### Project Report: Maximizing Bicycle Utilization Across New York City Bridges

\*\*Business Problem\*\*

New York City aims to increase bicycle utilization across its bridges by leveraging weather data insights. By identifying patterns in bicycle usage based on weather conditions, the project seeks to inform transportation planning to encourage cycling as a sustainable and efficient commuting option.

---

\*\*Business Objective\*\*

\*\*Maximize Bicycle Utilization Across New York City Bridges\*\*

The goal is to boost the daily bicycle count crossing into and out of Manhattan by identifying optimal conditions and strategies that influence higher bicycle traffic.

---

\*\*Business Constraints\*\*

1. \*\*Minimize Operational Costs:\*\* Strategies should not incur substantial operational or maintenance costs for the bridges.

2. \*\*Consider Environmental Impact:\*\* All plans should align with sustainability goals, supporting the city’s environmental objectives.

3. \*\*Maximize Public Safety:\*\* Any implemented strategies should prioritize the safety of cyclists and pedestrians.

---

\*\*Success Criteria\*\*

1. \*\*Business Success Criteria:\*\* Attain at least a 20% increase in the average daily count of bicycles crossing these bridges within the next year.

2. \*\*Data Analysis Success Criteria:\*\* Build a predictive model with an accuracy of at least 90% for forecasting daily bicycle counts based on weather conditions and historical trends.

3. \*\*Economic Success Criteria:\*\* Enhance local business revenue by promoting increased bicycle usage, targeting a 10% rise in sales for businesses near the bridges due to increased foot and bicycle traffic.

---

### Data Collection

This dataset provides daily counts of bicycles crossing various East River bridges in New York City, along with associated weather information.

Key features include:

- \*\*Weather Variables:\*\* High and low temperatures.

- \*\*Bridge Counts:\*\* Daily bicycle counts for Brooklyn Bridge, Manhattan Bridge, Williamsburg Bridge, and Queensboro Bridge.

---

### Descriptive Analysis

#### Summary Statistics

| Feature | Count | Mean | Std Dev | Min | 25% | 50% | 75% | Max |

|--------------------|-------|---------|---------|-------|---------|---------|---------|--------|

| High Temp (°F) | 210 | 60.58 | 11.18 | 39.9 | 55.0 | 62.1 | 68.0 | 81.0 |

| Low Temp (°F) | 210 | 46.41 | 9.52 | 26.1 | 44.1 | 46.9 | 50.0 | 66.0 |

| Brooklyn Bridge | 210 | 2269.63 | 981.24 | 504 | 1447 | 2379.5 | 3147 | 3871 |

| Manhattan Bridge | 210 | 4049.53 | 1704.73 | 997 | 2617 | 4165 | 5309 | 6951 |

| Williamsburg Bridge| 210 | 4862.47 | 1814.04 | 1440 | 3282 | 5194 | 6030 | 7834 |

| Queensboro Bridge | 210 | 3352.87 | 1099.25 | 1306 | 2457 | 3477 | 4192 | 5032 |

| Total | 210 | 14534.5 | 5569.17 | 4335 | 9596 | 15292.5 | 18315 | 23318 |

#### Skewness and Kurtosis

- \*\*Skewness:\*\* The dataset exhibits slight negative skewness across most features, indicating that values are fairly symmetrical but slightly skewed toward lower counts.

- \*\*Kurtosis:\*\* Most features display negative kurtosis, suggesting a distribution that is flatter than normal, with a lower probability of extreme values.

| Feature | Skewness | Kurtosis |

|----------------------|------------|-------------|

| High Temp (°F) | -0.175504 | -0.800185 |

| Low Temp (°F) | -0.037792 | -0.052755 |

| Brooklyn Bridge | -0.315446 | -0.999362 |

| Manhattan Bridge | -0.108822 | -0.899696 |

| Williamsburg Bridge | -0.258221 | -0.828972 |

| Queensboro Bridge | -0.291826 | -0.947052 |

---

### Modeling Techniques and Results

Predictive modeling focused on capturing the correlation between weather conditions and daily bicycle counts.

1. \*\*Regression Analysis:\*\* Developed a model to forecast bicycle counts based on high and low temperatures.

2. \*\*Decision Tree Model:\*\* Trained to capture nonlinear relationships between temperature and bicycle counts on each bridge.

---

### Insights and Conclusion

- \*\*Temperature Impact:\*\* Warmer days saw significantly higher bicycle counts, suggesting a strong positive correlation between temperature and bridge traffic.

- \*\*Seasonal Usage Patterns:\*\* Bicycle counts varied seasonally, with peak usage in late spring and summer, providing insights for seasonal planning and resource allocation.

### Economic Contribution

Promoting cycling near the bridge areas may increase foot traffic and potential revenue for local businesses. Enhanced cycling infrastructure based on weather data can further support this economic benefit by increasing the accessibility of bridge areas for commuters and tourists alike.