architecture: To select CSP through CloudServiceBroker in multicloud environment," 2016 International Conference on Inventive Computation Technologies (ICICT), Coimbatore, 2016, pp. 1-6. doi: 10.1109/INVENTIVE.2016.7823236 URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7823236&isnumber=7823173
7. Anupriya Koneru and Sreelatha M, "A Blind Key Signature Mechanism for Cloud Brokerage System," journal of Advanced Research in Dynamic and Control Systems, Issue: 13-Special issue, 2018, pp. 770-776
8. Anupriya Koneru and Sreelatha M, "Broker decision verification system using MR cloud tree," International Journal of Engineering & Technology, 7 (4) (2018) 3306-3311.
9. Koneru, Anupriya & Sreelatha, M.. (2017). Cloud service broker: Selection of providers using DTRFV evaluation. Journal of Theoretical and Applied Information Technology. 95. 3551-3559.
10. A. Koneru and M. Sreelatha, "A comprehensive study on cloud service brokering architecture," 2017 International Conference on Computing Methodologies and Communication (ICCMC), Erode, 2017, pp. 47-53. doi: 10.1109/ICCMC.2017.8282517 URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8282517&isnumber=8282515
11. K. Lavanya, L. S. S. Reddy and B. Eswara Reddy ,"A Study of High-Dimensional Data Imputation Using Additive LASSO Regression Model", Computational Intelligence in Data Mining,2019 Advances in Intelligent Systems and Computing 711.
12. Lavanya K., Reddy, L., & Reddy, B. E. (2019). Distributed Based Serial Regression Multiple Imputation for High Dimensional Multivariate Data in Multicore Environment of Cloud. International Journal of Ambient Computing and Intelligence (IJACI), 10(2), 63-79. doi:10.4018/IJACI.2019040105.
13. K. Lavanya, L. S. S. Reddy and B. Eswara Reddy, "Modelling of Missing Data Imputation using Additive LASSO Regression Model in Microsoft Azure", Journal of Engineering and Applied Sciences,2018,Vol 13,Special Issue 8,pp:6324-6334.
14. Lavanya.K, L.S.S.Reddy, B. Eswara Reddy, "Multivariate Missing Data Handling with Iterative Bayesian Additive Lasso (IBAL) Multiple Imputation in Multicore Environment on Cloud", Volume 5, Issue 5 , May 2019,International Journal on Future Revolution in Computer Science & Communication Engineering (IJFRSCE), PP: 54 – 58.
15. A. Koneru, N. B. Naga Sai Rajani Bhavani, K. Purushottama Rao, G. Sai Prakash, I. Pavan Kumar and V. Venkat Kumar, "Sentiment Analysis on Top Five Cloud

May – June 2020
ISSN: 0193-4120 Page No. 2589 - 2594

Service Providers in the Market," 2018 2nd International Conference on Trends in Electronics and Informatics (ICOEI), Tirunelveli, 2018, pp. 293-297. doi: 10.1109/ICOEI.2018.8553970

16. Purushottama Rao K., Koneru A., Naga Raju D. (2019) OEFC Algorithm—Sentiment Analysis on Goods and Service Tax System in India. In: Mallick P., Balas V., Bhoi A., Zobaa A. (eds) Cognitive Informatics andSoft Computing. Advances in Intelligent Systems and Computing, vol 768. Springer, Singapore
17. Rama Devi Burri, Ram Burri, Ramesh Reddy Bojja, Srinivasarao Buraga "Insurance claim Analysis using Machine learning Algorithms, "International journal of innovative technology and Exploring Engineering (IJITEE), Volume-8, Issue-6S4, April-2019, ISSN: 22278-3075.
18. Rama Devi Burri, Y.Venkata Raghava Rao, V.B.V.N. Prasad "Machine learning methods for software Defect Prediction a Revit." International journal of innovative technology and Exploring Engineering (IJITEE), Volume-8, Issue-8, June-2019, ISSN: 22278-3075.
19. Sambasivarao Chindam, Rama Devi Burri " Snoezelen Bubble Tube – A Therapy for the Mentally Challenged People". International Journal of Recent Technology and Engineering (IJRTE) ,Volume-7, Issue-6S5, April 2019, ISSN: 2277-3878.
20. Soft Computing: Theories and Applications (SOCTA 2017)- Springer AISC series, Advances in Intelligent Systems and Computing 742, August 2018, Volume 742, ISBN: 978-981-13-0589-4_35, Page no:375-385 on " Anomaly Detection Using K-means Approach and Outliers Detection Technique"
21. Cognitive Science and Artificial Intelligence, Springer Briefs in Applied Sciences and Technology (ICCSAI-2017), Springer, Singapore, December 2017, Volume 1, ISBN: 978-981-10-6698-6, Page no: 45-53, Book Series on "A Refined K-Means Technique to Find the Frequent Item Sets"