# **Travel Recommendation & Analysis Project**

## **Executive Summary**

This project aimed to build a travel recommendation system by analysing user travel data. The primary objective was to leverage machine learning to provide personalized attraction recommendations based on user ratings and behaviour. The project successfully created a recommendation engine and provided key insights into visitor trends and preferences.

## **Approach and Methodology**

The project's approach was centred on **collaborative filtering**, a technique that recommends new items to users based on the preferences of similar users.

### **Data Cleaning and Preparation**

Before analysis, the raw data from multiple CSV files was meticulously cleaned and prepared. The process involved:

1. **Data Consolidation:** All eight provided CSV files were loaded into a single programming environment.
2. **Merging:** The datasets were merged into a single, comprehensive Data Frame. This step involved linking various data points, such as user transactions, attraction details, and location data, using common identifiers like UserId and AttractionId.
3. **Handling Missing Values:** To ensure the integrity of the data and prevent errors in the model, all rows with any missing values were removed from the consolidated dataset.

### **Machine Learning Model**

The core of the recommendation system is a **cosine similarity model**. This model works by:

1. **Creating a User-Item Matrix:** The pre-processed data was transformed into a matrix where rows represent users and columns represent attractions. Each cell contains the user's rating for that attraction, with 0 representing an unrated item.
2. **Calculating User Similarity:** The model then calculates a similarity score between every pair of users based on their rating patterns. The **cosine similarity** metric was used for this, measuring the angle between two user vectors to determine how alike their preferences are.
3. **Generating Recommendations:** To recommend an attraction to a user, the system finds the most similar users and identifies attractions that they rated highly but the target user has not yet visited. These unvisited attractions are then recommended.

## **Key Findings and Analysis**

The analysis of the cleaned dataset revealed several significant trends and findings, which were visualized to provide clear insights.

* **Top Visited Attractions:** A bar chart showing the number of visits per attraction clearly identified the most popular destinations. This finding is crucial for targeted marketing and for tourism boards to understand visitor hotspots.
* **Visitor Distribution by Mode:** A pie chart illustrated the proportion of travellers for each visiting mode (e.g., Family, Couples, Solo, Friends). This showed which travel groups are most common and helps tailor marketing campaigns to specific audiences.
* **Top Regions by Visit Count:** A bar chart highlighted the regions with the highest number of visits. This finding helps in strategic planning and resource allocation for travel companies and government bodies.

## **Actionable Insights**

The findings and the functional recommendation system provide valuable actionable insights:

* **Personalized Marketing:** Travel agencies can use the recommendation model to send personalized email promotions to users. For example, if a user enjoys nature-related attractions, the model can recommend similar national parks or waterfalls they haven't visited yet.
* **Targeted Advertising:** Businesses can leverage the visitor distribution data to create targeted advertising campaigns. A hotel, for instance, could design a "Family Fun Package" and advertise it specifically to users traveling in Family mode.
* **Enhanced User Experience:** By providing relevant and timely recommendations, the system can significantly improve a user's travel planning experience, leading to higher engagement and satisfaction.
* **Strategic Business Decisions:** The analysis of top regions and attractions can guide investment decisions for new travel services, tours, or hospitality ventures. For example, a tour operator might prioritize expanding services in the most-visited regions.