



Northeastern University

Final Project Report

Decision Support and Business Intelligence

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Introduction

The project is focused on analyzing bike sharing systems to get insights on demand of bike rentals. We explored various business questions by performing analysis using data visualization tool, tableau. The visualizations provided an efficient display of the key performing indicators affecting demand growth. The dataset used for the project consists of basic information regarding bike rentals such as year, month, week, day, date, and season when the bikes were rented along with the climatic conditions. The goal is to perform data analysis using Business Intelligence tools and make data-driven business decisions.

About Dataset

The Bike Sharing dataset is incredibly famous on Kaggle, and it contains the rented bike data from 2011 to 2012 years with seasonal and weather effects.

In the modern world, bike-sharing systems are the new business models with membership, return, rentals, and multiple other business-friendly options. The users can rent and return bikes whenever they want using these systems. Since it involves the demand and supply of bikes, it provides an edge to the organization if it could predict the demand for rental bikes ahead of time to ensure an appropriate supply is available. These businesses encourage the world to go green and benefit the users' health.

It saves time and money for the users. Since these are lightweight and low-capital businesses, organizations can deploy the supply points at multiple places. The main challenge with this business model is maintaining the bikes at all deployment points against the changing climatic conditions. Hence, knowing who uses bikes and when they use bikes helps organizations maximize revenue, minimize losses, and increase profit.

Feature	Count
Samples	17,378
Columns	17

Business Questions

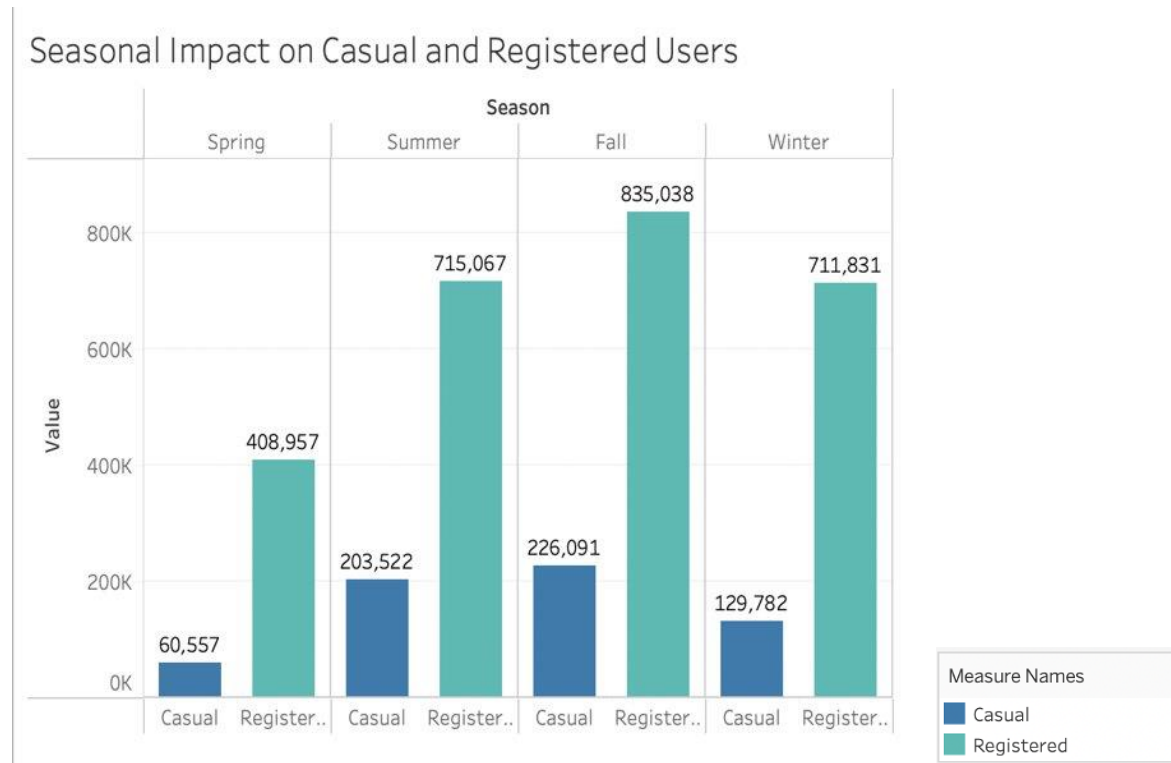
1. What is the best season for bike rentals?
2. Is there any difference in demand for bike rentals between casual and registered users?
3. How does the usage of bikes change as the wind speed changes throughout the year?
4. What is the effect of temperature and humidity on demand of bike rentals?
5. Which weather conditions are ideal for renting a bike?

Data Analysis

The visualizations made with the Tableau data visualization tool are displayed below. To arrive at the suggested answers for all business problems, the variables of interests are taken into consideration. In this section, each proposed solution is explained in detail:

1) What is the best season for bike rentals?

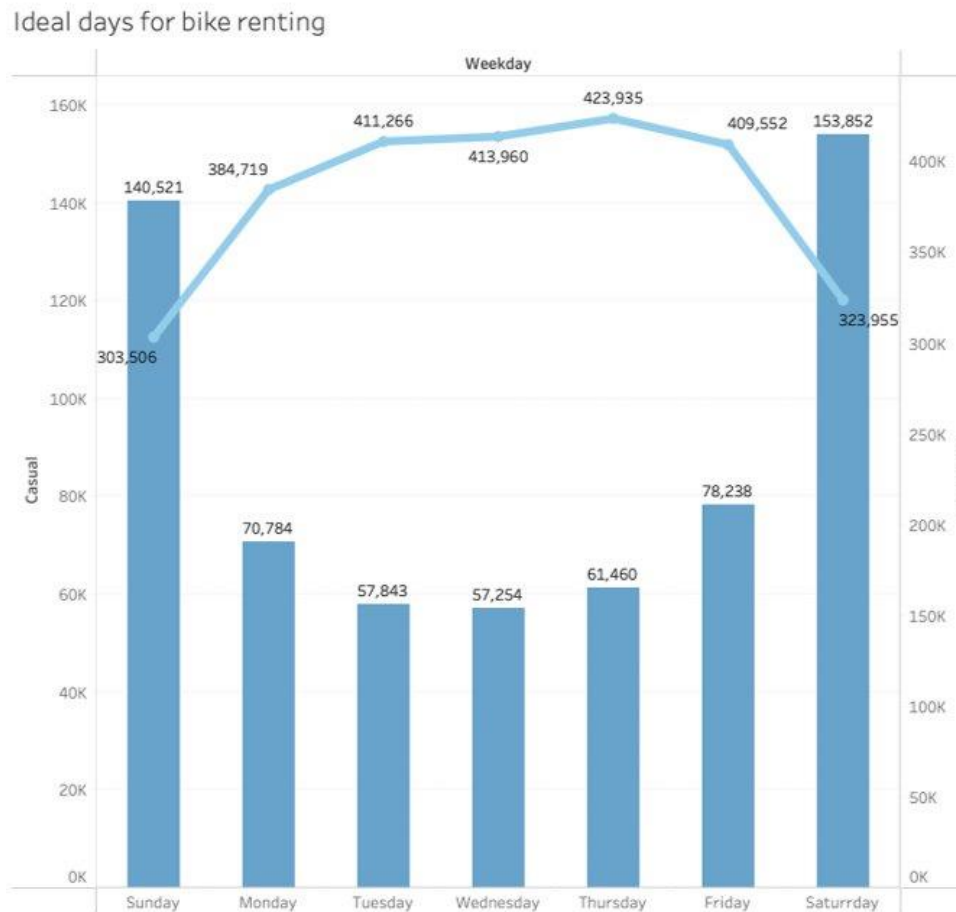
Here, the sum values for the casual and registered attributes given in the dataset are determined and displayed seasonally.



The first visualization gives an extensive number of casual and registered users with respect to seasons. It demonstrates that season 3, which is fall, has the highest number of users for both types. In contrast, season 1, which is spring, has the lowest number of registered users and casual users.

2) Is there any difference in demand for bike rentals between casual and registered users?

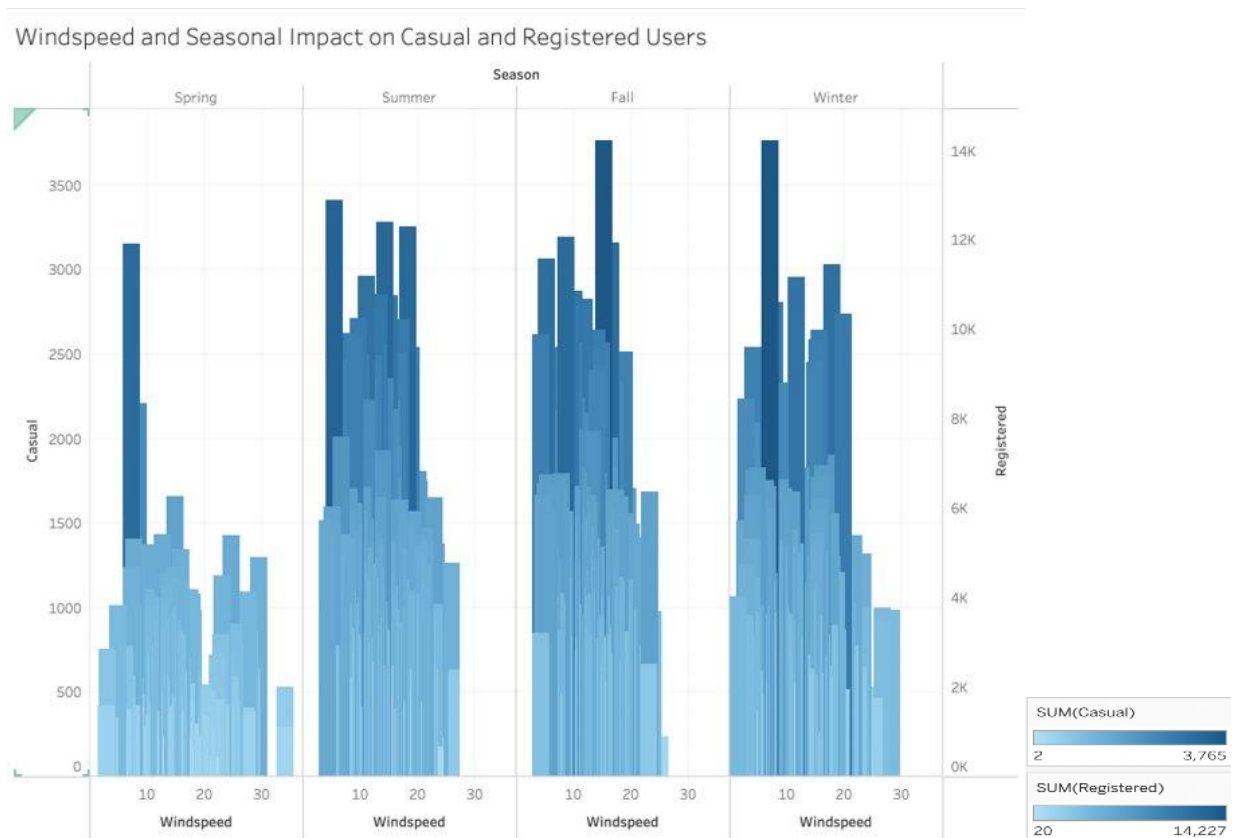
The dual axis scale function of tableau has been used in this section. It aided in scaling the two variables of interest i.e., casual, and registered users to be placed on the same axis.



This visualization shows which day users often prefer to rent bikes. Here, the bars represent the number of casual users, whilst the line shows the number of registered users. It has been found that weekend rentals are preferred by casual users. On the other hand, the registered users who typically have some sort of subscription rent bikes on a regular basis, as seen by the line in the graph, with the weekdays having the greatest number of registered users.

3) How does the usage of bikes change as the wind speed changes throughout the year?

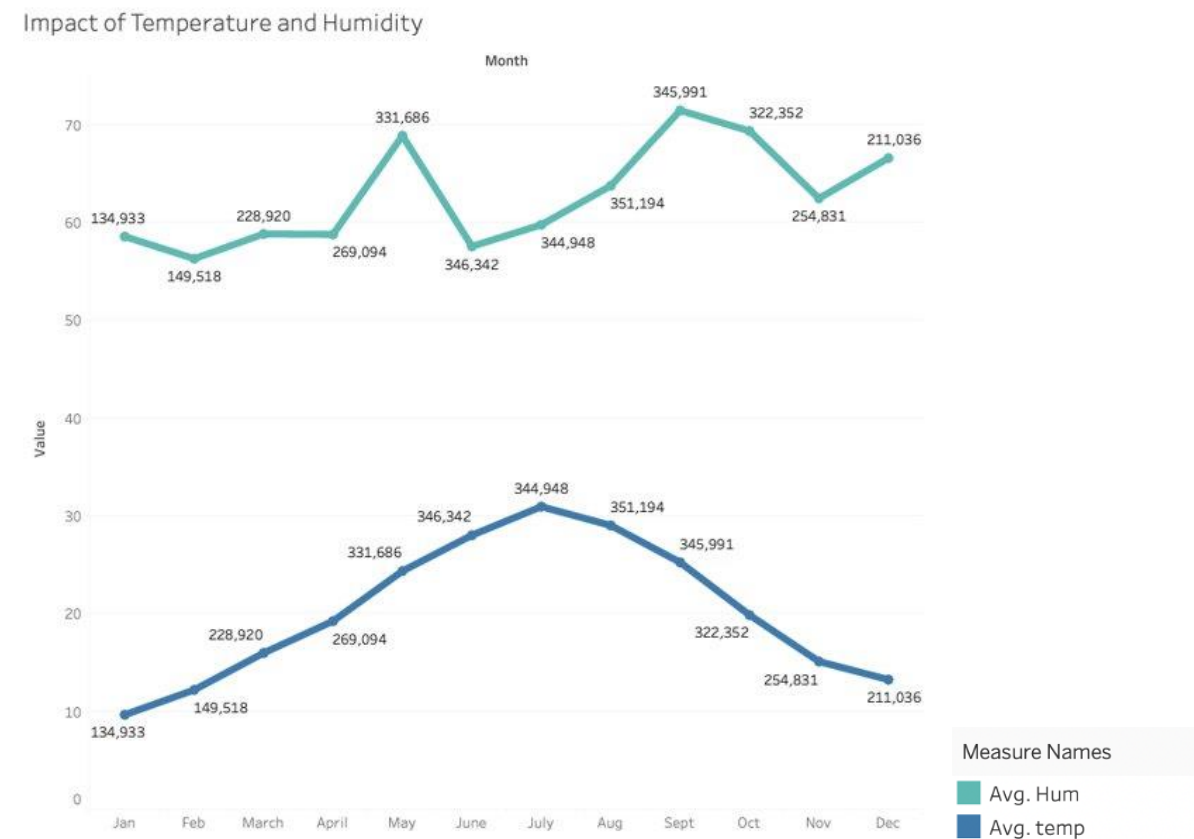
Now, we tried to implement the same method of dual axis feature to identify the effect of windspeed on both types of variables separately for each season.



Here is a detailed illustration of how the season and wind speed affect bike rentals. Each season's wind speed is shown separately while the bike is being rented out. Again, data demonstrates that given the best days' tendency for having winds between 10 and 20 mph, both types of users select fall as the ideal season to rent bikes. The use of bicycles declines as wind speed rises, the argument reports.

4) What is the effect of temperature and humidity on demand of bike rentals?

The dual line code is used for this work to examine the variation in temperature and humidity on the same scale throughout the duration of the year. This aids in figuring out which months are likely to have the optimal combination of humidity and temperature to meet demand for bike rentals.

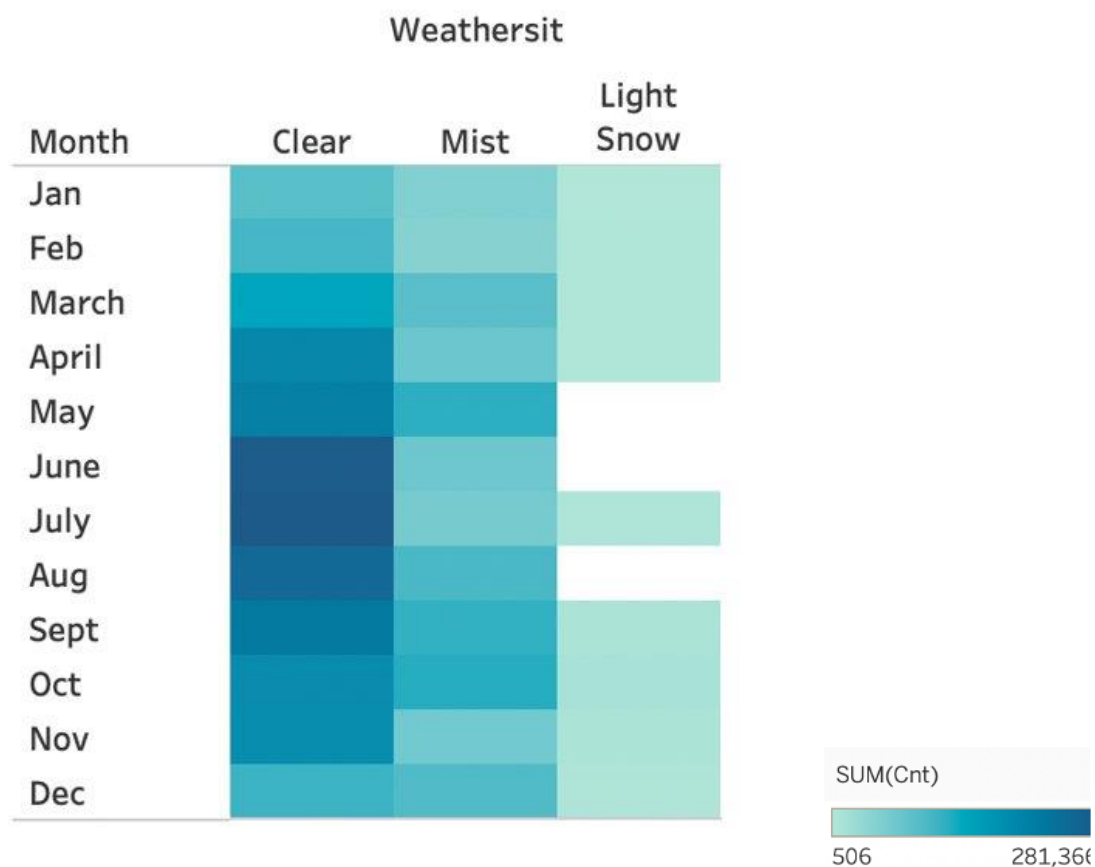


This graph makes it easy to comprehend how the temperature and humidity fluctuate throughout the course of the year. The labels written on the lines indicate the overall number of users for those specific months. It concludes that August and September are the months with the biggest number of users renting bikes. The average temperature is discovered to be at its highest during this time, and the average humidity is found to be at its lowest. It demonstrates that August, the month with the biggest number of users, often experiences temperatures around 30 degrees and humidity levels around 65 degrees.

5) Which weather conditions are ideal for renting a bike?

Here, the heatmap has been generated to see the areas with greater density and discover data trends. The area with greater density is represented by darker shades. In this case, it means that during the months and weather situation when the number of users is greatest is represented by dark blue color.

Impact of Weather Situation



The dataset contains three different weather conditions, which are contrasted with the aid of this visualization. It offers insightful information on how the local weather situation affects bike rentals. It demonstrates that the ideal conditions for renting bikes are found to be clear skies, particularly in the months of June through August. Additionally, it demonstrates that the least desired weather conditions are light snow or light rain.

Conclusions

The insights derived from the analysis successfully meet the requirements proposed in business questions. The best time of the year to rent bikes has been determined to be the fall. It was discovered that registered users prefer renting bikes on weekdays, whereas casual users prefer weekends. Furthermore, the study discovered that the demand for bike rentals is significantly influenced by climatic factors including temperature, humidity, and wind speed.

By detecting usage trends for bike rentals, this demand analysis will help to increase customer satisfaction. This will in turn improve supply planning and marketing, leading to an overall increase in the growth of the bike rental business.

Questions

For this section, we talked about how AT&T is using data analytics and AI, and we stated explicitly the following questions:

1) What kind of data analytics culture do they have?

A) The AT&T business profit maximization relies on data-driven decisions. Since customers data usage varies over time, being able to predict the user's future data usage and designing a customized package boosts the revenue. AT&T uses predictive analytics for predicting the data usage and unsupervised learning techniques for the package recommendations.

2) How is the organization using AI and data analytics to drive business decisions and offer client products?

A) The organization uses time series models and advanced deep learning models to capture the user data usage trends and seasonality to offer the most suitable recharge packages and plan the number of towers in the locations to improve the user experience.

3) How does BI and data analytics allow them to make better business decisions and product offerings?

A) The business uses the data it gathers to open chances in predictive analytics for both its customers and its internal business processes. Predictive analytics can be used to improve customer service interactions, better maintain clients' equipment before an issue occurs, and save hundreds of thousands of dollars by spotting systems that are about to fail.

Predictive analytics can be used to improve customer service interactions, better maintain clients' equipment before an issue occurs, and save hundreds of thousands of dollars by spotting systems that are about to fail. In order for its systems to detect, for instance, that a U-verse set top box is rebooting in the middle of the night or is about to break, with big data, it is possible to predict when a problem might happen and reach out to the client in question before the service is negatively impacted.

4) What will be required of them as the Industrial Revolution 4.0 progresses, if they are to maintain a leadership role?

While many businesses are still having trouble managing Industry 4.0's complexity, certain companies, like AT&T, seemed to be "doing it right." We discovered that when sustaining a leadership position, a corporation may encounter several difficulties. The difficulties include being overly concerned with immediate outcomes, not properly comprehending Industry 4.0 technologies, and having too many technology options. Organizations must also take action to create or modify goods and services with societal effect in mind. The industry has to be inspired by the prospect of increased profits and expansion.

Finally, we state that leveraging well-defined strategic procedures and data to support decisions can provide businesses a competitive edge; businesses profit from taking a long-term perspective when investing in Industry 4.0 technology.

5) Is the firm helping support a global need and do you see them being successful?

According to our research, we can connect the industry to the global market with AT&T Business Solutions. We can utilize our global IP network and IT infrastructure, mobility, and application solutions to leverage the efficiency of IT infrastructure and applications that provide the global reach, scale, stability, security, and performance that businesses have come to expect from AT&T.

This methodology is effective because the company's products are continually improved to match the customers' shifting operational and business needs. The following are the characteristics demonstrating the company's performance in terms of global needs. More than 220 nations can be called from the US via the company. They are recognized as the top wireless provider for long-distance connections abroad. We may also be reached while traveling abroad using our regular wireless number. Moreover, they provide affordable international long-distance rates. As a result, the study concludes that the company is successfully addressing and promoting worldwide requirements.

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