**Seoul Bike Rental Prediction: A Machine Learning Approach**

1. **Introduction**

This project aims to predict bike rental demand in Seoul using machine learning to optimize bike-sharing operations and improve user experience. We use a public dataset with weather, time, and holiday data.

1. **Methodology**

* Data Preprocessing: Handling missing values, encoding categorical variables, scaling features, and addressing outliers.
* EDA: Analyzing data distributions, correlations, and trends.
* Feature Engineering: Creating new features like time categories, weekend/weekday, and interaction terms.
* Model Selection: Evaluating Linear Regression, Random Forest, XGBoost, and SVR using R-squared and RMSE.
* Hyperparameter Tuning: Optimizing the best model using GridSearchCV.

1. **Results and Recommendations**

* XGBoost was the most accurate model (R-squared: 0.866, RMSE: 58,223).
* Random Forest also performed well (R-squared: 0.852, RMSE: 61,834).
* Important features: temperature, hour, season, humidity, solar radiation.

**4.Recommendations for Bike-Sharing Operators**

1. Focus on areas with high predicted rentals during peak hours and warmer months.
2. Adjust pricing based on real-time demand and weather.
3. Proactively manage fleet size.

**5.Conclusion**

This project demonstrates the potential of machine learning for predicting bike rental demand, helping to optimize bike-sharing programs and improve urban mobility.