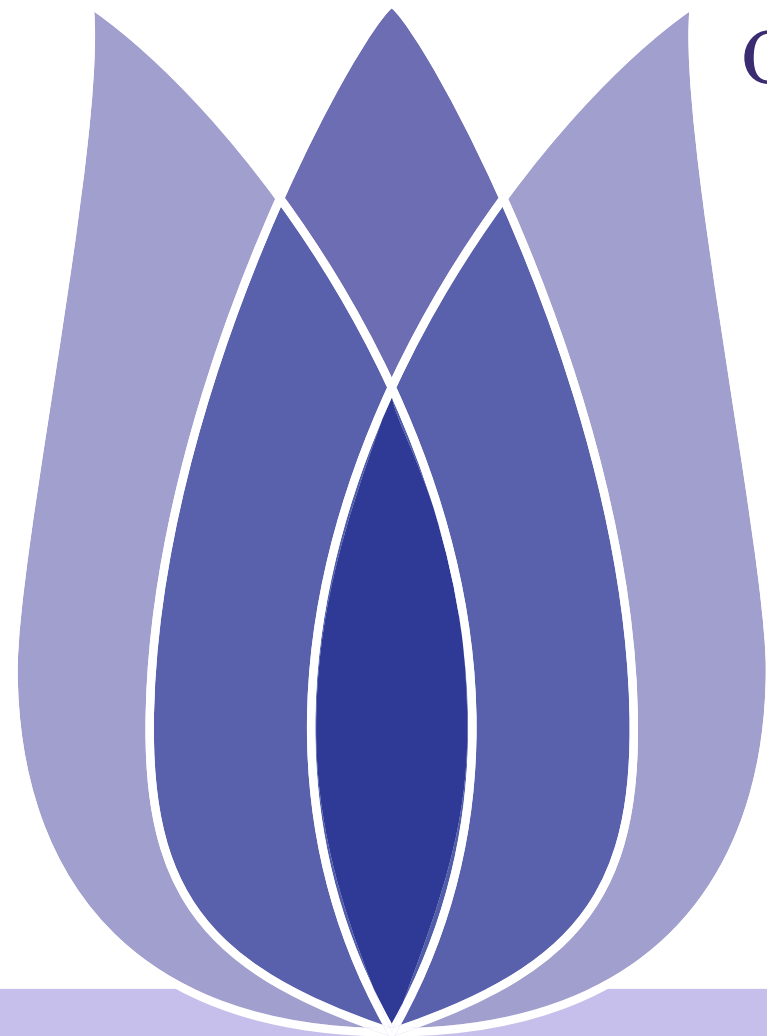


Bike Sharing Demand

YAO YANG

Chongqing University of Posts and Telecommunications test

July 23, 2023





Overview

Problem Definition

Data Clean

Knowledge Discovery

Model Solution

Problem Definition

Bike Sharing Demand

Data Clean

Data Describe

Data Visualization Plot

Knowledge Discovery

Variable Relationship Discovery

Target Variable Analysis

Fill In Zero Values

Model Solution

Model Building

Model Fusion Stacking

Final prediction result



Problem Definition

Bike Sharing Demand

Data Clean

Knowledge Discovery

Model Solution

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Knowledge Discovery

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Defn

The goal of this project is to forecast bike rental demand given the input feature like the duration of travel, departure location, arrival location, and time elapsed.

Evaluation metrics: RMSLE (Root Mean Squard Logarithmic Error) is required to evaluate the model.

$$RMSLE = \sqrt{\frac{1}{n} \sum_{i=1}^n [\log(p_i + 1) - \log(a_i + 1)]^2}$$

n is the number of test set samples, pi is the test value, and ai is the actual value. When the root mean square error is smaller, it means that the fitting effect of the data is better and the test value is closer to the actual value.



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[Problem Definition](#)

[Data Clean](#)

[Data Describe](#)

[Data Visualization Plot](#)

[Knowledge Discovery](#)

[Model Solution](#)

Data Clean



- [Problem Definition](#)
- [Data Clean](#)
- [Data Describe](#)
- [Data Visualization Plot](#)
- [Knowledge Discovery](#)
- [Model Solution](#)

Defn

You are provided hourly rental data spanning two years. For this competition, the training set is comprised of the first 19 days of each month, while the test set is the 20th to the end of the month. You must predict the total count of bikes rented during each hour covered by the test set, using only information available prior to the rental period.

- **train.csv** It contains a training set of target variables.
- **test.csv** It does not contain a training set of target variables.
- **sampleSubmission.csv** It is a properly formatted sample submission file.



Data Describe

Problem Definition

Data Clean

Data Describe

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Knowledge Discovery

Model Solution

- **datetime** - hourly date + timestamp
- **season** - 1 = spring, 2 = summer, 3 = fall, 4 = winter
- **holiday** - whether the day is considered a holiday
- **workingday** - whether the day is neither a weekend nor holiday
- **weather** - 1: Clear, Few clouds, Partly cloudy, Partly cloudy
2: Mist + Cloudy, Mist + Broken clouds, Mist + Few clouds, Mist
3: Light Snow, Light Rain + Thunderstorm + Scattered clouds, Light Rain + Scattered clouds
4: Heavy Rain + Ice Pallets + Thunderstorm + Mist, Snow + Fog
- **temp** - temperature in Celsius
- **atemp** - "feels like" temperature in Celsius
- **humidity** - relative humidity
- **windspeed** - wind speed
- **casual** - number of non-registered user rentals initiated
- **registered** - number of registered user rentals initiated
- **count** - number of total rentals



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Data Describe

- Problem Definition
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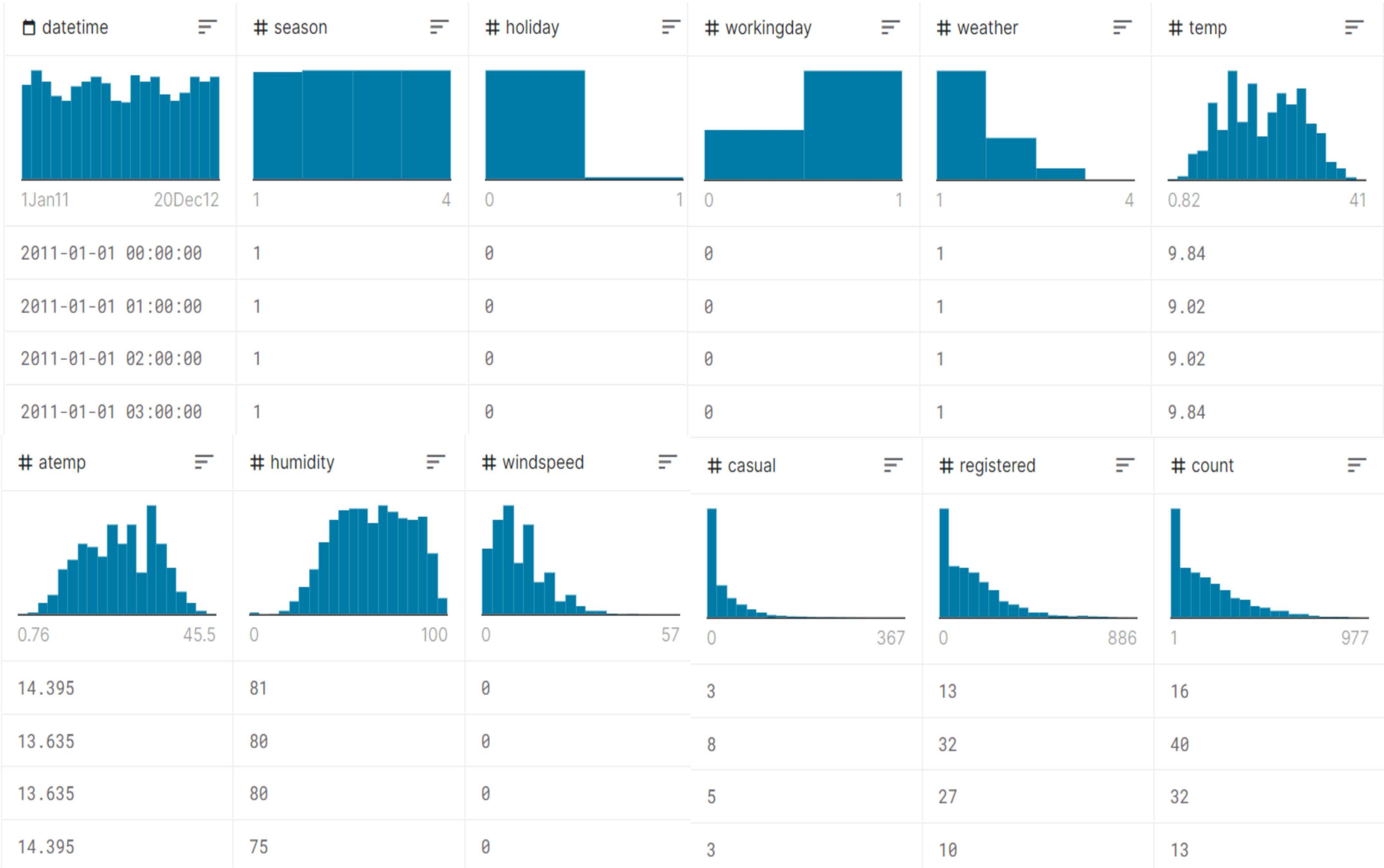


Figure 1: Describe



Data Visualization Plot

- Problem Definition
- Data Clean
- Data Describe
- Data Visualization Plot**
- Knowledge Discovery
- Model Solution

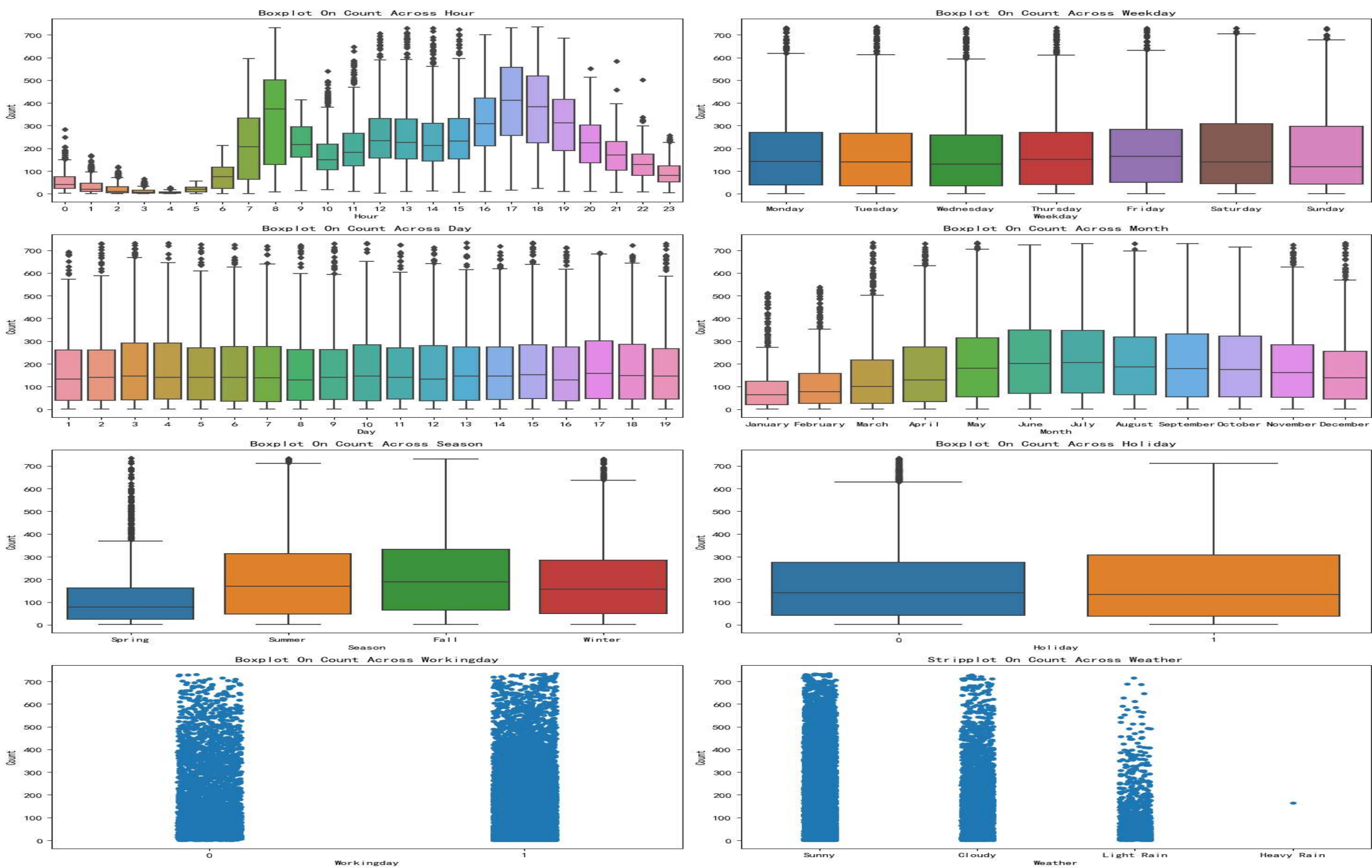


Figure 2: Box Plot and Scatter Plot



Data Visualization Plot

- Problem Definition
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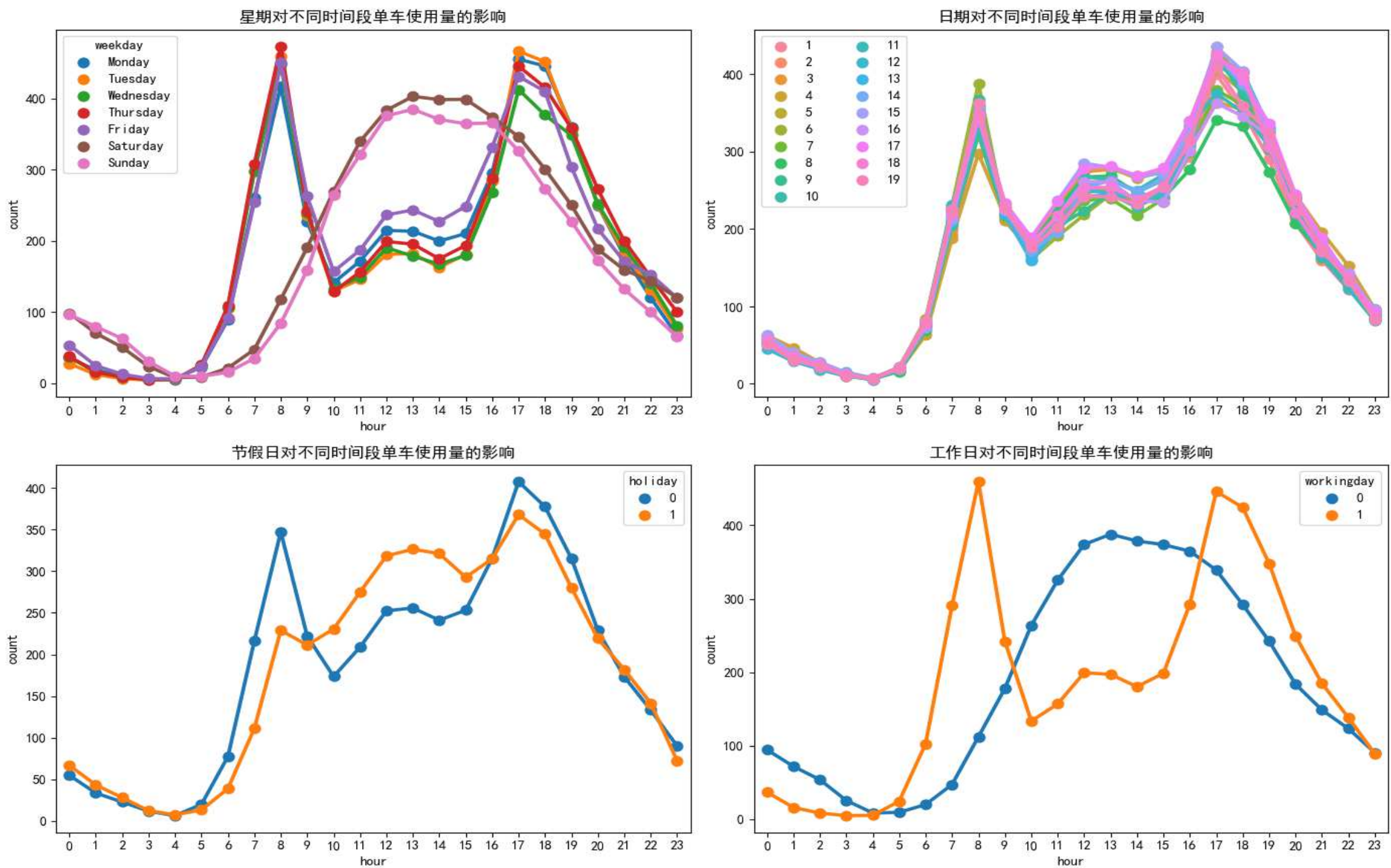


Figure 3: Line Chart



Data Visualization Plot

- Problem Definition
- Data Clean
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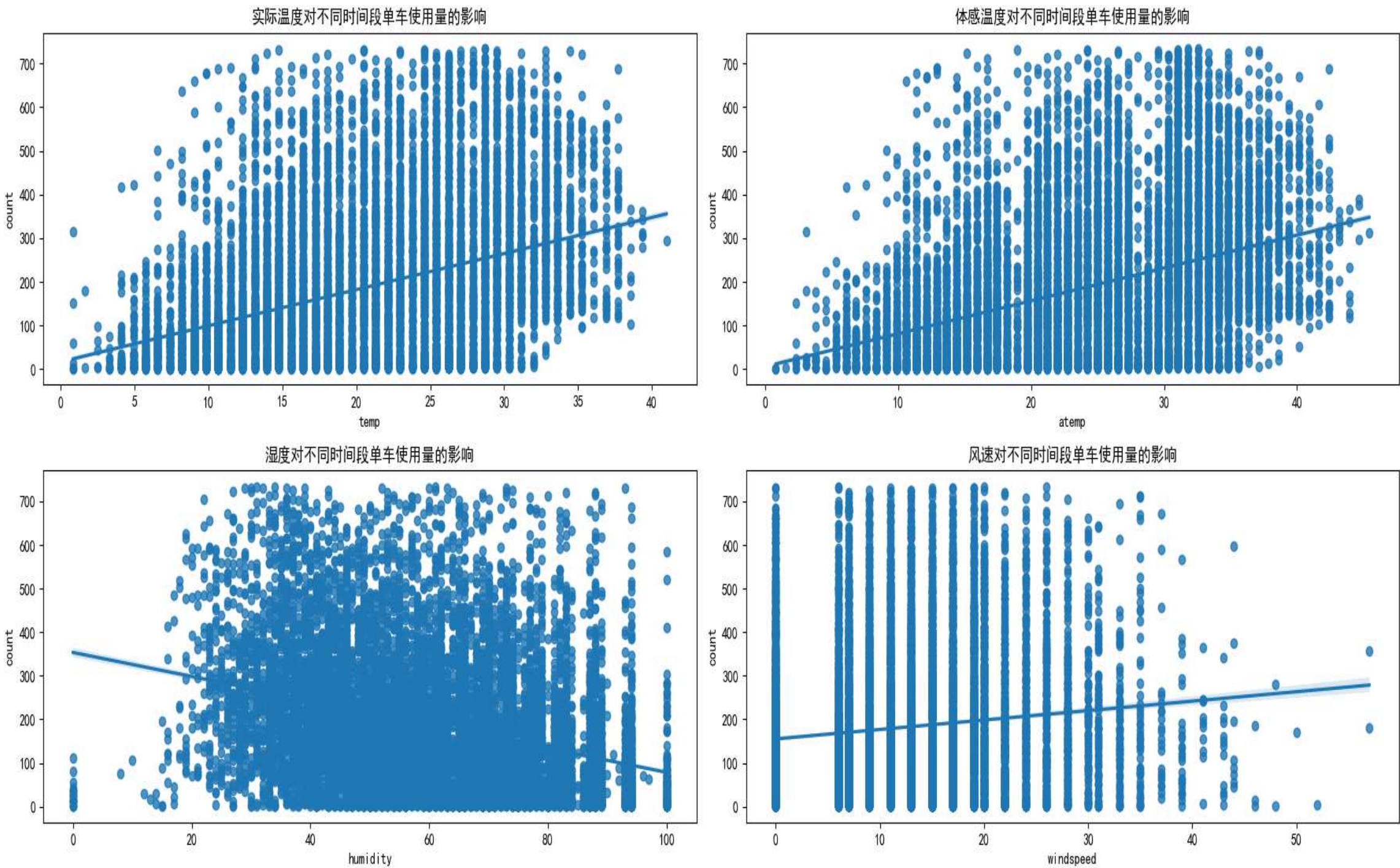


Figure 4: Scatter Plot



Data Visualization Plot

- Problem Definition
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- Data Visualization Plot**
- Knowledge Discovery
- Model Solution

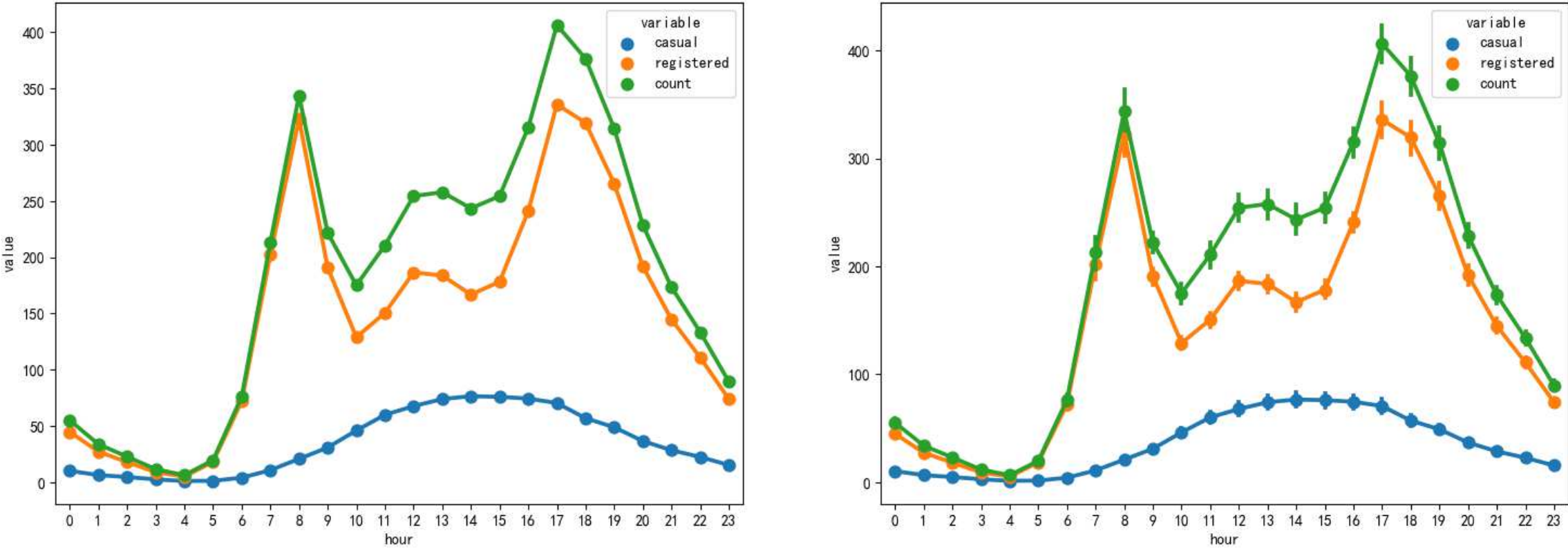


Figure 5: Line Chart



Problem Definition

Data Clean

Knowledge Discovery

Variable Relationship Discovery

Target Variable Analysis

Fill In Zero Values

Model Solution

Knowledge Discovery



Variable Relationship Discovery

- Problem Definition
- Data Clean
- Knowledge Discovery
- Variable Relationship Discovery**
- Target Variable Analysis
- Fill In Zero Values
- Model Solution

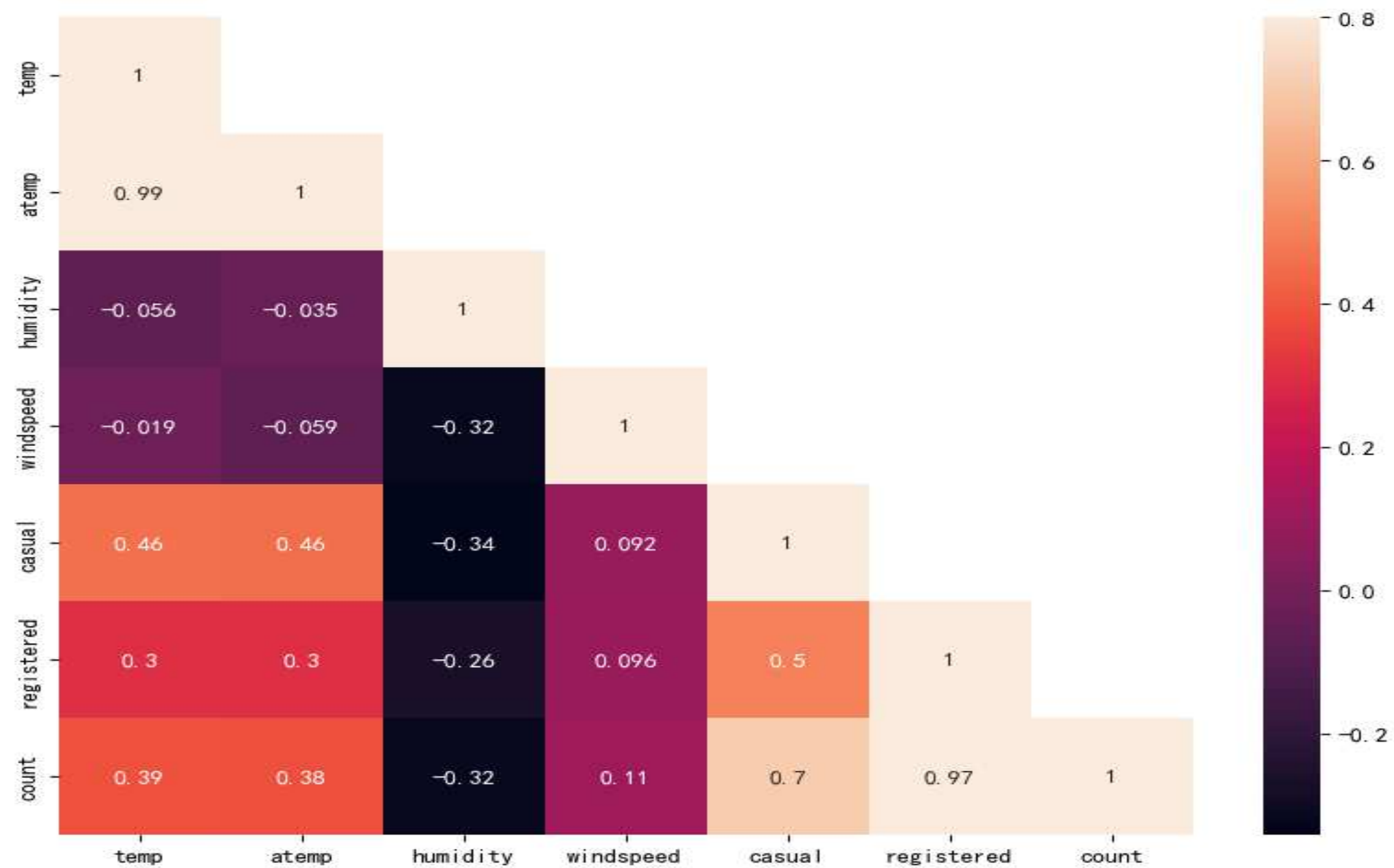


Figure 6: Hot Map



Target Variable Analysis

- Problem Definition
- Data Clean
- Knowledge Discovery
- Variable Relationship Discovery
- Target Variable Analysis**
- Fill In Zero Values
- Model Solution

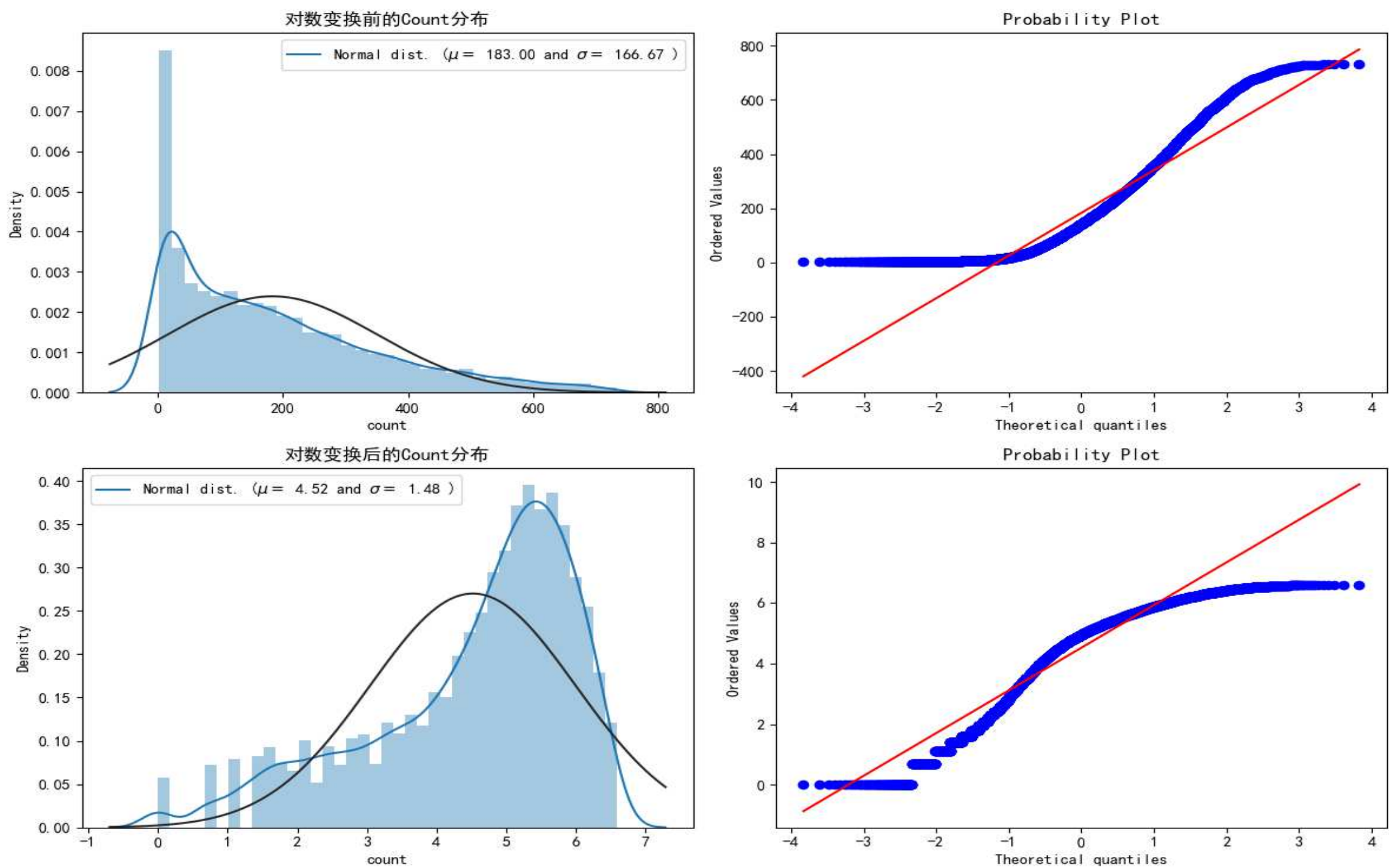


Figure 7: Variable Conversions



Fill In Zero Values

- Problem Definition
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- Target Variable Analysis
- Fill In Zero Values**
- Model Solution

The random forest model will be used to fill the zero values in the windspeed feature.

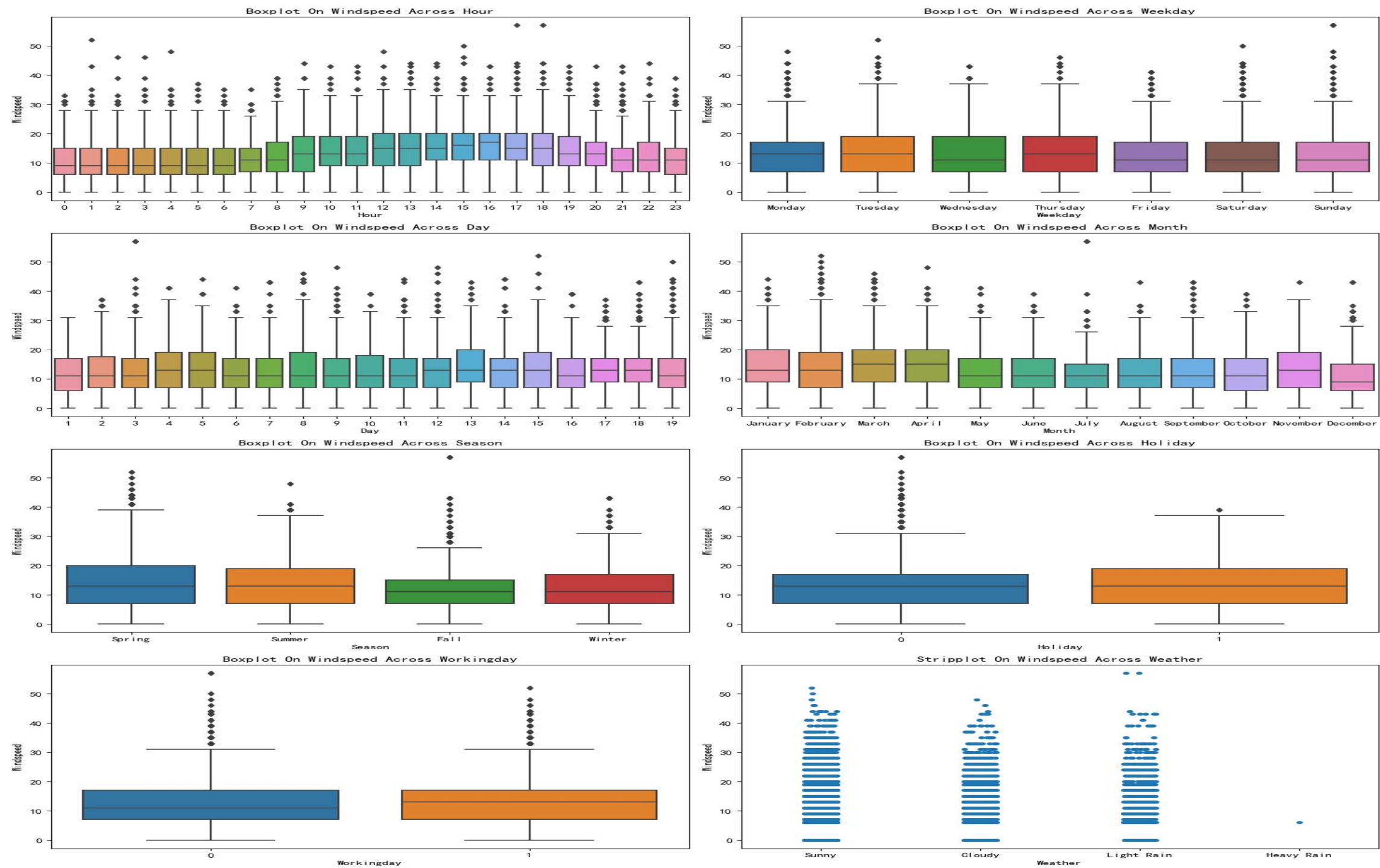


Figure 8: Relationship Between Features and Windspeed



Problem Definition

Data Clean

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Model Solution

Model Building

Model Fusion Stacking

Final prediction result

Model Solution



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- Knowledge Discovery
- Model Solution
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Summary of RMSLE scores for the 16 models:

	Model	RMSLE
15	LightGBM	0.316161
11	RandomForestRegressor	0.375379
10	BaggingRegressor	0.394187
14	XGBoost	0.422559
13	GBRT	0.435759
8	DecisionTreeRegressor	0.523695
9	ExtraTreeRegressor	0.554145
12	AdaBoostRegressor	0.697286
4	KernelRidge Regression	0.813210
7	KNN	0.864965
6	SVR	1.045943
5	ElasticNet Regression	1.053736
3	Ridge Regression	1.053749
2	Lasso Regression	1.054156
0	Linear Regression	1.054414
1	Logistic Regression	1.127804

Figure 9: RMSLE Scores



Model Fusion Stacking

- [Problem Definition](#)
- [Data Clean](#)
- [Knowledge Discovery](#)
- [Model Solution](#)
- [Model Building](#)
- [Model Fusion Stacking](#)
- [Final prediction result](#)

RMSLE For Stacking: 0.3144



Final prediction result

- Problem Definition
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Result

The best two models Stacking and LightGBM are weighted and the final prediction is saved.

- Model: Stacking*0.6+LightGBM*0.4
- Score: 0.50413
- Rank: 1741/3243