ISYE 6501 Project Report

Team Members: Tyra Silaphet, Navya Bingi, and Bo Yang

Introduction

For our course project, we selected "Enhancing the Guest Experience" at Walt Disney World as our analytics success story. Disney is a world-renowned tourist destination that has been popular for decades, upholding its reputation for delivering magical and memorable experiences. Analytics plays a huge role for Disney because their goal to fulfill guests and ensure their stay exceeds expectations is only possible with data. The article explains how this company uses analytics to forecast, optimize, and simulate guest experiences to make their stay worthwhile and memorable, while maximizing profit. For example, it is important for the company to have an idea of expected park attendance in order to strategically plan for enough labor at every area of the park, such as at check in, rides, etc.

Problem Statement: Most guests tend to only visit the park a few times, while some only visit once in their lifetime. This creates a unique challenge: Disney needs to maximize their time and ensure they experience as many key attractions as possible, tailored to their family's interests, preferences, and time constraints. To address this challenge, we propose combining the results from three different analytical models—ARIMA, Clustering, and Optimization—to create a comprehensive, integrated solution. This approach delivers personalized, dynamic itineraries ensuring a seamless and memorable park experience for all guests.

1. ARIMA Model

Data Required**:**

- Historical wait time data
- Local events: sports games, entertainment activities
- Real-time crowd patterns
- Family priorities
- Weather data
- Maintenance schedules
- Schedule of entertainment, adventures and fireworks shows in parks

Disney can use an ARIMA model to analyze wait times and learn patterns, such as when peak wait times are or if holidays tend to cause longer wait times. If we also considered weather data and park attendance, we could adjust the wait time predictions, accordingly, creating a more realistic solution. Using the final model, we can forecast wait times for any attraction at any specific time.

By using an ARIMA model, Disney can improve guest experience while maximizing revenue. For example, the predicted wait times from the model can be broadcasted on the Disney app to provide guests with live expected wait times for different attractions. Guests would be able to assess whether they should still stand in line or go to a different ride and come back. This way, guests are making the best use of their

time and Disney can avoid frustrated customers. Another application of the model is in crowd management, where labor is allocated according to predicted wait times. This way, less crowded attractions can have more visitors while long queues can be shortened.

2. **Clustering Model**

Data Required:

- Age groups
- Geographic origin
- Income
- Family size
- Guest preferences
- Feedback and sentiment from customers
- Behavior of guests (spending, fast pass)
- Timeframe of visit

Categorization of guests will prove useful in many ways, such as marketing and improving recommendations made by travel agents. Demographic data combined with specific user behavior data can be used to build clustering models to segment guests. Clustering can even help analysts understand what attractions are popular among different groups and recommend tailored itineraries.

There are many ways clustering algorithms can help Disney make informed decisions. One such way is through targeting marketing campaigns to each guest segment. For instance, for guests who enjoy dining experiences, promoting the resort's assortment of restaurants and concession stands will attract foodies. Advertising characters meet and greet families with young children is another example. Clustering can also be used to tailor recommendations based on which cluster a person/family belongs to. A thrill seeker might enjoy Space Mountain and suggesting morning times would ensure that they avoid crowds. Clustering complements the ARIMA forecasting model because we can not only predict guest behavior and wait times, but we can also influence it based on the groupings of guests.

3. **Optimization Model**

Data Required:

- Attraction clusters from model 2
- Guest/family preferences
- Predicted wait times from model 1
- Physical location of attractions
- Attraction duration
- Park hours

The optimization model uses techniques such as linear programming and constraint satisfaction to develop tailored itineraries for guests. It integrates predicted wait times from the ARIMA model and guest

segmentations from clustering to recommend the most efficient order of attractions. This model takes into account factors like the physical location of attractions, ride duration, and family priorities while minimizing travel time and wait times.

By using the optimization model, Disney can maximize guest satisfaction by ensuring that families and individuals experience their high-priority attractions with minimal wait times. This model generates personalized itineraries that balance children's activities, such as character meet-and-greets, with adult activities, like "Drinks Around the World." Also, the model adapts dynamically to real-time updates, such as unexpected ride downtimes or changes in crowd patterns, ensuring a seamless experience for guests. This way, Disney enhances the overall park experience, ensuring guests make the most of their limited time in the park.

Integration of Models

The true value of this solution lies in the integration of all three models:

1. The ARIMA model forecasts real-time wait times, providing a dynamic input to both Clustering and Optimization models.
2. The Clustering model segments guests into tailored groups, allowing the Optimization model to align recommendations with each group's unique preferences.
3. The Optimization model combines these insights to deliver itineraries that maximize guest satisfaction while balancing operational constraints.

This interconnected system ensures that Disney can create personalized experiences that adapt dynamically to changing conditions, while maintaining operational efficiency.

Re-run models:

New data is always coming in, and during the holidays, data will be different. The models should be revalidated every month or so in order to accommodate any new data or new trends. For example, during the holidays, Disney will host certain events such as Halloween or Christmas specialties. More people might visit the resorts during these times, and certain data might be different, such as higher park attendance numbers, etc.

Conclusion

In this project, we tackled Disney's unique challenge of delivering personalized, dynamic itineraries that allow guests to experience their high-priority attractions with minimal wait time through the integration of three analytical models: ARIMA, Clustering, and Optimization. Each model played a critical role in addressing different aspects of the problem, and together they provided a comprehensive solution to enhance the guest experience.

The ARIMA model forecasts wait times, ensuring recommendations are timely and practical. The Clustering model segments guests, allowing for deeper personalization and more relevant offerings. The

Optimization model integrates these insights to generate itineraries that adapt dynamically to each guest's needs and the park's operational realities.

This solution reflects Disney's commitment to prioritizing guests by delivering personalized, thoughtful recommendations. By leveraging data and analytics, Disney enhances the overall park experience, ensuring every guest—whether a first-time visitor or a lifelong fan—leaves with unforgettable memories.