Recommendation System for a Timeshare Travel Exchange Company

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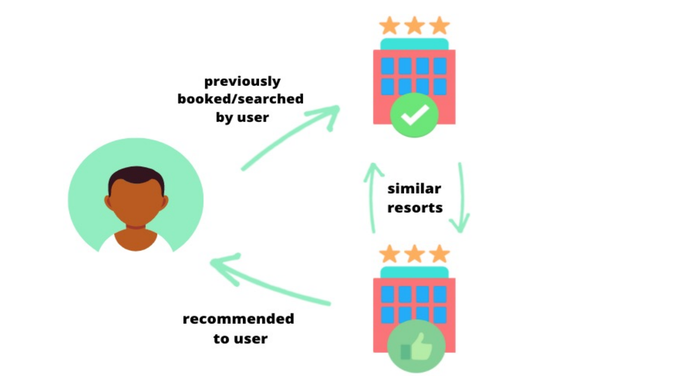
ABSTRACT

This study provides the frameworks to incorporate search data into a resort recommendation system for a timeshare travel exchange company. The recommendation system aims to suggest customized search options based on previous user search activity. We used real-time search data of past users to understand the trends and patterns these users have based on predicting their propensity to travel and on predicting the bookings they made to train the recommendation system. We developed two models, one for finding out customer propensity to travel and the other for providing customized recommendations

INTRODUCTION

Personalized resort recommendations:



Having a robust, relevant, and diverse recommendation system leads to cost savings and enriched customer experiences. Thus, incorporating the current user context becomes crucial to provide accurate and appropriate recommendations.

RESEARCH QUESTIONS

- ✓ Which customers are most likely to travel, so that the targeting can be optimal?
- ✓ What resorts should we recommend to the customers who are likely to travel ?

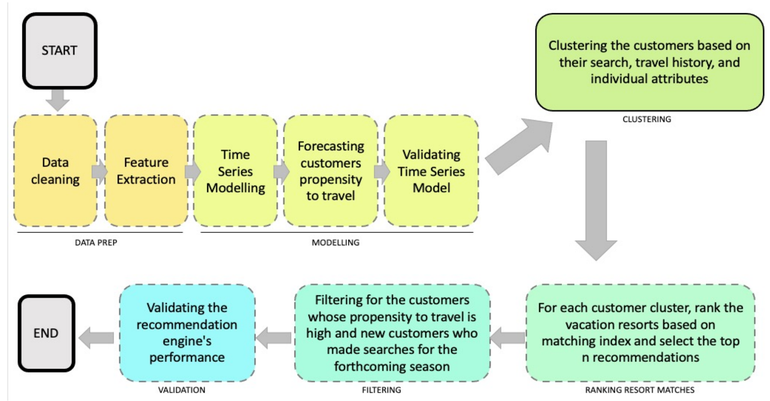
LITERATURE REVIEW

Author, Year	Collaborative Filtering	Content based Filtering	Random Forest	Stochastic Vector Machine	Gradient Boosting	Hybrid Filtering	Deep Learning Model
Naumov, 2019							✓
Afoudi, 2021	✓						
Ramzan, 2019		✓				✓	
Granberg 2020			✓	✓			
Arruza, 2016					✓		

After discussing and evaluating various modeling approaches, we went ahead with Neural networks & Content-based Filtering as it suited our field.

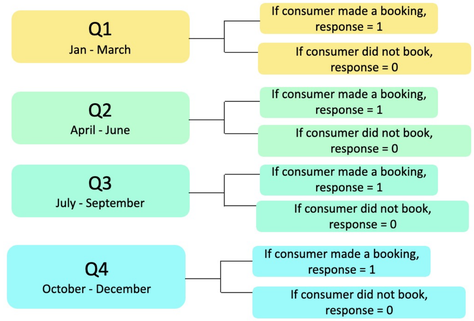
METHODOLOGY

Below are the steps we followed to build the recommendation engine.



CUSTOMER PROPENSITY

Since the model needs to predict customer propensity to book, all the data is aligned to the starting point of the seasons, and factors were calculated up to that point. Four tailings are created for each year by taking response variable as one - if the customer books for the vacation in the next season.



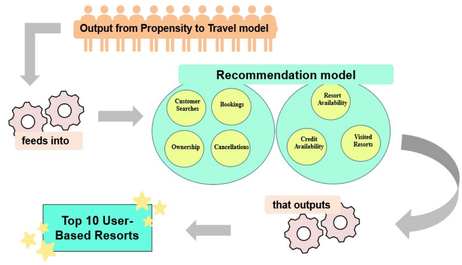
CONTENT-BASED FILTERING

- I is Interaction term
- SI is the Sample Interaction
- $I_{Booking} > I_{Search} = I_{Request}$
- $SI_{Booking} = 4/2^n$, if n = 1, it's the most recent search

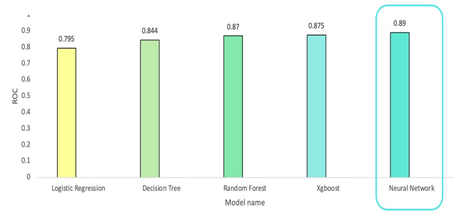
Interaction term is created by considering the customer searches, requests, bookings, cancellations and ownerships. Bookings are given four times the weightage of searches, requests and cancellations. Ownerships are given twice the weightage. Recency is taken into consideration by giving highest weightage to the recent search and the next one gets half the weightage, and so on. With the interaction term, the top two resorts were taken for matching process, where for each resort, using cosine similarity, top five similar resorts are recommended to the user. Some other factors considered while recommending the resort;1) Resort availability in the next season, 2) Customer credit availability, 3) Already visited resorts. In calculating the resort similarity, highest importance is given to the unit type, location attributes, and amenities.

RESULTS

With the current data setup, 95% of the data had zero as the response variable, which makes it harder for statistical model to learn the underlying patterns in the data. To overcome the clear imbalance in the response variable distribution, data has been under sampled and used the model build on under-sampled data to predict on the customers and the recommendations were made for these customers



The Neural Network models performs the best.



Although it is a black box model (where the interpretability is low), the consistent and superior performance makes it the best model. The neural network model we used has one input layer, three dense layers and one output layer

MODEL USAGE	Customer Propensity	Recommendation Engine
RUN TIME	60 minutes	60 minutes
USABILITY	Gives the list of customers to target	Gives list of recommendations to the targeted customers

CONCLUSIONS

- ➢ A neural network model with 0.89 ROC is built to identify the customers who have the propensity to make a booking in the forthcoming season
- ➢ Customer loyalty, Search Patterns, and Booking patterns play a crucial role in determining the propensity of the customer to travel
- ➢ A Clustering model is built based on the customer attributes and interaction patterns, so as to profile the customers
- ➢ An engine that recommends resorts using content-based filtering is built for the customers who are predicted to book in the forthcoming season
- ➢ The engine could improve the business of our client by increasing the efficiency of the marketing campaign by four times it's current capacity

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