

AI Product Service Prototype Development and
Business/Financial Modelling

AI BASED TRAVEL RECOMMENDATION SYSTEM FOR TOURISM INDUSTRY

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Project Link:

https://github.com/RohitNale/Market-Segmentation-Analysis/blob/main/AI_in_Tourism_Industry.ipynb



Abstract:

Tourism encompasses leisure and business travel, as well as the theory and practice of touring, the business of attracting, accommodating, and entertaining tourists, and the business of running tours. People "travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure and not less than 24 hours, business and other purposes". According to the World Tourism Organization, tourism is defined as "beyond the common perception of tourism as being limited to holiday activity only." The main objective of our business is to develop a web application that involves a ticket booking system and a recommendation system for different locations based on the ratings provided by the users, which will suggest clusters of places that the users may find interesting to visit in general. The ticket booking system will involve bookings of train, bus, flights, and booking of private transport as well.

Problem Statement:

The project aims to develop a quick ticket booking system and to recommend a cluster of places, it will also involve hotel bookings as well in the later stage of the project. Initially the project will aim on Ticket booking and construct a recommender system that can suggest a number of interesting venues based on users preferences. The long term project development will take care of all these steps as shown below.



Market Need Assessment

An online reservation system is available at all times. This gives potential visitors the freedom to book a room whenever they want. It also allows you to increase your sales because you are not restricted by working hours. In fact, studies show that having an online reservation system available 24 hours a day, seven days a week greatly increases the number of hotel reservations.

- To determine the impact of consumer behaviour on the perception of customers and their behaviour in the tourism industry.
- Examine the factors that influence tourism consumer behaviour.
- To gain a better understanding of how tourist destinations affect consumer behaviour.

- To assess the factors that influence consumer behaviour when it comes to selecting India as a tourist destination.

Our web application includes overviews on occupancy rates, best-selling packages, and a recommender system.

The customer while booking tickets and planning their travel, they look for:

- Better customer relationship
- Synchronisation of information
- Increases flexibility and efficiency
- Saves time and money
- Keeping track of reservations
- Ease of use and secure payment.

TARGET SPECIFICATIONS AND CHARACTERIZATIONS:

Markets are broken down into psychographic markets (attitudes, beliefs and values) and geographic (location) markets. This approach allows us to develop a thorough understanding of these market segments, and to determine what markets are a match for the tourism products and services offered in the app. Based on the science of psychographics, researchers developed a market segmentation system. Psychographics is the next step in the evolution of traditional demographics for identifying and communicating with target markets. Rather than simply grouping travellers by age, income, gender, family status, or educational level, which is all useful information, psychographics digs deeper into people's social values and worldviews. Mainly the aim is to target middle class families so they can travel to their preferred locations at the cheapest available cost. Below you will find a breakdown of each of the traveller segments to give you a better idea.

Free Spirits account for 13% of the global market. Free Spirits are outgoing and open-minded people. Their zest for life extends to their attitude toward travel. They enjoy high-end experiences that they can share with others because they are experimental and adventurous.

Cultural Explorers make up 12% of the global market and are defined by their love of constant travel and opportunities to embrace, discover, and immerse themselves in the culture, people, and settings of the places they visit.

Authentic Experiencers (9 % of global market) are typically reserved travellers who seek genuine, tangible interaction with the destinations they seek, with a particular interest in learning about the history of the places they visit.

Personal History Explorers (13 % of the global market) are defined as travellers by their desire to connect with their own cultural roots while travelling in comfort, style, and security.

No-Hassle Travellers (10 % of global market) are cautious, responsible, and reserved individuals looking for safe group travel that allows them to escape the responsibilities and obligations of daily life.

Rejuvenators (6 % of global market) They are family-oriented people who travel with others to get away from the stresses of everyday life in order to be pampered and indulged.

Gentle Explorers (25 % of global market) are primarily defined by their aversion to leaving the comforts of home and travelling "on condition," demanding the best and most comfortable environments for themselves when forced to do so.

External Search

Wikipedia info on Indian Tourism

https://en.wikipedia.org/wiki/Tourism_in_India#:~:text=Tourism%20in%20India%20is%20important,8.1%25%20of%20its%20total%20employment.

Other References

<https://www.hotelmize.com/blog/6-examples-of-how-ai-is-used-in-the-travel-industry/#:~:text=AI%20assistants%20and%20Intelligent%20chatbots,a%20more%20personalized%20booking%20experience.>

<https://1000projects.org/consumer-behavior-on-indian-tourism-project.html>

<https://studiousguy.com/business-model-of-makemytrip/>

Step 1: Prototype Selection

Feasibility: Product/Service can be developed in a short period of time. And is very user friendly.

Viability: with the world moving to AI based solutions, recommendation systems will always be in demand and will only have scope for improvement.

Monetization: This web application can be deployed directly with capability for immediate monetization.

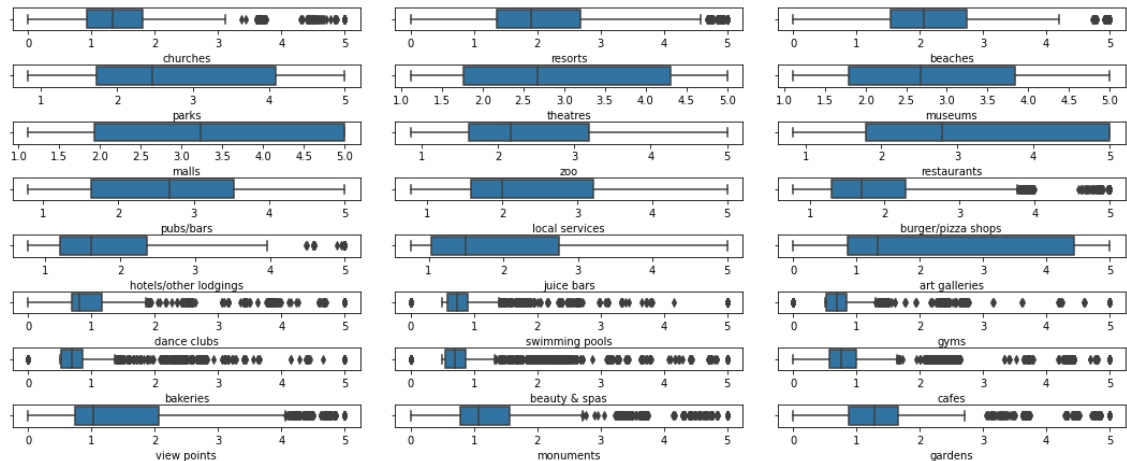
DATASETS:

This data set has been sourced from Google Travel Review Ratings Data Set. This data set is populated by capturing user ratings from Google reviews. Reviews on attractions from 24 categories are considered. Google user rating ranges from 1 to 5 and average user rating per category is calculated.

- Attribute 1 : Unique user id
- Attribute 2 : Average ratings on churches
- Attribute 3 : Average ratings on resorts
- Attribute 4 : Average ratings on beaches
- Attribute 5 : Average ratings on parks
- Attribute 6 : Average ratings on theatres
- Attribute 7 : Average ratings on museums
- Attribute 8 : Average ratings on malls
- Attribute 9 : Average ratings on zoo
- Attribute 10 : Average ratings on restaurants
- Attribute 11 : Average ratings on pubs/bars
- Attribute 12 : Average ratings on local services
- Attribute 13 : Average ratings on burger/pizza shops
- Attribute 14 : Average ratings on hotels/other lodgings
- Attribute 15 : Average ratings on juice bars
- Attribute 16 : Average ratings on art galleries
- Attribute 17 : Average ratings on dance clubs
- Attribute 18 : Average ratings on swimming pools
- Attribute 19 : Average ratings on gyms
- Attribute 20 : Average ratings on bakeries
- Attribute 21 : Average ratings on beauty & spas
- Attribute 22 : Average ratings on cafes
- Attribute 23 : Average ratings on viewpoints
- Attribute 24 : Average ratings on monuments
- Attribute 25 : Average ratings on gardens

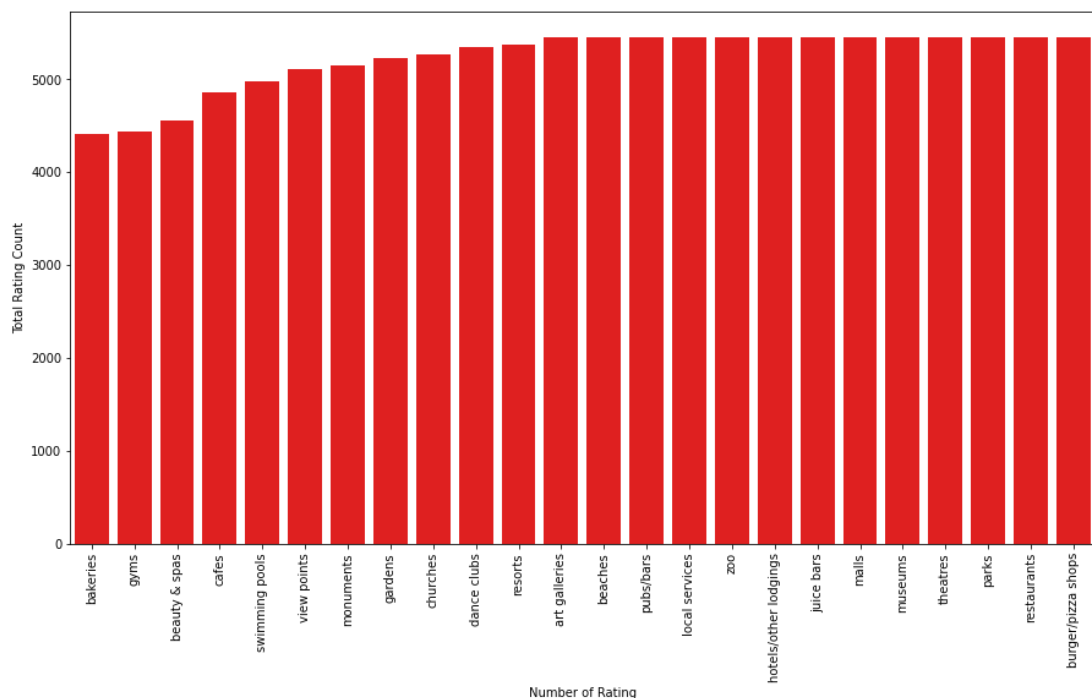
EDA

First we will perform data cleaning, where we will find the missing data from our datasets and then we will do all the exploratory data analysis for the Google Review ratings dataset. On performing analysis there are few data points which have null values, since it is very less we can simply drop the rows which include the null values. Now let's plot a box plot of different ratings to understand the variability in ratings.

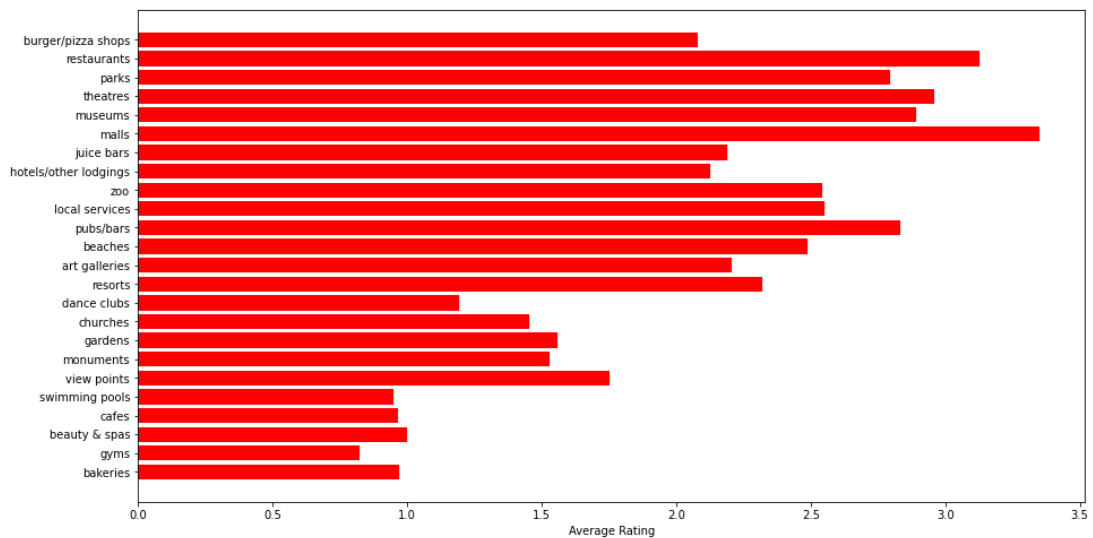


Box plot for different attributes rating distribution

The plot below shows the total number of ratings for different attributes in the data. Here we can see that the least number of Rating counts is from “Bakeries” and “gyms”.

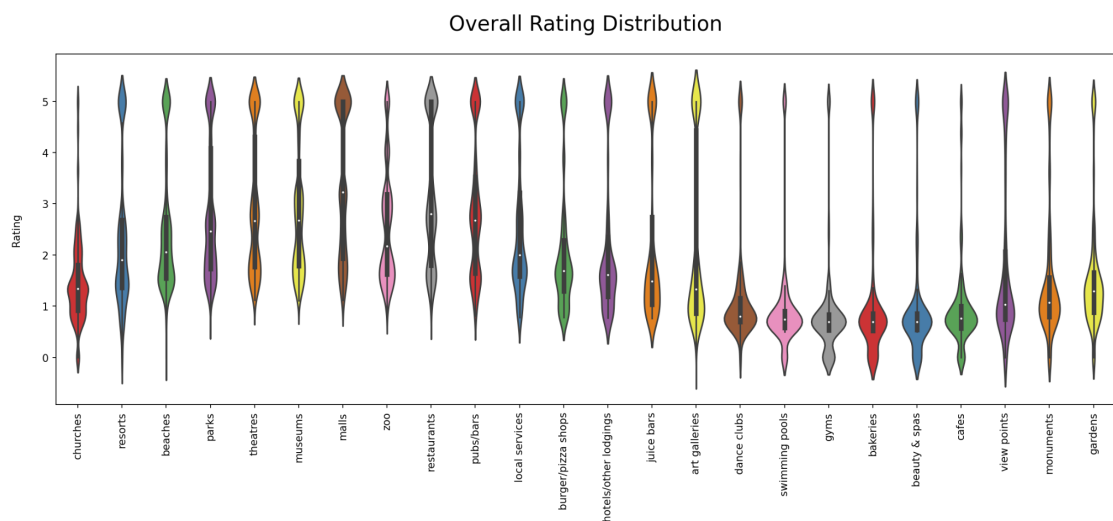


Total number of Ratings for each category



Horizontal bar plot for Average Rating

The above horizontal bar plot shows the average rating for different places. Here we can see that the highest average rating is for “Juice bars”, “Restaurants”, and “Theatres”. These are the prime spots for tourist attraction in any place. Hence our business will also focus on places including this type of facility primarily.



Violin Plot for overall Rating Distribution

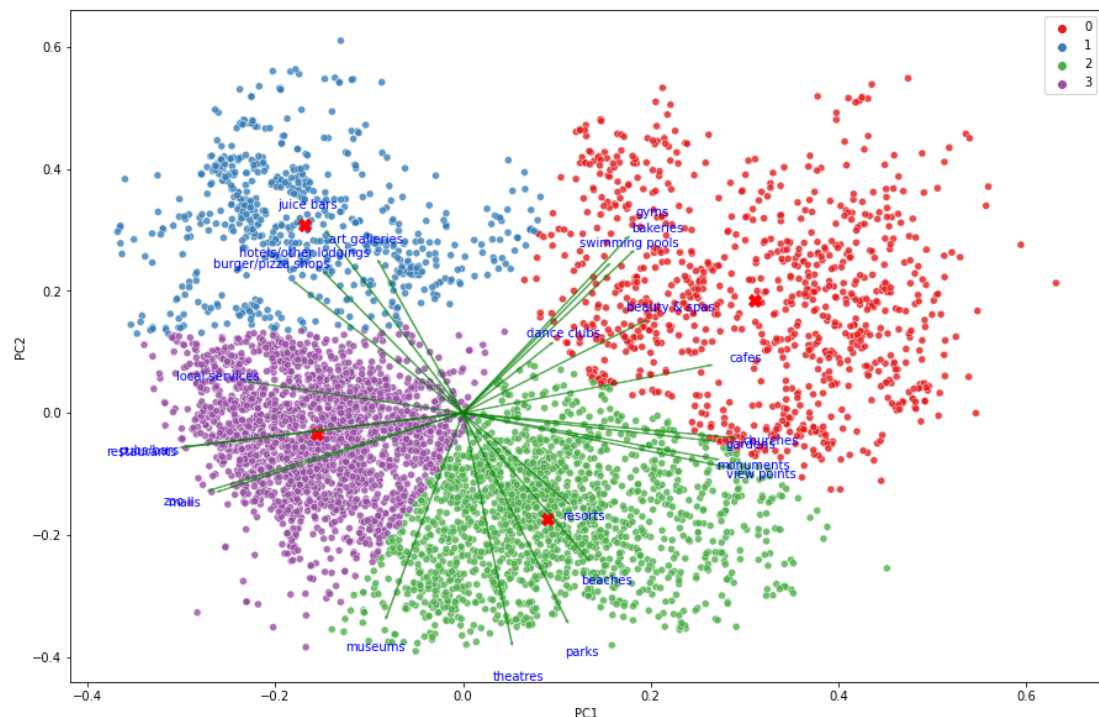
K-means Clustering

Unsupervised Learning algorithm K-Means Clustering divides the unlabeled dataset into different clusters. K specifies the number of predefined clusters that must be created during the process; for example, if $K=2$, two clusters will be created, and if $K=3$, three clusters will be created, and so on. It allows us to cluster data into different groups and provides a simple way to discover the categories of groups in an unlabeled dataset without any training. It's a centroid-based algorithm, which means that each cluster has its own centroid.

The main goal of this algorithm is to reduce the sum of distances between data points and the clusters that they belong to. The algorithm takes an unlabeled dataset as input, divides it into a k-number of clusters, and repeats the process until no better clusters are found. In this algorithm, the value of k should be predetermined.

In general PCA scaled data always gives the best result for K-means clustering. So we have used a min-max scaler for scaling our PCA components data and fitted it in our k-means algorithm.

Result of K-Means clustering



K-means clustering

As a result of the K-Means clustering, the user is divided into four clusters (segments), as shown below.

Cluster#0 (Red): Users who prefer natural settings such as beaches and parks, as well as museums and theatres.

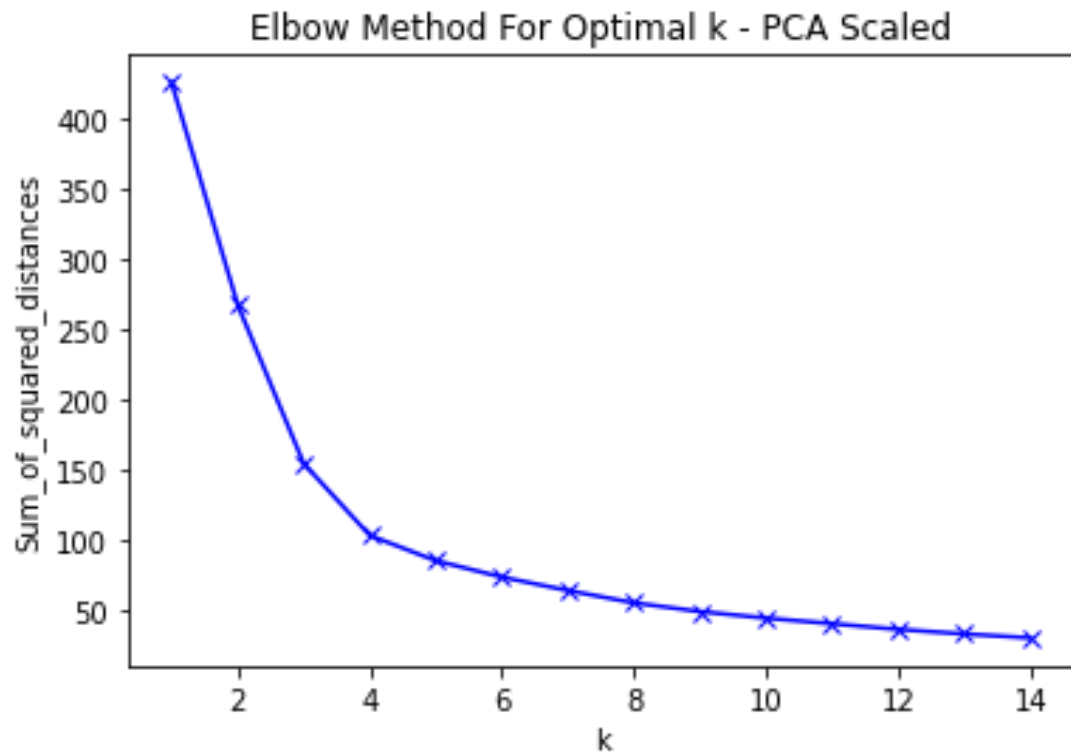
Cluster #1 (Blue): Fast food fanatics who pay attention to hotels and juice bars, as well as having a passion for art.

Cluster#2 (Green): Activity seeker; this user enjoys going to local services, spending time at the zoo, shopping in malls, dining in fine restaurants, and visiting pubs/bars.

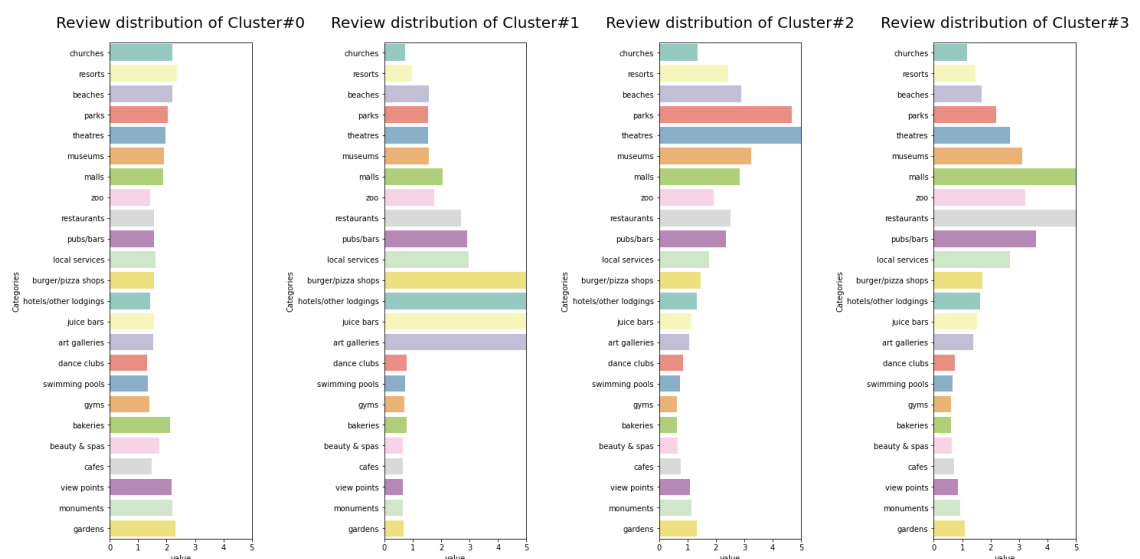
Cluster #3 (Violet): Members of this cluster are not widely dispersed, and they may or may not share common interests, according to the scatter plot.

The elbow method is a heuristic used in cluster analysis to determine the number of clusters in a data set. Plotting the explained variation as a function

of the number of clusters and selecting the elbow of the curve as the number of clusters to use is the method. Other data-driven models, such as the number of principal components to describe a data set, can use the same method to choose the number of parameters. Below plot shows the number of clusters versus the Sum of squared distance plot, for our clustering we have chosen the value of number of clusters as 4.



Number of clusters vs. squared Distances



Review distribution of Various plot

The graph above depicts the median of user ratings in each cluster. As previously stated,

Cluster #0: Enjoys the most beaches, parks, theatres, and museums.

Cluster #1: Burgers/pizza, hotels/other lodgings, juice bars, and art galleries are among their favourite things.

Cluster #2: Most enjoy malls, zoos, restaurants, pubs/bars, and local services.

Cluster #3: Despite the fact that users in this group gave all attractions an overall rating of 2, they appear to pay more attention to dance clubs, swimming pools, gyms, bakeries, beauty and spas, cafes, view points, monuments, and gardens than the other three clusters. As a result, cluster#3 can be summed up as a healthy and sightseeing enthusiast.

BUSINESS OPPORTUNITIES:

They assist individuals in having a more personalised, faster, and safer travel experience. Artificial Intelligence is already having a major impact on the travel and tourism business as we speak. Artificial Intelligence's participation in traditional human cognition processes has made living easier. Time and money are saved.

Technology has aided in the reduction of expenses, the improvement of operational efficiency, and the enhancement of services and customer experience. Improved communication, reservations, and guest service systems can benefit both customers and businesses.

Conclusion

From the above EDA and k-means clustering we can conclude the following observation for one of the features of our web application.

The distribution of ratings in each attraction category differs. Some have a wide range of distribution, while others are concentrated in low-rated areas.

We also compared the various data preparation methods and discovered that standardised data and reduced dimension with PCA were the most effective. We can divide Google review users into four distinct groups. Despite the low cumulative explained variance ratio from only two principal components, each cluster has the characteristics listed below.

Cluster#0 (Red): Users who prefer natural settings such as beaches and parks, as well as museums and theatres.

Cluster #1 (Blue): Fast food fanatics who pay attention to hotels and juice bars, as well as having a passion for art.

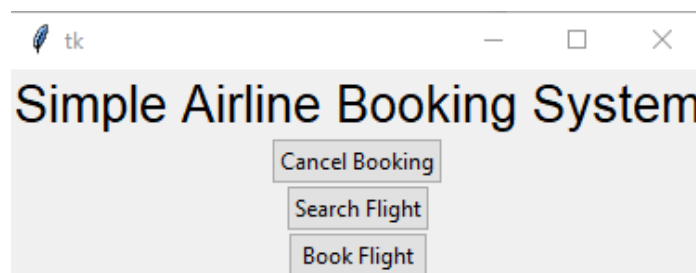
Cluster#2 (Green): Activity seeker; this user enjoys going to local services, spending time at the zoo, shopping in malls, dining in fine restaurants, and visiting pubs/bars.

Cluster#3 (Violet): Although users in this cluster gave all attractions an overall rating of about 2, they appear to pay more attention to dance clubs, swimming pools, gyms, bakeries, beauty and spas, cafes, view points, monuments, and gardens than the other three clusters. As a result, the cluster can be summed up as a healthy and sightseeing enthusiast.

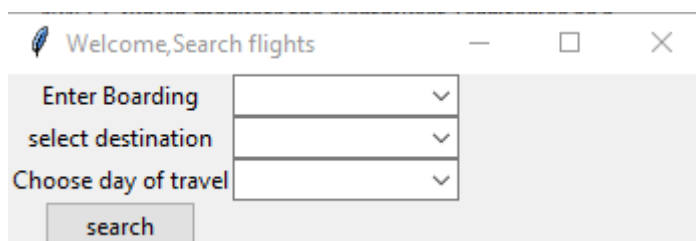
With data on how various user groups prefer various attractions. We can also use this data to create a recommender system, in which we can suggest specific types of attractions to specific users in order to improve their travel experience and increase revenue for attraction points.

UI interface for Ticket Booking System

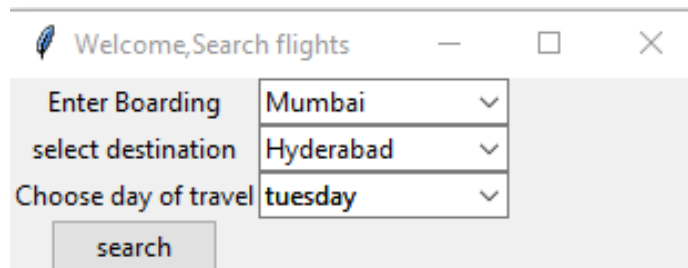
The UI interface for our ticket booking system includes Searching for flight, booking a flight and cancelling booked tickets. This is just a simple interface for the above mentioned features and is demonstrated below.



We will demonstrate our application by booking a flight from a Boarding point to destination and we will choose the date of travel as shown below.

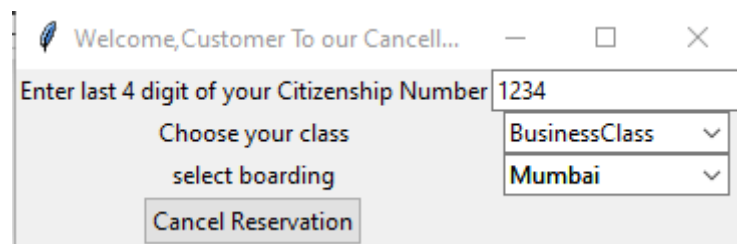


We can choose the boarding point and destination on a particular day.



A screenshot of a flight search window titled "Welcome, Search flights". The window contains three dropdown menus: "Enter Boarding" with "Mumbai" selected, "select destination" with "Hyderabad" selected, and "Choose day of travel" with "tuesday" selected. Below these menus is a "search" button.

Here is what it looks like.



A screenshot of a flight cancellation window titled "Welcome, Customer To our Cancell...". The window contains a text input field for "Enter last 4 digit of your Citizenship Number" with the value "1234". Below this is a "Choose your class" dropdown menu with "BusinessClass" selected, and a "select boarding" dropdown menu with "Mumbai" selected. At the bottom is a "Cancel Reservation" button.

We can also cancel pre-booked flights by giving the mentioned details as shown in the figure above.

BENCHMARKING ALTERNATE PRODUCTS:

In today's fast-paced world, Online Travel Agencies like Expedia, MakeMyTrip and Goibibo enormously influence the way travellers make tour bookings. These Online Travel Agencies offer many benefits to travelling bookers by bundling hotel reservations with rental cars, air tickets, etc. They allow users to book air tickets, bus tickets, buy holiday packages, book hotels and accommodations and even hire cabs. They can also access other travel-related services provided by third-party vendors like visa processing and travel insurance. All these services are available through their apps, websites and at times, even by their owned and franchise stores.

MakeMyTrip: MakeMyTrip is a unicorn with a high net worth. The company focuses on technology and data to make the customer experience more personalised and satisfactory. MakeMyTrip lets the users book tickets, buy holiday packages, get accommodations and access other travel-related services through their app, website or stores. Besides this B2C (business-to-consumer) model, they have also introduced MyBiz, to offer various corporate travel-related services. MyBiz lets businesses manage the travel and accommodation of its employees easily through various features such as a single dashboard, MyBiz wallet, for central payment processing and instant refunds to MyBiz Wallet on cancellations etc.

Goibibo: Goibibo is a leading travel aggregator whose business transactions are performed online. It is the largest booking engine and has been ranked in the first position in the travel sector through mobile apps. Goibibo offers trusted and fast experiences to its users in terms of searching the required product, making bookings, making payments, options of cancellation, settlement and refund nature. It is a B2C or business to customer organisation as it deals directly with its customers by providing transportation and accommodation facilities. Recently Goibibo has launched two vital features to its product kit. Anywhere to Anywhere flight booking helps in getting the best fare options for international destinations to-and-from any place in the world. Flight Advice is a search engine that helps users in finding results of their personal choice. It includes price options, preferred destination routes or even duration of a flight.

TripAdvisor: TripAdvisor (www.tripadvisor.com) is a comprehensive travel search engine and directory that assists consumers in their search for travel information via the web. By choosing a destination consumers are presented with a variety of destination relevant information such as articles, guidebooks, reviews, user comments on cities, hotels and activities, and booking facilities. Currently TripAdvisor is amongst the most successful recommender systems in e-tourism. As an external site TripAdvisor cooperates with world's leading players in e-tourism including Expedia, Travelocity, Orbitz, Hotels.com and others. TripAdvisor provides users a tool (QuickCheck-Tool) to check hotel pricing and availability and ranks hotels worldwide based on a popularity index that is measured by the quantity and quality of content written about the hotel on the web. Advice to its users is also given by providing independent travel reviews and comments written from former TripAdvisor customers.

SkiMatcher: SkiMatcher (www.skimatcher.com) is a recommendation technology developed by TripleHop Technologies Inc. It provides recommendations to ski- and winter tourists in North America and Europe. At its heart is a team of travel writers and researchers writing content and rating most popular North American and European ski resorts which are presented to web users online. Activities and characteristics for a specific destination are qualitatively ranked, loaded into a database and used to match user preferences. SkiMatcher offers its users individual recommendations based on user input and recommendations of travel experts provided via email or phone.

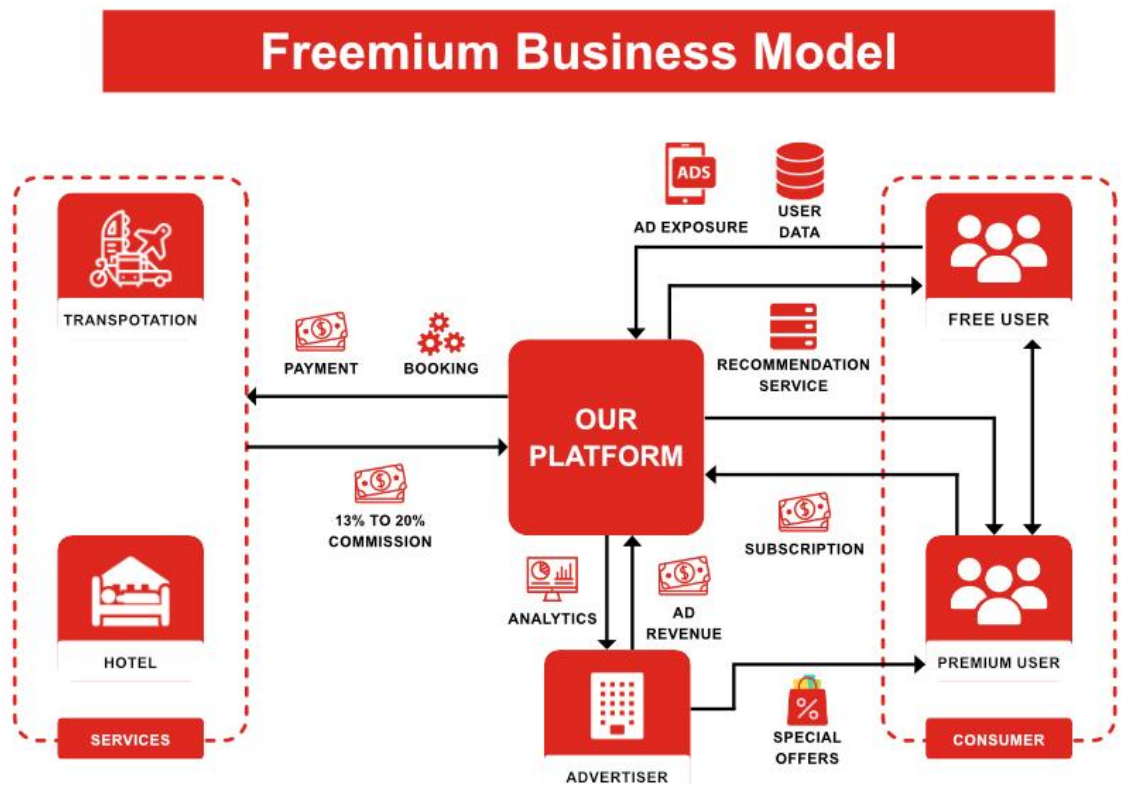
APPLICABLE REGULATIONS:

- Data protection and privacy rules.
- Licence for the open-source codes that might be used in the model implementation.
- Laws related to AI

APPLICABLE CONSTRAINTS:

- Data collection from the customer.
- The customer should know about the time, money and scope of the project before it starts.
- Transparent use of the data obtained from the customer

BUSINESS MODEL



In this part of the report, we will look at the business model suggested for the idea presented earlier. There are many business models available but we have chosen the 'Freemium Business Model' which is the one suited for our idea.

With the advent of globalisation, travel and tourism have reached great heights. Travelling has become an integral part of people's lifestyle. As a result, travel agencies are growing. E-commerce has played a vital role in enhancing the travel industry's growth. Travel companies can now reach customers anywhere in the world and offer them the best possible options. Startups like MakeMyTrip and Golbibo have transformed the industry with their exemplary business models.

FREEMIUM BUSINESS MODEL:

The freemium business model was born out of a blog post created by venture capitalist Fred Wilson. According to Fred Wilson, the advantages of offering a free option was the ability to rapidly acquire customers. The goal of using it was to "eliminate all barriers to the initial customer acquisition".

Fred Wilson didn't have a name for the concept of using a free level to acquire customers, and so he asked his audience to come up with a name.

A commenter, Jarid Lukin, then suggested the name Freemium model. The Freemium model then evolved and became known as the Freemium business model. In a nutshell, the freemium business model involves providing a basic version of a product or service for free, with the intention of persuading sufficient numbers of customers to pay for a more advanced version.

The Freemium business model is a revenue model and a marketing strategy, **not a business model**.

Services like Dropbox, Skype, LinkedIn or Spotify have successfully implemented the freemium business model and offer both free and premium-priced versions.

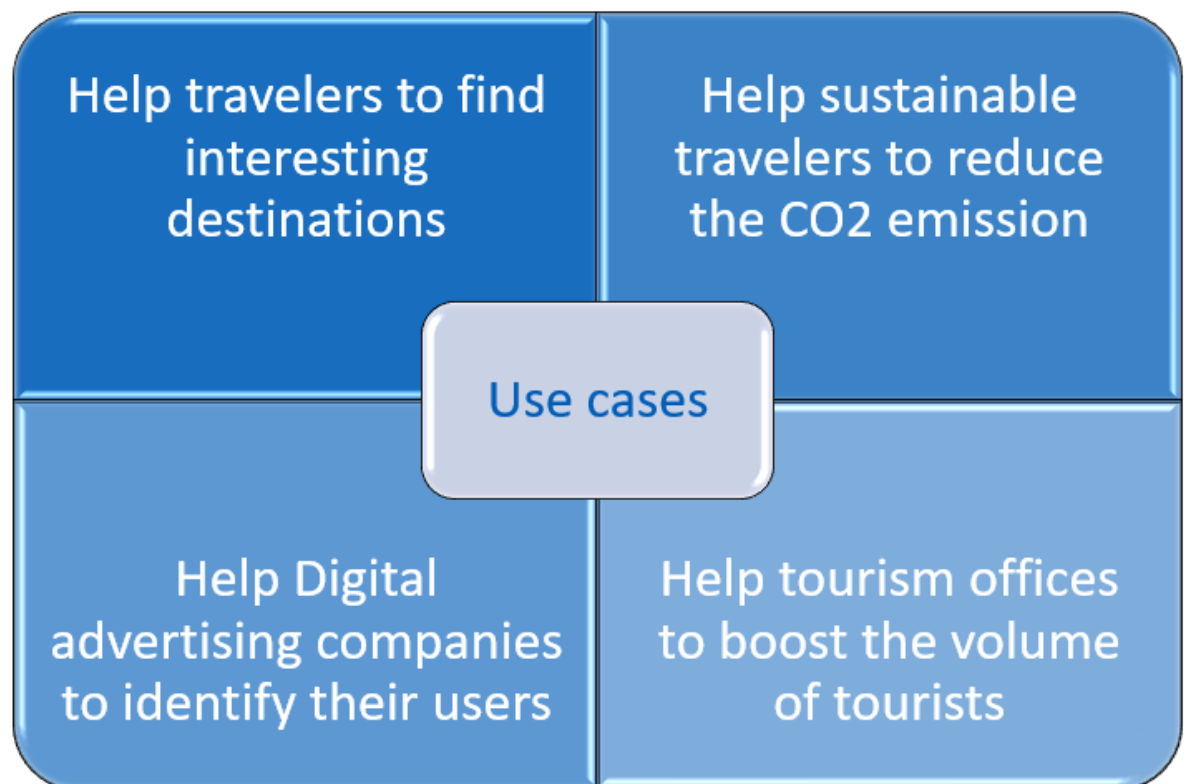
But, A large number of other online digital companies have **experienced freemium as a costly trap**.

However, entrepreneurs and senior managers in organisations still have a limited understanding of **why some freemium business models become successful and sustainable while others do not**.

USE CASES FOR TRAVEL RECOMMENDER SYSTEMS:

The new Tourism Recommendations System helps users for personalised destination recommendations. Here we determine destination similarity and see how to call the API and add smart recommendations to your app. It also provides plane ticket booking and hotel booking service for interested customers.

In the travel industry, recommender systems can be applied in a variety of ways like recommending travel offers (flights, trains, etc.), hotels, activities or even your next destination.



For travel apps, OTAs and other travel sellers

Recommender systems can help suggest new destinations that might interest users. The unprecedented COVID-19 crisis has resulted in numerous travel restrictions which prevent leisure travellers from visiting their dream destination. With this API, you can help recommend non-restricted alternative destinations that users will likely find appealing, thus increasing the probability of a booking.

For tourism offices, DMOs and digital advertising companies

Knowing destination similarity can help identify competitor destinations for each origin market. These insights can be used to differentiate your destination or target travellers interested in similar locations.

For travel sustainability

Knowing destination similarity can also aid sustainability in travel. You can use the API to suggest alternative and appealing destinations that are closer to a traveller's home city (or simply better served by direct flights) and therefore result in less CO2 emissions. This same process can be used to reduce over-tourism by recommending similar destinations with fewer tourists or which offer a more local, authentic and ultimately rewarding experience.

SERVICE DESCRIPTION:

1. Customers

Free users can directly access the recommendation systems and find the popular places in specific locations or destinations and their travel. They can also book hotels and flights from the platform.

Premium users pay the subscription fee for special offers and discounts on hotels and flights. They also get extra information of different nearby locations from their destination.

2. UI of online platform and mobile application

The platform takes source and destination as an input on the home page. Based on the destination, the recommendation system shows details of different hotels and tourist spots. It also shows ads related to destinations and shows different government related schemes of tourist spots.

We are spending money in creating or gathering the information of tourist spots and generating revenue from ads.

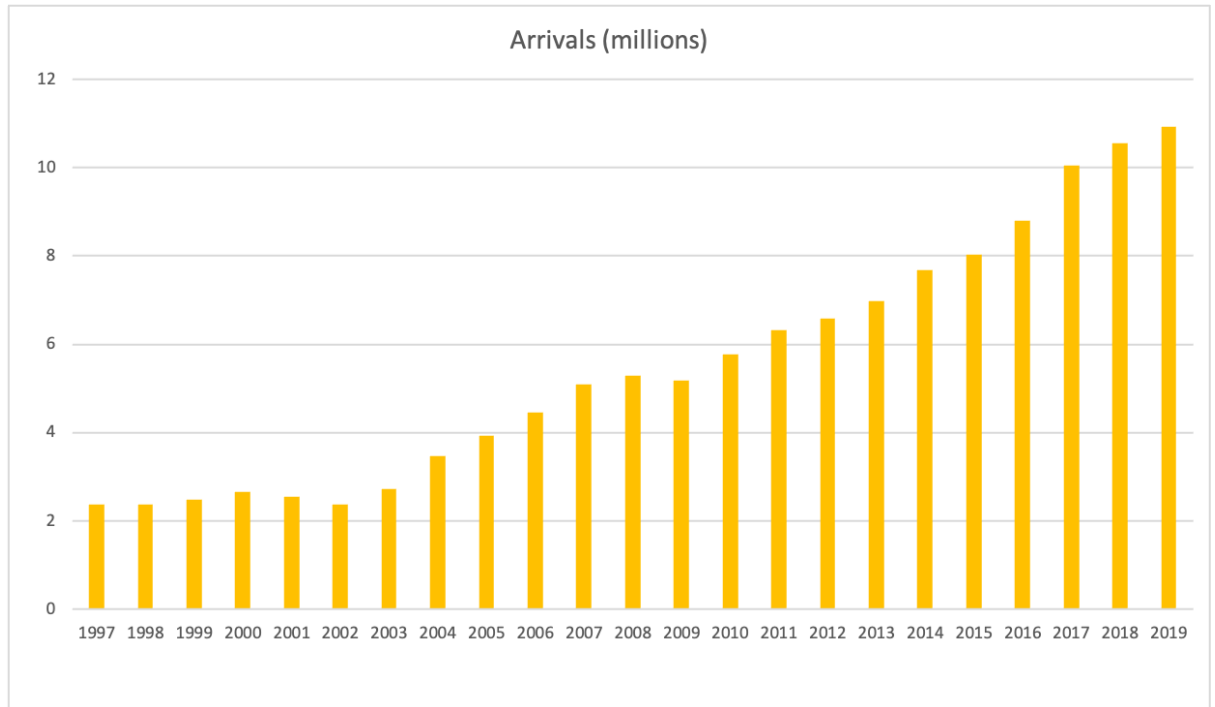
3. Flight and Hotel Booking

We are providing customers to different travel companies and hotel services. The traveller can book their ticket from the platform and also avail different offers. Travellers search for a property in a location they wish to stay and browse available options according to price, amenities etc. Booking is made through our platform and the traveller pays the amount listed by the hotel owners and an additional transaction fee. The Traveler stays there and finally, we pay the amount to the hotel owners after deducting their commission. Reviews from hotel owners and travellers are provided to the broader community.

FINANCIAL EQUATION:

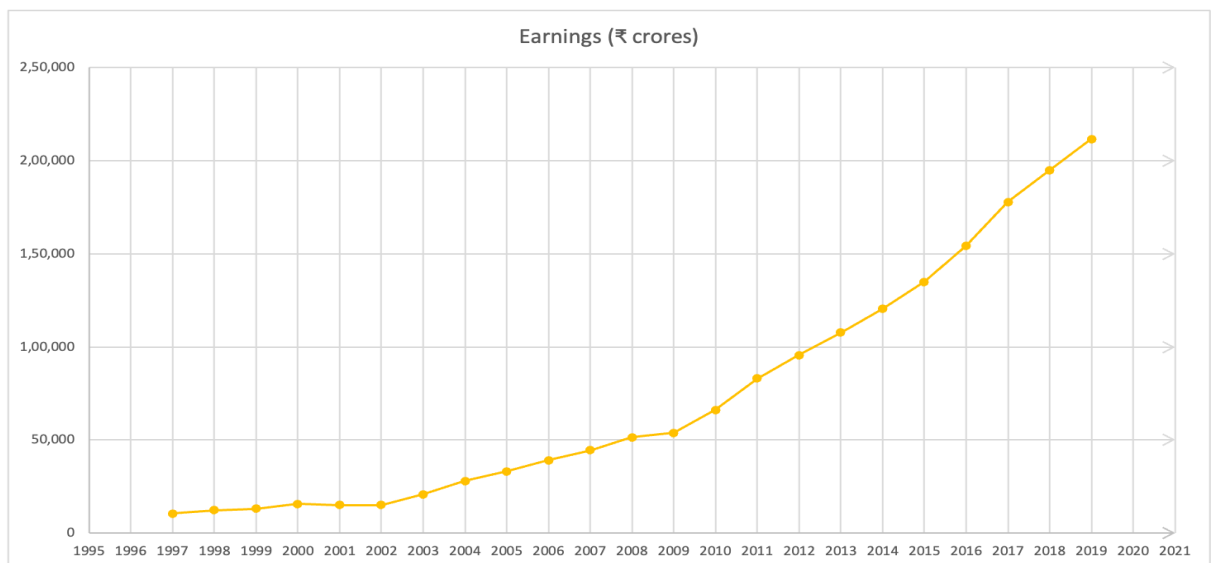
The developed product can be launched into the Tourism Industry. This application can serve as a bridge between tourists and various service providers. The current trends in the market can be drawn out from the statistical plots shown below.

FOREIGN TOURISTS ARRIVAL TO INDIA:



From the above plot, it is evident that India has become a popular tour destination and hence there is a huge market in the tourism industry.

REVENUE GENERATED BY THE TOURISM INDUSTRY:



From the above plot, we can infer that there is almost a linear increase in the revenue generated by the tourism industry.

COST OF PRODUCTION:

A team of full-stack developers, ML engineers, marketing professionals are required in developing and deploying the service. The product can be developed in about 3 months of time.

Full stack developers are responsible for building the web application and maintaining the back end side too. ML engineers are responsible to collect and prepare the datasets and build a recommendation system. Marketing executives will be useful to reach out to flight companies, hotels, resorts etc to register in our application.

The average pay of a full stack developer in India is Rs 55k per month. We need 2 full stack developers which costs to Rs 330000. The average pay of a marketing executive is Rs 22.5k per month. We need to hire 10 marketing executives from 10 states of India to reach our clients. This costs Rs Rs 7.75 lakh. The average salary of an ML engineer is about Rs 60k per month. This sums up to Rs 1.8 lakh. Other costs such as travel costs, hiring costs etc range upto 1 lakh. Hence the overall cost for making the product is about Rs 14 lakh.

Initially we can charge Rs 100 per night for every booking through our portal. Also we can charge a 5% transaction fee for every flight booking made through our portal. We can make profit from our flight partners, accommodation clients and also charge some fee from our customers. Once we have captured the market, we could increase our service charge.

Let us assume that the product generates Rs 5000 from one hotel per month.

The finance equation is

$$y = mx(t) - c$$

where,

y is the profit

m is the price of the product

c is the total production cost

x(t) is sales as function of market

After substituting the above deduced values, the equation becomes

$$y = 5000x(t) - 1400000$$