

# Kaggle Project Oral Presentation

## Predicting Cyclist Traffic in Paris

Raphael Guenoun & Roy Bensimon



## **SOMMAIRE**

I.  
**PROJECT  
PRESENTATION**

---

p. 3

II.  
**EDA AND DATA  
PROCESSING**

---

p. 4-8

III.  
**MODEL SELECTION**

---

p. 9

IV.  
**EVALUATION OF THE  
FINAL MODEL**

---

p. 10

V.  
**FUTURE RESEARCH**

---

p. 11

VI.  
**CONCLUSION**

---

p. 12

## **PROJECT PRESENTATION**

---

- GOAL: Accurately predict hourly cyclist traffic using temporal and external data across 56 counters in Paris.
- Performance Metric: Root Mean Square Error (RMSE), chosen for its ability to measure prediction accuracy by penalizing larger errors more heavily.
- Data Preparation: Handled 496,827 entries with no missing values
- Timeframe:
  - Training data: September 1, 2020 - September 9, 2021
  - Public Test data: September 10, 2021 - October 18, 2021

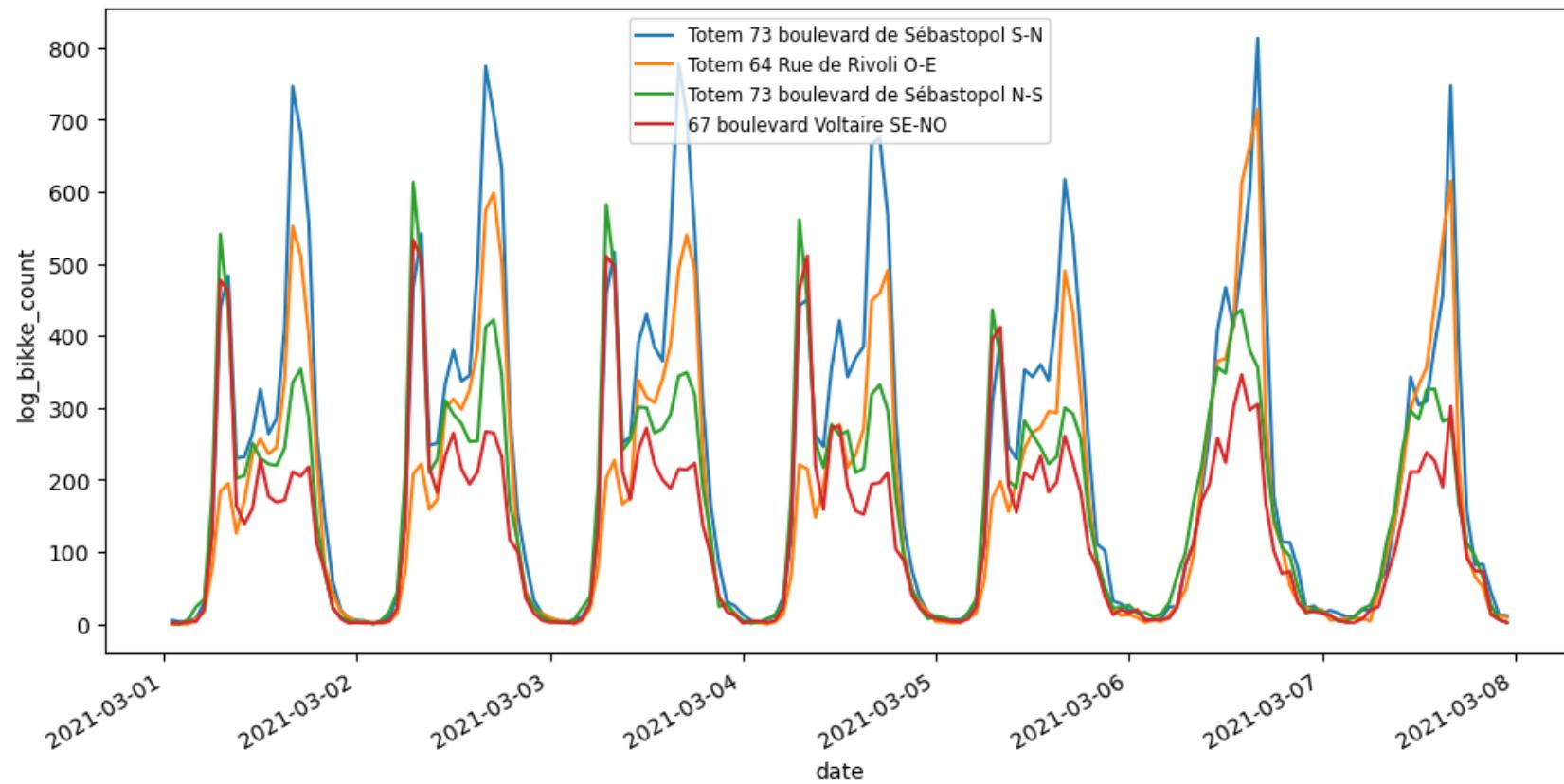
## ENCODING OF THE DATA

One-Hot	Cyclical Encoding	Standard Scaler	Target Encoder	Interaction Column
Counter Name Years Weekday	Hours Days Months	All Numerical Columns	Counter Name	Hour x Month

- **One-Hot Encoding:** Maintains the unique identity of categorical variables like `counter_name` without implying any order.
- **Cyclical Encoding:** Captures the periodic nature of temporal variables such as `hour` and `month` for better modeling.
- **Standard Scaling:** Ensures all numerical features have a consistent scale, improving model convergence.
- **Target Encoding:** Highlights the average impact of each counter on `log_bike_count`, leveraging its predictive power.

## ENCODING OF THE DATA

The **cyclical** character of days and hours



## External Dataset

### Handling Numerical Features

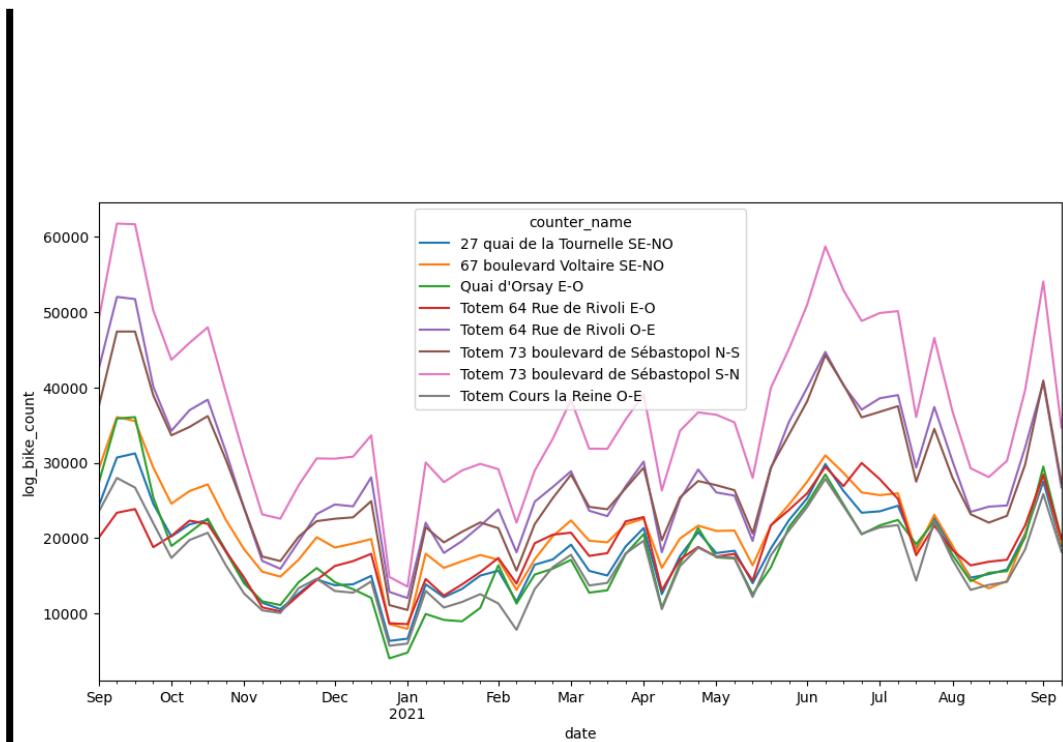
*Addressed missing or irrelevant values by:*

- Eliminating features with over **10% missing data**.
- Filling remaining gaps using the **median** to minimize outlier impact.
- Removing columns containing **single constant values**.

### Incorporating Boolean Indicators

*Added key event-related features to capture patterns:*

- *Holiday*
- *Bank Holiday*
- *Quarantine periods*
- *Christmas Holidays*



Bike count trends showing a dip during the Christmas period.

## Exploratory Data Analysis

Plot showing the relationship between features and bike count

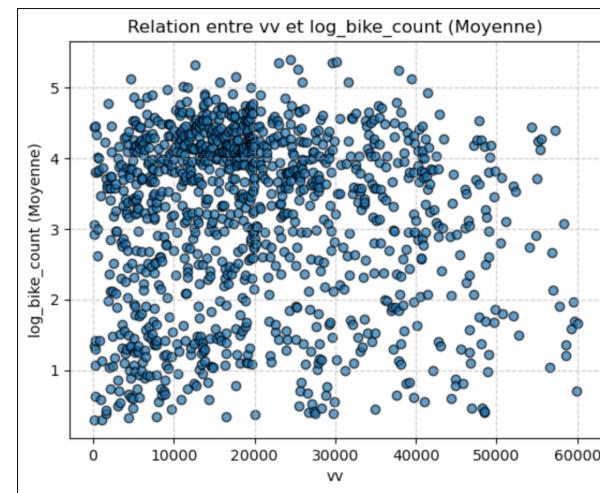
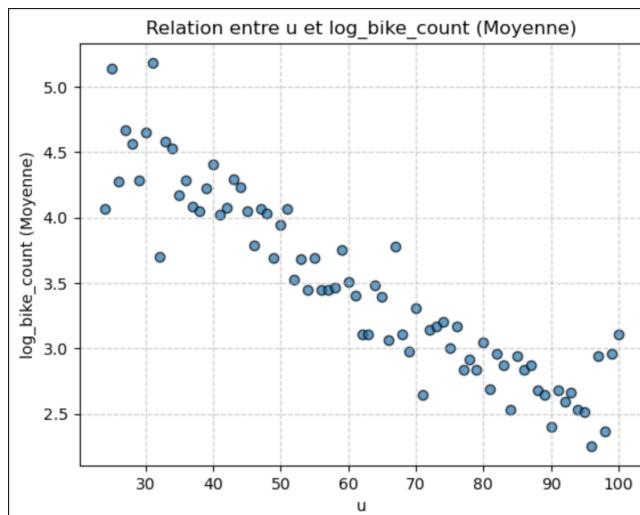
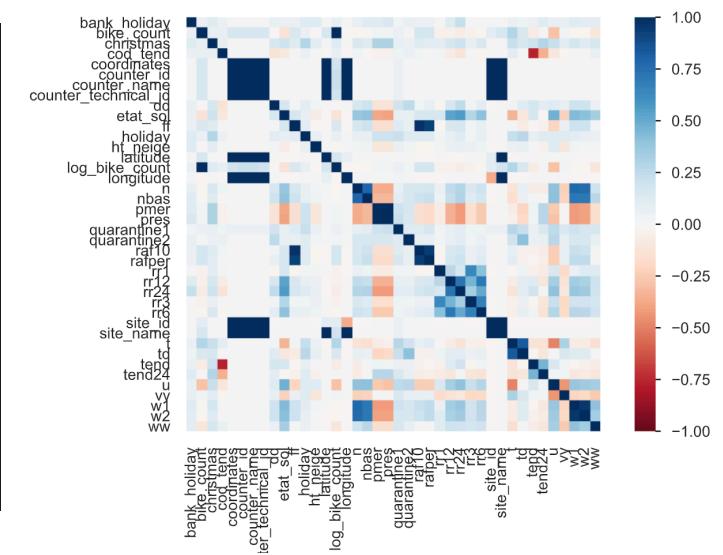


Chart displaying the correlation among variables.



This analysis establishes a baseline understanding of the relationships between variables, enabling the identification of key predictors to be included in the final model.

## MODEL SELECTION

---

### **Models Tested:**

- Linear Regression
- Random Forest
- XGBoost (final choice)

### **Evaluation Metric:**

Root Mean Square Error (RMSE)

### **XGBoost Hyperparameter Tuning:**

- learning\_rate
- max\_depth
- n\_estimators
- subsample using GridSearchCV.

---

### **Final Model:**

XGBoost: Selected for its superior performance and ability to capture non-linear relationships effectively.

MODELS	RMSE BEFORE TUNING	RMSE BEFORE TUNING
LINEAR REGRESSION	1.25	-
RANDOM FOREST	0.85	0.75
XGBOOST	0.68	0.66

## Model Selection

Submission and Description

Private Score (i)

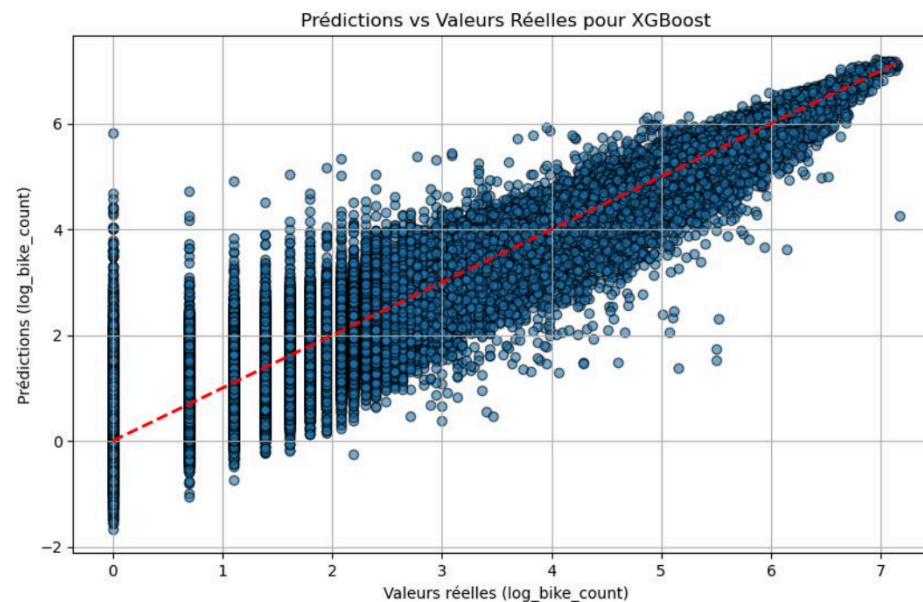
Public Score (i)

	Submission and Description	Private Score	Public Score	
<input checked="" type="checkbox"/>	<b>submission_Ridge.csv</b> Complete · Raphael Guenoun · 8d ago · Ridge_before_tunning	<b>1.0368</b>	<b>1.0426</b>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<b>submission_RandomForest.csv</b> Complete · Raphael Guenoun · 8d ago · random_forest_before_tunning	<b>0.7676</b>	<b>0.7841</b>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<b>submission_XGBoost.csv</b> Complete · Raphael Guenoun · 8d ago · XG_boost_before_tuning	<b>0.6783</b>	<b>0.6942</b>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<b>submission2_XGBoost_Grid.csv</b> Complete · Raphael Guenoun · 8d ago	<b>0.6611</b>	<b>0.6745</b>	<input type="checkbox"/>

## EVALUATION OF THE FINAL MODEL

Our final best result on Kaggle:

	<b>submission2_XGBoost_Grid.csv</b>	<b>0.6611</b>	<b>0.6745</b>	<input type="checkbox"/>
Complete · Raphael Guenoun · 8d ago				



Scatter Plot of Actual vs Predicted Log Bike Counts

## FUTURE RESEARCH

---

### **Investigating outliers with unusually low or high bike counts**

Examine causes like road closures, weather anomalies, or data collection errors.

### **Integrating additional external data sources**

Include metrics such as traffic density, air quality, or public transportation usage to enhance model accuracy.

### **Adopting advanced time-series models**

Explore LSTMs and GRUs to better capture temporal dependencies in bike usage trends.

### **Implementing counter-specific models**

Tailor predictions by training individual models for each counter to address location-specific patterns.

Thank you for your attention