Bike Share Demand Forecasting Methods

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Contents

1 Introduction

Bike rentals where the customer can pick up and drop off a bike at their leisure at several locations has become popular. This dataset outlines attributes related to the travel of customers. Data gathered by the rental companies includes things like the date, temperature, count of users, humidity and more. The collection of attributes has the potential to assist researchers in developing an understanding of the mobility in a city.

2 Data Analysis

Column Name	Type	Description
1. datetime	Character	YYYY-MM-DD HH24 (example: 2011-01-01 04:00:00)
2. season	Integer	(1-4)
3. holiday	Integer	(0 or 1)
4. workingday	Integer	(0 or 1)
5. weather	Integer	(1-4)
6. temp	Float	temperature in Celsius
7. atemp	Float	"feels like" temperature in Celsius
8. humidity	Integer	relative humidity
9. windspeed	Float	wind speed
10. **casual**	Integer	count of casual users
11. **registered**	Integer	count of registered users
12. **count**	Integer	count of total users (*primary response variable*)

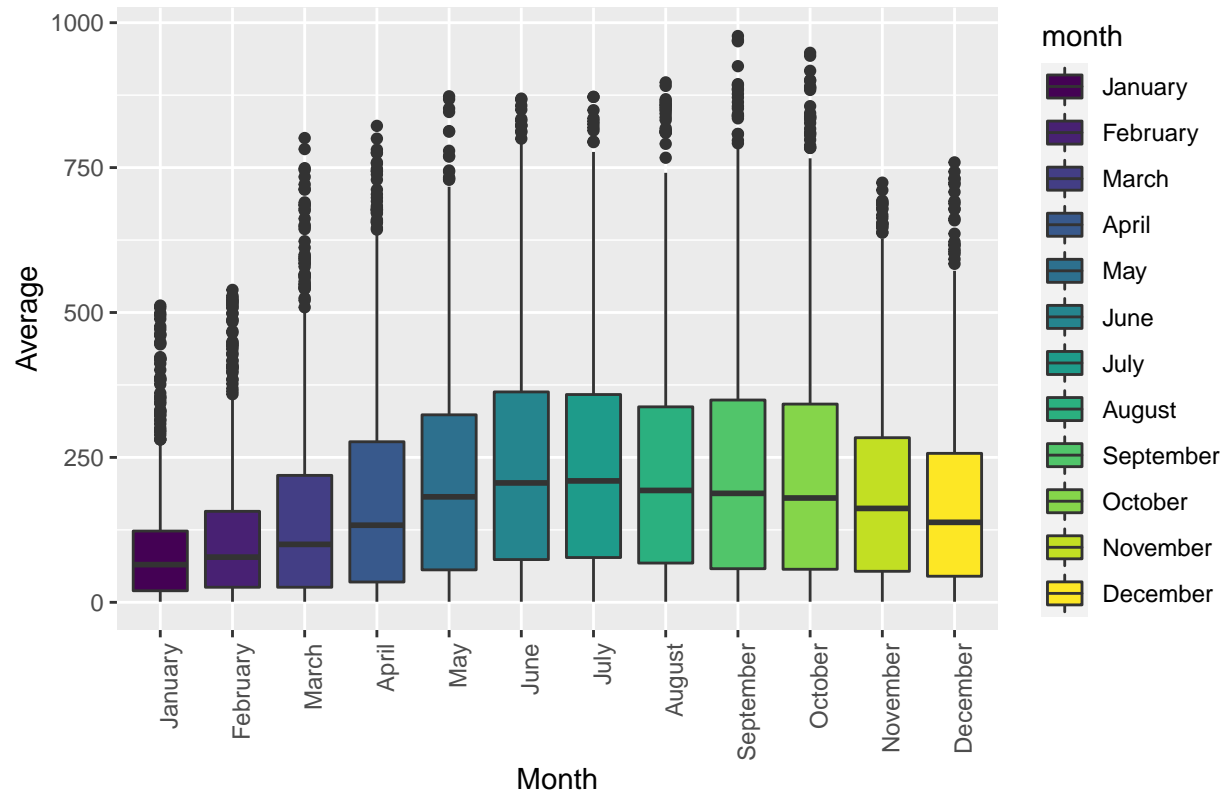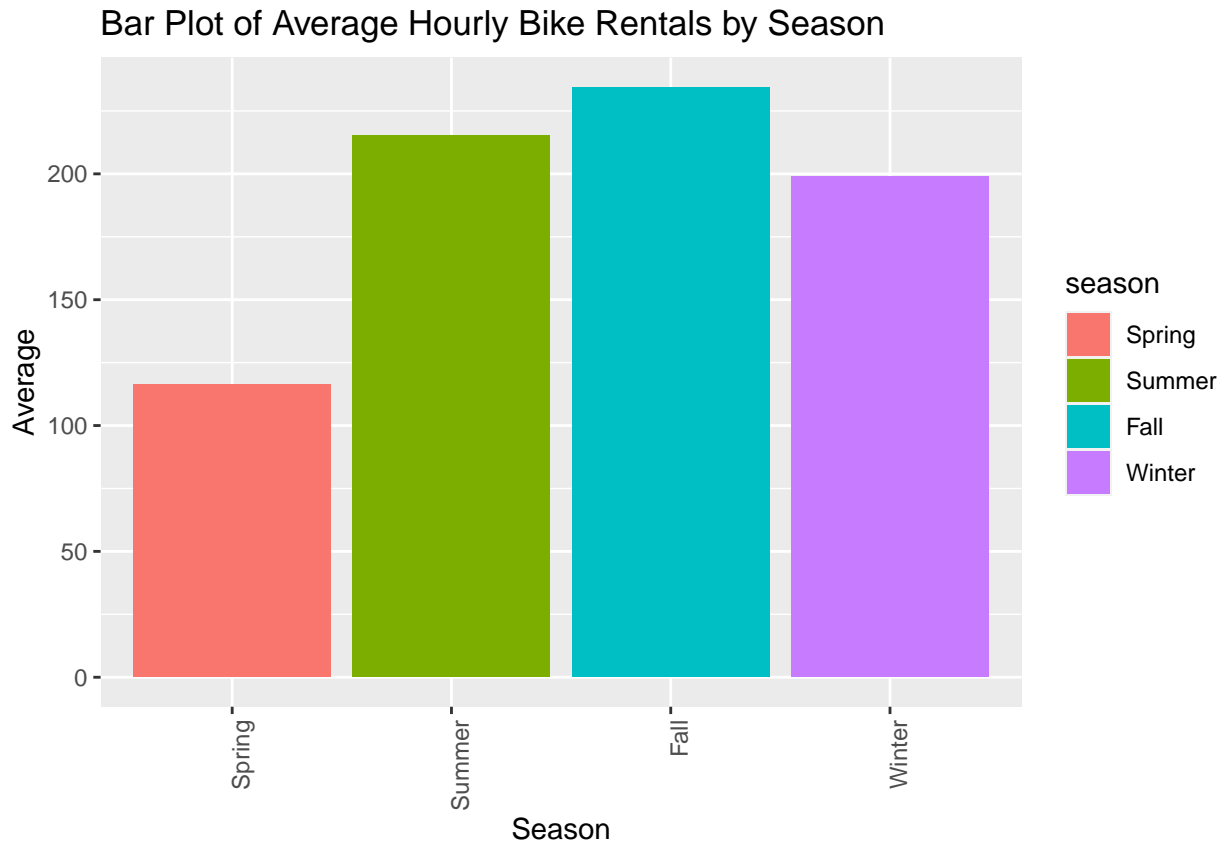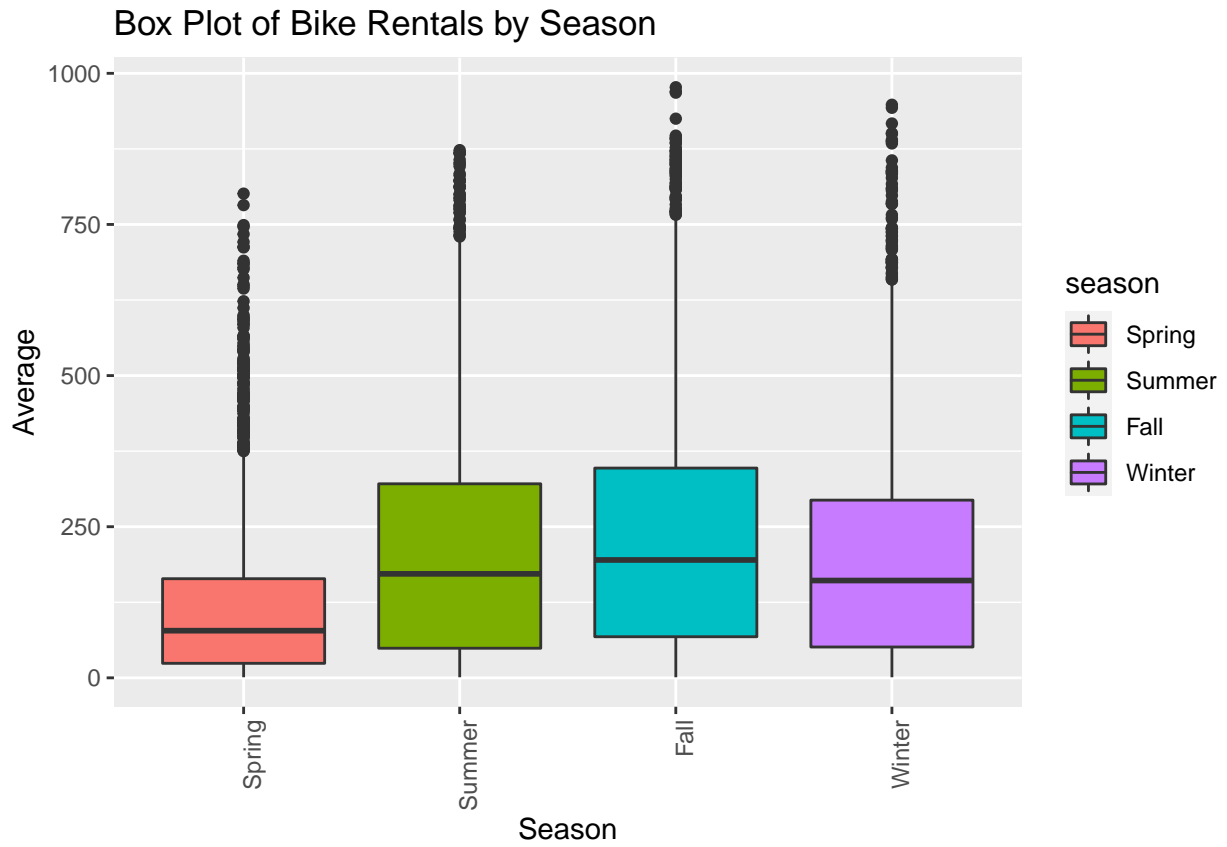## Histogram of Hourly Bike Count
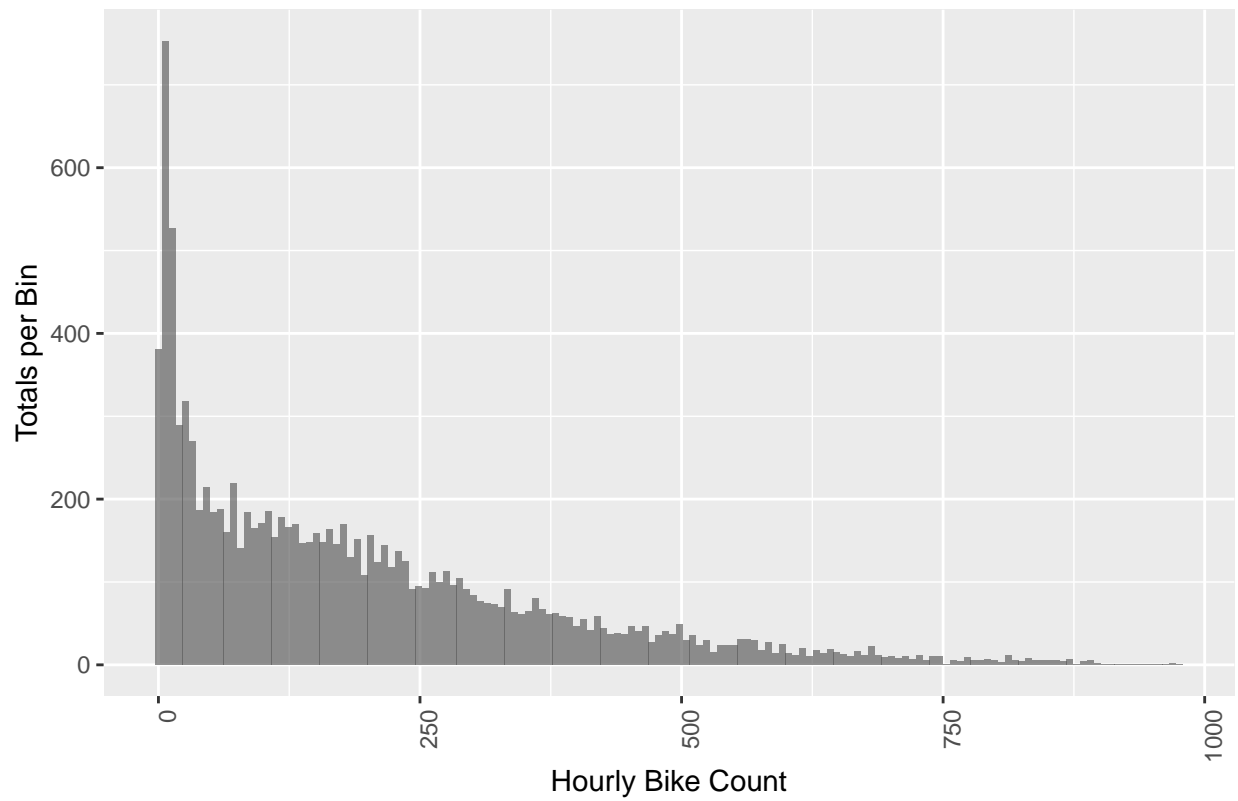
Var1	Freq
Min.	1.0000
1st Qu.	42.0000
Median	145.0000
Mean	191.5741
3rd Qu.	284.0000
Max.	977.0000

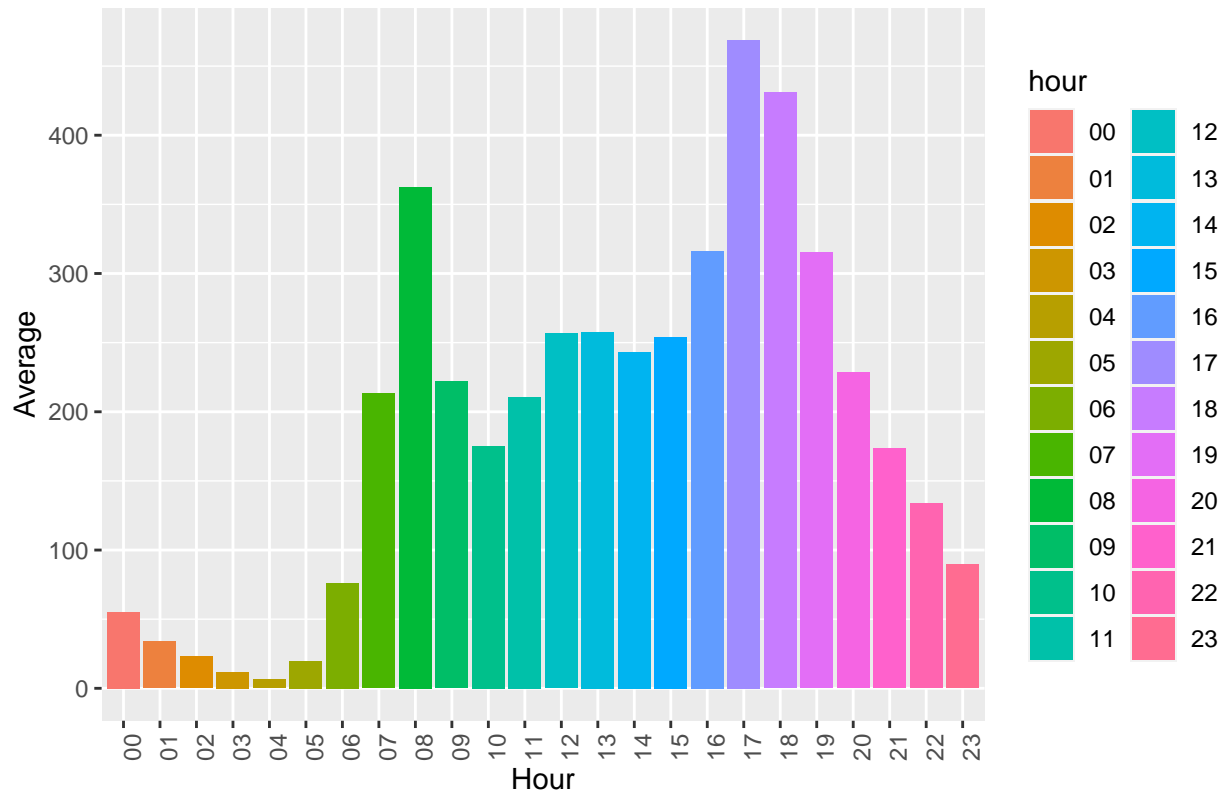Bar Plot of Average Hourly Bike Rentals by Month
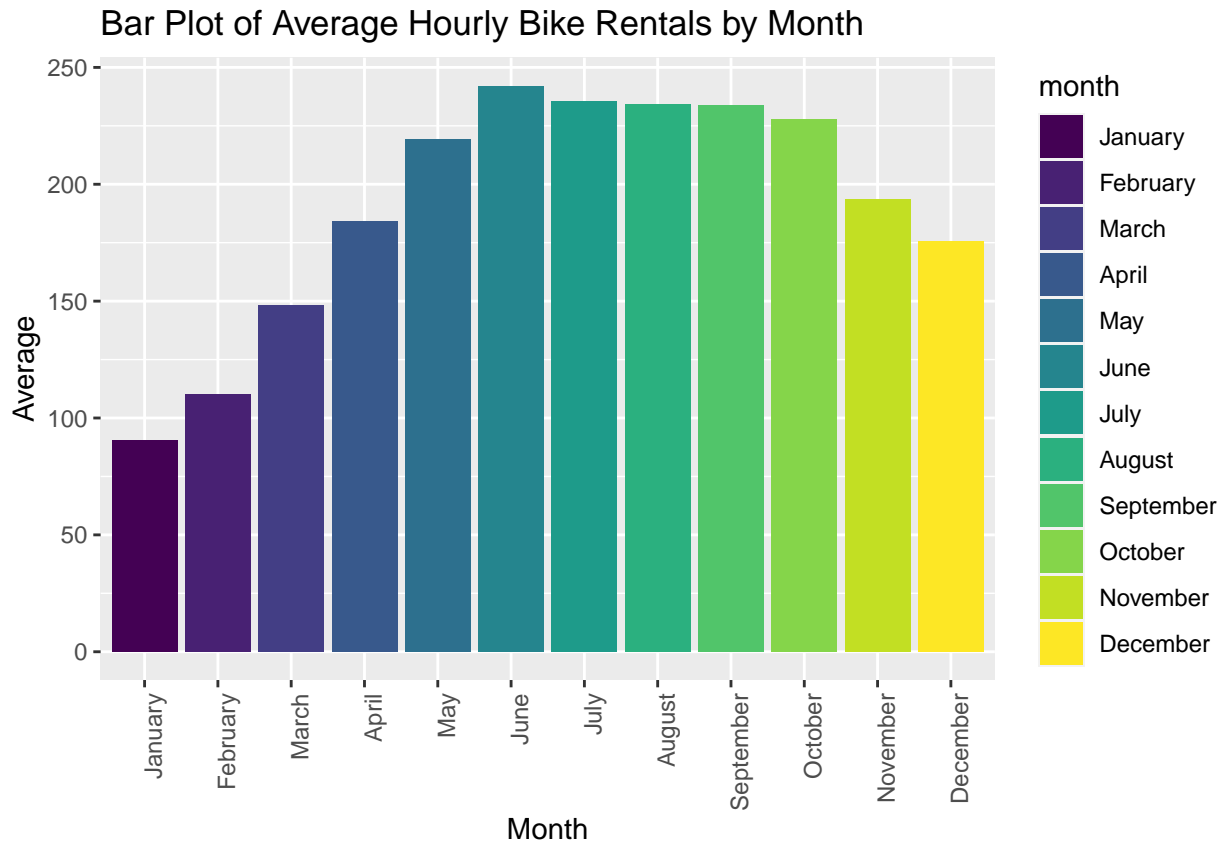
Box Plot of Bike Rentals by Month

Bar Plot of Average Hourly Bike Rentals by Season
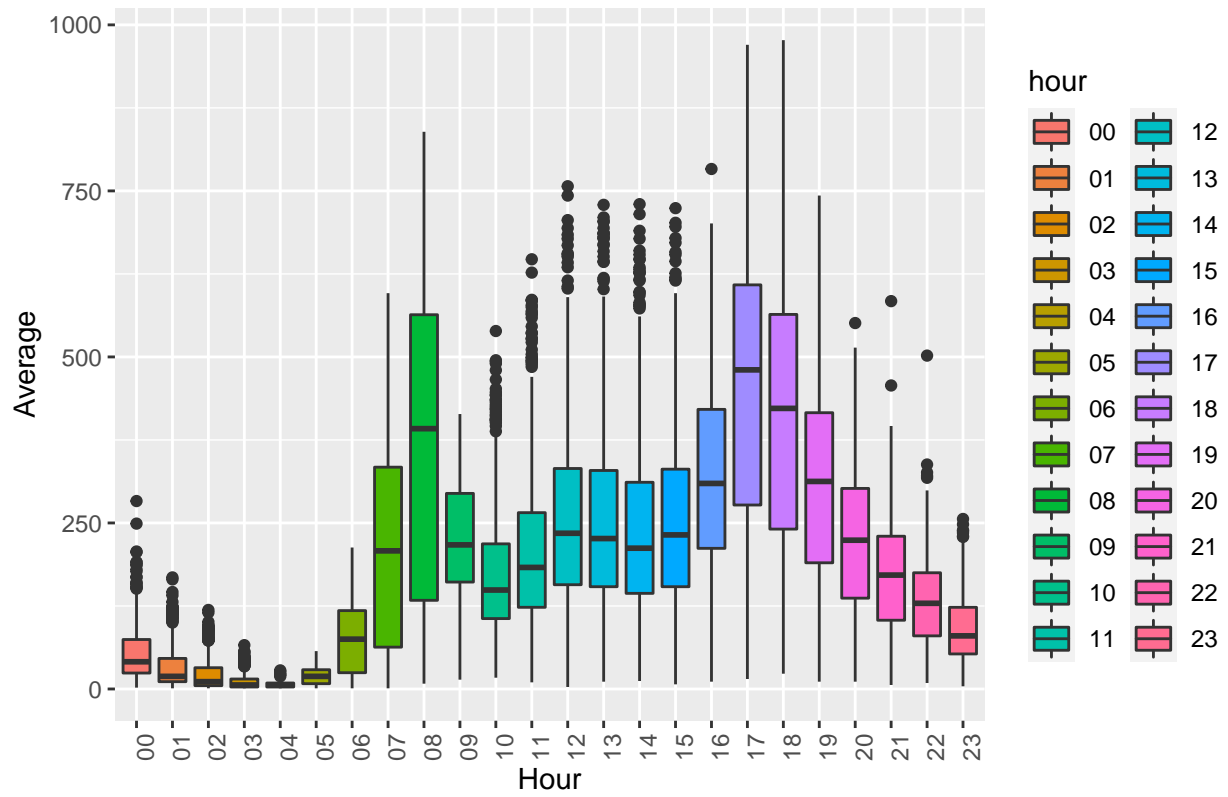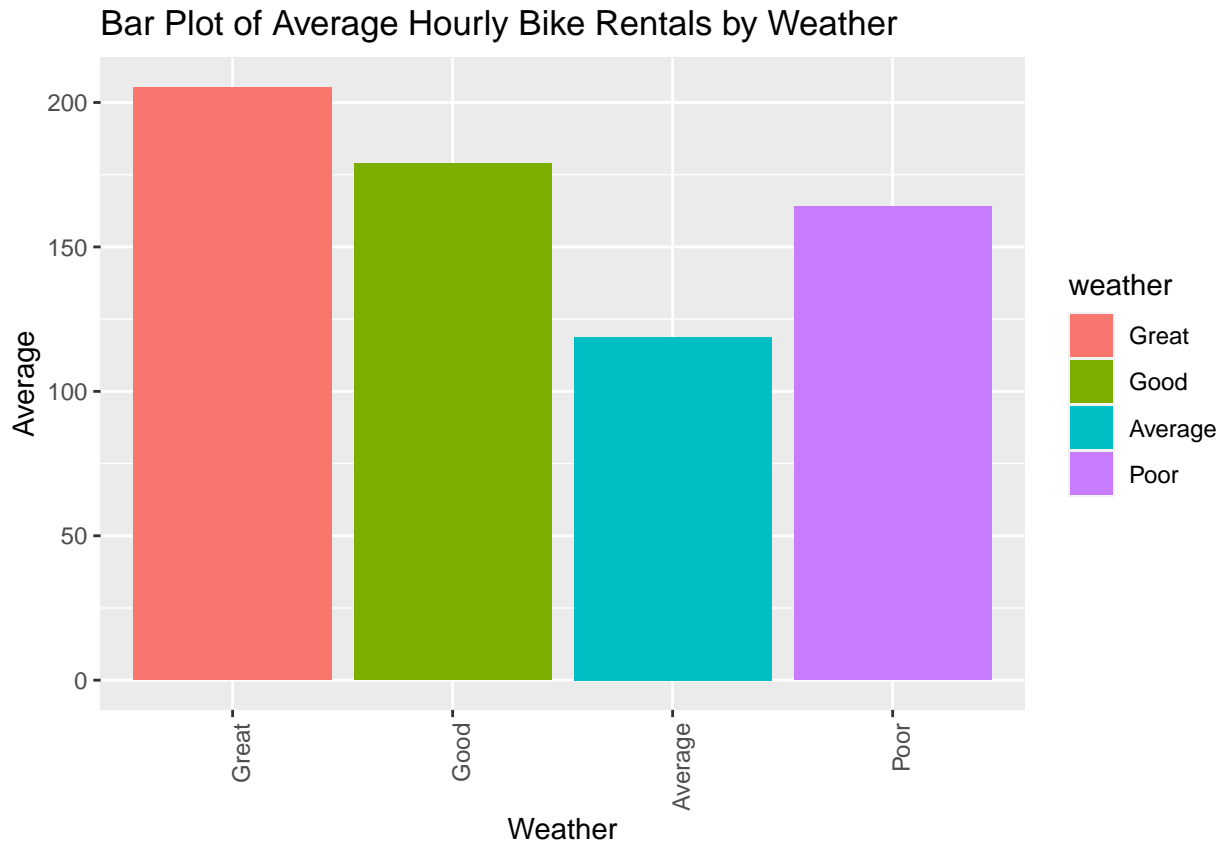
Box Plot of Bike Rentals by Season

Bar Plot of Average Bike Rentals by Hour
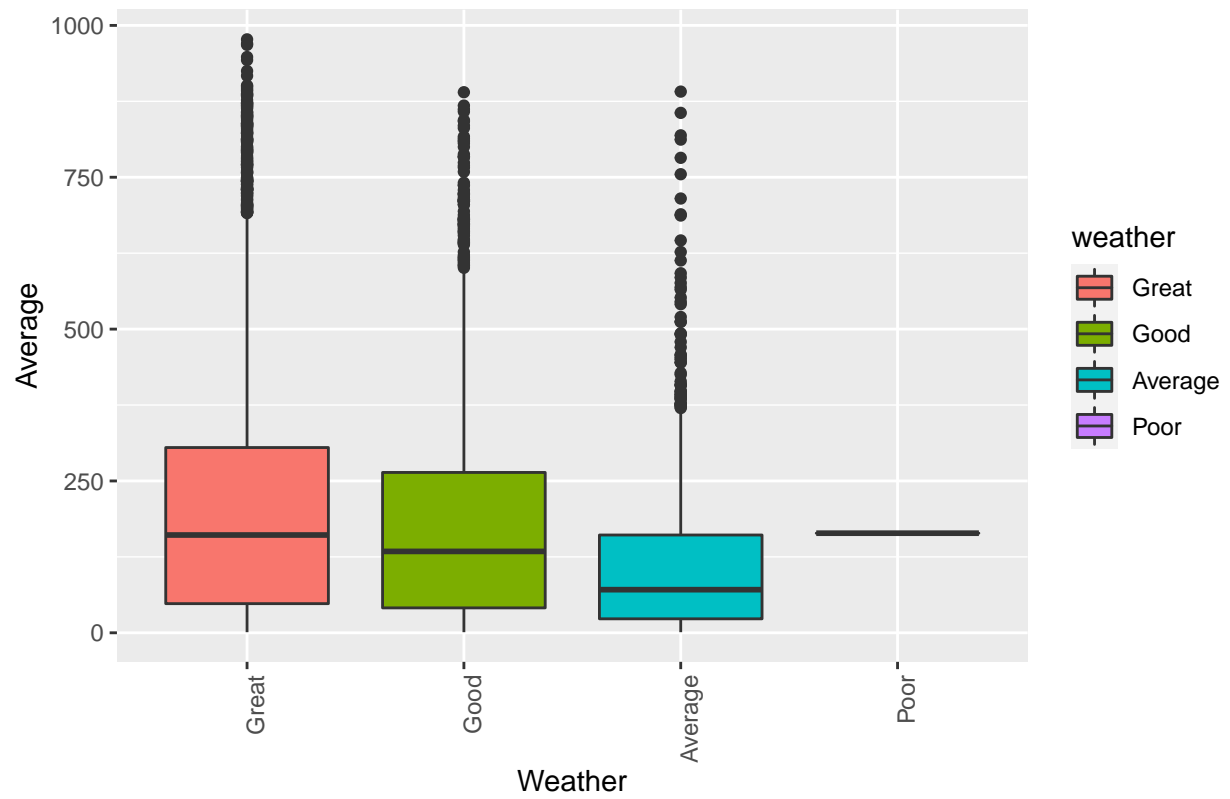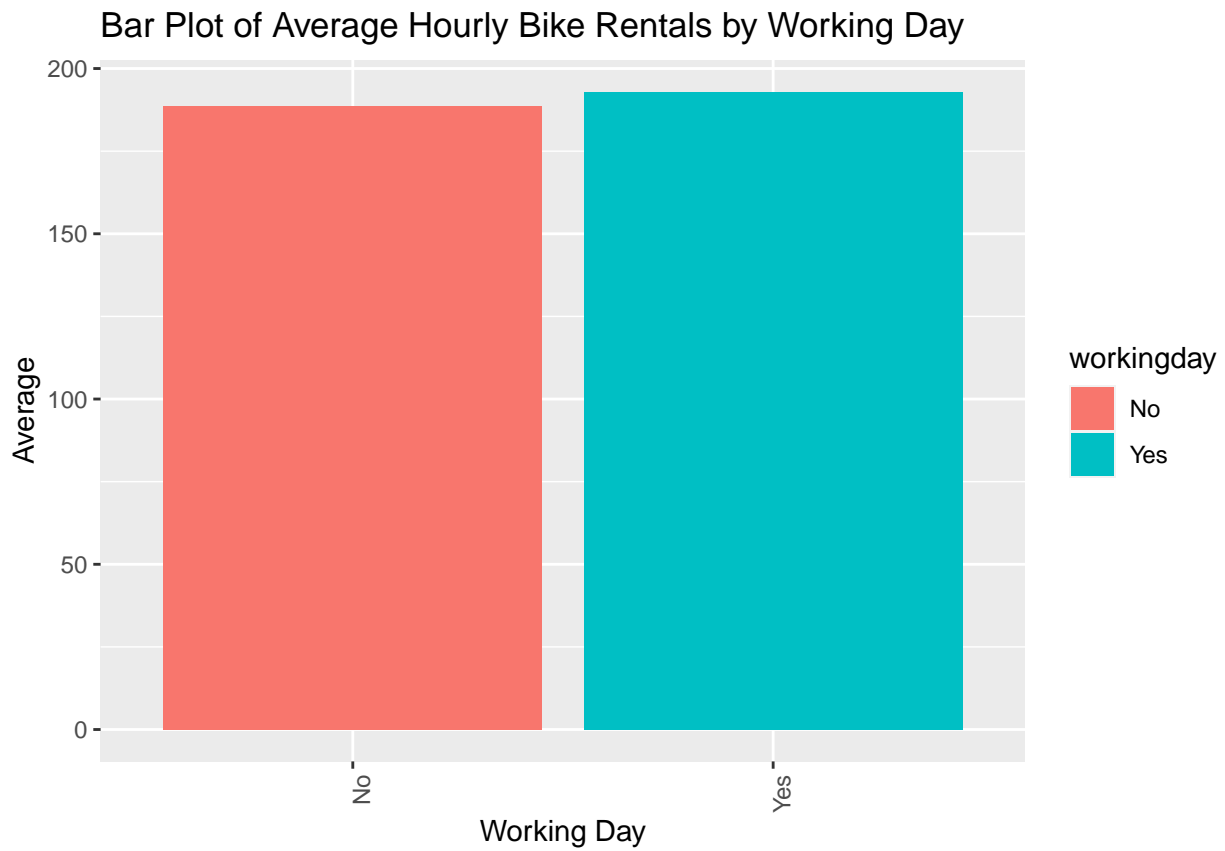
Box Plot of Bike Rentals by Hour

Bar Plot of Average Hourly Bike Rentals by Weather

Box Plot of Bike Rentals by Weather
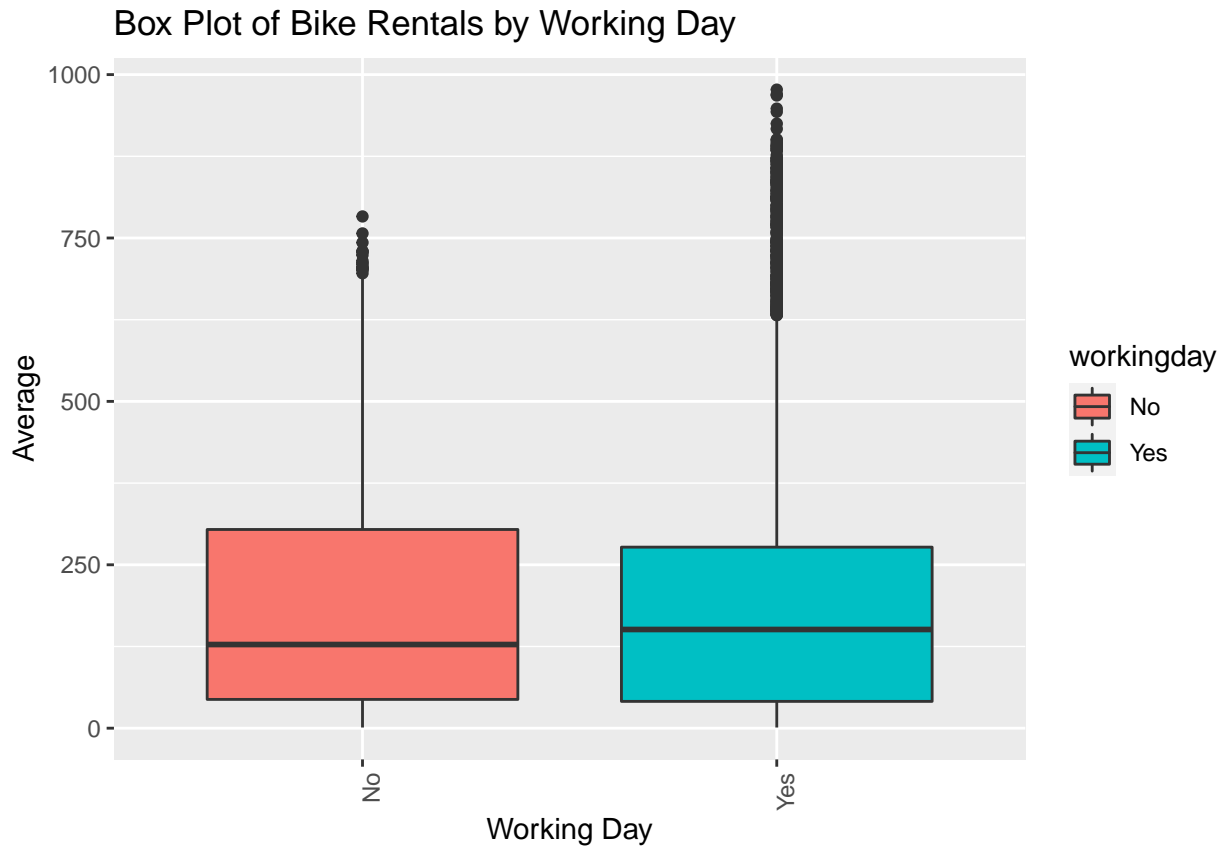
Bar Plot of Average Hourly Bike Rentals by Working Day

Box Plot of Bike Rentals by Working Day

Bar Plot of Average Hourly Bike Rentals by Holiday
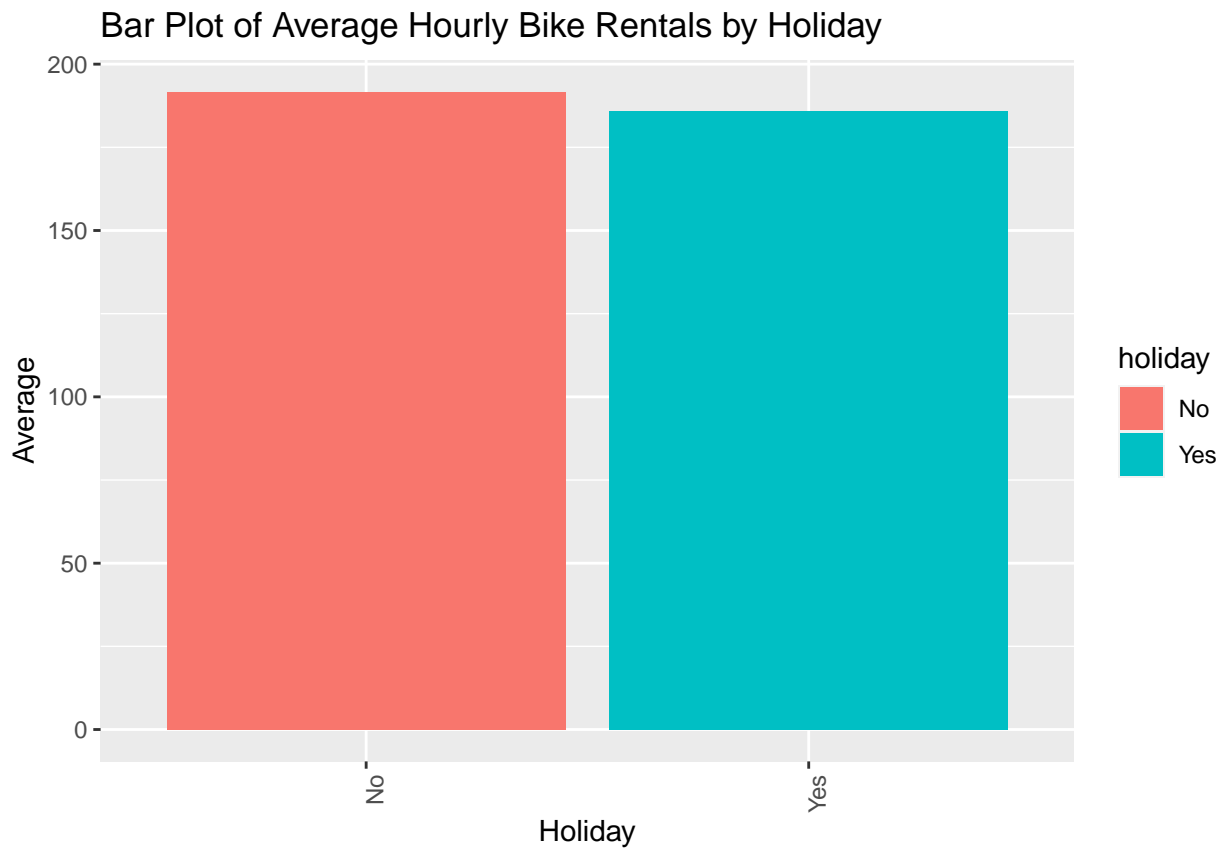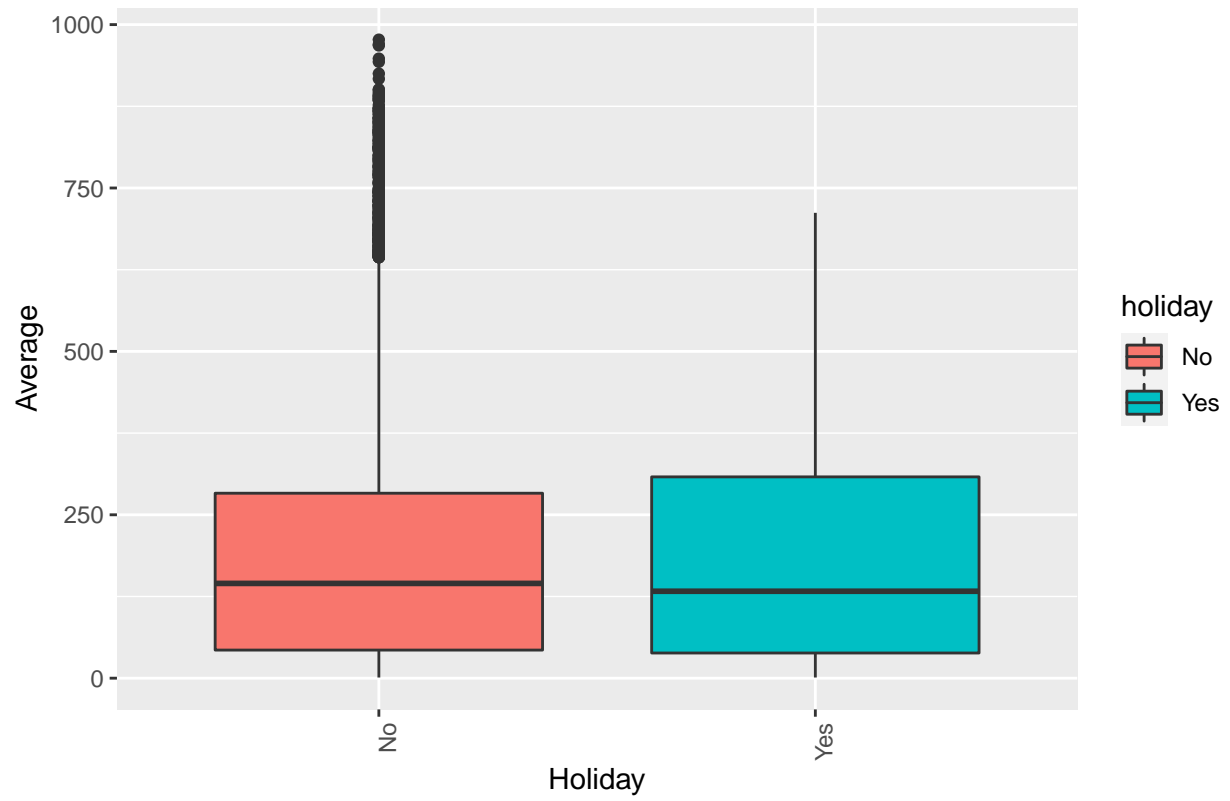
Box Plot of Bike Rentals by Holiday

```
## Warning: 'guides(<scale> = FALSE)' is deprecated. Please use 'guides(<scale> =
## "none")' instead.
```
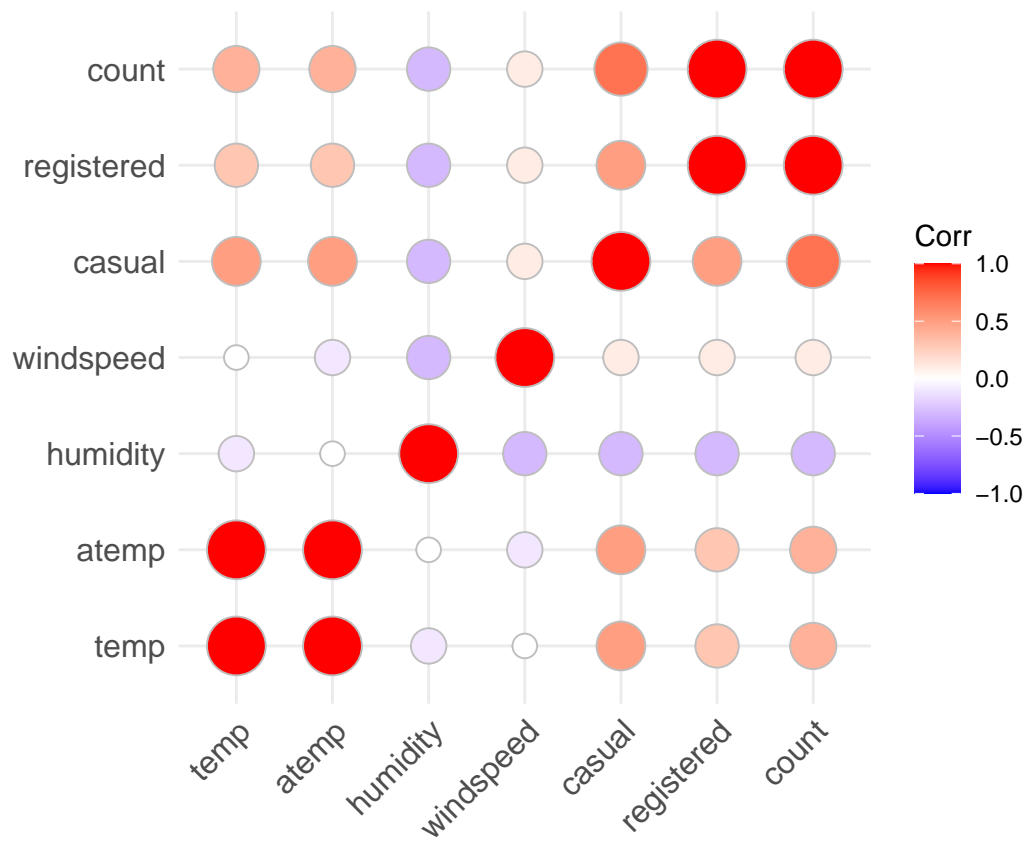
Line Chart of Counts by Tempurature
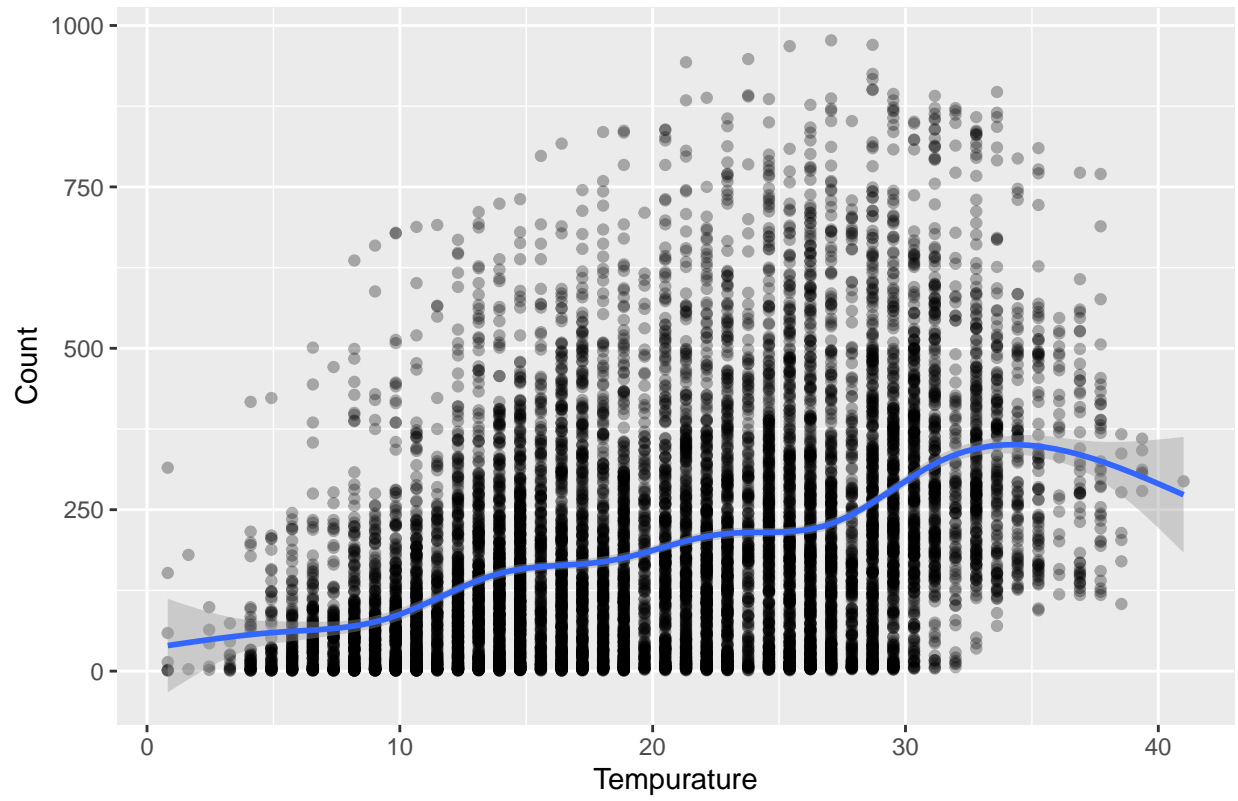
Line Chart of Counts by 'Feels Like' Tempurature
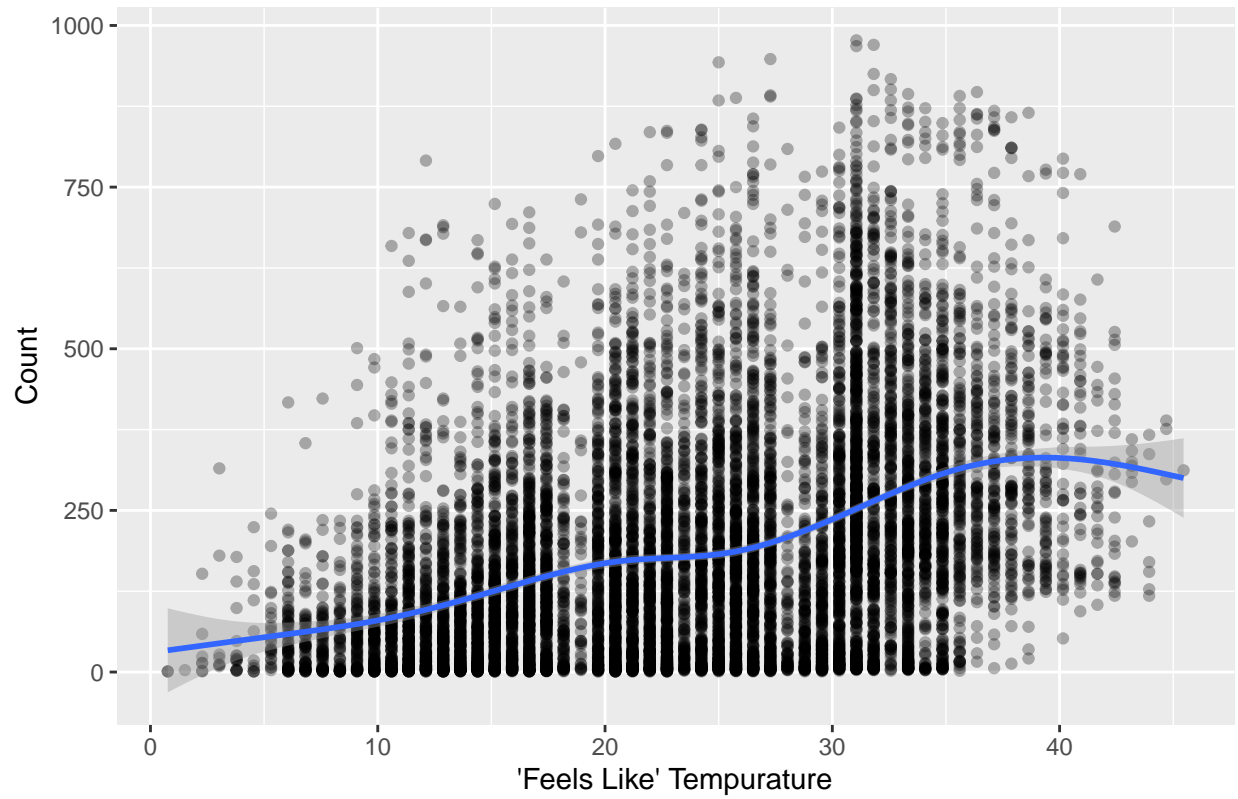
Line Chart of Counts by Wind Speed

Line Chart of Counts by Humidity

Hourly Rental Trends for June 1st – June 19th, 2012
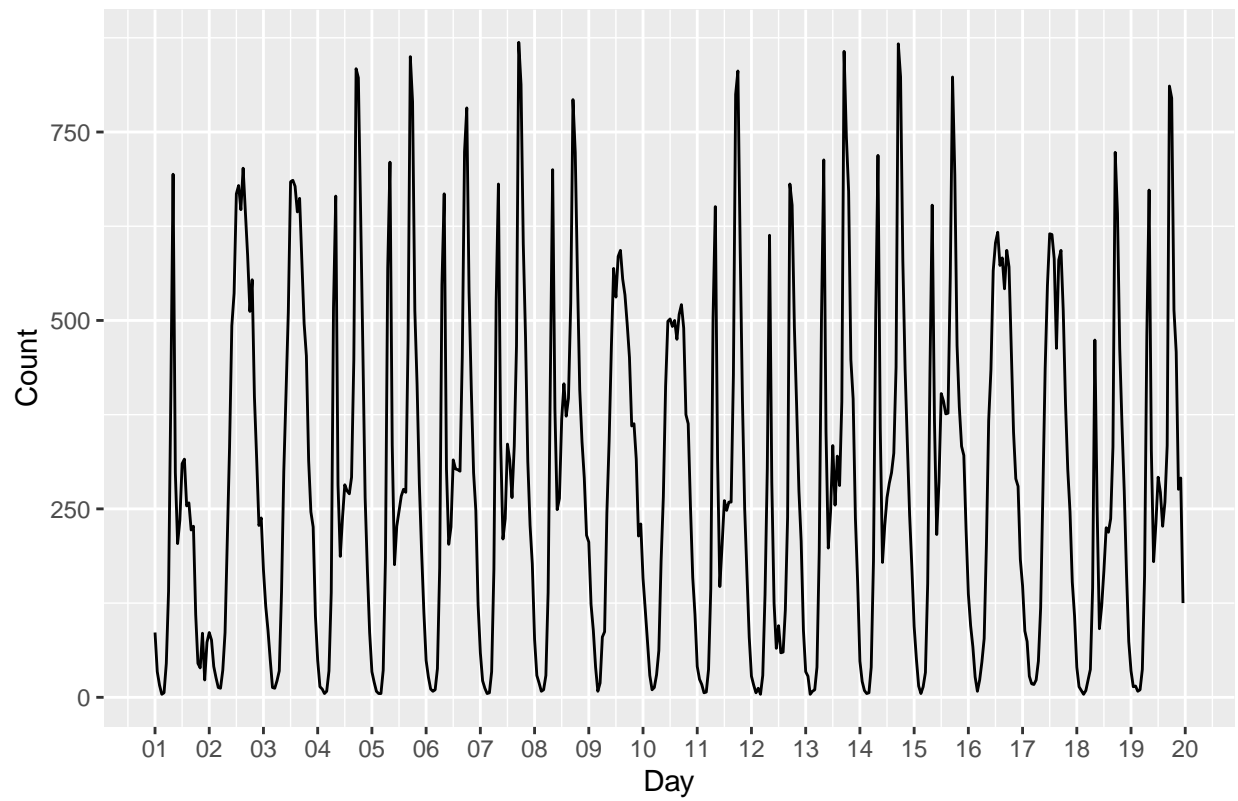
3 Methods

3.1 ARMA Model

```
## Warning: Removed 288 row(s) containing missing values (geom_path).
```

7 Day Forecast (ARMA)
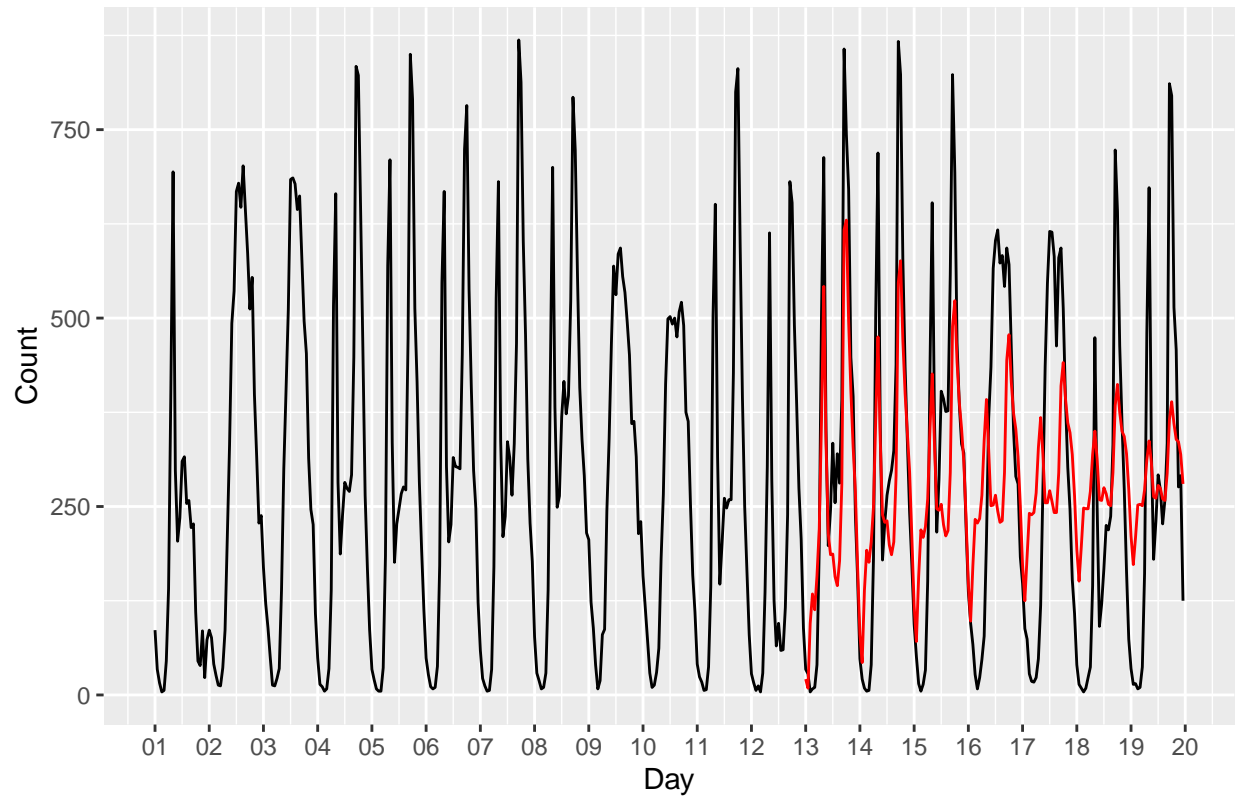
```
## Warning: Removed 432 row(s) containing missing values (geom_path).
```

1 Day Forecast (ARMA)

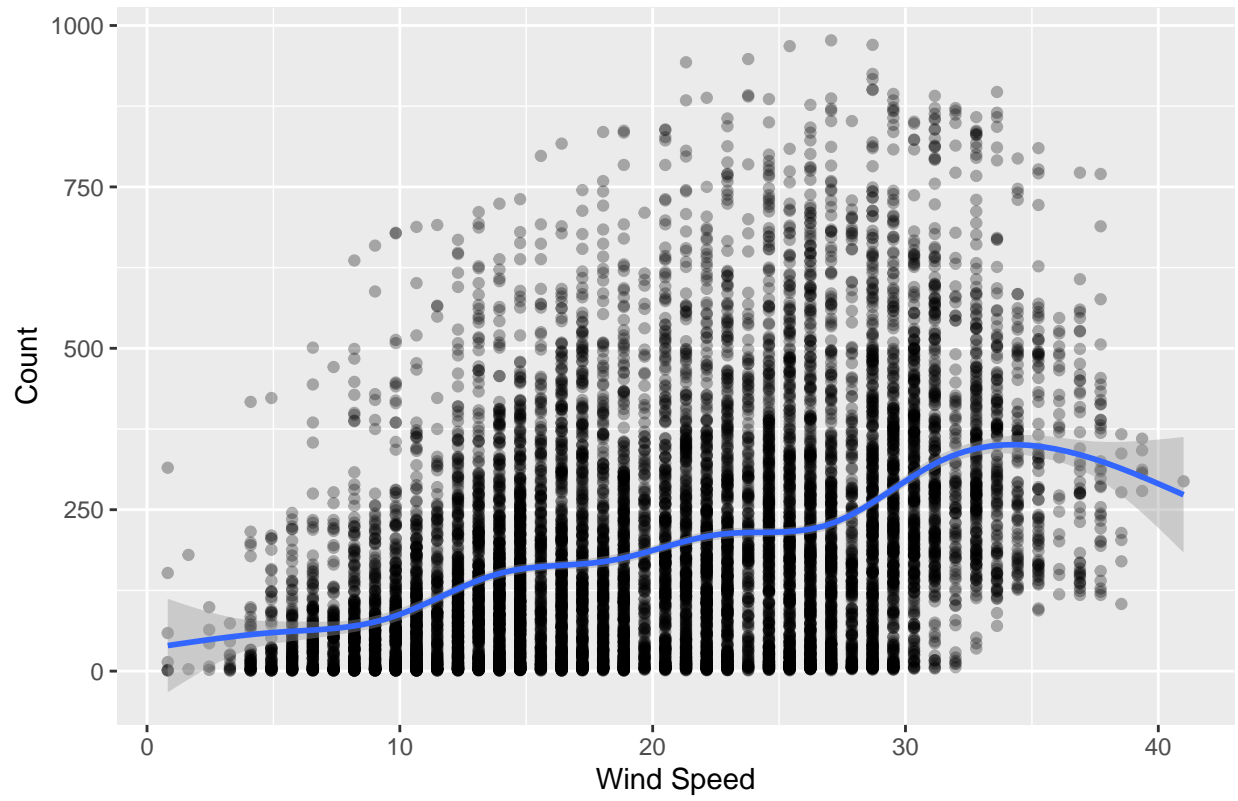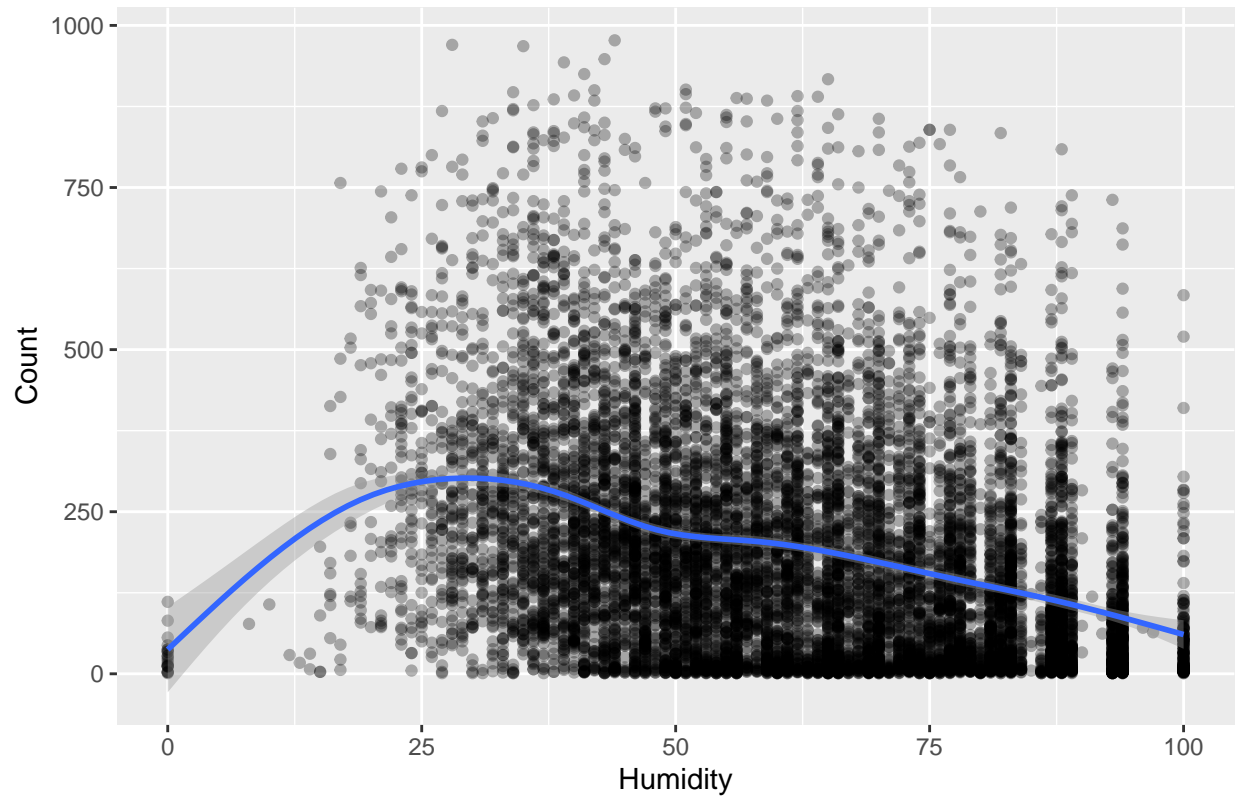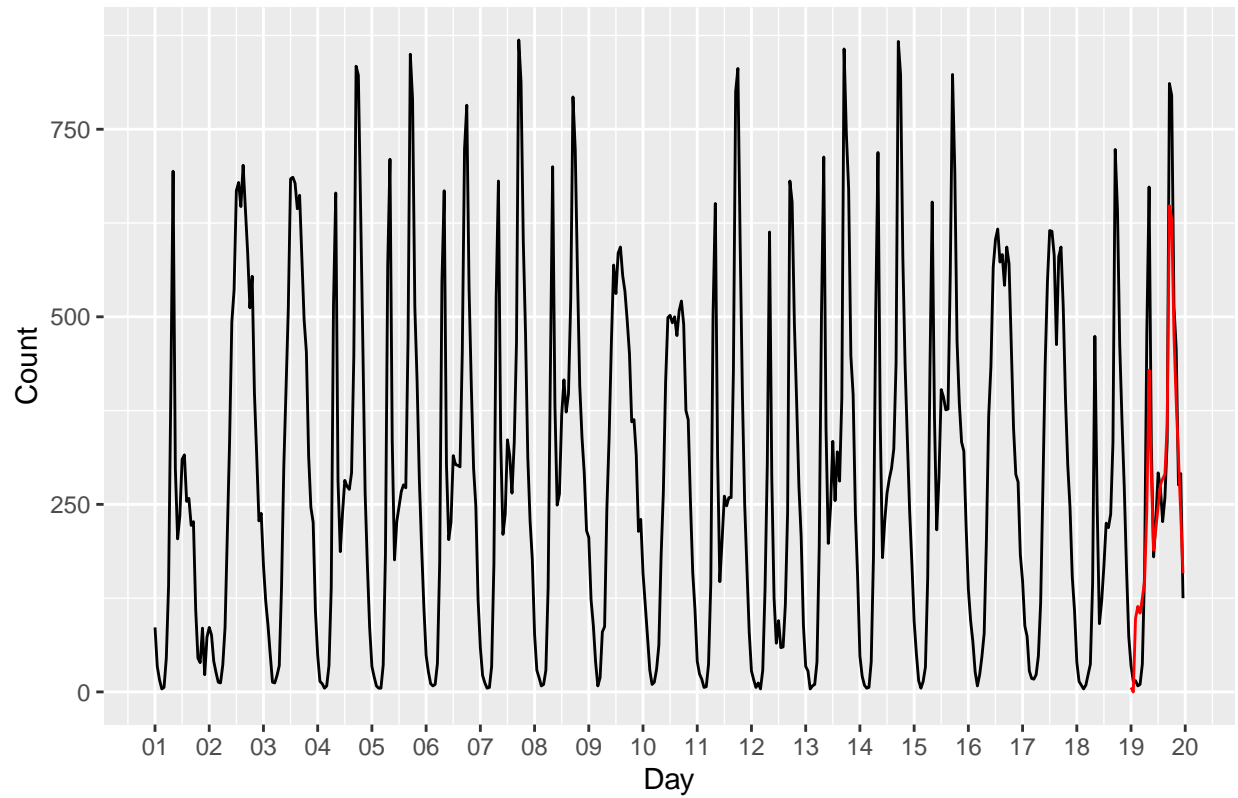| Feature 1	Feature 2	Correlation Coefficient
temp	atemp	0.9849481
registered	count	0.9709481
casual	count	0.6904136
casual	registered	0.4972497
temp	casual	0.4670971
atemp	casual	0.4620665
temp	count	0.3944536
atemp	count	0.3897844
temp	registered	0.3185713
atemp	registered	0.3146354
windspeed	count	0.1013695
humidity	registered	-0.2654579
humidity	count	-0.3173715
humidity	windspeed	-0.3186070
humidity	casual	-0.3481869

3.2 Vector Auto-Regressive (VAR) Model

train.2012.june$count & train.2012.june$temp

train.2012.june$count & train.2012.june$weather
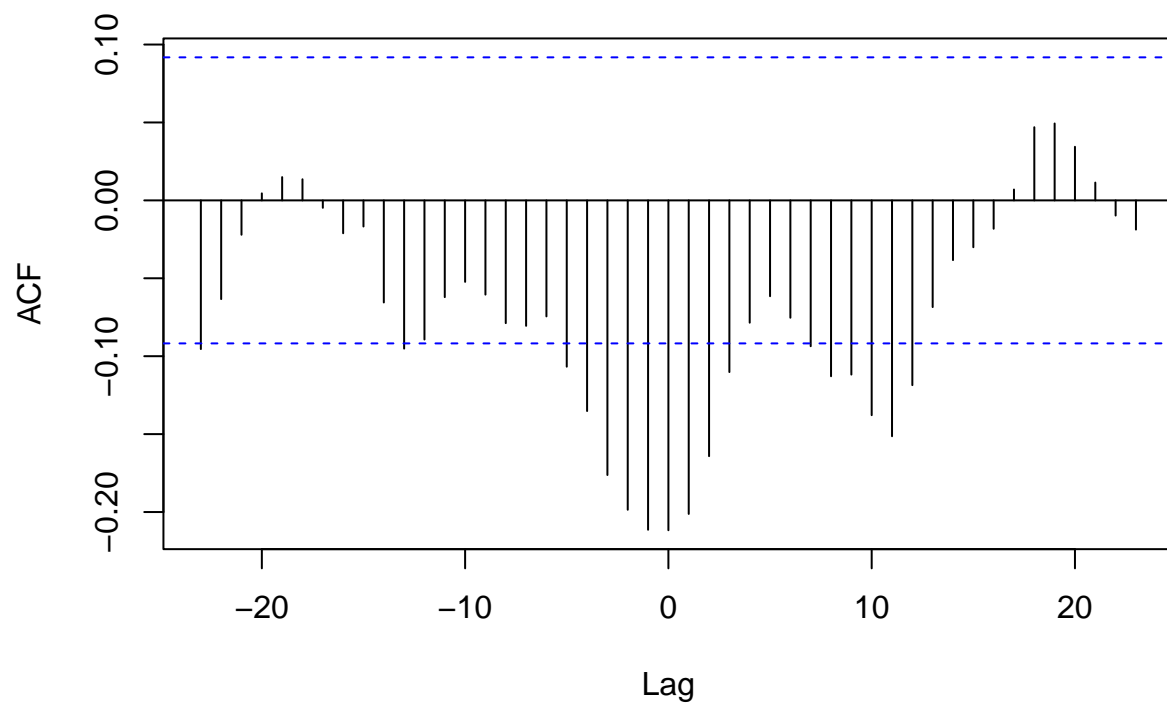
train.2012.june$count & train.2012.june$humidity
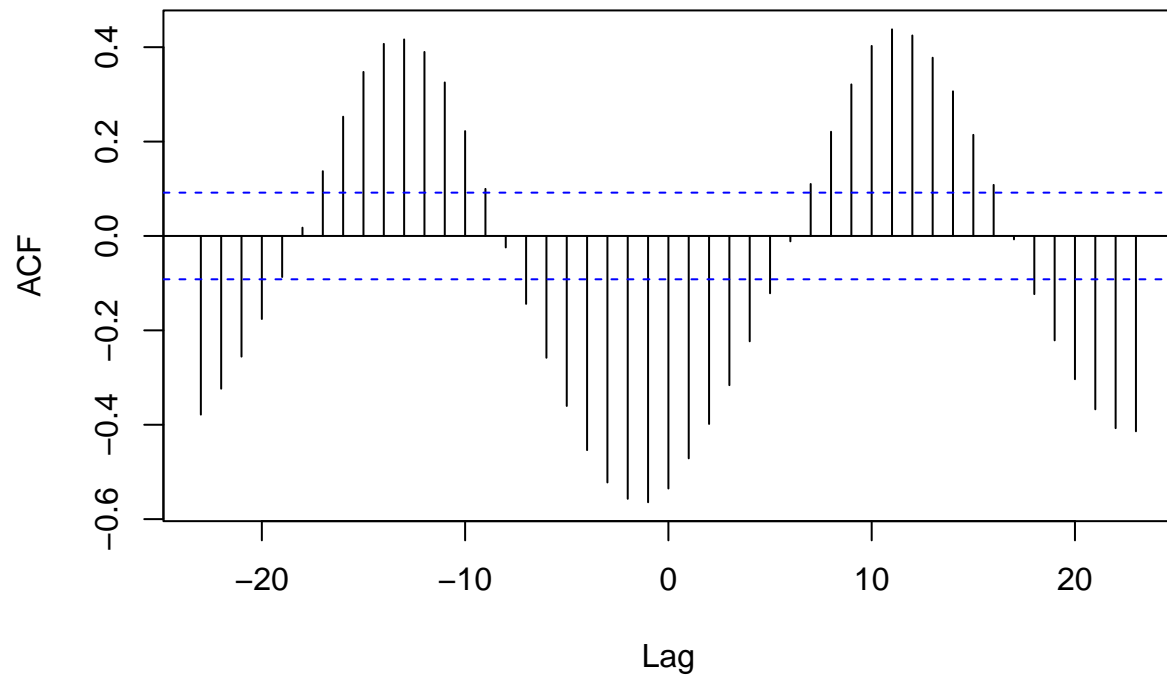
train.2012.june$count & train.2012.june$hour
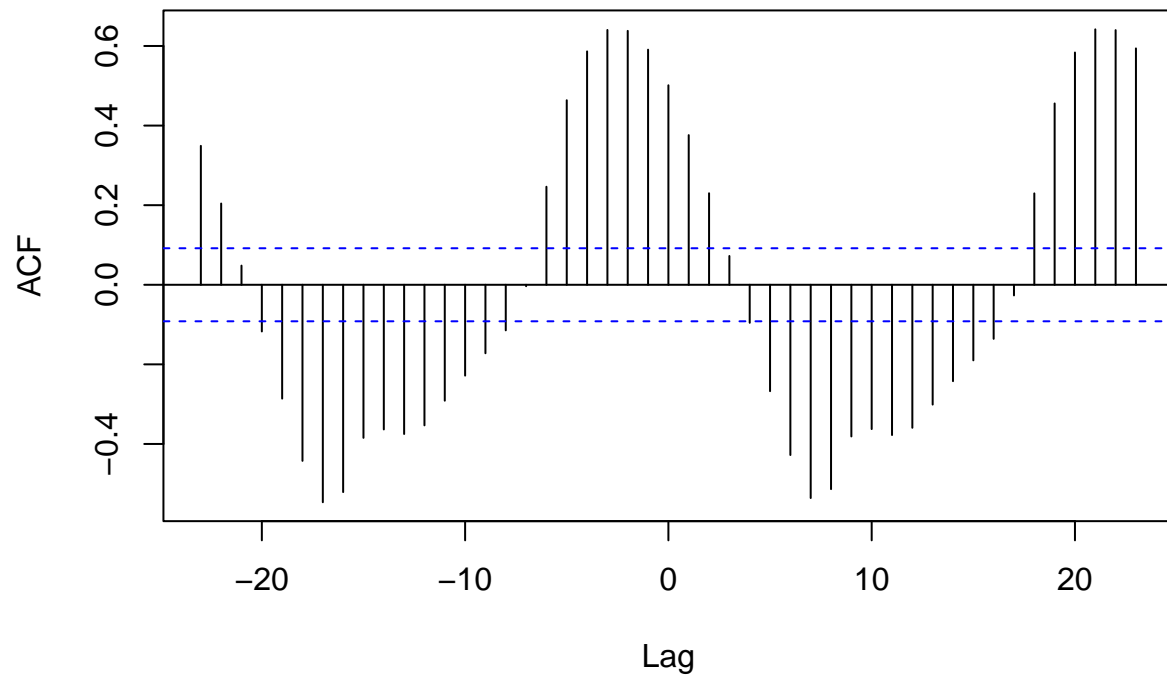
3.2.1   7 Day Forecast

```
## Warning: Removed 288 row(s) containing missing values (geom_path).
```


7 Day Forecast (VAR)
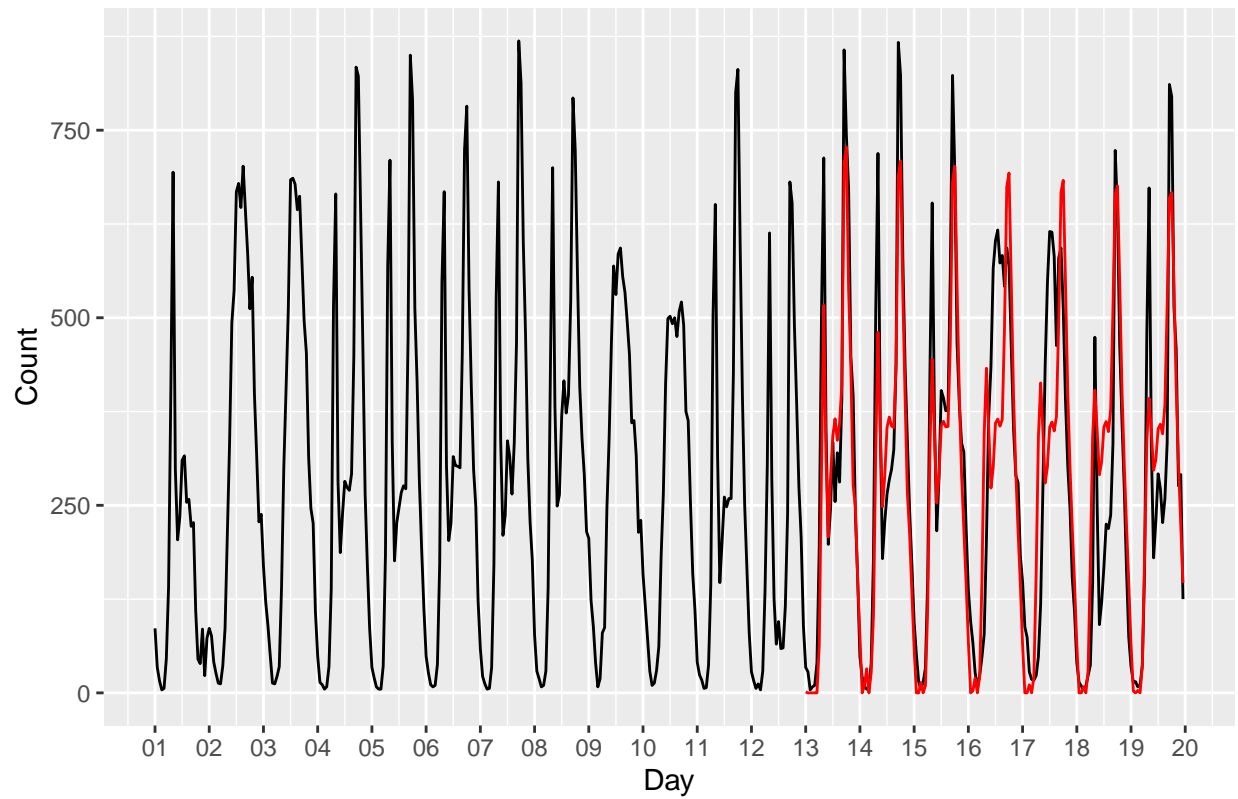
3.2.2   1 Day Forecast

```
## Warning: Removed 432 row(s) containing missing values (geom_path).
```

1 Day Forecast (VAR)

3.3 Neural Network Model

3.3.1 7 Day Forecast

```
## Warning: Removed 288 row(s) containing missing values (geom_path).
```
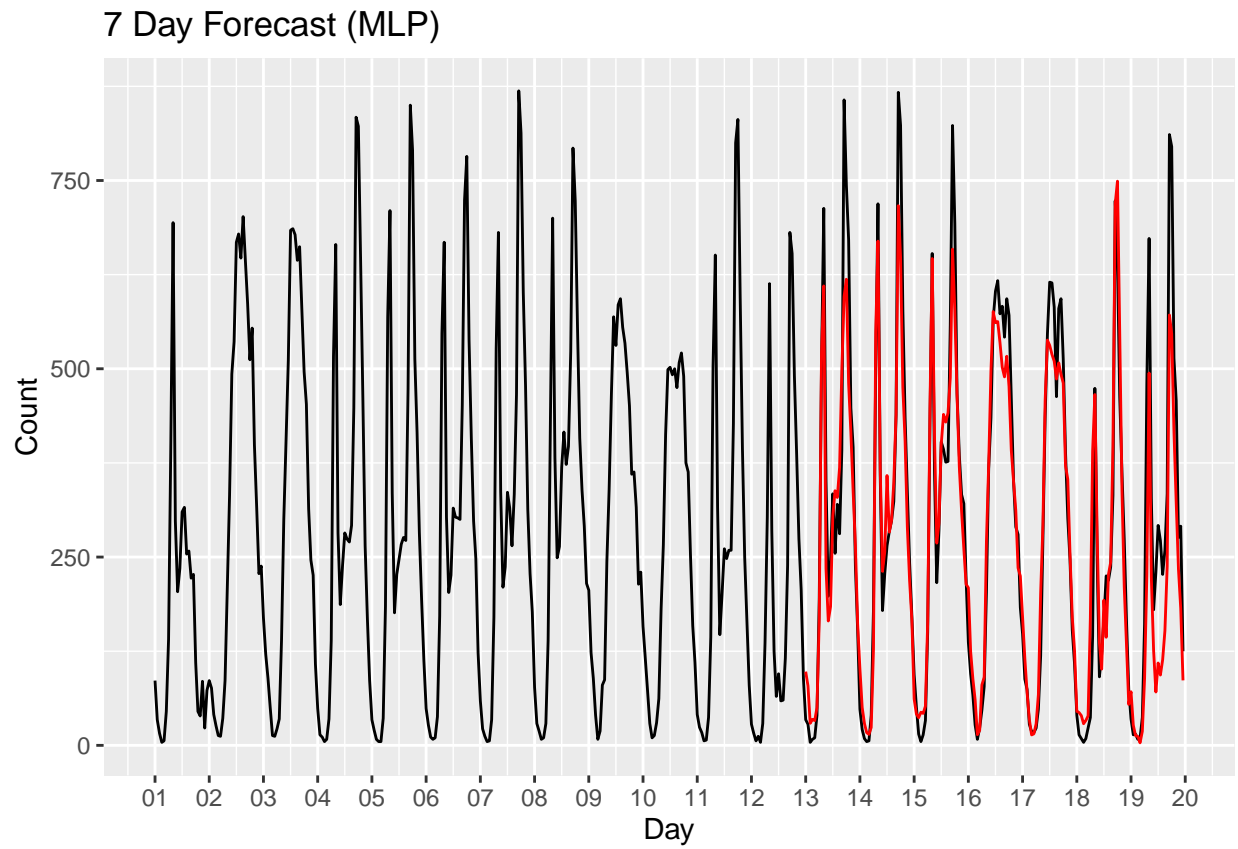

7 Day Forecast (MLP)

3.3.2 1 Day Forecast

```
## Warning: Removed 432 row(s) containing missing values (geom_path).
```


1 Day Forecast (MLP)
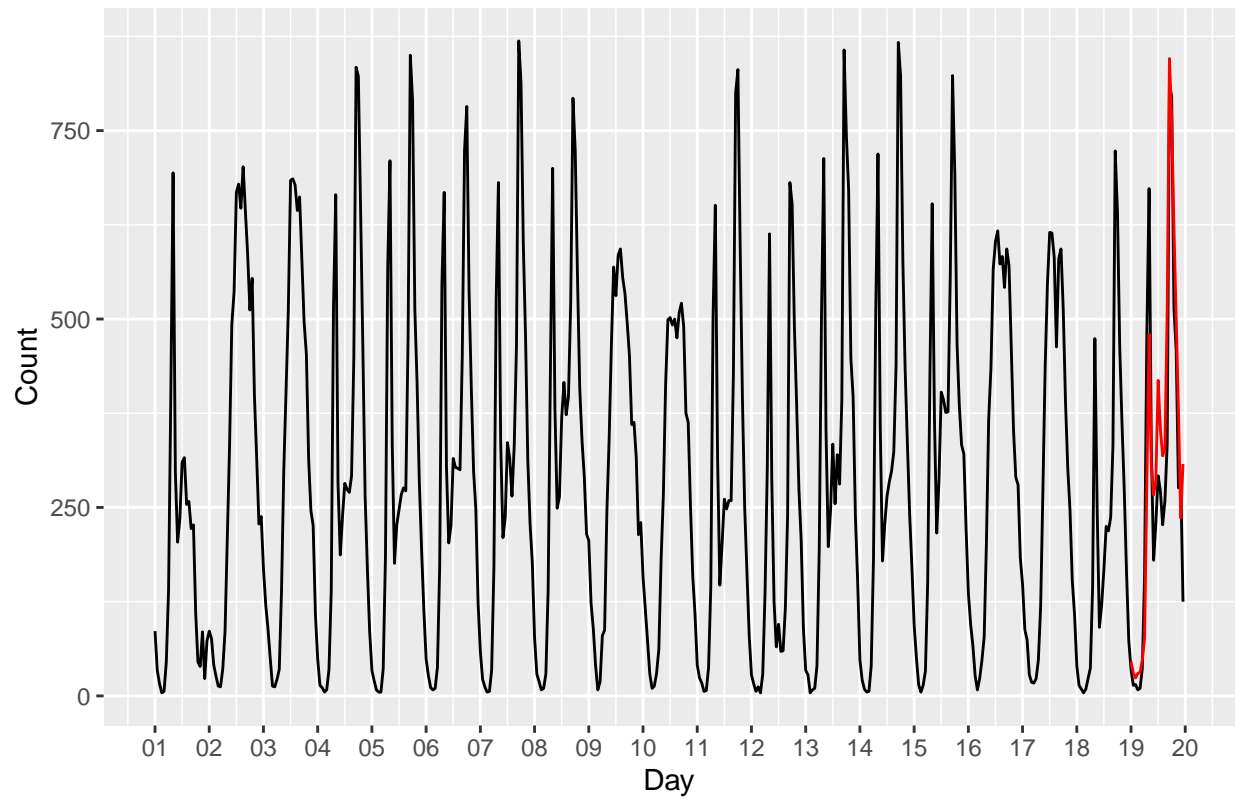
3.4 Ensemble Model

3.4.1 7 Day Forecast

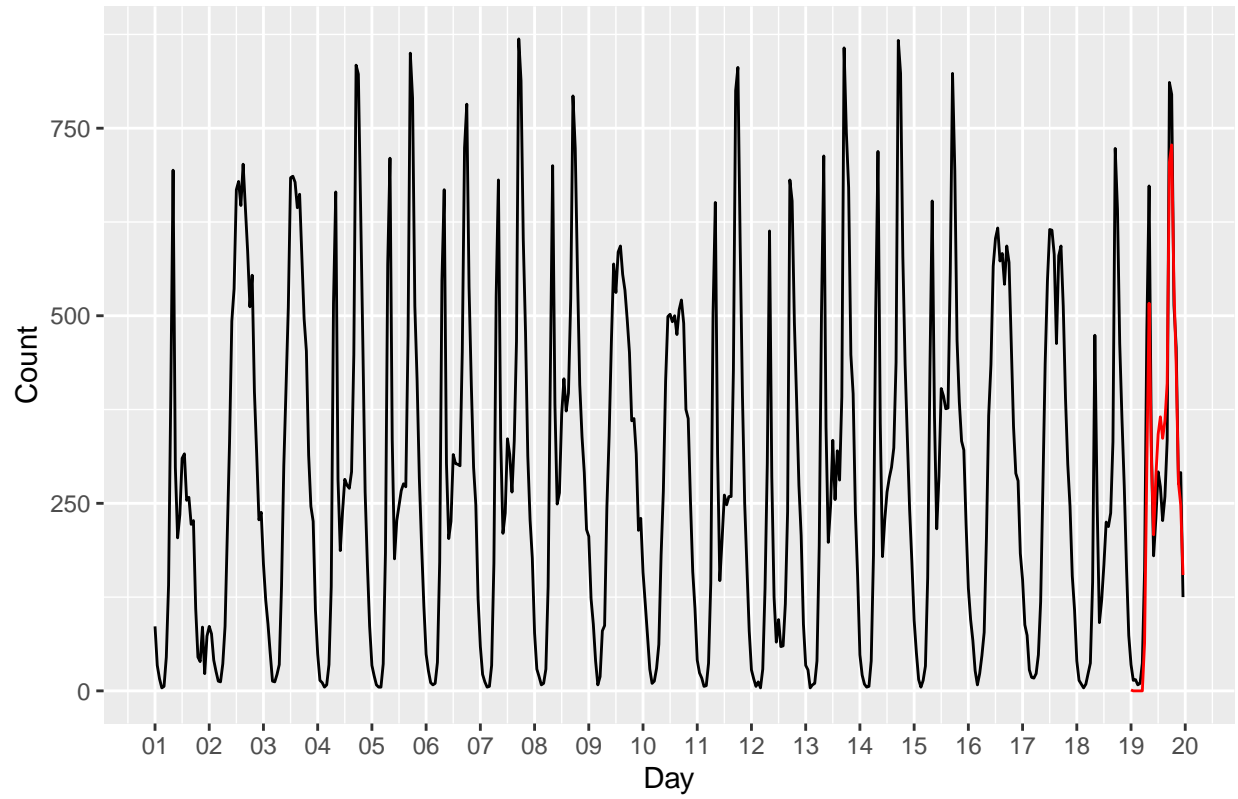|	Actual	Predicted (ARMA)	Predicted (VAR)	Predicted (MLP)	Predicted (Ensemble)
289	34	21	1	98	50
290	28	9	0	79	40
291	4	95	0	29	15
292	8	134	0	35	17
293	10	113	0	33	16
294	40	158	0	50	25

3.4.2 1 Day Forecast

	Actual	Predicted (ARMA)	Predicted (VAR)	Predicted (MLP)	Predicted (Ensemble)
433	35	6	1	46	23
434	14	0	0	31	15
435	15	98	0	24	12
436	8	114	0	30	15
437	10	105	0	31	16
438	37	125	0	48	24

4 Results

4.1 7 Day Forecast

4.1.1 ASE

[Make a Table]

4.1.2 RMSE

[Make a table]

4.2 1 Day Forecast

4.2.1 ASE

[Make a Table]

4.2.2 RMSE

[Make a table]

5 Appendix

5.1 Solution One

5.2 Solution Two