NYPD Shooting Incidents

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2022-01-16

Libraries

First I will import the libraries I will use for my report.

```
library(tidyverse)
library(knitr)
library(lubridate)
library(ggplot2)
```

Data Source

I will include the NYPD shooting incidents data that can be found here: (https://data.cityofnewyork.us/api/views/833y-fsy8/rows.csv?accessType=DOWNLOAD)

```
nypd_data = read_csv('https://data.cityofnewyork.us/api/views/833y-fsy8/rows.csv?accessType=DOWNLOAD')
```

Variables

Then I will create some variables for manipulation and categorization of data.

```
time_shifts = hour(hm("00:00","6:00","12:00","18:00","23:59"))
time_of_day = c("Night", "Morning", "Afternoon", "Evening")
q = setNames( rep(c('Winter', 'Spring', 'Summer','Fall'),each=3), c(12,1:11))
```

Dataset cleanup

I will not use Lon_Lat, X_COORD_CD, Y_COORD_CD, VIC_RACE, PERP_RACE, LOCATION_DESC, JURISDICTION_CODE, PRECINCT so I will omit from my data set. I will create the new columns MONTH_NUM, change the date as type mdy, and set the time of day and season.

```
nypd_data = nypd_data %>%
  mutate(
    MONTH_NUM = as.numeric(format(as.Date(OCCUR_DATE, '%m/%d/%Y'), '%m')),
    HOUR = as.numeric(hour(OCCUR_TIME)),
    OCCUR_DATE = mdy(OCCUR_DATE),
    TIME_OF_DAY = cut(x=hour(OCCUR_TIME), breaks = time_shifts, labels = time_of_day, include.lowest=TRU
    SEASON = unname(q[as.character(MONTH_NUM)]),
    ) %>%
```

```
  rename(DATE = 'OCCUR_DATE',
         TIME = 'OCCUR_TIME',
         ID = 'INCIDENT_KEY') %>%
  select(-c(Lon_Lat, X_COORD_CD, Y_COORD_CD, VIC_RACE,
            PERP_RACE, LOCATION_DESC, JURISDICTION_CODE, PRECINCT))
```

Then I set my model on the TIME_SQ column as a quadratic function.

```
crimes_by_time_of_day = nypd_data %>% group_by(TIME_OF_DAY, TIME, HOUR, BORO, SEASON) %>% summarize(CASE
quadr = lm(CASES ~ TIME_SQ, data = crimes_by_time_of_day)
crimes_by_time_of_day = crimes_by_time_of_day %>% mutate(PREDICTION = predict(quadr))
crimes_by_season = nypd_data %>% group_by(SEASON, BORO) %>% summarize(CASES = sum(Latitude/Latitude), MU
```

Data Summary

Here is a summary of the data by time of day and season:

```
summary(crimes_by_time_of_day)
```

```
##     TIME_OF_DAY       TIME              BORO               CASES
##  Night    :9679   Length:25596      Length:25596       Min.   : 1.000
##  Morning  :1707   Class1:hms        Class :character   1st Qu.: 2.000
##  Afternoon:5202   Class2:difftime   Mode  :character   Median : 3.000
##  Evening  :9008   Mode  :numeric                       Mean   : 4.805
##                                                        3rd Qu.: 6.000
##                                                        Max.   :34.000
##     MURDERS           TIME_SQ           HOUR          SEASON
##  Min.   : 0.0000   Min.   : 2.00   Min.   : 0.00   Length:25596
##  1st Qu.: 0.0000   1st Qu.: 6.50   1st Qu.: 3.00   Class :character
##  Median : 0.0000   Median :12.12   Median :15.00   Mode  :character
##  Mean   : 0.9556   Mean   :11.24   Mean   :12.19
##  3rd Qu.: 1.0000   3rd Qu.:14.50   3rd Qu.:20.00
##  Max.   :10.0000   Max.   :20.00   Max.   :23.00
##    PREDICTION
##  Min.   :2.648
##  1st Qu.:3.699
##  Median :5.012
##  Mean   :4.805
##  3rd Qu.:5.567
##  Max.   :6.851
```

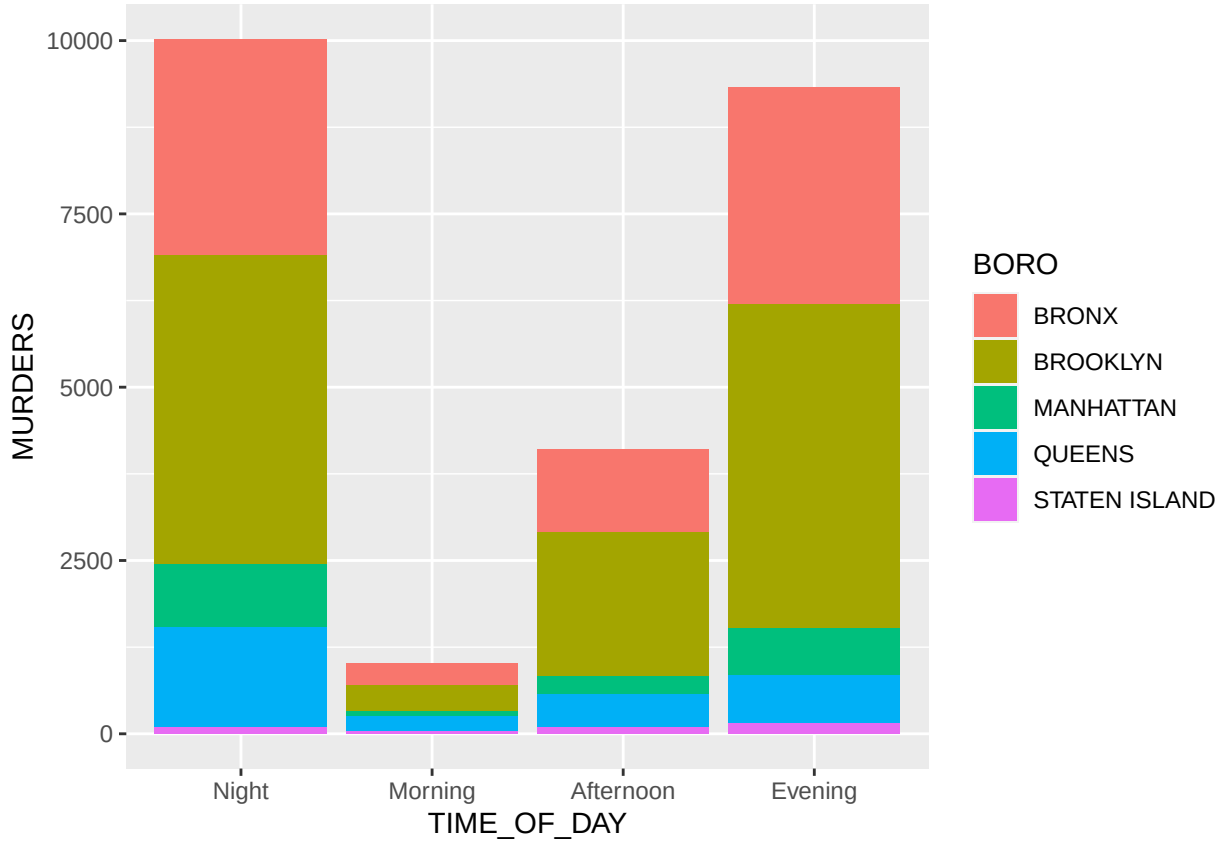
```
summary(crimes_by_season)
```

```
##     SEASON              BORO               CASES         MURDERS
##  Length:20          Length:20          Min.   : 157   Min.   : 34.0
##  Class :character   Class :character   1st Qu.: 686   1st Qu.:117.8
##  Mode  :character   Mode  :character   Median :1016   Median :190.0
##                                        Mean   :1280   Mean   :246.4
##                                        3rd Qu.:1800   3rd Qu.:351.5
##                                        Max.   :3642   Max.   :671.0
```

Visualizations and Analysis

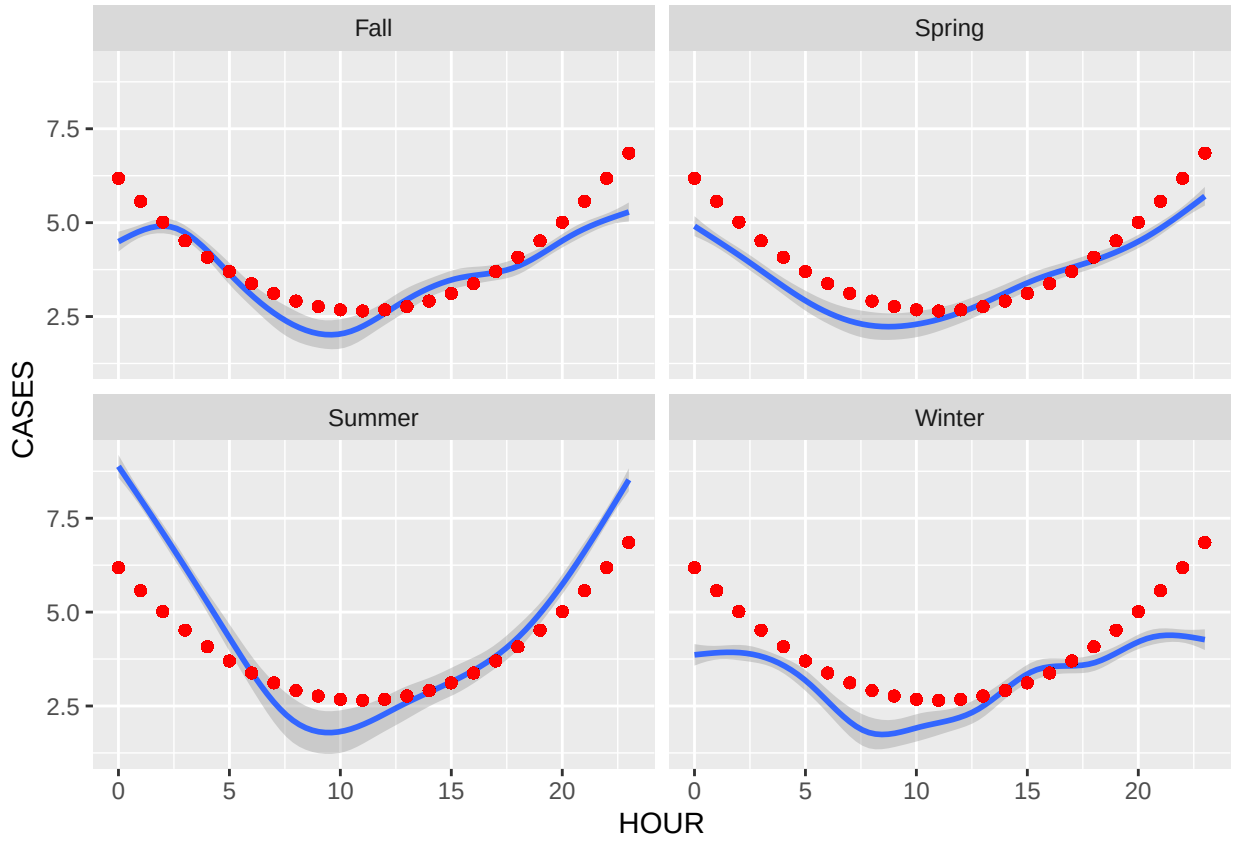
In the graphs it can be seen how there are more crimes during the evening and at night. During some seasons, there are less hours of sunlight, this could be affecting how my model is predicting incidents. It seems like during the summer more incidents occur.

```
ggplot2::ggplot(data = crimes_by_time_of_day) + geom_bar(mapping = aes(x=TIME_OF_DAY, y=MURDERS, fill=BO
```

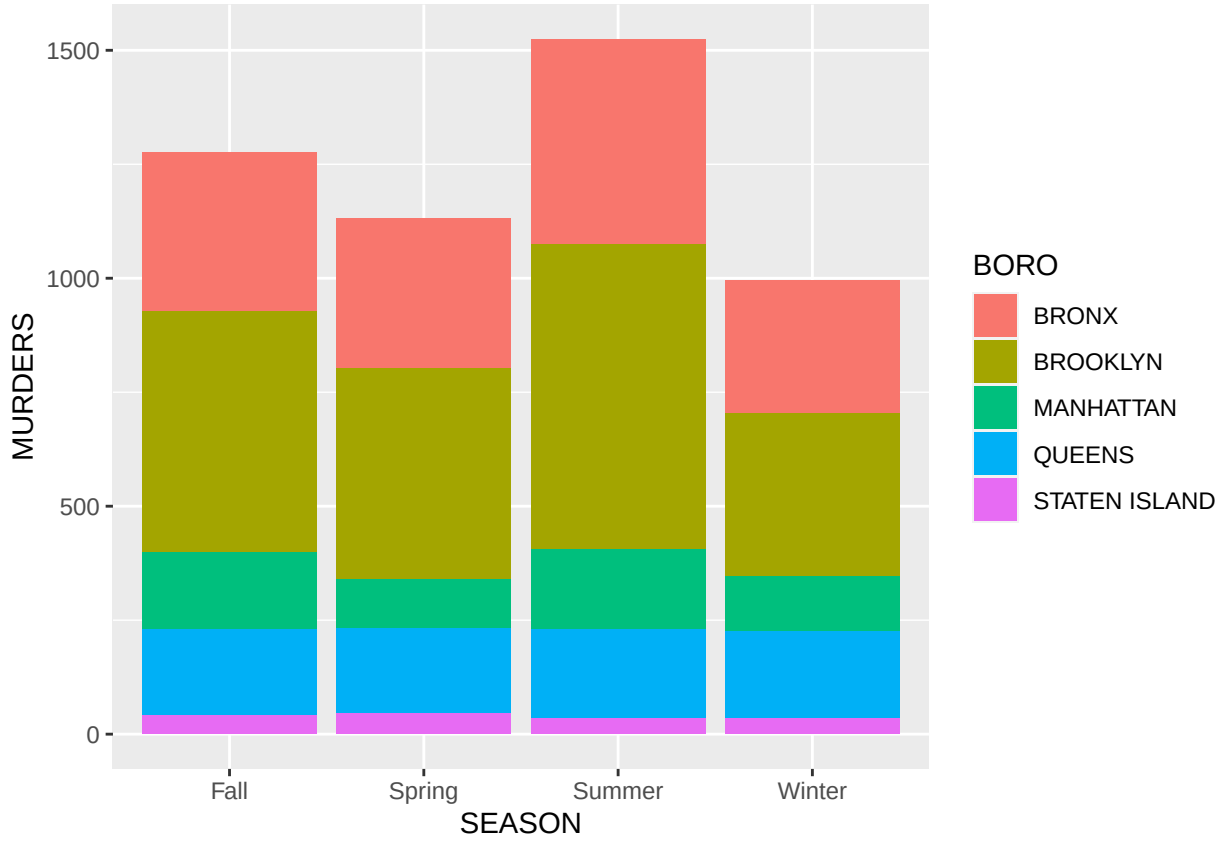



```
# `geom_smooth()` using method = 'gam' and formula 'y ~ s(x, bs = "cs")'
ggplot2::ggplot(data = crimes_by_time_of_day) + geom_smooth(mapping = aes(x=HOUR, y=CASES)) + geom_poin
```

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




```
ggplot2::ggplot(data = crimes_by_season) + geom_bar(mapping = aes(x=SEASON, y=MURDERS, fill=BORO), stat=
```



BIAS

In the data set there are columns for victim and perpetrator race, I believe these are common sources of bias, and have not included in the data for study.

```
sessionInfo()
```

```
## R version 4.2.1 (2022-06-23)
## Platform: x86_64-apple-darwin17.0 (64-bit)
## Running under: macOS Big Sur ... 10.16
##
## Matrix products: default
## BLAS:   /Library/Frameworks/R.framework/Versions/4.2/Resources/lib/libRblas.0.dylib
## LAPACK: /Library/Frameworks/R.framework/Versions/4.2/Resources/lib/libRlapack.dylib
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
##  [1] lubridate_1.9.0  timechange_0.1.1 knitr_1.40       forcats_0.5.2
##  [5] stringr_1.4.1    dplyr_1.0.10     purrr_0.3.5      readr_2.1.3
##  [9] tidyr_1.2.1      tibble_3.1.8     ggplot2_3.4.0    tidyverse_1.3.2
```

```
##
## loaded via a namespace (and not attached):
##  [1] lattice_0.20-45     assertthat_0.2.1    digest_0.6.30
##  [4] utf8_1.2.2          R6_2.5.1            cellranger_1.1.0
##  [7] backports_1.4.1     reprex_2.0.2        evaluate_0.18
## [10] highr_0.9           httr_1.4.4          pillar_1.8.1
## [13] rlang_1.0.6         googlesheets4_1.0.1 curl_4.3.3
## [16] readxl_1.4.1        rstudioapi_0.14     Matrix_1.4-1
## [19] rmarkdown_2.17      splines_4.2.1       labeling_0.4.2
## [22] googledrive_2.0.0   bit_4.0.4           munsell_0.5.0
## [25] broom_1.0.1         compiler_4.2.1      modelr_0.1.9
## [28] xfun_0.34           pkgconfig_2.0.3     mgcv_1.8-40
## [31] htmltools_0.5.3     tidyselect_1.2.0    fansi_1.0.3
## [34] crayon_1.5.2        tzdb_0.3.0          dbplyr_2.2.1
## [37] withr_2.5.0         grid_4.2.1          nlme_3.1-157
## [40] jsonlite_1.8.3      gtable_0.3.1        lifecycle_1.0.3
## [43] DBI_1.1.3           magrittr_2.0.3      scales_1.2.1
## [46] cli_3.4.1           stringi_1.7.8       vroom_1.6.0
## [49] farver_2.1.1        fs_1.5.2            xml2_1.3.3
## [52] ellipsis_0.3.2      generics_0.1.3      vctrs_0.5.0
## [55] tools_4.2.1         bit64_4.0.5         glue_1.6.2
## [58] hms_1.1.2           parallel_4.2.1      fastmap_1.1.0
## [61] yaml_2.3.6          colorspace_2.0-3    gargle_1.2.1
## [64] rvest_1.0.3         haven_2.5.1
```