Bon Voyage

A Trip Recommendation System

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ABSTRACT

Recommender systems have become an active research topic during the last two decades, thus giving rise to several approaches and techniques. They have also become increasingly popular among practitioners and used in variety of areas including movies, news, books, research articles restaurants, garments, financial services, insurance, social tags and products in general. Tourism is an important sector for economic development and a potential application area of use of recommender systems.

In this paper, we present an overview of one stop recommender for both travel destination and modest accommodation ideal for novice travellers. Section I will give a brief introduction, Section II illustrates Background/Related Work in this domain, in Section III we give our Proposed Solution/ Methodology, Section IV is our Evaluation Criteria, Section V is the Conclusion and Section VI is References.

∗Article Title Footnote needs to be captured as Title Note

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vector, vacation, history, recommender, travel, housing, accommodations, content-based recommendation, collaborative filtering

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1 Introduction

Travel is one of the greatest pleasures of modern life. People need respite from their day-to-day work as it gets monotonous. We observe that the preferences for every person changes based on that person’s idea for an ideal vacation. Our solution to this is assist people by recommending the best possible solution to their travel and housing needs. To do this, we use the Airbnb Data from 66 of the most frequently visited cities and the travel history of 300 users. Based on the user travel history, we create a theme for every user based on the most commonly traveled places by each user. Once we get this, we identify the similar users to this user through multiple features. After this, we identify the most similar city to the user and based on this, we identify which place is the best for him to stay.

2 Related Work

The Existing recommendation systems for tourism have no implementational proof due to lack of proper dataset. Housing recommendation for Airbnb has been worked out in notable Kaggle competitions and have in fact given resounding successful results [1]. But its success is specific to the company and does not generalize to travel planning as a whole. For instance, the Airbnb dataset is divided into 84 sets each corresponding to a specific city and recommendations are in place of a particular city only. This can't be a holistic travel recommender, since it conveniently ignores city features like terrain, historical or religious significance, culture and lifestyle, etc. With our proposed recommender model, we will consider user’s thematic preferences while finding potential travel destinations and further recommend housing accommodations.

3 Proposed Solution/Methods Used

3.1 Data Sets

Here we are considering two types of datasets:

1. **Simulated Dataset based on User Vacation History**: We randomly populate vacations and extract thematic users from the random pool. Themes represents the user preferences i.e. in which time of year user prefers to go on vacation, his feature of attractions (beach, nightlife, modern architecture etc.), trip expenses (how much money user willing to spend for his trip) etc. Considering all these themes, we create a vacation vector denoting a single vacation for a specific user. Likewise, User Travel History includes collection of user vacation vectors v1, v2, v3 and so on.

|  |
| --- |
| **Target user history**:  ['Vienna', 'San Francisco', 'Berlin', 'Vancouver']  **Recommended user's histories:**  ['Vienna', 'Geneva', '**Dublin**', 'Melbourne']  ['Copenhagen', '**Dublin**', 'Brisbane', 'Paris']  ['Sydney', 'Mallorca', 'Berlin', 'San Francisco']  ['Sydney', 'Hawaii', 'Mallorca', **'Dublin'**]  ['Tasmania', **'Dublin'**, 'Cape Town', 'Milan']  ['Hawaii', 'Cape Town', 'Berlin', 'Canberra', **'Dublin'**] |

1. **Airbnb Dataset**: Using this dataset, we recommend housing accommodation to the users on their selected city. We extract preferences (Expense category and Stay Length) from user history and filter Airbnb housings w.r.t those preferences.

3.2 Methodology

We believe that a single stop recommender for both travel destination and modest accommodation would be of great assistance for novice travel planners. Based on this approach, we divide our implementation in two phases as shown below:

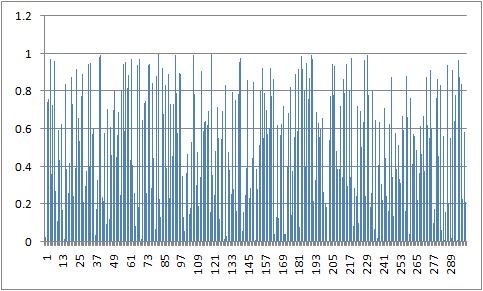
1. **Phase-1 User based Collaborative Filtering**: In phase I, our main aim is to recommend top cities to the target user based on its prior vacation history. The prior history consists of multiple vacation vectors for each user. We extract tags from vacations and create User Vector from weighted sum of tags. In order to determine the other users who shared same preferences, we calculated their cosine similarity score. Then we create a suggestion pool of cities from the history of similar which were not visited by target users. From this pool, we return the top 5 highly recommended cities.
2. **Phase-2 Content Based Filtering**: Using TF-IDF Vectorizer and Cosine Similarity, we extract user preferences and filter housing based on these preferences. Initially we choose a random housing from our filtered list. “Summary” or “Description” for each housing contains descriptive text. After removing the stop words, we apply TF-IDF approach to vectorize the text. Then we implement cosine similarity on this vector representation to find similar housing.

4 Evaluation and Analysis

The evaluation for our recommendation system is split into two phases.

4.1 PHASE I – City Recommendation:

For a given user vector, we choose top 6 similar users provided by our recommendation system and document similarities between their prior travel destinations. Similarity is based on parameters like season of the year, feature of attractions, user travel and expenditure preferences. Figure 1 depicts the cosine similarity between the selected user and all other users in the dataset.

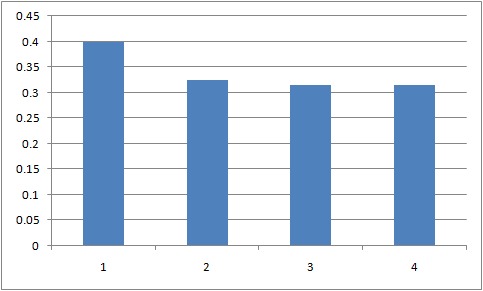


**Figure 1: Cosine Similarity vs Users**

Suggestion pool contains highest occurrences for Dublin, which is then fed as input to phase II of the models.

4.2 PHASE 2 – Accommodation Recommendation:

Once we have a target city, we find top 4 housing accommodations which consider thematic preferences of the selected user. Figure 2 gives a plot showing the recommended scores for these selected housings.

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**Figure 2: Recommended Score vs Housing**

|  |
| --- |
| **Dublin**  Recommending 4 products like Spacious City Centre Apartment  Description: Ideally located in one of Dublin’s most popular areas, this home is a **pleasant stroll into the main streets**. The neighborhood is perfectly located to provide you with...  ---  Recommended: **Georgian Luxury**  Description: Georgian Period 3 bed home in central zone of Dublin. **Walk everywhere**. Nestled on a historical leafy street in Dublin, this traditional Georgian home is a pleasant s...  (score:0.3995059096180262)  Recommended: **Central Penthouse Apartment along the River Liffey**  Description: Our apartment is in a great location as the city center is on your door step and is only a few minutes’ **walk to all the major sight**s including Guinness Storehouse, T...  (score:0.32391805845147104)  Recommended: **Stylish and Modern Two Bedroom Dublin Apartment**  Description: My lovely and modern 2-bedroom apartment in Fitzwilliam Quay, Dublin 4, is the perfect place for a group of between 2 and 4 to stay whilst visiting this beautiful c...  (score:0.31491069768084357)  Recommended: **Central location next to St. Stephen's Green**  Description: The neighborhood is perfectly located to provide you with all you need particularly those great “local” feels that many of us seek while abroad. It's the ideal place...  (score:0.3141840138813951) |

5 Conclusion and Discussion

The Existing recommendation systems for tourism have no implementational proof due to lack of proper dataset. Housing

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