EDA

Xin

2024-05-14

```
library(electBook)
```

```
## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo
```

```
load("Irish.RData")
```

```
head(Irish$indCons[,1:10])
```

```
##      I1002 I1003 I1004 I1005 I1013 I1015 I1018 I1020 I1022 I1024
## 8114 0.022 0.593 2.002 0.755 0.035 0.398 0.547 0.376 0.229 1.030
## 8115 0.133 0.707 1.602 0.898 0.112 0.689 0.603 0.275 0.198 0.807
## 8116 0.094 0.684 1.525 0.736 0.046 0.407 0.511 0.259 0.201 0.859
## 8117 0.023 0.563 1.393 0.738 0.036 0.223 0.593 0.249 0.212 0.210
## 8118 0.133 0.489 1.221 0.849 0.065 0.132 0.570 0.241 0.121 0.056
## 8119 0.090 0.521 1.032 0.695 0.093 0.117 0.481 0.122 0.127 0.169
```

```
df0 <- Irish$indCons
df0$sum_dem <- rowSums(Irish$indCons)
```

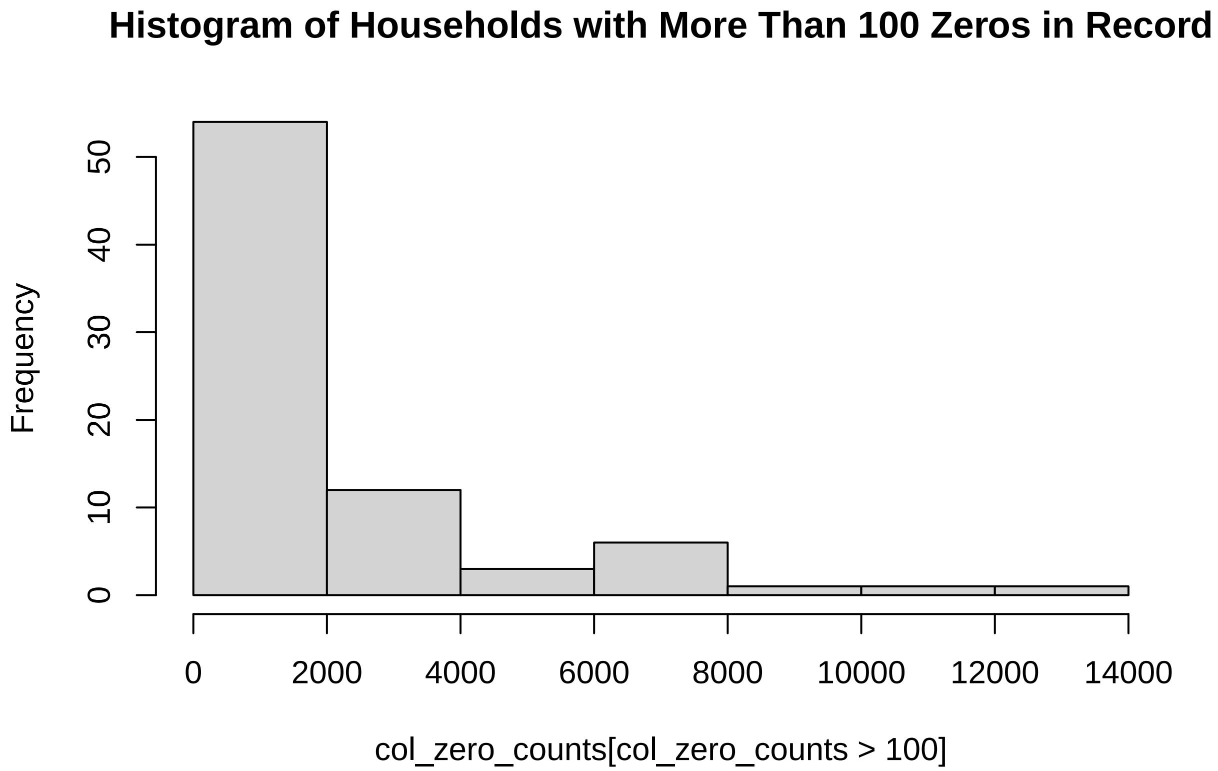
```
sum(apply(Irish$indCons, 2, function(x) sum(x == 0)))
```

```
## [1] 170228
```

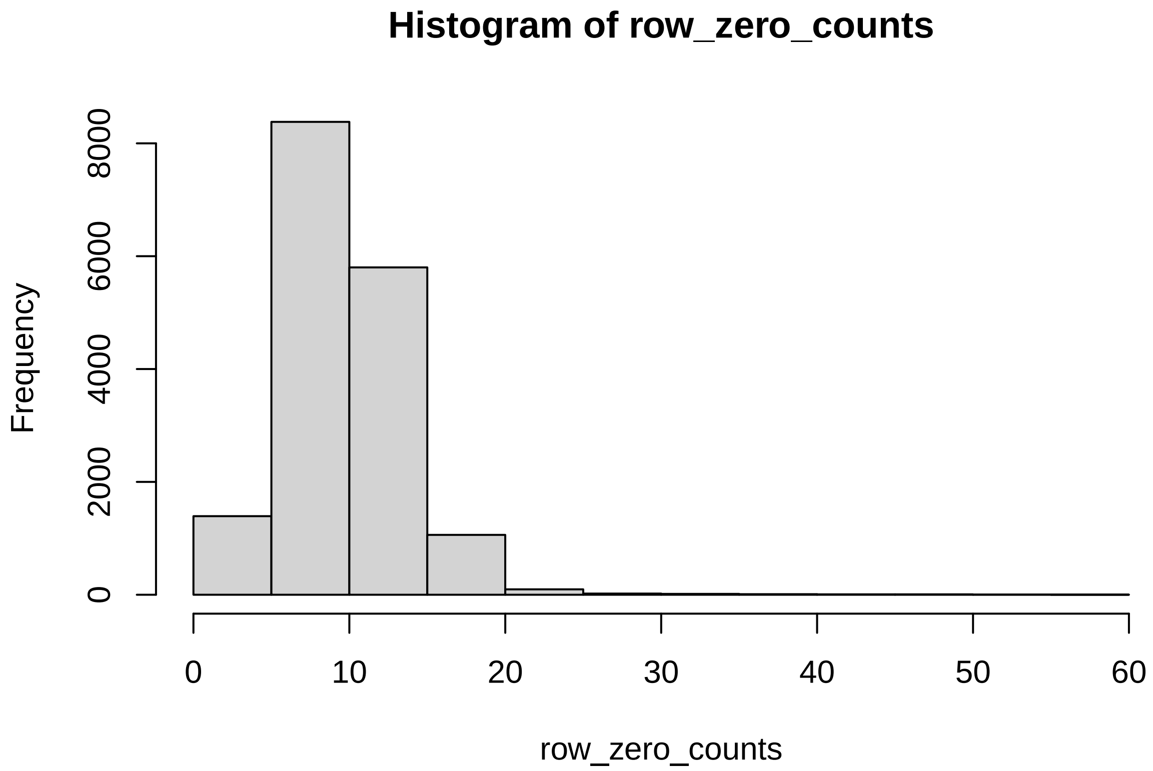
```
#There are many zeros in the demand data frame
print(16799*2674)
```

```
## [1] 44920526
```

```
# Count zeros in each column
col_zero_counts <- colSums(Irish$indCons == 0)

# Histogram of columns with more than 100 zeros
hist(col_zero_counts[col_zero_counts > 100], main="Histogram of Households with More Than 100 Zeros in
abline(v = 0.5 * nrow(df), col = "red", lwd = 2)
```



```r
# Count zeros in each row
row_zero_counts <- rowSums(Irish$indCons == 0)

hist(row_zero_counts)
```



```
head(Irish$extra)
```

```
##   time       toy dow  holy tod temp            dateTime
## 1    1 0.9863014 Wed FALSE   0    4 2009-12-29 23:00:00
## 2    2 0.9863014 Wed FALSE   1    4 2009-12-29 23:30:00
## 3    3 0.9863014 Wed FALSE   2    4 2009-12-30 00:00:00
## 4    4 0.9863014 Wed FALSE   3    4 2009-12-30 00:30:00
## 5    5 0.9863014 Wed FALSE   4    4 2009-12-30 01:00:00
## 6    6 0.9863014 Wed FALSE   5    4 2009-12-30 01:30:00
```

```
df <- cbind(df0[,"sum_dem"],Irish$extra)
colnames(df) <- c("sum_demand", colnames(Irish$extra))
```

```
head(df)
```

```
##   sum_demand time       toy dow  holy tod temp            dateTime
## 1   1674.398    1 0.9863014 Wed FALSE   0    4 2009-12-29 23:00:00
## 2   1404.605    2 0.9863014 Wed FALSE   1    4 2009-12-29 23:30:00
## 3   1180.766    3 0.9863014 Wed FALSE   2    4 2009-12-30 00:00:00
## 4   1022.626    4 0.9863014 Wed FALSE   3    4 2009-12-30 00:30:00
## 5    877.018    5 0.9863014 Wed FALSE   4    4 2009-12-30 01:00:00
## 6    775.936    6 0.9863014 Wed FALSE   5    4 2009-12-30 01:30:00
```

Visualizing main characteristics

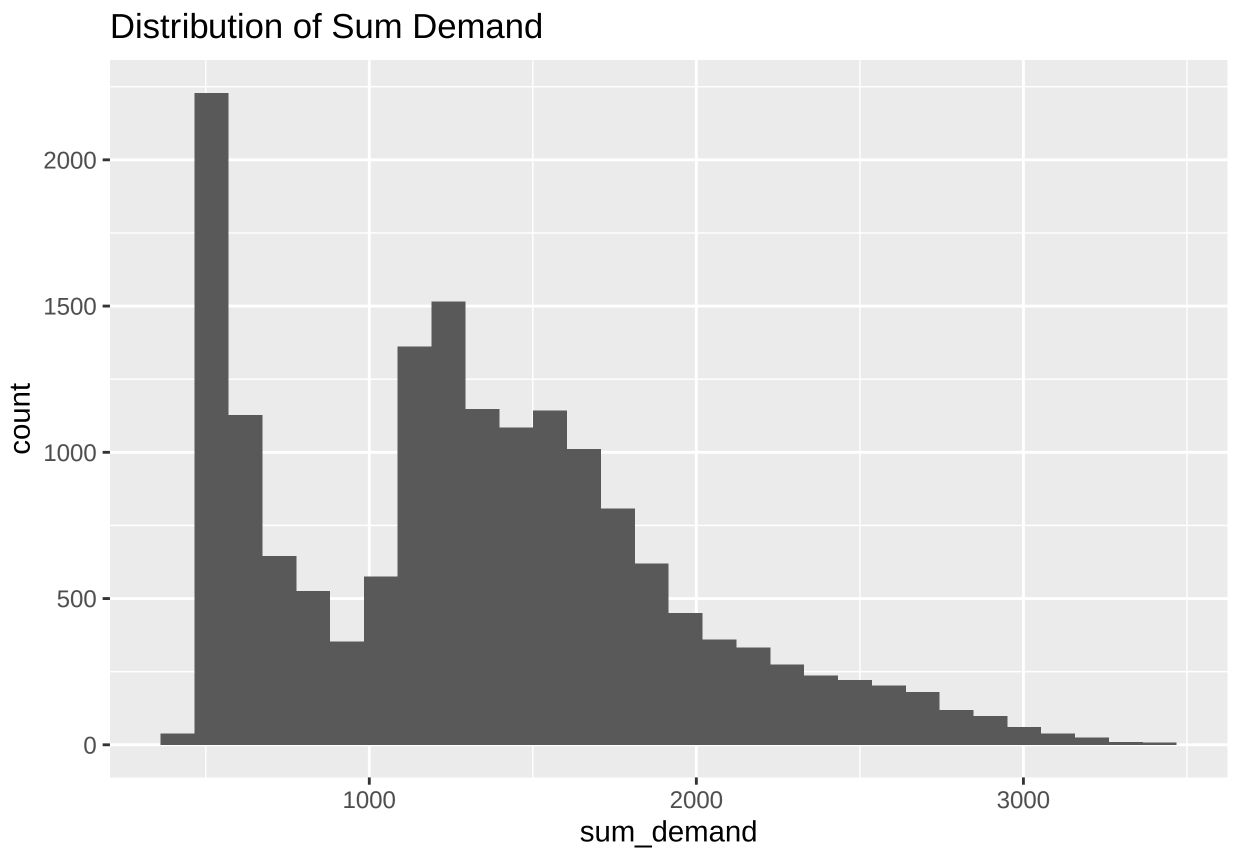
```
# Load necessary libraries
library(ggplot2)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

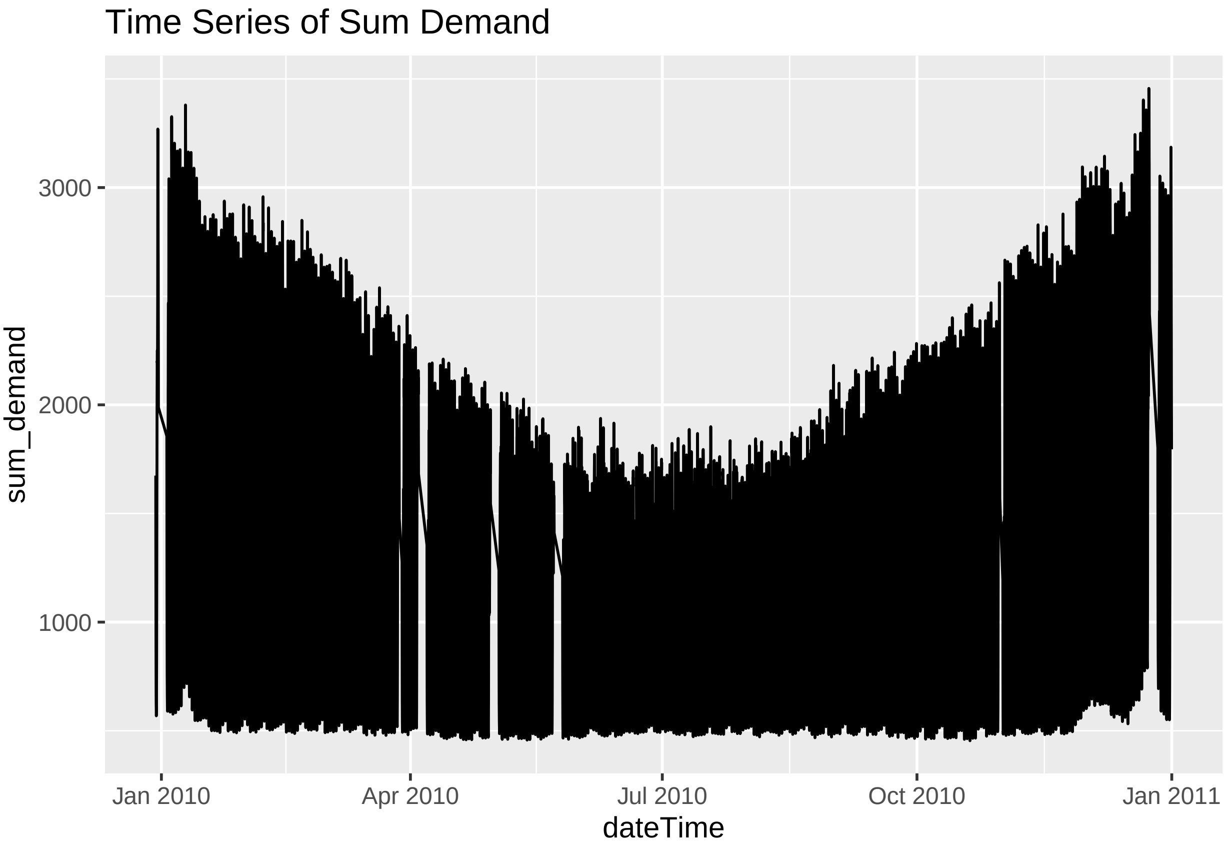
```
# Basic summary of each column
summary(df)
```

```
##    sum_demand          time             toy           dow          holy
##  Min.   : 454.1   Min.   :    1   Min.   :0.0000   Sun:2208   Mode :logical
##  1st Qu.: 802.8   1st Qu.: 4200   1st Qu.:0.2411   Thu:2496   FALSE:16799
##  Median :1297.0   Median : 8400   Median :0.5041   Mon:2400
##  Mean   :1334.3   Mean   : 8400   Mean   :0.4975   Tue:2400
##  3rd Qu.:1688.8   3rd Qu.:12600   3rd Qu.:0.7452   Wed:2544
##  Max.   :3456.5   Max.   :16799   Max.   :0.9918   Sat:2352
##                                                    Fri:2399
##       tod             temp             dateTime
##  Min.   : 0.0   Min.   :-10.000   Min.   :2009-12-29 23:00:00.00
##  1st Qu.:12.0   1st Qu.:  4.000   1st Qu.:2010-03-31 10:45:00.00
##  Median :24.0   Median :  9.000   Median :2010-07-05 22:30:00.00
##  Mean   :23.5   Mean   :  8.616   Mean   :2010-07-03 00:08:03.46
##  3rd Qu.:35.5   3rd Qu.: 14.000   3rd Qu.:2010-10-01 10:15:00.00
##  Max.   :47.0   Max.   : 24.000   Max.   :2010-12-31 22:30:00.00
##
```

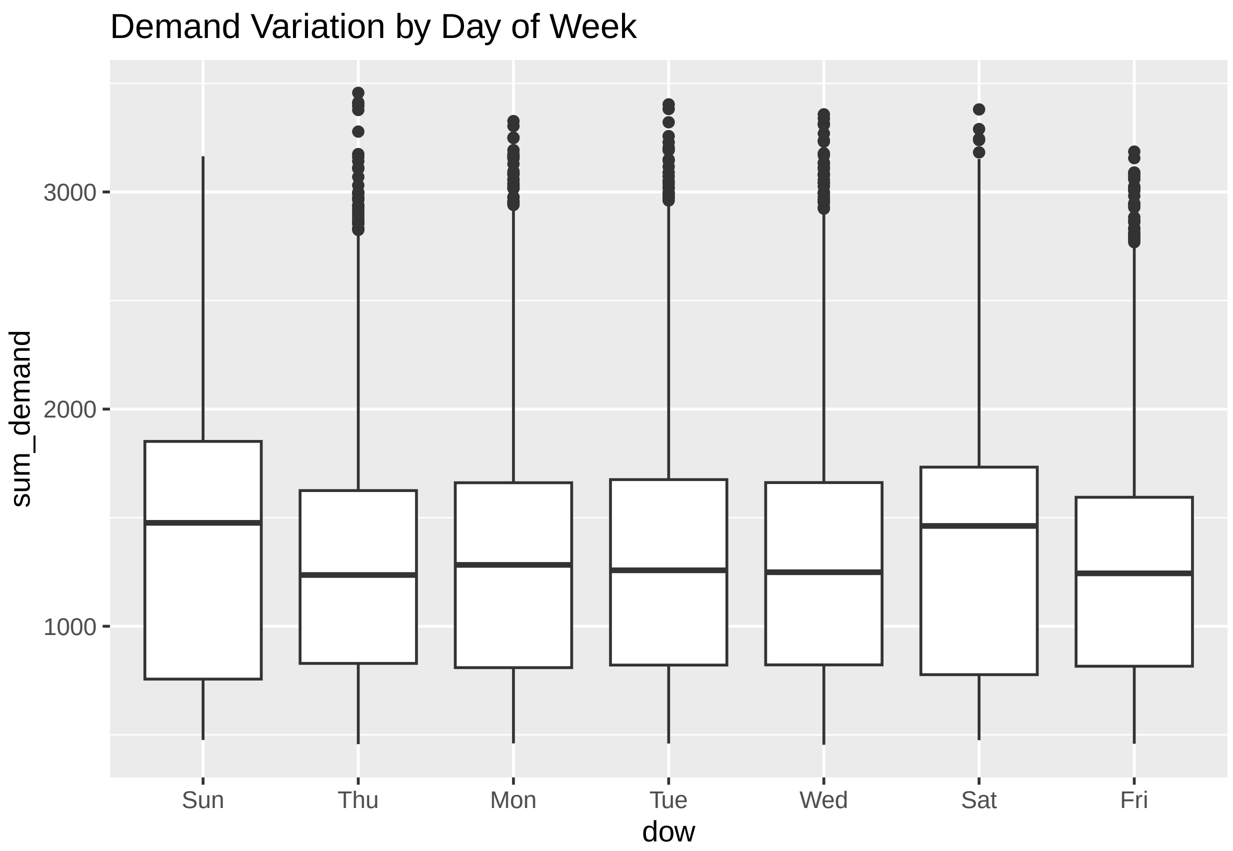
```
#`holy` is all FALSE

# Visualizing distribution of sum_demand
ggplot(df, aes(x=sum_demand)) + geom_histogram(bins=30) + ggtitle("Distribution of Sum Demand")
```



```
# Time series plot of sum_demand
ggplot(df, aes(x=dateTime, y=sum_demand)) + geom_line() + ggtitle("Time Series of Sum Demand")
```

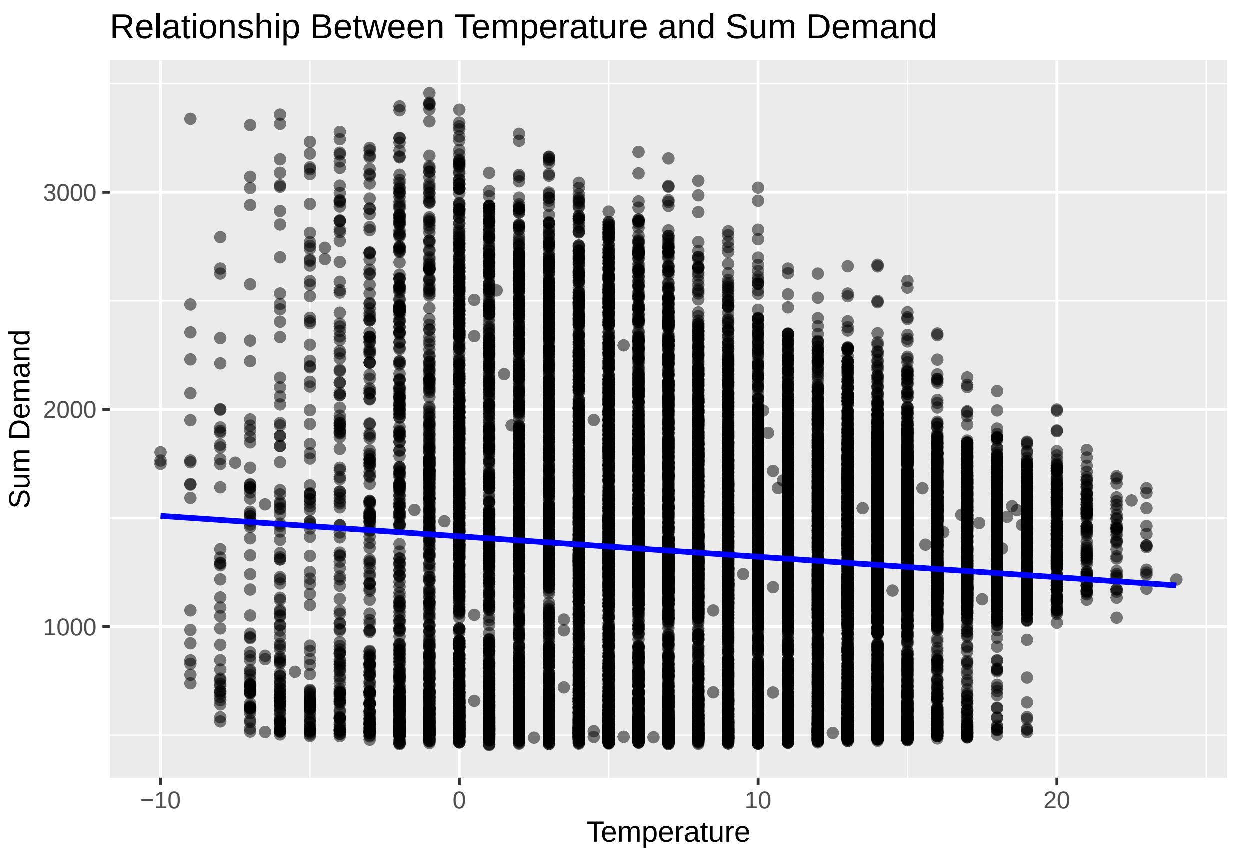


```
# Boxplots to check variation of sum_demand across days of the week
ggplot(df, aes(x=dow, y=sum_demand)) + geom_boxplot() + ggtitle("Demand Variation by Day of Week")
```



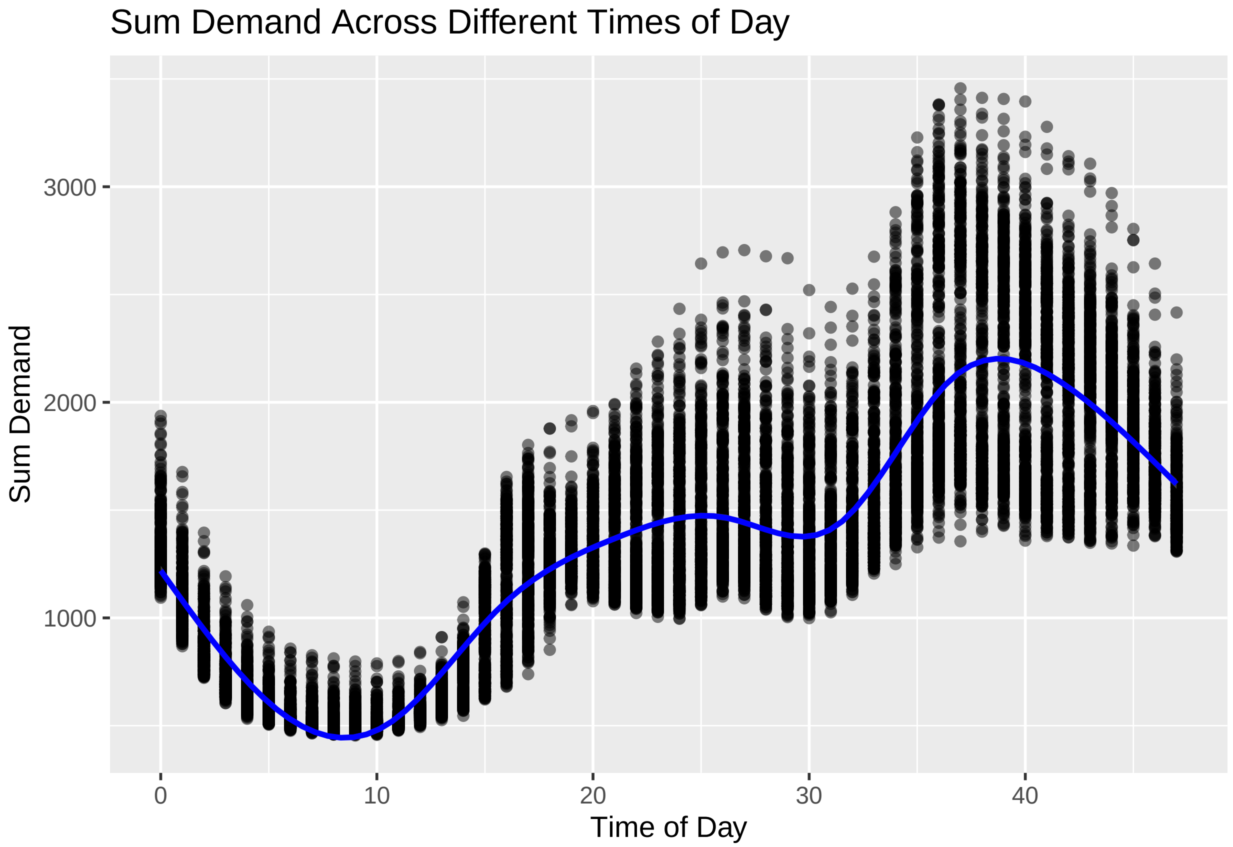
```r
# Scatter plot of sum_demand vs. temperature
ggplot(df, aes(x=temp, y=sum_demand)) +
    geom_point(alpha=0.5) +
    geom_smooth(method="lm", se=FALSE, color="blue") +
    labs(x="Temperature", y="Sum Demand", title="Relationship Between Temperature and Sum Demand")
```

```
## `geom_smooth()` using formula = 'y ~ x'
```



```
# Line plot for sum_demand across different times of day
ggplot(df, aes(x=tod, y=sum_demand, group=1)) +
    geom_point(alpha=0.5) +
    geom_smooth(color="blue") +
    labs(x="Time of Day", y="Sum Demand", title="Sum Demand Across Different Times of Day")
```

```
## `geom_smooth()` using method = 'gam' and formula = 'y ~ s(x, bs = "cs")'
```


Sum Demand Across Different Times of Day
Sum Demand
3000
2000
1000
0
10
20
30
40
Time of Day