**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:** To what extent do temperature, humidity, and US holidays affect the forecasting accuracy of daily bike rental counts in Washington DC?

**Hypothesis**: **Null hypothesis** – Temperature, humidity, and US holidays statistically significantly affect the forecasting accuracy of the daily bike rentals in Washington DC. **Alternate Hypothesis**- Temperature, humidity, and US holidays do not significantly improve the forecasting accuracy of bike rentals in Washington DC.

**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:** 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.

**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 considering seasonality, US holidays and the external regressors (temperature and humidity).

**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 two prophet forecasting models that will be used to predict daily bike rentals over a 90-day period. The first model will serve as the baseline, using only historical rental counts. The second model will incorporate the US holidays, temperature, and humidity to potentially enhance the model. Lastly, a t-test will be used to compare the RMSE values of each model determining whether the extra variables are statistically significant. With this comparison, I can determine whether or not to reject the null hypothesis.

**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.