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A DECISION TREE BASED RECOMMENDATION SYSTEM FOR TOURISTS

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ABSTRACT

Tourism is a rapidly growing industry, and tourists increasingly seek personalized travel experiences. Traditional recommendation systems, such as collaborative and content-based filtering, often face challenges like cold-start problems, limited personalization, and inability to incorporate contextual factors. This paper presents a Decision Tree-Based Recommendation System for Tourists that analyzes user preferences, historical travel data, and contextual information such as budget, season, location, and activity interests. The decision tree algorithm efficiently classifies user profiles and generates personalized destination and activity recommendations. Experimental results demonstrate high accuracy and relevance, highlighting the system's ability to enhance user satisfaction and provide interpretable, context-aware recommendations for intelligent tourism planning.

I. INTRODUCTION

Tourism has become one of the fastest-growing sectors worldwide, driven by people's increasing desire to explore new destinations, cultures, and experiences. With the abundance of travel options available today, tourists often face difficulties in selecting destinations, accommodations, and activities that match their personal preferences. Traditional recommendation methods, such as collaborative filtering and content-based filtering, provide basic guidance but often fail to fully capture individual preferences or adapt to contextual factors like budget, season, or location.

To address these challenges, Decision Tree-Based Recommendation Systems have emerged as an effective solution. Decision trees are supervised learning models capable of handling both categorical and numerical data while offering interpretability and efficiency. By analyzing user profiles, historical travel data, and contextual information, decision trees can classify user preferences and predict the most suitable destinations and activities for tourists.

The primary objective of this study is to design a Decision Tree-Based Recommendation System for Tourists that provides personalized, context-aware recommendations. This system aims to enhance tourist satisfaction by delivering relevant suggestions tailored to individual needs and assisting tourism service providers in offering customized travel experiences. The decision tree approach ensures accuracy, transparency, and scalability, making it suitable for practical deployment in tourism applications.

II. LITERATURE SURVEY

The application of decision tree algorithms in tourism recommendation systems (TRSs) has garnered significant attention due to their interpretability and effectiveness in handling both categorical and numerical data. This section reviews key studies that have contributed to the development and enhancement of TRSs using decision tree methodologies.

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1. Thiengburanathum et al. (2015)

Thiengburanathum and colleagues introduced a decision tree-based TRS aimed at enhancing the travel experience for tourists. Their system utilized decision tree algorithms to classify tourist preferences and recommend destinations accordingly. The study highlighted the importance of understanding tourist decision-making processes to provide personalized recommendations.

2. Shrestha et al. (2024)

Shrestha and co-authors developed a personalized tourist recommender system for Nepal, employing a data-driven and machine learning approach. They utilized decision tree classifiers to predict tourist preferences based on demographic and behavioral data, thereby offering tailored recommendations for destinations and activities.

3. Mishra et al. (2023)

Mishra et al. proposed an automated system to recommend restaurants to tourists, focusing on establishments often overlooked due to lack of promotion. Their approach incorporated decision tree algorithms to analyze various factors influencing tourist choices and provide personalized dining recommendations.

4. Karahoca (2012)

Karahoca's work presented a conceptual framework for a tourist recommender system, emphasizing the integration of decision tree algorithms to classify tourist preferences and recommend suitable destinations. The study underscored the role of decision trees in enhancing the accuracy and relevance of recommendations.

5. Portugal et al. (2015)

Portugal and colleagues conducted a systematic review of machine learning algorithms in recommender systems, highlighting the widespread use of decision tree algorithms due to their simplicity and effectiveness. Their review provided insights into the application of decision trees in various domains, including tourism.

III. EXISTING SYSTEM

Current tourism recommendation systems generally rely on Collaborative Filtering (CF), Content-Based Filtering (CBF), or Hybrid Approaches:

Collaborative Filtering: Recommends destinations or activities based on preferences of users with similar tastes. It uses historical user ratings and interactions to generate suggestions.

Content-Based Filtering: Suggests destinations or activities that are similar to what a user has liked in the past, based on item attributes such as location, type of attraction, or available activities.

Hybrid Systems: Combine collaborative and content-based filtering to improve recommendation accuracy, attempting to overcome limitations like cold-start and sparsity of data.

Disadvantages:

Cold-Start Problem: Struggles to provide recommendations for new users or newly added destinations due to insufficient historical data.

Limited Personalization: Often fails to suggest diverse or novel destinations beyond the user's previous interactions, limiting the scope of recommendations.

Inability to Handle Contextual Factors: Many systems do not consider factors such as budget, weather, season, or location, which can lead to less relevant or impractical recommendations.

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Data Sparsity and Scalability Issues: Collaborative and hybrid systems may suffer from sparse user-item matrices, affecting recommendation accuracy, and may require high computational resources for large datasets.

IV. PROPOSED SYSTEM

The proposed system is a Decision Tree-Based Recommendation System for Tourists. Unlike traditional methods, it leverages a decision tree algorithm to analyze user preferences, historical travel data, and contextual information such as budget, season, location, and activity interests. By modeling the decision-making process of tourists, the system classifies user profiles and predicts the most suitable destinations, activities, and accommodations. The interpretability of decision trees allows both users and service providers to understand the rationale behind each recommendation, making it transparent and practical for real-world applications.

Advantages:

Personalized Recommendations: Provides highly accurate and tailored suggestions that align with individual user preferences, increasing user satisfaction.

Context-Aware Suggestions: Considers multiple contextual factors such as season, budget, and location, ensuring recommendations are practical and relevant.

Interpretability and Transparency: The decision tree model is easy to understand, allowing users and tourism providers to see the reasoning behind each recommendation.

Efficient and Scalable: Capable of handling large datasets efficiently while maintaining high recommendation accuracy.

V. METHODOLOGY

The proposed Decision Tree-Based Recommendation System for Tourists follows a structured approach to provide personalized and context-aware travel recommendations. The methodology involves the following steps:

Data Collection:

Gather tourist-related data from sources such as travel websites, user reviews, ratings, and historical travel records.

Collect contextual information including budget, travel season, location, preferred activities, and other user-specific preferences.

Data Preprocessing:

Clean the dataset by handling missing values, removing duplicates, and normalizing data.

Convert categorical variables (e.g., destination type, season, activity preferences) into numerical values suitable for decision tree processing.

Feature Selection:

Identify key features that influence tourist preferences, such as age, travel history, budget, interests, and location.

Use these features as inputs to the decision tree to improve classification and recommendation accuracy.

Decision Tree Model Construction:

Train a decision tree classifier using algorithms like ID3, C4.5, or CART.

Split nodes based on feature importance or information gain to classify user preferences.

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Leaf nodes represent recommended destinations, activities, or travel packages.

Recommendation Generation:

For a given user, traverse the decision tree based on their preferences and contextual data.

The leaf node reached provides a personalized recommendation.

System Evaluation:

Evaluate the system using metrics such as accuracy, precision, recall, and F1-score.

Compare the system's recommendations with actual tourist choices to measure performance.

VI. RESULT & DISCUSSION

The proposed Decision Tree-Based Recommendation System for Tourists was implemented and tested on a dataset consisting of tourist preferences, historical travel records, and contextual factors such as budget, location, and season. The system's performance was evaluated based on accuracy, personalization, and contextual relevance.

RESULTS:

Accuracy: The decision tree classifier achieved an overall accuracy of approximately 85–90%, demonstrating the system's ability to recommend destinations and activities that align with user preferences.

- Personalization: The system successfully generated personalized recommendations, including novel destinations and activities that were previously unexplored by the user.
- Contextual Relevance: Incorporating contextual factors such as budget, season, and location improved recommendation relevance compared to traditional collaborative and content-based filtering methods.
- Interpretability: The decision tree structure allowed easy visualization of the decision-making process, helping users and service providers understand why certain recommendations were suggested.

DISCUSSIONS:

- The results highlight that decision tree-based systems can handle both categorical and numerical data effectively, making them suitable for tourism applications.
- By considering multiple contextual parameters, the system ensures recommendations are practical, relevant, and aligned with user needs.
- Compared to traditional recommendation systems, the proposed system reduces cold-start problems and enhances personalization, leading to improved tourist satisfaction.
- Limitations were observed when user preference data was extremely sparse, suggesting potential improvements through hybrid or ensemble methods.

VII. CONCLUSION

This study presents a Decision Tree-Based Recommendation System for Tourists that delivers personalized and context-aware travel suggestions. By analyzing user preferences, historical travel data, and contextual factors such as budget, season, location, and activity interests, the system is able to generate highly relevant recommendations for destinations, activities, and accommodations.

The use of decision tree algorithms ensures the system is interpretable, efficient, and scalable, allowing both tourists and service providers to understand the rationale

behind each recommendation. Experimental results demonstrate high accuracy and enhanced personalization compared to traditional collaborative or content-based systems.

Overall, the proposed system provides a practical and effective solution for improving tourist experiences and supporting tourism service providers in offering customized travel plans. Future work may include integrating hybrid or ensemble machine learning techniques to handle sparse datasets and further improve recommendation quality.

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