**Data Analytics Capstone Topic Approval Form**

**Student Name:** Tyson Biegler

**Student ID:** 012170282

**Capstone Project Name:** Washington DC bike rental forecasting

**Project Topic**: Forecasting daily bike rentals in Washington DC using historical data and other external factors.

**This project does not involve human subjects research and is exempt from WGU IRB review.**

**Research Question:** How accurately can daily bike rental counts in Washington DC be forecasted using date, US holidays, temperature, and humidity?

**Hypothesis**: **Null hypothesis** – The previously mentioned regressors do not have a significant effect on the forecasting accuracy. **Alternate Hypothesis**- The previously mentioned regressors significantly improve the forecasting accuracy of bike rental data.

**Context:** According to *Fanaee-T (2013),* there are over 500 bike sharing programs around the world with over 500,000 bikes. Capital Bikeshare relies on accurate demand forecasting to optimize availability since Washington DC is the 12th most visited city in the country with an estimated 25.95 million tourists visiting in 2023 alone *(RoadGenius, 2024)*. Understanding the rental patterns and how they are affected by the weather, time of year, or events, can help the company allocate bikes efficiently.

**Data:** *Identify data you will need to collect that is relevant to the situation or question.*I will be using the data provided by the UCI Machine Learning Repository. However, *Fanaee-T (2013),* mentions in the data’s readme file that the data was compiled from 2 years of bike share data, publicly available at capitalbikeshare.com, and weather data collected from freemeteo.com.

The day.csv file contains 731 daily records of bike share rentals in Washington DC. The columns I will use include **dteday** (date in yyy-mm-dd format), **temp** (normalized temperature in Celsius), **hum** (normalized humidity), and **cnt** (count of total rentals).

This dataset is publicly accessible without third-party authorization. The full dataset can be found on the UCI Machine Learning Repository listed in the sources section.

*Note: If you are using restricted information, please have the Third-Party Authorization Form signed by an authorized agent on behalf of the data owner. The data owner’s legal name is required on the form.*

**Data Gathering:** The data was downloaded from the UCI Machine Learning Repository and loaded into R using the read\_csv() function.

**Data Analytics Tools and Techniques**: I will be completing this project in R (R 4.4.0) in RStudio (2024.09.1 Build 394). I will be using the following libraries: tidyverse, lubridate, and prophet.

I will use prophet to build a forecasting model with seasonality and the external regressors (temperature and humidity), and linear regression for model performance to compare the predicted and actual values.

**Justification of Tools/Techniques:** Meta’s prophet model is designed to be used on time series data and can easily incorporate the effects of the US holidays *(Crunching the Data, 2022)* that are included in the dataset

**Project Outcomes**: This project will include a prophet forecasting model that will be used to predict daily bike rentals over a 90-day period. This model will incorporate date, temperature, humidity, and US holidays to achieve an value over 80% when comparing the predicted and actual values. This project will also allow me to deliver practical actionable recommendations for optimizing the bike rental allocations throughout the year.

**Projected Project End Date**: This project will be completed by 5/31/2025

**Sources**:

Crunching the Data. (2022, December 11). *When to use Facebook Prophet*. <https://crunchingthedata.com/when-to-use-facebook-prophet/>

Fanaee-T, H. (2013). Bike Sharing [Dataset]. UCI Machine Learning Repository. <https://doi.org/10.24432/C5W894>.

RoadGenius. (2024, November 4). *Washington tourism statistics*. RoadGenius. <https://roadgenius.com/statistics/tourism/usa/washington/>

**Course Instructor Signature/Date:**

The research is exempt from an IRB Review.

An IRB approval is in place (provide proof in appendix B).

Course Instructor’s Approval Status: Approved

Date: Click here to enter a date.

Reviewed by:

Comments: Click here to enter text.