

Hw4Part2

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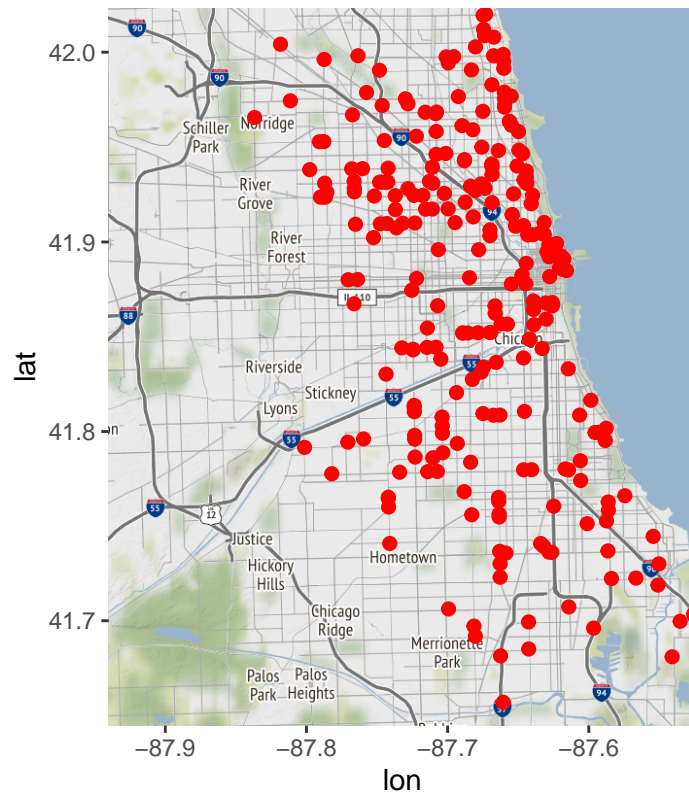
2023-02-18

```
# -----Setting the libraries to be used-----  
library(tidyverse)  
library(ggmap)  
library(tibble)  
library(spatstat)
```

Part a

```
pacman::p_load(ggmap, osmdata)  
chicago<-get_map(location = getbb("chicago") ,source = "stamen")  
  
chicago_points<-read_csv("/Users/rafa/Documents/Master Austin/MAESTRIA_AUSTIN/Advanced Predictive Model  
  
lon_chicago<-chicago_points$lon  
lat_chicago<-chicago_points$lat  
  
ggmap(chicago)+  
  geom_point(data = chicago_points,  
            aes(x = lon, y = lat),  
            color = "red",  
            size = 2) +  
  ggtitle("Chicago City supermarkets")
```

Chicago City supermarkets



ANSWER

If I were to draw the smallest rectangle (axis aligned rectangle, not rotated) on the map that included all supermarket locations; there would be no supermarkets in top right corner because there is water in there. It is not possible to see supermarkets in this location.

Part b

```
load("/Users/rafa/Documents/Master Austin/MAESTRIA_AUSTIN/Advanced Predictive Models/Hw4/Hw4Part2Data.R")
```

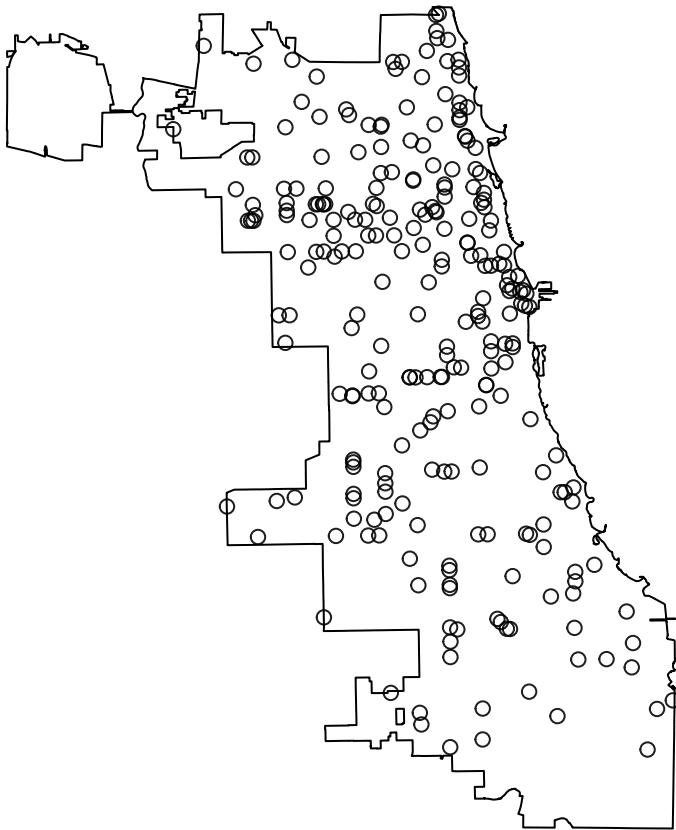
```
class(markets_ppp)
```

```
## [1] "ppp"
```

```
# exploratory analysis -- scatterplot
```

```
plot(markets_ppp,  
      main="Markets locations in Chicago")
```

Markets locations in Chicago



ANSWER

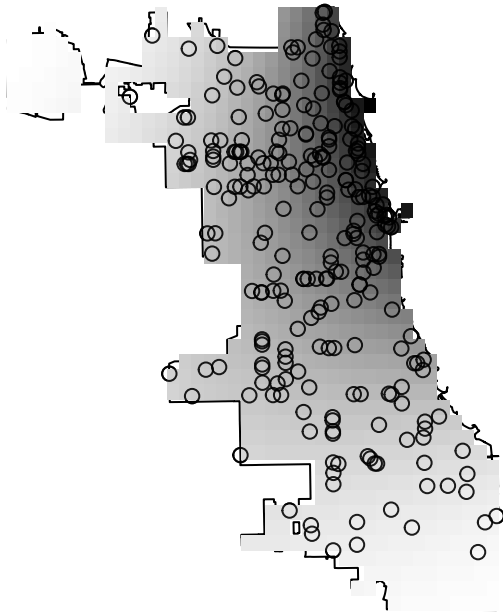
- 1) Looking at the plot, the data looks to NOT follow a regular distribution. We notice variation in the locations of the supermarkets, so is not regularly distributed everywhere.
- 2) The intensity is not constant everywhere in Chicago. We can notice some gaps at the south of Chicago, while in the north there are more markets. Hence the number of events per unit area will vary from region to region in the map of Chicago.

Part c

```
fit3 <- ppm(markets_ppp, ~ polynom(x, y, 2))
```

```
plot(markets_ppp,
      main="Markets locations in Chicago")
plot(fit3,
      how = "image",
      se = FALSE,
      add=TRUE,
      col = grey(seq(1,0,length=128)))
```

Markets locations in Chicago



```
print("The parameters")
```

```
## [1] "The parameters"
```

```
fit3
```

```
## Error in solve.default(M) :
##   system is computationally singular: reciprocal condition number = 2.14998e-38
## Error in solve.default(M) :
##   system is computationally singular: reciprocal condition number = 2.14998e-38
## Nonstationary Poisson process
##
## Log intensity: ~x + y + I(x^2) + I(x * y) + I(y^2)
##
## Fitted trend coefficients:
```

```
##      (Intercept)          x          y      I(x^2)      I(x * y)
## -3.139597e+04 -2.255093e-02  1.564752e-02 -1.439943e-09  5.155933e-09
##      I(y^2)
## -1.929811e-09
##
## Standard errors unavailable; variance-covariance matrix is singular
signif(-3.139597e+04,4)

## [1] -31400
pred_forecast <- data.frame(x = 443674, y = 4636999)

signif(predict(fit3,type="cif",locations=pred_forecast),4)

## [1] 7.706e-07
```

ANSWER

The intercept of estimated (log) intensity function is **-31400**

The numerical value of the intensity function at the point ($x = 443674$, $y = 4636999$) is **7.706e-07**