A Novel Approach of Machine Learning Based Recommendation System for Hotels

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Abstract

One of the first things to do while planning a trip is to book a good place to stay booking a hotel online can be an overwhelming task with thousands of hotels to choose from for every destination motivated by the importance of these situations we decided to work on the task of recommending hotels to users we used Expedia's hotel recommendation dataset which has a variety of features that helped us achieve a deep understanding of the process that makes a user choose certain hotels over others the aim of this hotel recommendation task is to predict and recommend five hotel clusters to a user that he/she is more likely to book given hundred distinct clusters.

Keywords: *Travel recommendation Systems, Supervised Learning, Feature Selection.*

1. Introduction

A machine learning-based hotel advisory system involves a sophisticated program which uses algorithms developed using machine learning to help consumers identify lodging options that best suit their requirements and interests the system uses approaches like filtered data based on content collaboration filtering or hybrid methods to deliver highly accurate and tailored recommendations by evaluating large datasets that include user profiles search histories booking habits and reviews a more personalized and dynamic user experience is provided by machine learning which improves the systems capacity to learn from user interactions and make better recommendations over time in addition to improving customer happiness by streamlining the search and booking process this strategy maximizes hotel occupancy rates significant progress in recommendationsystems is still being driven by machine learning even in the face of issues with data quality scalability and privacy still there is a flaw in the referral system that suggestspopular tourism destination that the Thailand without requiring user input this research developed a content-based filtering technique tourism recommender system.

TRS by taking into account the aspects mentioned its goal is to make it easier for consumers to find tourist destinations that fit them without requiring them to interact with the system too much the algorithm uses the users images to determine the favorite features of our tourist attractions the terms will subsequently be extracted from those images using machine learning ml using the vector space model those phrases will be utilized to find the similarity index with the terms of the photographs from the tourist attraction the top ten locations with the highest similarity index to the user will then be suggested by the system.

2. Literature Survey

Forhad, M et al.,[1] Study an effective hotel recommendation system through processing heterogeneous data was released in the journal electronics in the hotel recommendation system described this research improves recommendation accuracyby processing several kinds of heterogeneous input a more thorough study of user

preferences and hotel attributes is provided by the systems incorporation of data from many sources including user reviews ratings and contextual data the technology considerably enhances customer happiness and decision-making by precisely and individually recommending hotels through the efficient management and analysis of this variety of information.

G. Huming et al.,[2] In the month of april during the second international conference in multimedia and technology for information G huming and weilis research paper at the hotel reservation system built around joint filtering and rank boost algorithm was presented this work presents a novel hotel recommendation method that combines the ranking enhancement technique known as rank boost technique with shared filtering a widely used recommendation system method by combining these methods the system aims to provide individualized hotel recommendations while enhancing the proposals relevancy and accuracy while rank boost optimizes the suggested hotels ranking to ensurethe user sees the most relevant options a team filtering finds users who possess commoninterests.

Hu, R et al,.[3] in order to boost customer service suggested changes in context aware productive filtering strategies are combined the background information understanding as demonstrated in the research paper a context-aware collaboration-based filtering method for service recommendation by r hu w dou and j liu which was presented at the international conference on cloud and service computing to improve the relevance and precision ofsuggestions the authors suggest a model thatincorporates including time location and social context in addition to user preferences and historical data the strategy seeks to address short comings of conventional collaborative filtering which frequently overlooks the dynamic nature of user preferences influenced by various contexts by making use of this extra information regarding context the study describes the methodology application and assessment of the suggested system and shows notable advancements.

Lahlou, F. et al., [4] Presented their work textual comprehension context aware factorization machines improving recommendation by leveraging users reviews at the 2nd international conference on smart digital environment which took place in rabat morocco on october the goal of this research is to improve systems for suggestions with factored machines that use textual context from user reviews this method seeks to take advantage of the rich information that is embedded in textual reviews yet traditional recommendation systems frequently depend mostly on numerical ratings the suggested approach aims to offer more precise and customized recommendations by utilizing the semantic context of user feedback this novel strategy has the potential to enhance suggestion accuracy as demonstrated by the methodology trials and outcomes detailed in the study.

T. Chen et al.,[5] The use of fuzzy logic and nonlinear programming techniques are used to improve the hotel suggestions systems as described in the paper fuzzy is a and unpredictable programming approach for optimizing the performance of ubiquitous hotel recommendation by t chen and y h chuan which was published in the journal of ambient intelligenceand humanized computing vol 9 no 2 pp 275 284 2018 fuzzy sets are used in the study for modeling the amount of variation andcomplexity that are present in user preferences and environmental conditions the recommendation process is then optimized using the nonlinear programming frameworkenhancing the system's capacity to offer tailored and contextual relevant hotelrecommendations through tests and case studies the authors show how effective their method is by demonstrating no table increases in user happiness and suggestion accuracy this study provides.

Y. H. R. Saga et al.,[6] In order to adapt to such changes in users preferences over research paper hotel recommender system based on users preference transition was published at the 2008 IEEE international conference on systems man and cybernetics the proposed system plans to provide promptly suggested for hotels itfacilitates tracking changes in the interests of users and switches the suggestions in order to boost general consumer experience and satisfaction with proposed accommodations.

Y .J. Kim et al.,[7] In the journal sustainability vol 14 no 2 pp 113 2022 paper the impact of hotel service quality on satisfying customers through online reviews examines how hotel visitor experiences affect customer satisfaction as reflected in online reviews the study looks into the crucial aspects of customer experience that have significant effects upon contentment and how these experiences are shared onlineusing a sustainable development approach the writers use a quantitative method looking atdata from internet reviews to pin point the main factors that influence satisfaction the results highlight how vital it is to provide excellent client experiences in the hospitality sector and how important it is to maintainclient satisfaction and competitive edge in the world of technology.

Yashvardhan Sharma et al.,[8] A complex hotel recommendation system that takes into account numerous criteria from user reviews is presented in the research article a multi criteria review-based hotel recommendation system written by yashvardhan sharma published in 2015 this algorithm creates the rough and customized hotel suggestions by analyzing multiple hotel rating factors including location cleanliness service quality and value for money the system can accommodate a wide range of user tastes and offer more precise and sophisticated hotel recommendations by utilizing comprehensive review data which enhances user happiness and decision-making. Yoo, K.H et al., [9] The study what encourages users to write online travel reviews by k h yoo and u gretzel vol. 9, no. 2, pp. 275 284, 2018. looks at the fundamental reasons why people share their travel experiences online it was published in computing the decisions to post reviews through the examination to user-generated content on travel review platforms the writers offer valuable perspectives into the social and psychological factors involved the results emphasize the importance of social interactions in online communities as well as the role that altruistic and personal motivations play in promoting review authoring this study has important for marketers and travel agencies.

Zhou,c et al., [10] Research article an improved hotel recommendation system based on deep learning to increase recommendation accuracy more accurate and customized hotel recommendations are produced by the system thanks to deep machine learning algorithms which allow it to find intricate patterns and relationships within the data through the process of gathering information about specific user preferences and behaviors this method enables the platform to effectively manage big datasets and improve the quality of recommendations intelligent suggestion creation has advanced significantly with the use of this novel approach.

3. Proposed Methodology:

Several crucial processes are included the random forest methodology for hotel suggestions in order to provide precise and customized suggestions for users first and foremost gathering data is essential this includes user preferences historical reservations ratings hotel amenities and other pertinent data then to manage missing information standardize embed different variables of the data is preprocessed to efficiently assess the outcome of the method the input data is divided between test and training sets a technique for machine learning called random forest learning is used because of its reliability as well as ability to manage a high volume of information during training it builds several tree structures each based on a different random selection of randomness guarantees that the model data collection.
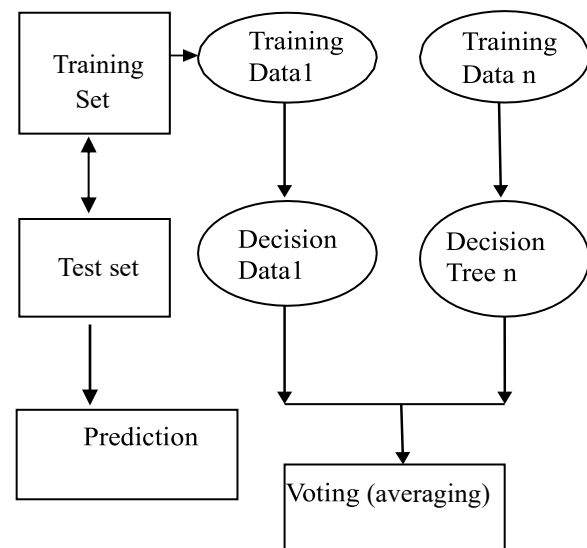

Figure 3.1: Block diagram of Random Forest algorithm

In the Figure 3.2, It is thorough procedure for the building a technique using machine learningml that will suggest hotels based on feedback from customers is shown in the diagram im- porting the including scikit-learn to perform data manipulating others analyze and model construct the hotel reviews datasets the ML model needs to be loaded and built in the following step the selected algorithm like a randomly generated forest is set up and trained set u data that has been processed the collection of information in order to assess of the technique the test collection is used to evaluate accuracy

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│ Upload data set for      │
│    hotel reviews         │
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│    Cleaning the data     │
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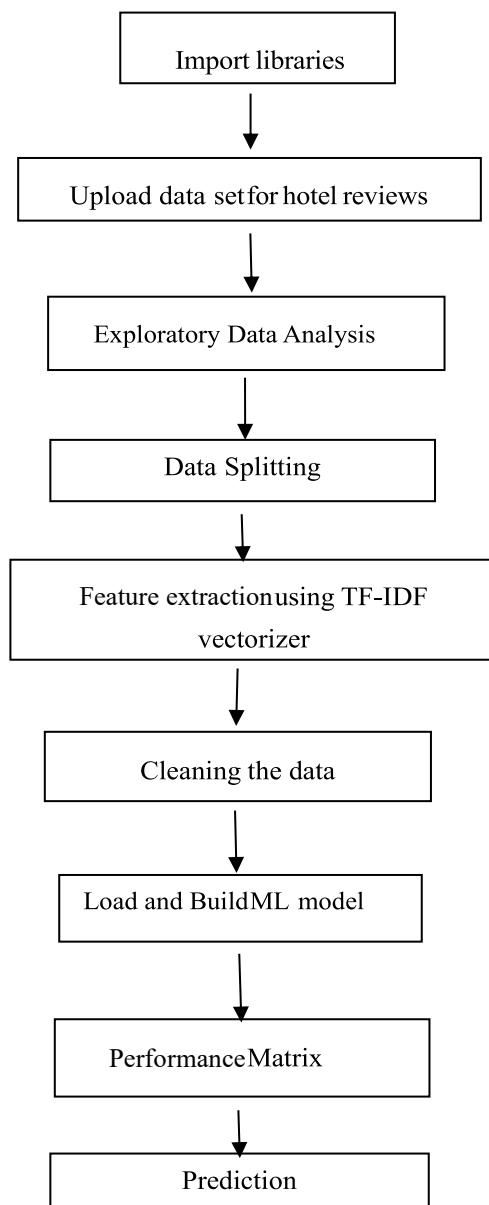
Figure 3.2: Flow diagram of proposed system

whereas the set for test is utilized for test the model following test the model predicts data set being tested and its efficacy is assessed using a various indicators like f1 score light on the dependability and predictive Capacity of the technique by going throughthis iterative process the technique is improvedand adjusted to deliver precise hotel choices based on customer feedback.

4. Results and Discussion

The Implementation for building a hotel recommendation system using a random forest algorithm has demonstrated a proportionate accuracy of 96.6% this impressive accuracy is achieved through a series of well-defined steps that ensure the models robustness and reliability firstly the necessary libraries are imported providing tools for data manipulation and model building the dataset of hotel reviews is then uploaded forming the basis for analysis with the exploratory data analysis EDA the data is thoroughly examined to identify patterns and detect any anomalies subsequent data cleaning addresses issues such as missing values and duplicates ensuring the datasets integrity the next step involves feature extraction using the term frequency-inverse document frequency (TF-IDF) vectorizer which converts the textual reviews into numerical features this transformation is crucial for enabling the ma chine learning algorithm to process and learn from the text data effectively the random forest model is then built and trained on this processed data the dataset is split into training and test sets with the training set used to train the model and the test set used for evaluation after training the model makes predictions on the test set the models performance is evaluated using various metrics with accuracy being a key indicator the accuracy of a model is given by the equation accuracy number of correct predictions total number of predictions 100 accuracy total number of predicting number of correct predicting 100 in this case the technique achieved an accuracy of 96.6 indicating that 96.6 of the predicting made by the technique were correct this high level of accuracy

reflects the effectiveness of the methodology in building a reliable hotel recommendation system through careful data preprocessing feature extraction and model tuning the methodology ensures that the model provides accurate and relevant hotel recommendations to users.

Conclusion

An important advance in the tourist industry tailored user experience is the machine learning powered hotel recommendation system the algorithm is able to provide highly relevant and tailored recommendations by incorporating a variety of data sources including user evaluations hotel attributes and contextual data the precise and customized recommendations are guaranteed by the integration of content-based filtering collaborative filtering and cutting edge deep neural network algorithms the system is guaranteed to remain efficient and current with changing user behaviors through ongoing monitoring assessment and model retraining this approach gives enterprises in the hotel and restaurant sector a competitive edge while also improving user happiness by streamlining the decision-making process.

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