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A Decision Tree Based Recommendation System for Tourists

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Abstract - We are implementing C4.5 decision tree algorithm with mRMR (minimum Redundancy - Maximum Relevance) features selection to recommend travel areas to tourist by using dataset from past tourist experiences. All existing algorithms such as collaborative or content filtering algorithms uses current user past experience data to recommend him new locations. These algorithms will not work if this current user has no past experiences data.

To overcome from above problem, we are using C4.5 decision tree algorithms which take experiences of previous users and then build a model and if new user enters his requirements, then decision tree will predict best location based on his given input. Decision tree don't need new users past experience data.

Key Words: IT, ML, SRS, GUI, OS, HTML, CSS, JS, UML, MRMR

1. INTRODUCTION

Every day, many people visit the e-commerce website to search required information such as well-known touristic locations around the world. People carries personal electronic devices such as mobile phone, laptops etc.; are being able to gather information about their surroundings, which is used by the so- called tourist recommendation system to suggest touristic attractions, based on context factors such as location, etc. The statistics shows, Revenue of leading online travel Agencies worldwide 2018. In 2018-year, Booking was the leading travel agency with a yield of approximately 14.53 billion U.S. dollars TripAdvisor have 37.7 million of visitors. (i.e., April 2018 by monthly users) Booking.com has 20.1 million of visitors.

The usage of internet browser to read online reviews is improved in 2019 than the 2018. 51% of people were reading thereviews in a daily basis. 36% of people are always agreed with the online review. 18% are regularly viewing, 27% are occasionally views the online review. 18% are not liked to view.As per the review survey of 2019 done by bright local website, Online reviews were impacting on decision making of consumers or visitors as per the statistics of 2019, 91% of users are agree with the online reviews. The tourism industry is an extremely important sector on a global scale, East Europe the travel and tourism sector has a positive impact on economy directly contributing an estimated 782billon euros to GDP in 2018. Europe is the global leader in international tourism with over 600 million tourists arriving in the region each year. Leading European countries in the travel and tourism in 2019 are Spain, Germany, France, UK, Switzerland, Austria, Portugal and Netherlands and Sweden. Tourist recommendation system will suggest the locations for visitors. Most of the earlier TRS have concentrated on approximate of selection the destination, activities (ex; restaurants, hotels) based on the user preference and interests.

They are lacking sparseness adaptability, correctness. Perhaps the best test in building up a TRS that give customized proposals of traveller objections is to improve the vacationer decision making process. In the proposed system the tourist recommendation system will give the best location for the visitor. In order to achieve this, it requires a deep understanding of the tourist decision-making and develops novel models for their information search process. To develop this system initiallywe required a dataset of east Europe, feature selection methods, Minimum Redundancy Maximum Relevance (MRMR) algorithm [10] and decision tree of supervised machine learning for classification. C4.5 decision tree is for translation. The proposed TRS has three main innovations. Firstly, two feature selection methods are used to remove the unnecessary (both irrelevant and redundant) inputs into the system and to decreasethe model complexity.

Secondly, a decision tree C4.5 is utilized as a classifier to recognize the tourist destination selection process. Tourists can discover the travel information on sites, forums, websites of points of interest etc. However, information overflow can occur on the web as there is as yet an absence of spotlight on the utilization of recommender innovation in the travel industryfield. During a trip, tourist should have the option to acquire visit data in a convenient way, whenever there are any changes in their planned tour. Recommendation system which provides tour information which is more useful for users, to succeed with the got information. There is additionally expanding interest formore data on local area attractions, for example, nearby food, shopping spots, spots of intrigue, etc. during the visit. A tool tomine items and/or collect user's opinions to help users in their search process and suggests items related to their preferences.

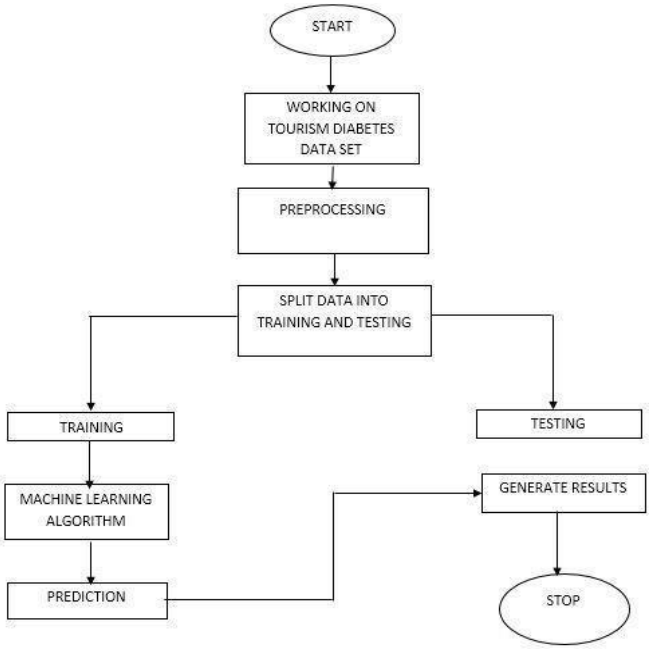

Fig -1: System Architecture

2.1 Implementation:

Implementing a decision tree-based recommendation system fortourists involves the following steps:

Define the problem and the decision tree model: The first step is to define the problem that the recommendation system is trying to solve. For example, the system may be designed to recommend tourist attractions or activities based on the user's interests, location, and budget. Next, you need to define the decision tree model that will be used to make recommendations. Collect and preprocess data: The next step is to collect data that will be used to build the decision tree. This data may include information about tourist attractions, such as their location, price, and popularity, as well as data about users, such as their interests and budget. Once the data is collected, it needs to be preprocessed to remove any outliers, missing values, or duplicates.

Build the decision tree: Using the preprocessed data, you can build the decision tree. The decision tree should be designed to take into account the user's preferences and constraints, such as their budget and location. Each node in the decision tree shouldrepresent a decision that the system needs to make, and each branch should represent a possible outcome based on that decision. Test the decision tree: After building the decision tree,you need to test it to make sure that it is accurate and effective. You can do this by using a set of test data to evaluate the system's performance. The test data should include examples of user queries and the recommendations that the system generates.

Deploy the recommendation system: Once the decision tree has been tested and optimized, it can be deployed as a recommendation system for tourists. Users can interact with the system by inputting their preferences and constraints, and the system will generate personalized recommendations based on their inputs.

Monitor and update the system: Finally, it is important to monitor the performance of the recommendation system over time and update it as needed. This may involve collecting additional data, retraining the decision tree model, or making changes to the system's algorithms or user interface to improve its accuracy and effectiveness.

2.2. ALGORITHMS:

2.2.1 DECISION TREE CLASSIFICATIONALGORITHM:

- Decision Tree is a Supervised learning technique that can be used for both classification and Regression problems, but mostly it is preferred for solving Classification problems. It is a tree-structured classifier, where internal nodes represent the features of a dataset, branches represent the decision rules and each leaf node represents the outcome.
- In a Decision tree, there are two nodes, which are the Decision Node and Leaf Node. Decision nodes are used to make any decision and have multiple branches, whereas Leaf nodes are the output of those decisions and do not contain any further branches.
- The decisions or the test are performed on the basis of features of the given dataset.
- It is a graphical representation for getting all the possible solutions to a problem/decision based on givenconditions.
- It is called a decision tree because, similar to a tree, it starts with the root node, which expands on further branches and constructs a tree-like structure.
- In order to build a tree, we use the CART algorithm, which stands for Classification and Regression Tree algorithm.
- A decision tree simply asks a question, and based on the answer (Yes/No), it further split the tree into subtrees.
- Below diagram explains the general structure of a decision tree:

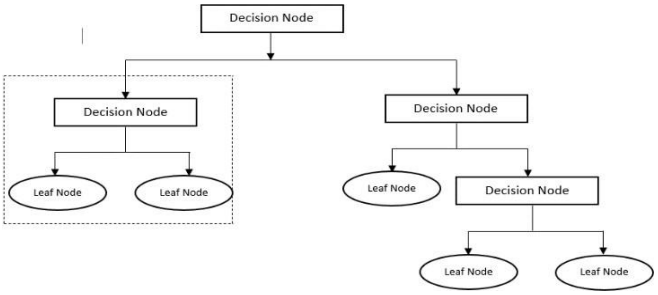

Fig -2: general structure of a decision tree

Decision Tree Technologies

- **Root Node:** Root node is from where the decision tree starts. It represents the entire dataset, which further gets divided intotwo or more homogeneous sets.
- **Leaf Node:** Leaf nodes are the final output node, and the tree cannot be segregated further after getting a leaf node.
- **Splitting:** Splitting is the process of dividing the decision node/root node into sub-nodes according to the given conditions.
- **Branch/Sub Tree:** A tree formed by splitting the tree.
- **Pruning:** Pruning is the process of removing the unwanted branches from the tree.
- **Parent/Child node:** The root node of the tree is called the parent node, and other nodes are called the child nodes.

2.2.2 MRMR ALGORITHM:

The possibility of the MRMR calculation is the calculation utilizing the MI incentive to rank the highlights dependent on thenegligible excess and maximal important standard. MRMR ascertains excess for each pair of highlights furthermore, figures the pertinence between the element and the class. It is defined as underneath. Many feature selection algorithms have been developed in the past and each of the feature selection algorithms was with a clear objective of improving classification accuracy while reducing the dimensionality. The relevance of afeature to the objective is the most important selection criterion because using highly relevant feature improves the accuracy of the system and also the equal concentration should be given forthe selected features need to be non-redundant

$$MRMR = max_{1\in\Omega_s}[I(i,h) - \frac{1}{|S|}\sum_{j\epsilon s} MI(i,j)$$

3. FUTURE ENHANCEMENT:

A decision tree-based recommendation system for tourists is a great way to help travellers make informed decisions about where to go, what to do, and where to stay during their trips. Here are some possible future enhancements that could make such a system even more effective:

- Incorporate more data sources
- Use machine learning to improve accuracy
- Offer more interactive features
- Integrate with other travel services
- Provide real-time updates

4. CONCLUSION

In this paper we introduced generating diet requirements for an individual electronically. It is a more efficient and apt method for the current technological world as information today is being stored in electronic devices instead of handwritten papers. It provides user the flexibility to access. In this paper, a decision tree-based tourist recommendation system has been introduced in endeavor of solving the current challenge of the location TRS. The decision rules from decision trees wereextracted. It utilizes less number of feature experimental results confirm pertinent of the proposed a TRS. The proposed TRS satisfies the tourists' requirements who plan to visit or during their visit the city of Europe. The system isbased on a dataset which contains ratings, review of more than 3 attributes. A trip Advisor website which will recommend the tourist location based on the travel agencies plans such as travel date, number of days, hotels etc are going to make a plan based on the travel agencies preferences because of this the tourist face some difficulties like our vacation get start but travel agency package date is at the end of our holiday or in our working time. The proposed TRS is processed offline used the Data Mining measure. This includes variables selection by using feature selection methods, decision making by using machine learning decision tree classification algorithm which classify the data based on the interest, if new user enter his requirements, then decision tree will predict best location based on his given input. By this sightseers can plan their trip based upon their interests in their holidays. For future work, various types of classifiers can be considered to increase the classification accuracy rate for the data sets. Moreover, front-end web application and an interactive and adaptive user interface will be designed and implemented.

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