

BIO593 (Big Data Analysis) Final Project

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Electric Vehicle (EV) Charging Behavior in existing Infrastructures

This is an R Markdown document to understand the processed statistics of the data. It is a trial version, which keeps record of possibly usable statistics for the research.

Descriptive Statistics

Energy used in kWh: Mean, Standard Deviation, Minimum, Maximum and Sum of all the charging events

```
mean(Clean_Data$`Energy (kWh)`, na.rm=TRUE)
```

```
## [1] 7.130723
```

```
sd(Clean_Data$`Energy (kWh)`, na.rm=TRUE)
```

```
## [1] 7.322503
```

```
min(Clean_Data$`Energy (kWh)`, na.rm=TRUE)
```

```
## [1] -2.022
```

```
max(Clean_Data$`Energy (kWh)`, na.rm=TRUE)
```

```
## [1] 99.843
```

```
sum(Clean_Data$`Energy (kWh)`, na.rm=TRUE)
```

```
## [1] 275859.2
```

GHG Savings in kg: Mean, Standard Deviation, Minimum, Maximum and Sum of all the charging events

```
mean(Clean_Data$`GHG Savings (kg)`, na.rm=TRUE)
```

```
## [1] 2.994941
```

```
sd(Clean_Data$`GHG Savings (kg)`, na.rm=TRUE)
```

```
## [1] 3.075413
```

```
min(Clean_Data$`GHG Savings (kg)`, na.rm=TRUE)
```

```
## [1] 0
```

```
max(Clean_Data$`GHG Savings (kg)`, na.rm=TRUE)
```

```
## [1] 41.934
```

```
sum(Clean_Data$`GHG Savings (kg)`, na.rm=TRUE)
```

```
## [1] 115862.3
```

Gasoline Savings in Gallons: Mean, Standard Deviation, Minimum, Maximum and Sum of all the charging events

```
mean(Clean_Data$`Gasoline Savings (gallons)`, na.rm=TRUE,)
```

```
## [1] 0.894905
```

```
sd(Clean_Data$`Gasoline Savings (gallons)`, na.rm=TRUE)
```

```
## [1] 0.9189758
```

```
min(Clean_Data$`Gasoline Savings (gallons)`, na.rm=TRUE)
```

```
## [1] -0.254
```

```
max(Clean_Data$`Gasoline Savings (gallons)`, na.rm=TRUE)
```

```
## [1] 12.53
```

```
sum(Clean_Data$`Gasoline Savings (gallons)`, na.rm=TRUE)
```

```
## [1] 34620.3
```

Total Plugged in Time in sec: Mean, Standard Deviation, Minimum, Maximum and Sum of all the charging events If further needed, it can be converted in a common time format.

```
mean(Clean_Data$`Total Duration (hh:mm:ss)`, na.rm=TRUE)
```

```
## Time difference of 13542.18 secs
```

```
sd(Clean_Data$`Total Duration (hh:mm:ss)`, na.rm=TRUE)
```

```
## [1] 13173.36
```

```
min(Clean_Data$`Total Duration (hh:mm:ss)`, na.rm=TRUE)
```

```
## Time difference of 0 secs
```

```
max(Clean_Data$`Total Duration (hh:mm:ss)`, na.rm=TRUE)
```

```
## Time difference of 86335 secs
```

```
sum(Clean_Data$`Total Duration (hh:mm:ss)`, na.rm=TRUE)
```

```
## Time difference of 513546681 secs
```

Total Charging Time in sec: Mean, Standard Deviation, Minimum, Maximum and Sum of all the charging events If further needed, it can be converted in a common time format.

```
mean(Clean_Data$`Charging Time (hh:mm:ss)`, na.rm=TRUE)
```

```
## Time difference of 6991.715 secs
```

```
sd(Clean_Data$`Charging Time (hh:mm:ss)`, na.rm=TRUE)
```

```
## [1] 5480.663
```

```
min(Clean_Data$`Charging Time (hh:mm:ss)`, na.rm=TRUE)
```

```
## Time difference of 0 secs
```

```
max(Clean_Data$`Charging Time (hh:mm:ss)`, na.rm=TRUE)
```

```
## Time difference of 73898 secs
```

```
sum(Clean_Data$`Charging Time (hh:mm:ss)`, na.rm=TRUE)
```

```
## Time difference of 270278716 secs
```

Time the EV is plugged in after it has been fully charged in sec: Mean, Standard Deviation, Minimum, Maximum and Sum of all the charging events If further needed, it can be converted in a common time format.

```
mean(Clean_Data$`Time no charge`, na.rm=TRUE)
```

```
## Time difference of 7494.711 secs
```

```
sd(Clean_Data$`Time no charge`, na.rm=TRUE)
```

```
## [1] 12815.21
```

```
min(Clean_Data$`Time no charge`, na.rm=TRUE)
```

```
## Time difference of 0 secs
```

```
max(Clean_Data$`Time no charge`, na.rm=TRUE)
```

```
## Time difference of 86124 secs
```

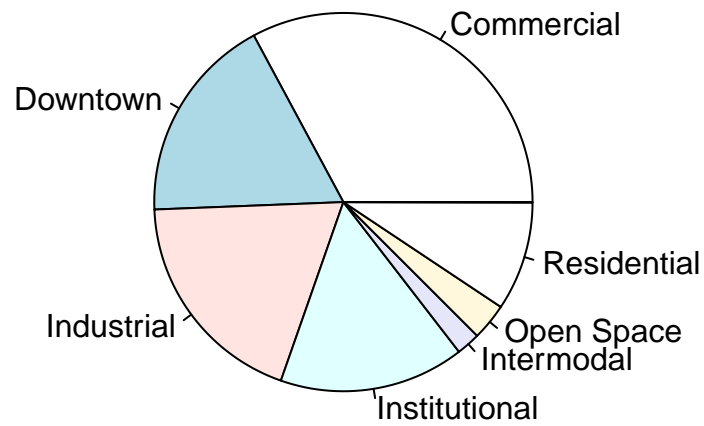
```
sum(Clean_Data$`Time no charge`, na.rm=TRUE)
```

```
## Time difference of 289797988 secs
```

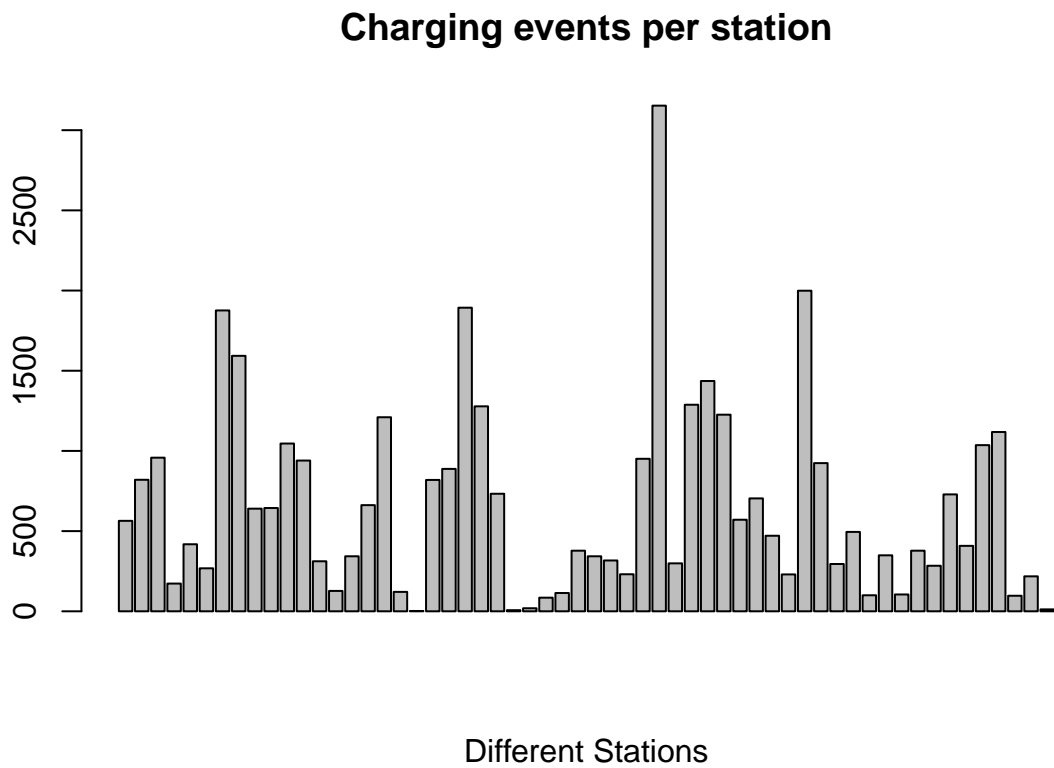
Descriptive Charts

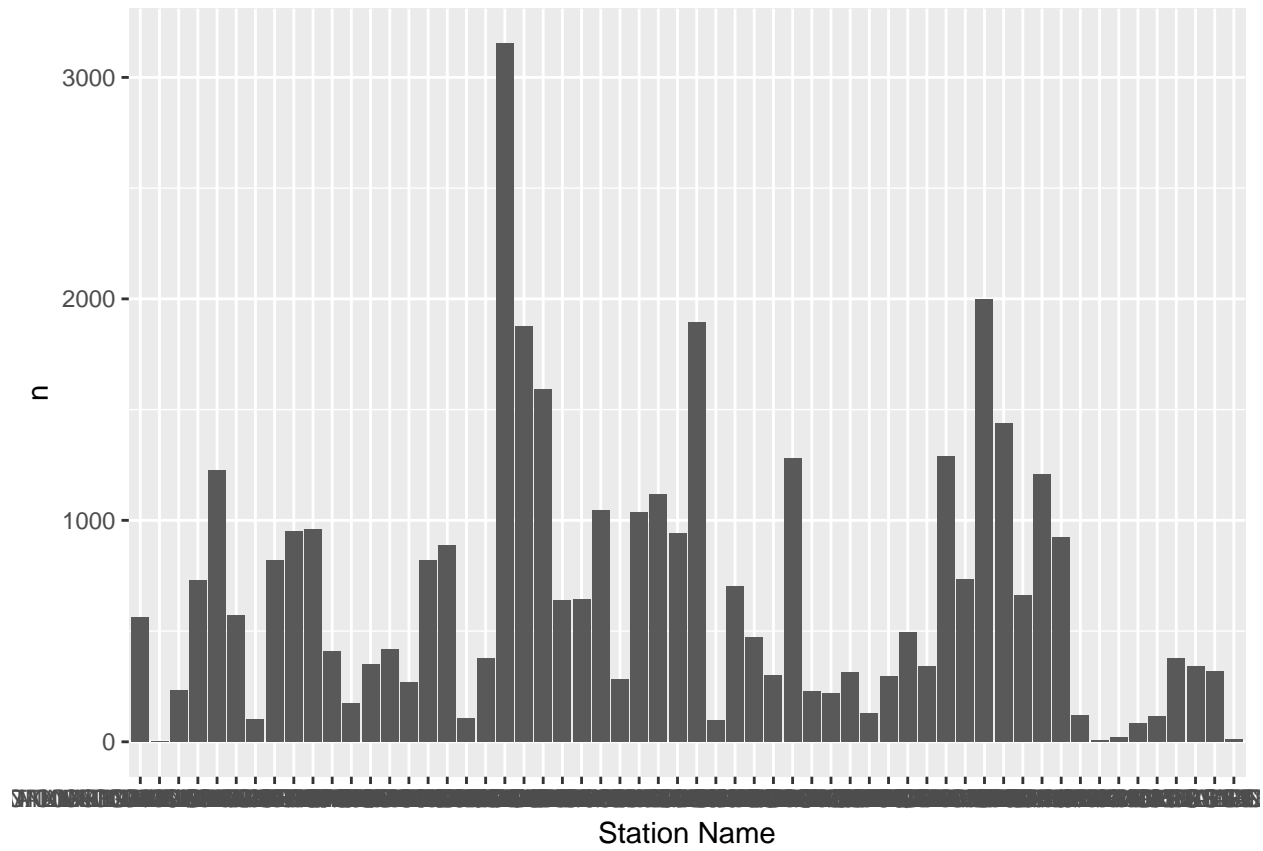
Pie Chart about Areas and the Amount of Charging Events.

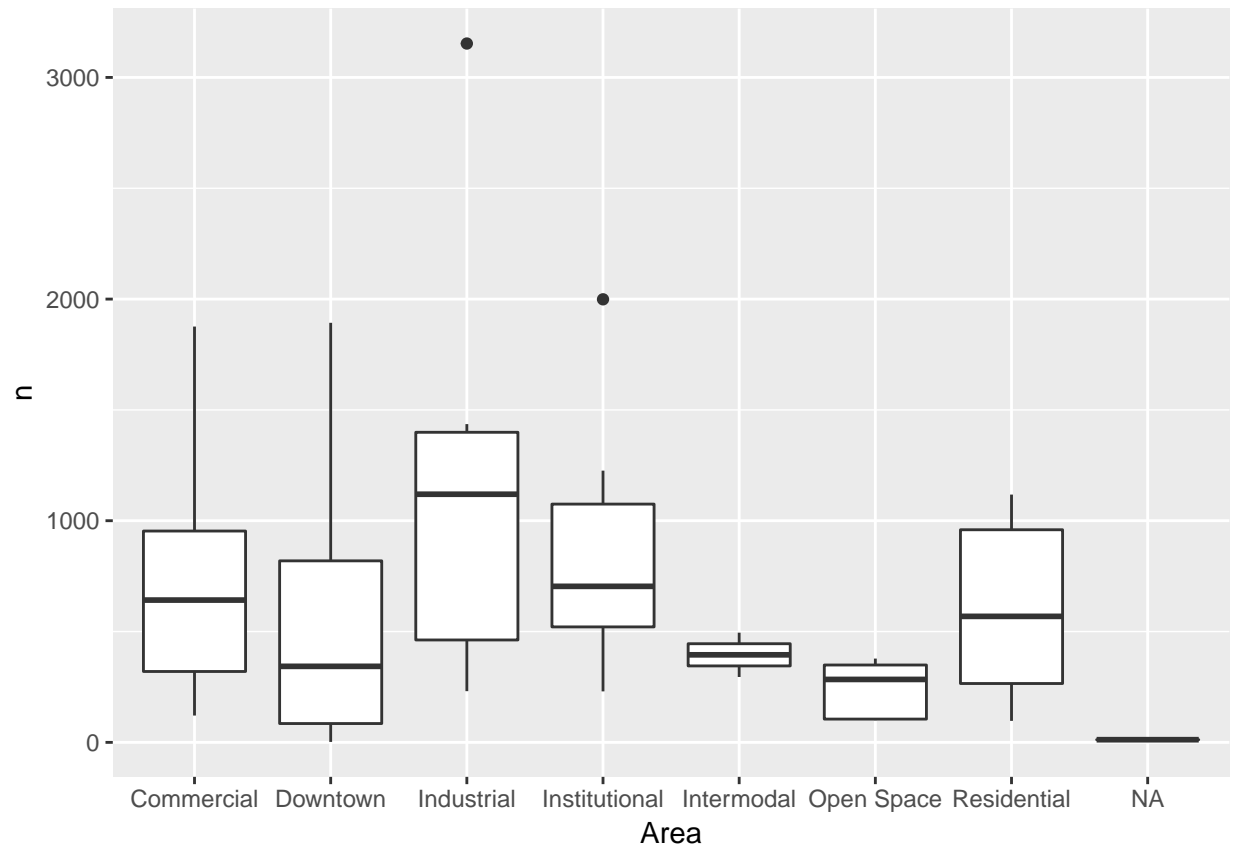
Charging Stations Used by Area



Two Versions of bar charts about the usage of single Stations. In the next step clustered in areas which show the range of the usage of the single stations in this region.

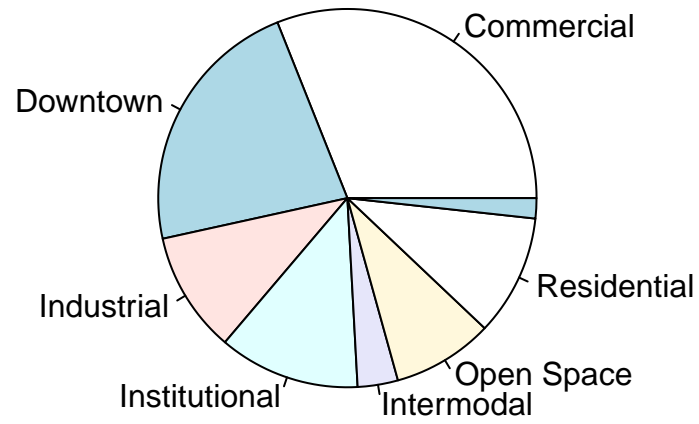




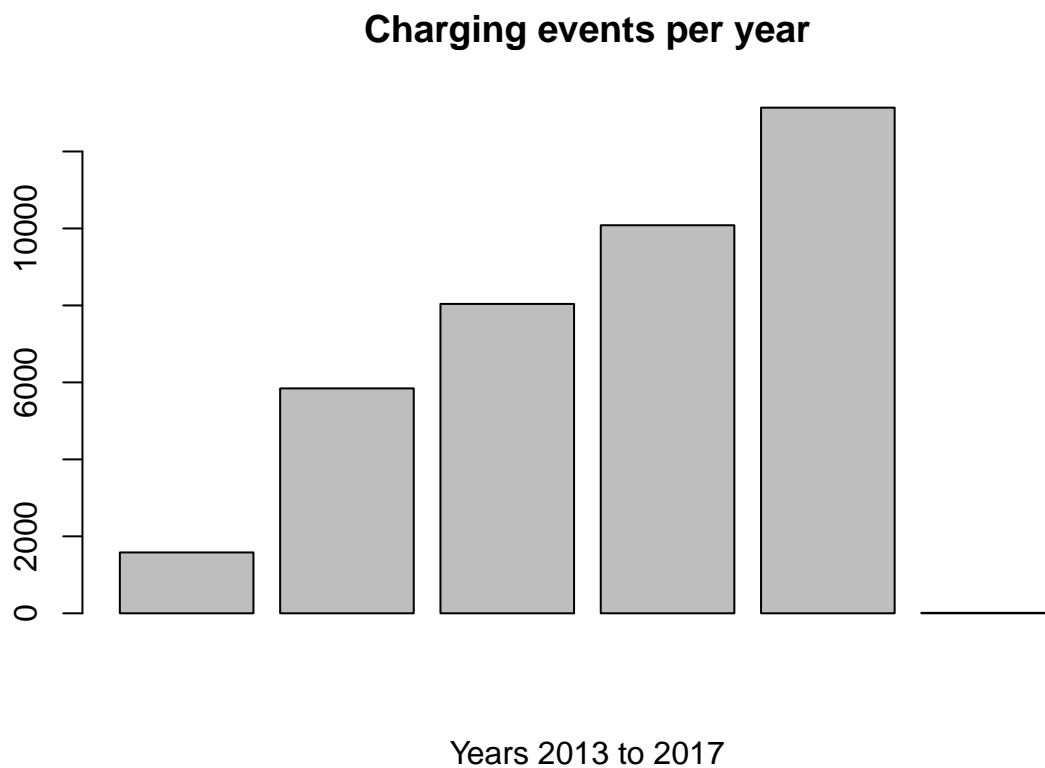


Pie Chart about Areas and the Amount of Charging Stations in the zone.

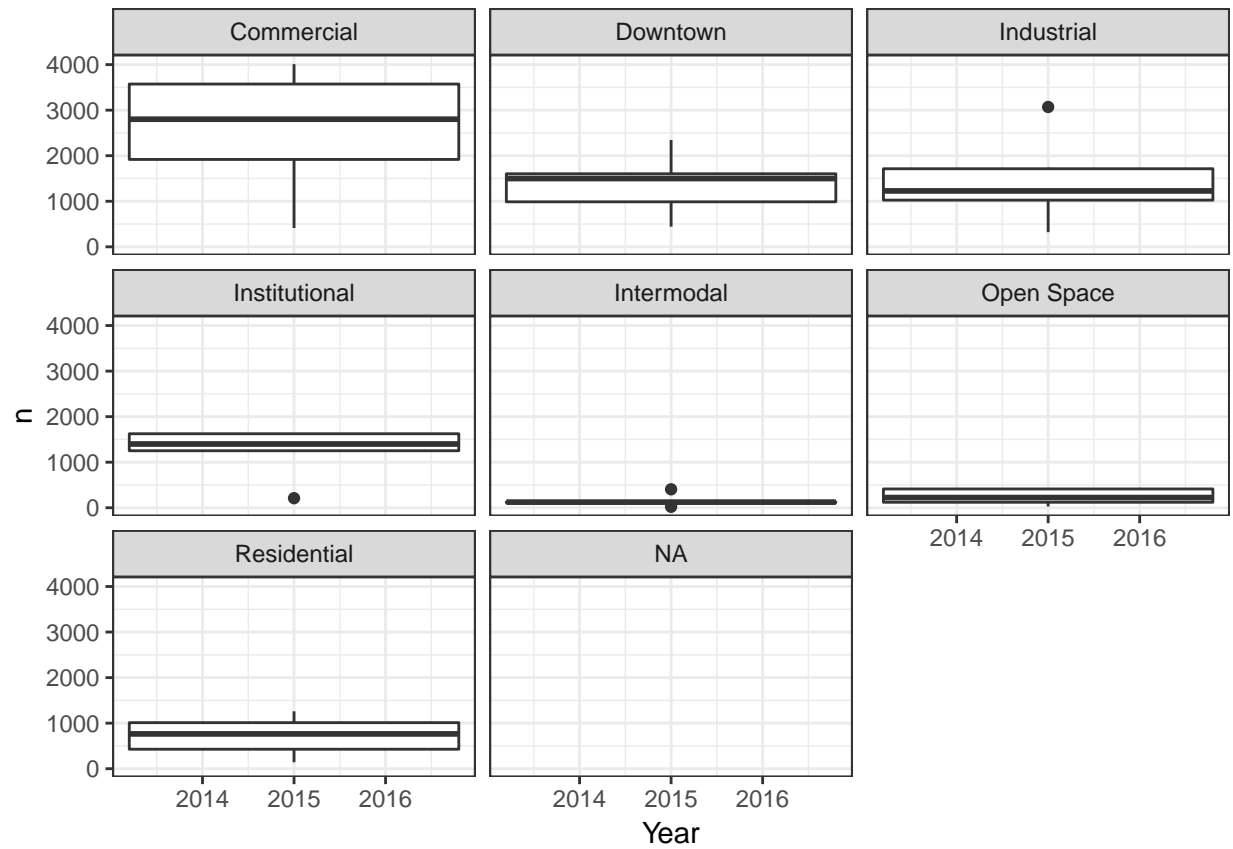
Charging Stations Used by Area



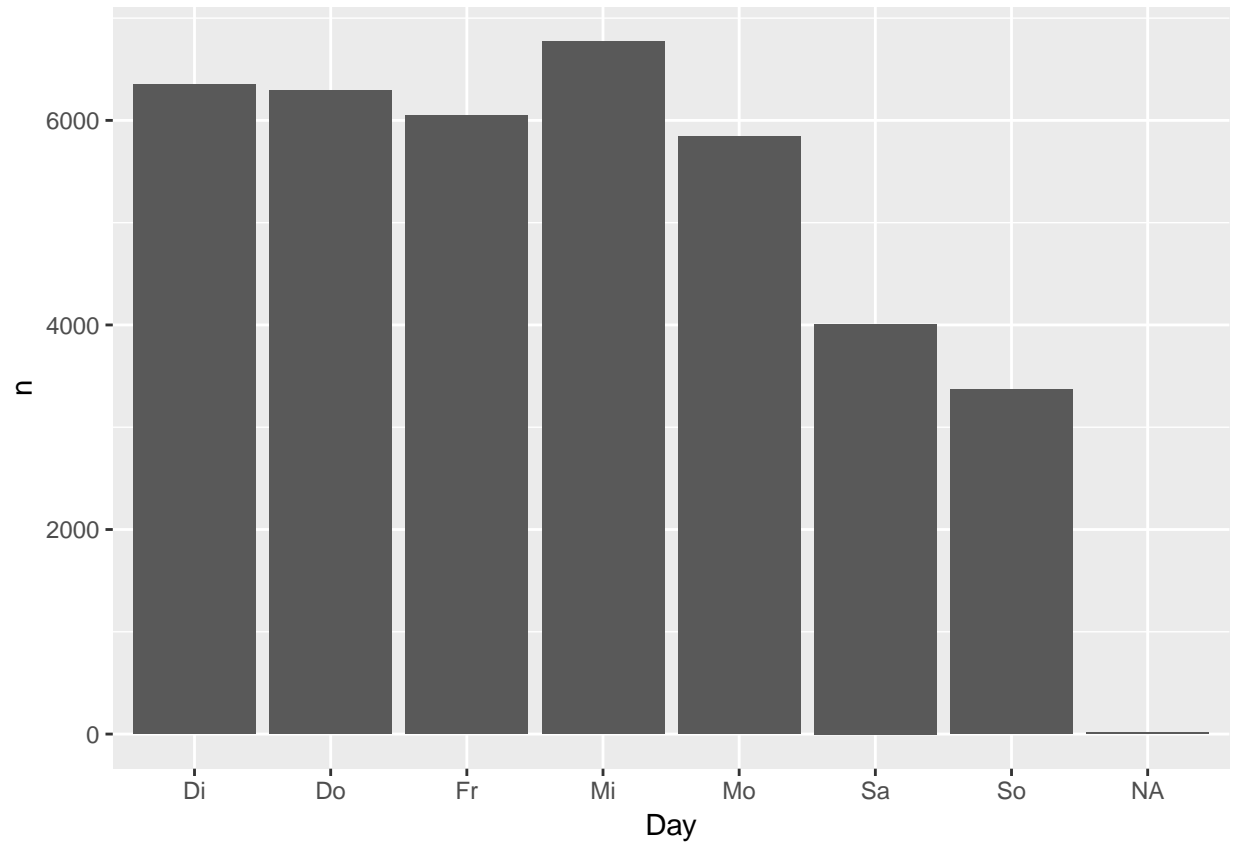
Barchart about the usage of all stations per year. In the next step clustered in areas which show the growth of charging events over the years in certain areas.

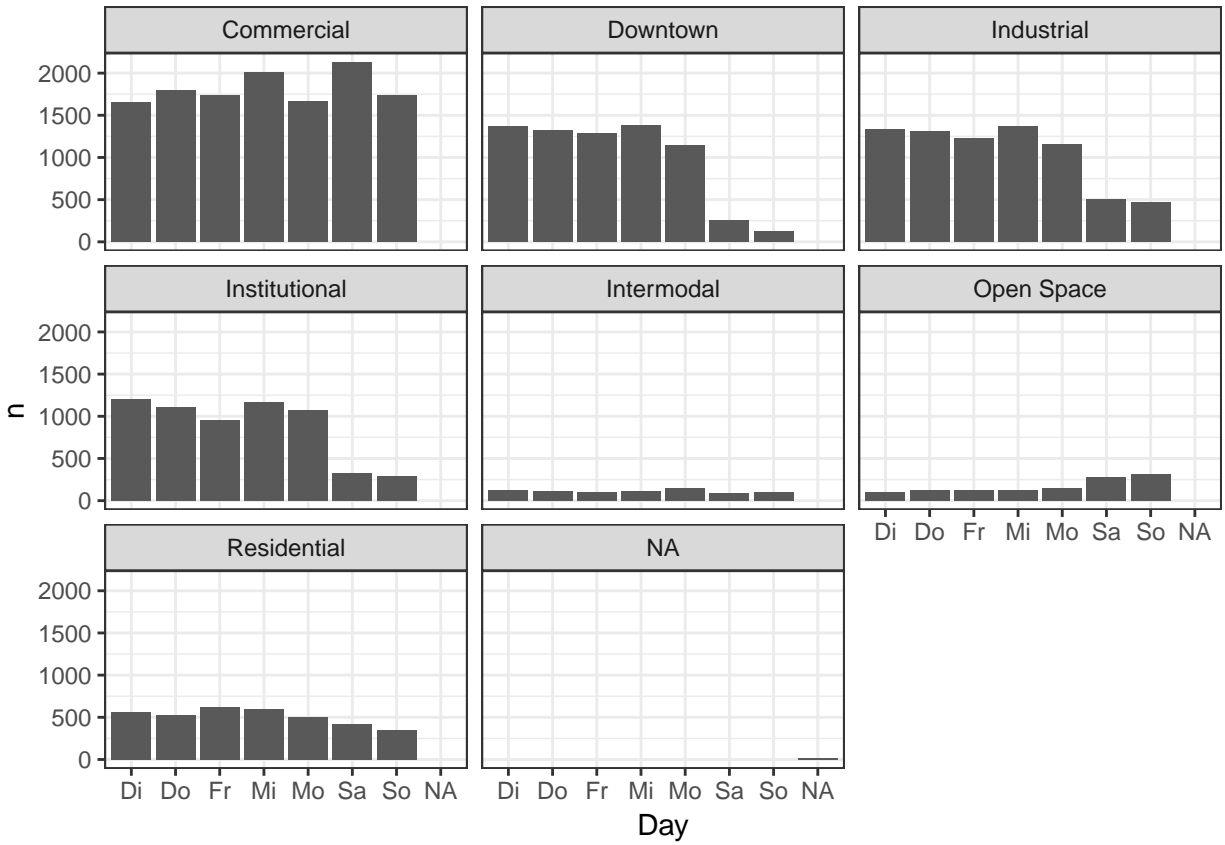


```
## Warning: Continuous x aesthetic -- did you forget aes(group=...)?  
## Warning: Removed 1 rows containing non-finite values (stat_boxplot).
```



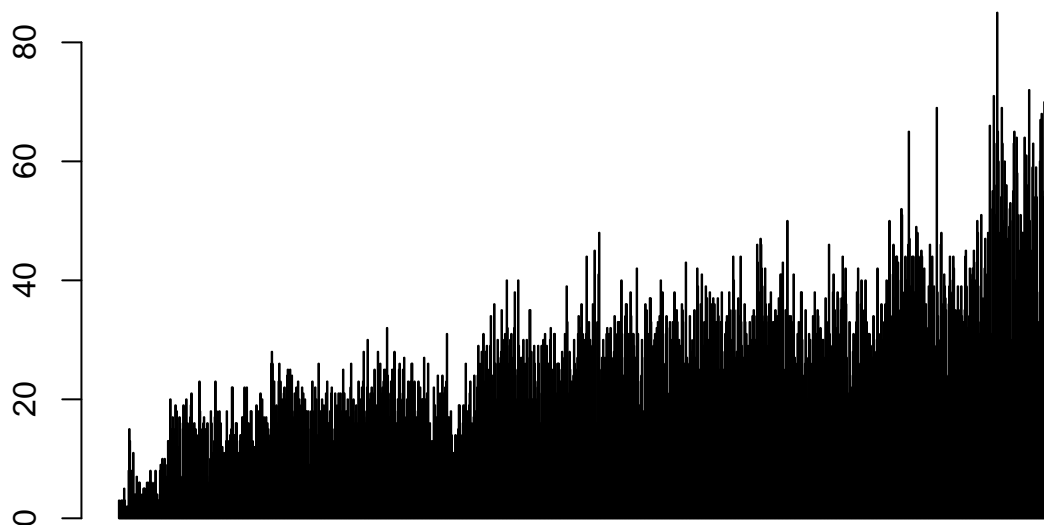
Barchart about the usage of all stations per weekday. In the next step clustered in areas which show the usage of charging stations per weekday in certain areas.





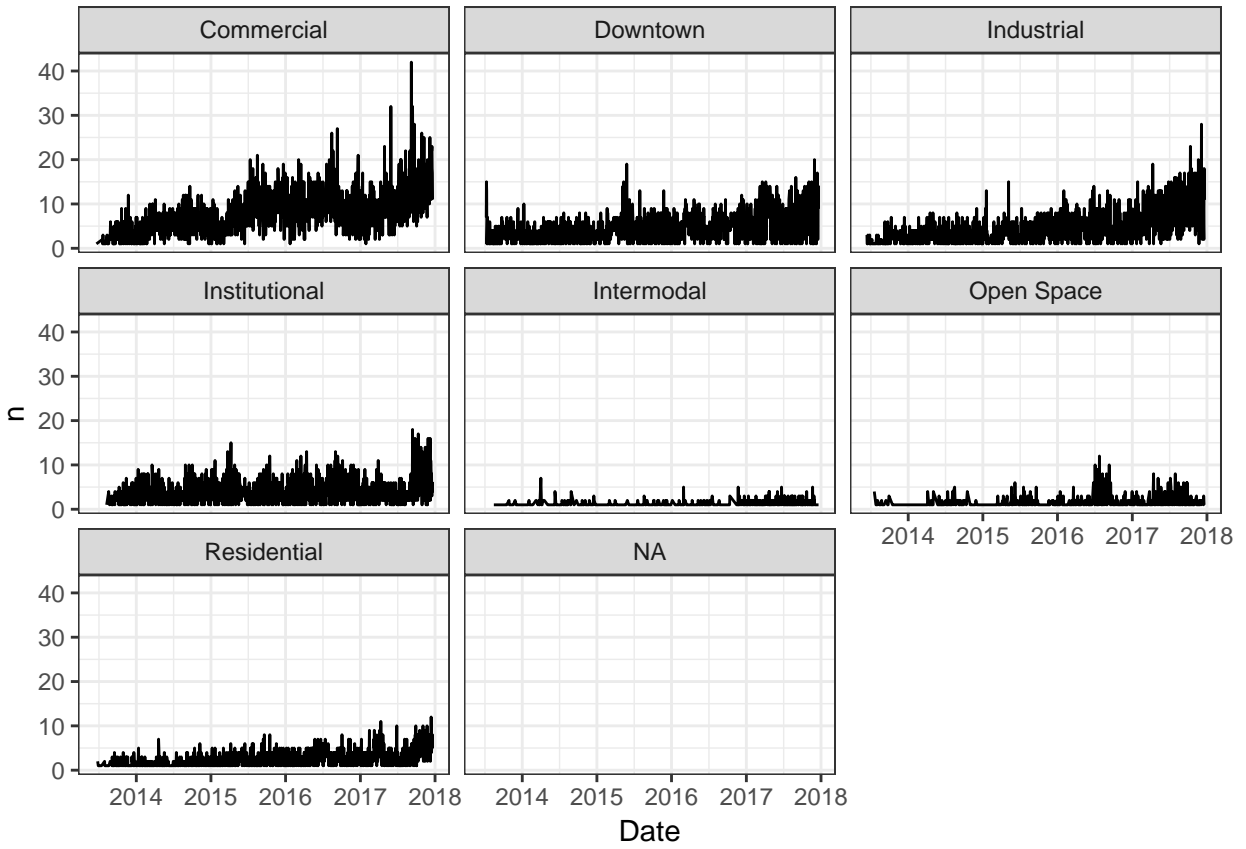
Barchart about the usage of all stations over time. In the next step clustered in areas, a line plot which show the usage of charging stations over the time certain areas.

Evolution of Charging events



Days, Month and Years

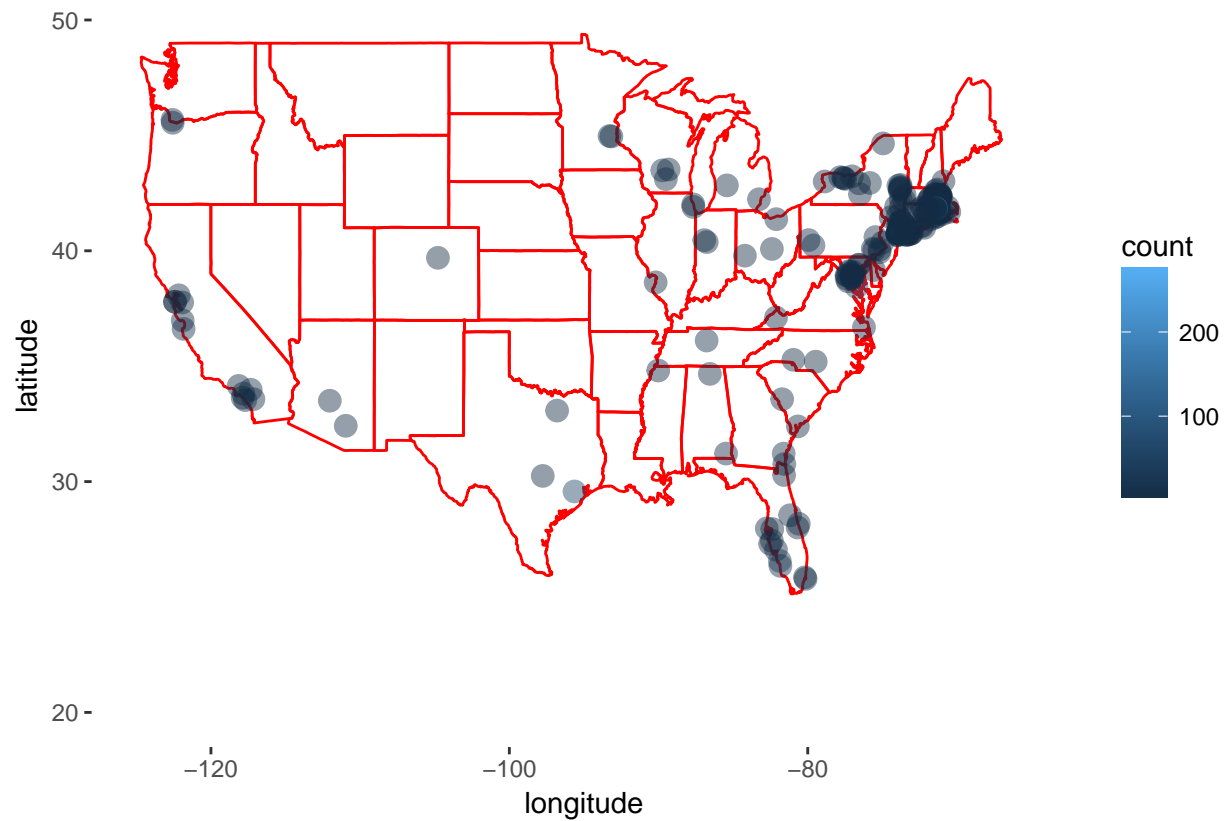
```
## Warning: Removed 1 rows containing missing values (geom_path).
```



Map of User Distribution

You can see two versions of a map of the United States which show the distribution of charging station users using RI charging stations.

```
## Warning: Removed 1 rows containing missing values (geom_point).
```



```
## Warning: Removed 1 rows containing missing values (geom_point).
```

