## Ex.No.8 Implement an application that stores big data in Hbase / MangoDB/ Pig using Hadoop / R

## Aim

To implement an application that stores big data in MongoDB using R.

## Pre-Lab Discussion

### Theory

**MongoDB with R**

Mongodb is a NoSql database platform that works on the concept of collection and documents. Collection: Collections are just like tables in relational databases. They are a group of Mongodb documents. These collections contain a set of documents. Document: Documents are like tuples/ rows in a relational database. R provides several libraries for creating a connection between mongodb and R such as: mongolite, Rmongo, rmongodb .

Step 1 - Install 'RMango package'

```
install.packages("RMongo")
library(RMongo)
```

Step 2 - Create a connection

```
r_mongo_con <- mongoDbConnect('db')
```

Step 3 - Check the connection

```
print(dbShowCollections(r_mongo_con)) # this verifies the established connection , returns errors if any
```

Step 4 - Run Queries

```
var_Query <- dbGetQuery(mongo, 'collection_name', "{'type': 'required_data'}")
```

Step 5 - Install mongolite package

```
install.packages('mongolite') library(mongolite)
```

Step 6 - Create a connection

```
mongolite_conn <- mongo(dataset, url)
```

The most popular packages to connect MongoDB and R are:

**mongolite:** A more recent R MongoDB driver, mongolite can perform various operations like indexing, aggregation pipelines, TLS encryption, and SASL authentication, among others. It’s

based on the jsonlite package for R and mongo-c-driver. We can install mongolite from CRAN or from RStudio (explained in a later section).

**RMongo:** RMongo was the first R MongoDB driver with a simple R MongoDB interface. It has syntax like the MongoDB shell. RMongo has been deprecated as of now.

rmongodb: rmongodb has functions to create pipelines, handle BSON objects, etc. Its syntax is very complex compared to mongolite. Just like RMongo, rmongodb has been deprecated and is not available or maintained on CRAN.

**Inserting data**

Let's insert the crimes data from data.gov to MongoDB. The dataset reflects reported incidents of crime (with the exception of murders where data exists for each victim) that occurred in the City of Chicago since 2001.

**PROGRAM:**

```
install.packages('gridExtra')
library (ggplot2)
library (dplyr)
library (maps)
library (ggmap)
library (mongolite)
library (lubridate)
library (gridExtra)
crimes=data.table::fread("crime.csv")
names (crimes)
names(crimes) = gsub(" ","",names(crimes))
names(crimes)
my_collection = mongo(collection = "crimes", db = "Chicago") # create connection,
database and collection
my_collection$insert(crimes)
my_collection$count()
my_collection$iterate()$one()
length(my_collection$distinct("PrimaryType"))
my_collection$count('{"PrimaryType":"ASSAULT" }')
query1= my_collection$find('{"PrimaryType" : "THEFT", "Domestic" : false }')
```

```
query2= my_collection$find('{"PrimaryType" : "THEFT", "Domestic" : true }',fields =
'{"_id":0, "PrimaryType":1, "Domestic":1}')
ncol(query1) # with all the columns
ncol(query2) # only the selected columns
domestic=my_collection$find('{"Domestic":true}',
fields   =         '{"_id":0}')
domestic$Date= mdy_hms(domestic$Date)
domestic$Weekday = weekdays(domestic$Date)
domestic$Hour = hour(domestic$Date)
domestic$month = month(domestic$Date,label=TRUE)
plot(domestic$Date,domestic$Hour, col=domestic$month)
pie(domestic)
barplot(domestic$Hour,domestic$month)
plot(domestic$District,domestic$Hour)
plot(domestic$District[1:1000], type="l", col="blue")
DayHourCounts = as.data.frame(table(domestic$Weekday, domestic$Hour))
DayHourCounts$Hour = as.numeric(as.character(DayHourCounts$Var2))
ggplot(DayHourCounts, aes(x=Hour, y=Freq)) + geom_line(aes(group=Var1, color=Var1),
size=1.4)+ylab("Count")+ ylab("Total Domestic Crimes")+ggtitle("Domestic Crimes in the
City of Chicago Since 2001")+theme(axis.title.x=element_text(size=14),axis.text.y =
element_text(color="blue",size=11,angle=0,hjust=1,vjust=0),axis.text.x
=element_text(color="blue",size=11,angle=0,hjust=.5,vjust=.5), axis.title.y =
element_text(size=14),legend.title=element_blank(),plot.title=element_text(size=16,color="
purple",hjust=0.5))
DayHourCounts$Type = ifelse((DayHourCounts$Var1 == "Sunday") |
(DayHourCounts$Var1 == "Saturday"), "Weekend", "Weekday")
ggplot(DayHourCounts, aes(x=Hour, y=Freq)) + geom_line(aes(group=Var1, color=Type),
size=2, alpha=0.5) +ylab("Total Domestic Crimes")+ggtitle("Domestic Crimes in the City of
Chicago Since 2001")+theme(axis.title.x=element_text(size=14),axis.text.y =
element_text(color="blue",size=11,angle=0,hjust=1,vjust=0),axis.text.x =
element_text(color="blue",size=11,angle=0,hjust=.5,vjust=.5), axis.title.y =
element_text(size=14),legend.title=element_blank(),plot.title=element_text(size=16,color="
purple",hjust=0.5))
DayHourCounts$Var1 = factor(DayHourCounts$Var1, ordered=TRUE,levels=c("Monday",
```

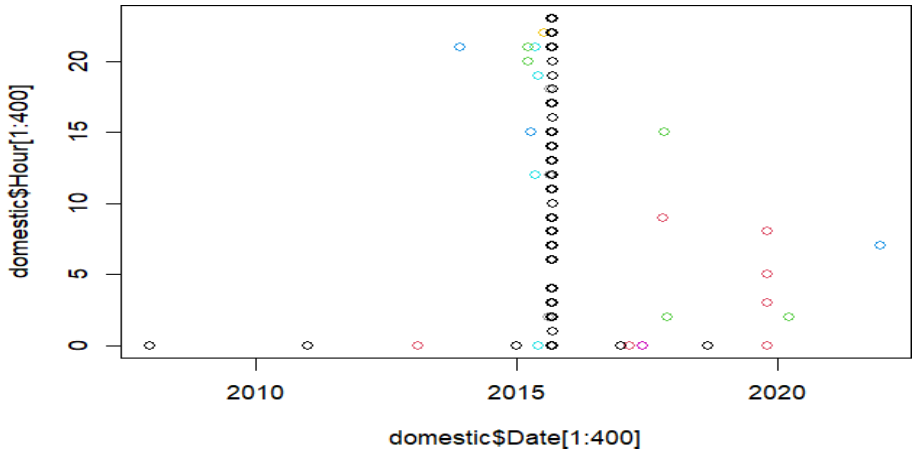
```
"Tuesday", "Wednesday", "Thursday", "Friday", "Saturday", "Sunday"))
ggplot(DayHourCounts, aes(x = Hour, y = Var1)) + geom_tile(aes(fill = Freq)) +
scale_fill_gradient(name="Total MV Thefts", low="white", high="red") +ggtitle("Domestic
Crimes in the City of Chicago Since 2001")+theme(axis.title.y =
element_blank())+ylab("")+theme(axis.title.x=element_text(size=14),axis.text.y =
element_text(size=13),axis.text.x = element_text(size=13), axis.title.y =
element_text(size=14),legend.title=element_blank(),plot.title=element_text(size=16,color="
purple"))
domestic=my_collection$find('{"Domestic":true}', fields ='{"_id":0,
"Domestic":1,"Date":1}')
domestic$Date= mdy_hms(domestic$Date)
domestic$Weekday = weekdays(domestic$Date)
domestic$Hour = hour(domestic$Date)
domestic$month = month(domestic$Date,label=TRUE)
WeekdayCounts = as.data.frame(table(domestic$Weekday))
WeekdayCounts$Var1 = factor(WeekdayCounts$Var1, ordered=TRUE, levels=c("Sunday",
"Monday", "Tuesday", "Wednesday", "Thursday", "Friday","Saturday"))
ggplot(WeekdayCounts,aes(x=Var1, y=Freq))+geom_line(aes(group=1),size=2,color="red")
+ xlab("Day of the Week") + ylab("Total Domestic Crimes")+ ggtitle("Domestic Crimes in
the City of Chicago Since 2001")+ theme(axis.title.x=element_blank(),axis.text.y =
element_text(color="blue",size=11,angle=0,hjust=1,vjust=0),axis.text.x =
element_text(color="blue",size=11,angle=0,hjust=.5,vjust=.5), axis.title.y =
element_text(size=14), plot.title=element_text(size=16,color="purple",hjust=0.5))
ASSAULT=my_collection$count('{"PrimaryType":"ASSAULT", "Domestic" : true }')
my_collection$aggregate('[{"$group":{"_id":"$LocationDescription","Count":{"$sum":1}}}
')%>%na.omit()%>%arrange(desc(count))%>%head(10)%>%
ggplot(aes(x=reorder(`_id`,count),y=count))+geom_bar(stat="identity",color='skyblue',fill='
#b35900')+geom_text(aes(label count), color = "blue") +coord_flip()+xlab("Location
Description")
```

**OUTPUT:**

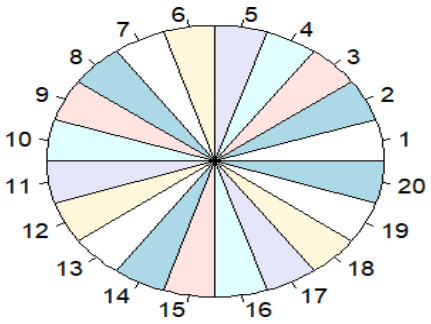
```
> names (crimes)
 [1] "ID"                  "Case Number"         "Date"
 [4] "Block"               "IUCR"                "Primary Type"
 [7] "Description"         "Location Description" "Arrest"
[10] "Domestic"            "Beat"                "District"
[13] "Ward"                "Community Area"      "FBI Code"
[16] "X Coordinate"        "Y Coordinate"        "Year"
[19] "Updated On"          "Latitude"            "Longitude"
[22] "Location"
> names(crimes) = gsub(" ","",names(crimes))
> names(crimes)
 [1] "ID"                  "CaseNumber"          "Date"                "Block"
 [5] "IUCR"                "PrimaryType"         "Description"         "LocationDescription"
 [9] "Arrest"              "Domestic"            "Beat"                "District"
[13] "Ward"                "CommunityArea"       "FBICode"             "XCoordinate"
[17] "YCoordinate"         "Year"                "UpdatedOn"           "Latitude"
[21] "Longitude"           "Location"
> my_collection = mongo(collection = "crimes", db = "Chicago") # create connection,
database and collection
> my_collection$insert(crimes)
List of 5
 $ nInserted  : num 7750924
 $ nMatched   : num 0
 $ nRemoved   : num 0
 $ nUpserted  : num 0
 $ writeErrors: list()
> my_collection$count()
[1] 7750924
> my_collection$iterate()$one()
$ID
[1] 10224738

$CaseNumber
[1] "HY411648"

$Date
[1] "09/05/2015 01:30:00 PM"

$Block
[1] "043XX S WOOD ST"

$IUCR
[1] "0486"

$PrimaryType
[1] "BATTERY"

$Description
[1] "DOMESTIC BATTERY SIMPLE"
```

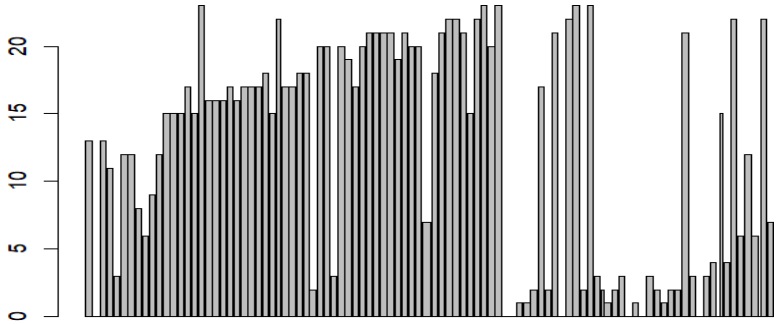
```
$LocationDescription
[1] "RESIDENCE"

$Arrest
[1] FALSE

$Domestic
[1] TRUE

$Beat
[1] 924

$District
[1] 9

$Ward
[1] 12

$CommunityArea
[1] 61

$FBICode
[1] "08B"

$XCoordinate
[1] 1165074

$YCoordinate
[1] 1875917

$Year
[1] 2015

$UpdatedOn
[1] "02/10/2018 03:50:01 PM"

$Latitude
[1] 41.81512

$Longitude
[1] -87.67

$Location
[1] "(41.815117282, -87.669999562)"

> length(my_collection$distinct("PrimaryType"))
[1] 36
> my_collection$count('{"PrimaryType":"ASSAULT" }')
[1] 504447
```

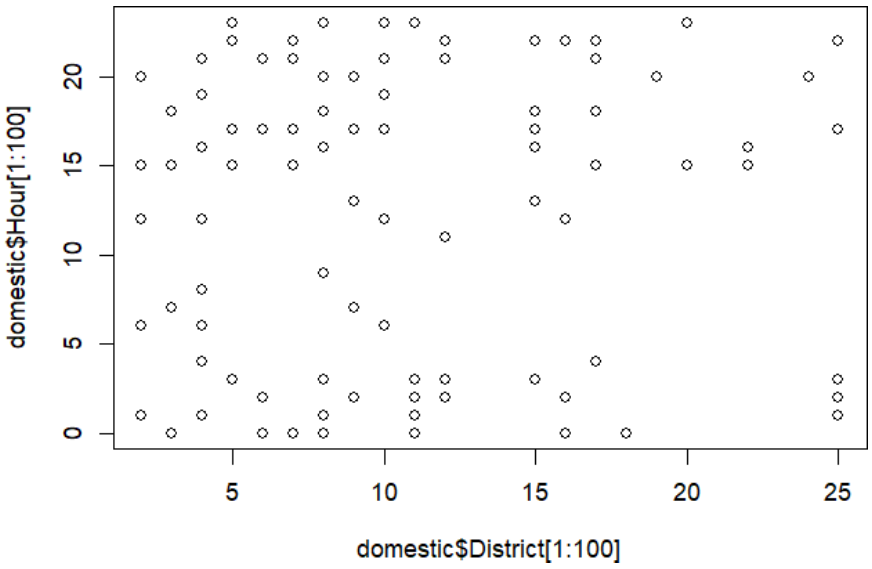
```
> query1= my_collection$find('{"PrimaryType" : "THEFT", "Domestic" : false }')
> query2= my_collection$find('{"PrimaryType" : "THEFT", "Domestic" : true }',
+                            fields = '{"_id":0, "PrimaryType":1, "Domestic":1}')
> ncol(query1) # with all the columns
[1] 22
> ncol(query2) # only the selected columns
[1] 2
> domestic=my_collection$find('{"Domestic":true}',
+ fields          =          '{"_id":0}')
> domestic$Date= mdy_hms(domestic$Date)
> domestic$Weekday = weekdays(domestic$Date)
> domestic$Hour = hour(domestic$Date)
> domestic$month = month(domestic$Date,label=TRUE)

> domestic$month = month(domestic$Date)
> plot(domestic$Date[1:400],domestic$Hour[1:400], col=domestic$month)
```

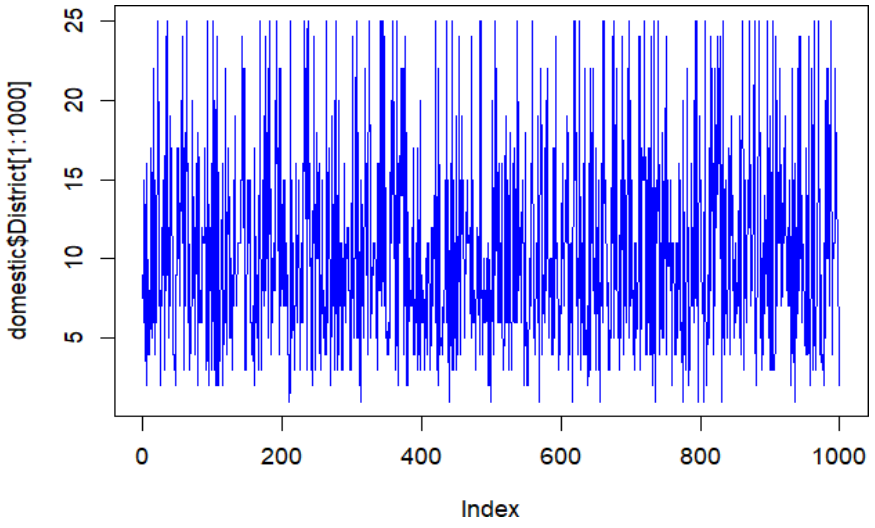


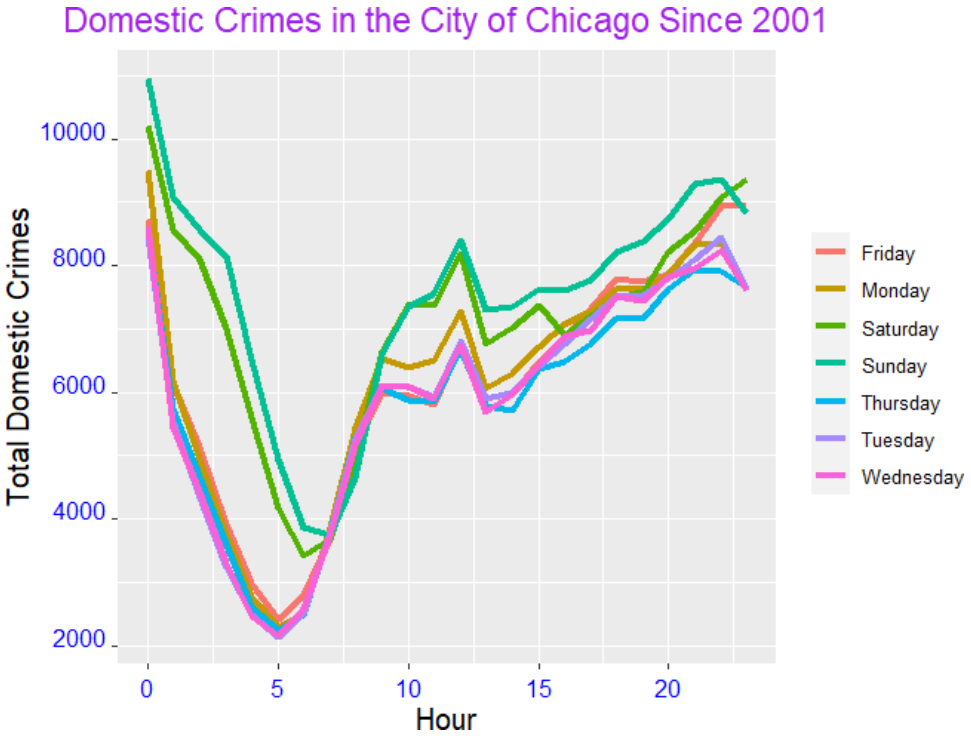

```
pie(domestic$Year[1:20])
```

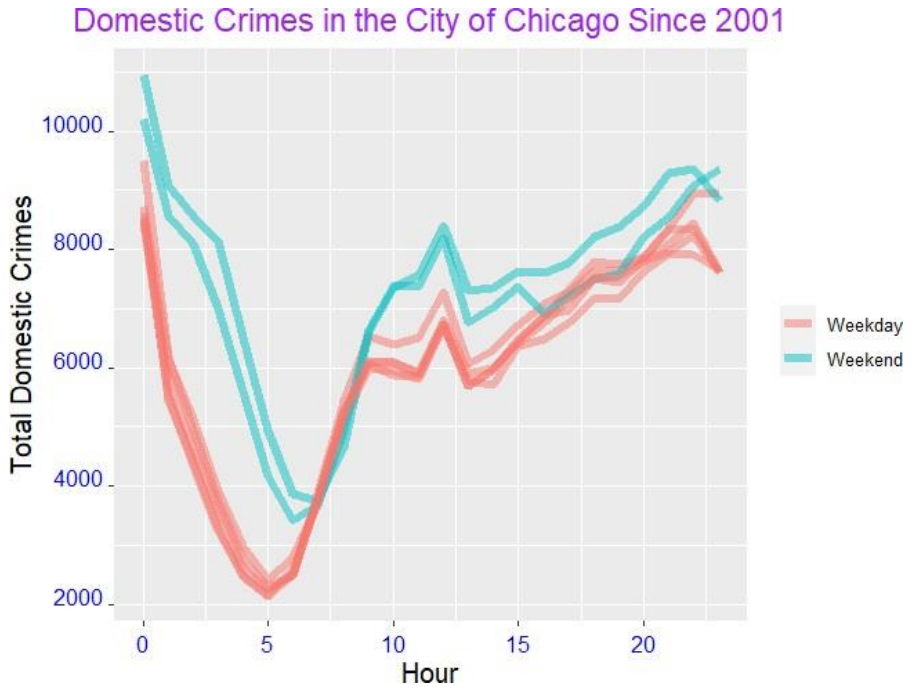


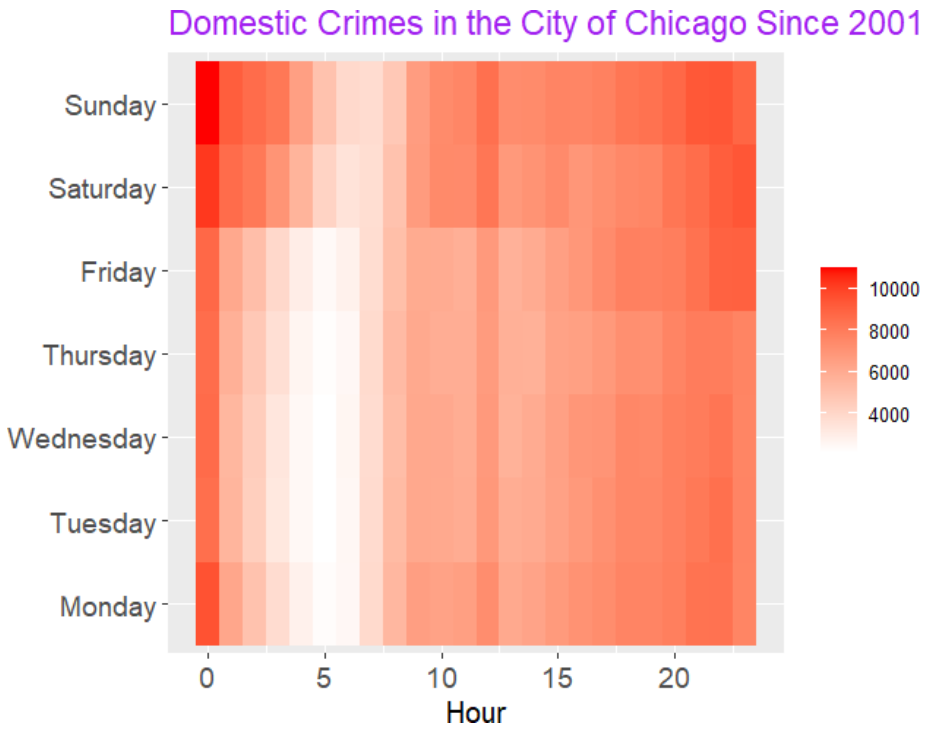

0
5
10
15
20

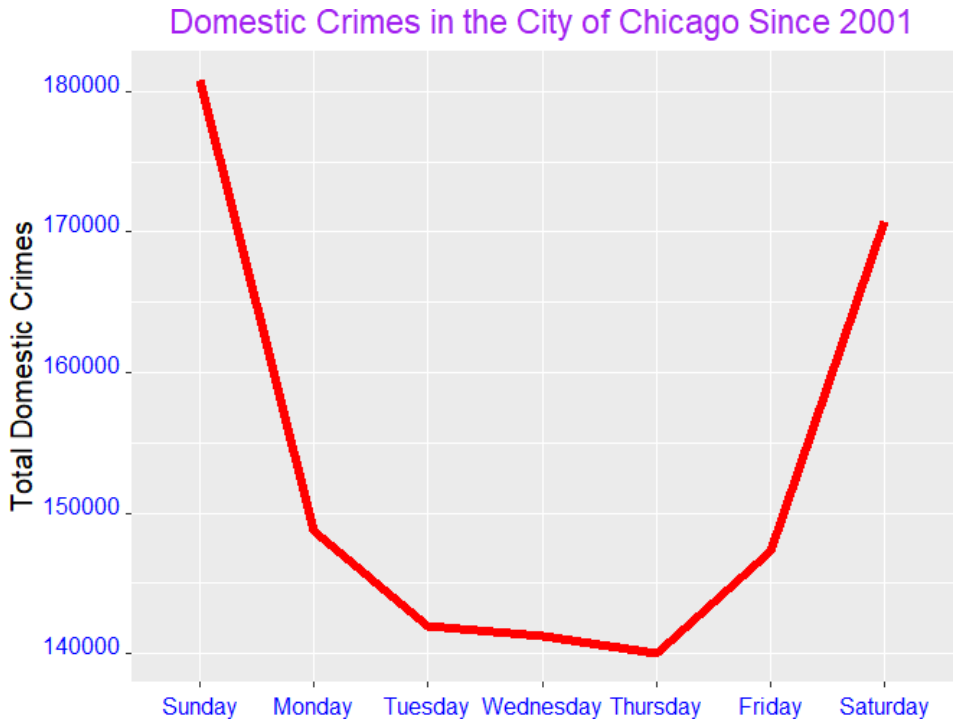

domestic$Hour[1:100]
0
5
10
15
20
5
10
15
20
25
domestic$District[1:100]


domestic$District[1:1000]
5
10
15
20
25
0
200
400
600
800
1000
Index


Domestic Crimes in the City of Chicago Since 2001
Total Domestic Crimes
10000
8000
6000
4000
2000
0
5
10
15
20
Hour
Friday
Monday
Saturday
Sunday
Thursday
Tuesday
Wednesday


Domestic Crimes in the City of Chicago Since 2001
Total Domestic Crimes
10000
8000
6000
4000
2000
0
5
10
15
20
Hour
Weekday
Weekend


Domestic Crimes in the City of Chicago Since 2001
Sunday
Saturday
Friday
Thursday
Wednesday
Tuesday
Monday
0
5
10
15
20
Hour
10000
8000
6000
4000


Domestic Crimes in the City of Chicago Since 2001
Total Domestic Crimes
180000
170000
160000
150000
140000
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday

**Result**