ISYE 6501
Project - Disney Analytics

For my project I decided to look at the big data and analytics used by the Walt Disney Company to improve their overall business as a whole as well as to increase customer satisfaction. The information displayed on *informs.org* is a little out of date, judging by the information that is displayed, it seems that most of it was done precovid, and while most of the practices that were implemented before are likely still being used, having been to the parks recently I know that some of the information has changed either temporarily or for good. For the sake of this project, I am going to go from the perspective of before covid and use the information as it was posted in the article.

The Walt Disney Company has a history of being one of the happiest places in the world. From the minute you arrive to the moment you leave, for all ages young and old, it seems that there is no end to the Disney Magic as it has so aptly earned its title. Part of the Disney experience is making sure that guests have a good time and enjoy themselves and that all of their needs or wants are met. One way Disney has gained this notoriety, in my opinion, is by following the data and paying attention to what people want and using the data to make predictions for future guests. This is apparent as Disney even has an annual conference, Disney Data & Analytics Conference, where they hold classes, sessions, and general ideas on how they have been very successful and how their business practices could be applied elsewhere.

The data collected by Disney was incorporated into several parts of what makes the magic experience so noteworthy. The MagicBands of Disney started back in 2013, these bands are simple RFID bracelets that the guest would wear for almost everything while vacationing at Disney. The MagicBand would unlock your hotel room, grant you access to the park, gain access to their FastPass system, allow you to link your wallet for ease of purchase and more. Overall it made collecting data for the company very easy. Data that could be extracted from your MagicBand could include, but would not be limited to:

- Time Enter/Exit of Hotel Room
- Time Enter/Exit of Park
- Time Spent in Park
- Which parks attended in One Day
- Rides in which FastPass were used
- Purchase History
- Length of Visit
- Food Venders Visited
- Reason for visit (not always known but can usually be determined)

With the incorporation of the MagicBand system at Disney, the company now had access to a huge amount of information about their guests and with this information could build an overall better experience. According to the article *informs.org*, Disney has even planned out a normal guests schedule down to specific 15 minute increments. While there are several examples that I

feel could have been implemented, I wanted to stick with three systems in which I feel they may have been used. As far as how often these models should be refreshed, with the constant flow of data that Disney has using both their MagicBands as well as their mobile app, which acts as a pseudo MagicBand, Disney could refresh each of the models almost monthly or even on an as needed basis.

Model 1
Given: Guests Attendance Rate,Individual Park Attendance, Time Spent in park
Use: Holt-Winters Forecasting
To: Make predictions on guests attendance on a daily basis, which would allow flexibility in employee schedules as well as park hours and operations.

With all the data about the time guests enter and leave the park, given the course of several days or even years of data, it would be relatively easy to create a model using Holt-Winters Exponential Smoothing to forecast guests park attendance on a daily basis. I chose Holt-Winters because it has forecasting properties, using level, trend, and seasonality which would be perfect for predicting guest attendance on any given day. This is due to the fact that the park attendance rate is most likely higher during the summer months as well as the major holiday breaks (Thanksgiving, Christmas, Spring Break).

This would allow Disney to create employee schedules based around the number of guests that are expected to attend that day. For example, not as many employees would be needed for a random day in October as much as a random day in June. This also would allow some employees to be more flexible with which park they work at during that day or week. For example, if one of the four parks is predicted to have a higher attendance rate than any other park on a particular day, the employees that can flex to the other park can move there to assist with the needed traffic flow. This process could also be improved by using optimization During the high attendance rate, mostly around the summer months, Disney would also predict when to extend park hours, called Extra Magic Hours, in which the park stays open later than usual. This could benefit the company and boost profits during their most popular season.

This depends solely on the state of Florida during the summer months. For any one who has ever been to Florida, the weather in Florida seems to almost rain on a random basis. The temperature is another factor that could dissuade people from attending at the predicted rate. Fortunately this is another benefit to using the Holt-Winters Model, it removes the random variability from the model, thus giving a more accurate prediction for park attendance, regardless of the weather status.

Model 2:
Given: Wait Times for Rides, Popularity of attraction (based on total number of previous riders), Time of Year, Results from Holt Winters Model Above
Use: Queuing Optimization Simulation
To: Identify rides least popular rides and plan to update/change and improve guest wait time while waiting for an attraction ride, which in turn will also facilitate the FastPass system.

New rides are being added and updated all the time at Disney. The goal is to take the rides that are least popular and either replace or update them with more attractive and fun rides. As a lot of the Disney rides are based on popular movies, as newer more popular movies come out, Disney would want to capitalize on this by incorporating it into their property, this however becomes a problem as new attraction rides take time to build. Instead of adding a full new ride oftentimes Disney will take an old attraction and update it to a newer more modern ride. This process can be monitored by looking at queuing optimization of wait times for attraction rides. Meaning the less popular attraction rides could be considered for updating or reworking as the need arises.

Using the Holt-Winters model from model 1, this prediction could determine how many people will need to work the attraction for that day. Then using that information in an optimization simulation, Disney could determine the number of employees or potentially extra carts for certain attractions. Take for example the Everest Ride in the Animal Kingdom. If for example the ride usually has 4 employees and 3 working train carts for the off season, it could have 7 employees and 5 working train carts during the more popular seasons, using the Holt-Winters to predict when the busy season is and using the optimization simulation to maximize productivity and minimize wait time for quests.

In addition, this would also allow Disney to monitor their Fastpass system so that they could offer Fastpasses to their most popular attractions. The way the Fastpass system works is by giving certain guests, usually resort members, access to plan out their day by picking a certain number of attraction rides to attend that day. During the more popular days, guests may be offered less passes to ride, as opposed to the low traffic days in which guests could have more. Optimization Simulation would be able to determine how many people could be given a Fastpass on any given day.

The only problem that could come up with this system is the fact that because a lot of the attraction rides are mechanical based, or like the Animal Kingdom rides which are animal based, some of the attraction rides can break down or be closed for several hours at a time or even several days. This could impact the choices guests make on which attraction to ride, however with proper optimization, this could be accounted for in such situations if the attraction were to be closed for more than a few hours, allowing for other rides to operate at a higher capacity to balance out the downed attraction.

Model 3:
Given: Hotel Choice, Pre-Plans made prior to booking, purchase history from other users (or from previous trips)
Use: Lasso/Ridge/Elastic Regression and Linear Regression Model after
To: Create a prediction model to help influence potential vacation ideas as well as purchases during a guests stay.

My third model is used to group personal interests that would then make suggestions for vacation opportunities or item purchase. For example, let's say a guest decides to stay for 5 days at a resort on Disney, one question that could be asked by the operator that is booking this trip could be "is there a reason or celebration for your visit?" If the guest says that they are celebrating their anniversary or honeymoon, then Disney could then make suggestions via previous guest history, derived from a Regression model, to help enhance the couple's experience, thus improving their overall experience. I feel that a Regression for this is best as it would take all the previous users information to determine how their time was spent, what restaurants were visited, and what purchases they made to better assist and ensure that guests have a magical experience. I think Lasso/Ridge/Elastic is best to be used as there are many things that go into a vacation when it comes to planning, and given all the data it would be helpful to find what information is correlated as to make an accurate model to make predictions for future guests.

While not every guest that books a vacation through Disney could reveal their intentions for their visit, often there could be products that are purchased that could indicate the reason for their stay, buying Mikey and Minnie Bride and Groom ears could help support the idea that the couple are celebrating their anniversary or marriage.

I personally have experienced this first hand. Back in 2021, I booked a trip to Disney and when the operator who helped me get a resort asked me why I was visiting, and I stated that we were celebrating our recent engagement. Upon our arrival at the resort, Disney gave us complimentary Groom ears to help celebrate our trip as well as upgrading our room to the honeymoon suit. All of this was free to us at no charge.

The only drawback that I could see to this model is you are making a prediction based on other users to help enhance their experience, this will not be true for every guest and not all the guests plan their trip out day by day. For example, for the guests that buy their tickets the day of the trip and visit just one park, no predictions could be made about the guests and thus would have no suggestions to make. This however I feel is that the normal experience at Disney as most of the information that is needed to attend Disney is tracked via their Magic Bands or even more recently their mobile app.

Overall I think that Disney is on the cutting edge using Big Data and Analytics to simultaneously boost productivity and overall guests experience. While Disney is a huge company that has a lot of moving pieces, I feel that the company has a genuine concern with making sure each individual guest as a magical experience, and although the amount of data they have collected on people could be considered somewhat scary, I think it's all well in good in that it's all built around keeping one of the happiest places on earth as magical as it can be.

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