analyticsedge

Mridul Jain

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Assignment 1 Answers

An Analytical Detective

There are two main types of crimes: violent crimes, and property crimes. In this problem, we'll focus on one specific type of property crime, called "motor vehicle theft" (sometimes referred to as grand theft auto). This is the act of stealing, or attempting to steal, a car. In this problem, we'll use some basic data analysis in R to understand the motor vehicle thefts in Chicago.

To download this data, click: mvtWeek1.csv

Start:
Read the dataset mvtWeek1.csv into R, using the read.csv function, and call the data frame "mvt".

```
mvt <- read.csv("mvtWeek1.csv")
```

1.1: How many rows of data (observations) are in this dataset?
Answer: 191641

```
nrow(mvt)
```

```
[1] 191641
```

1.2: How many variables are in this dataset?
Answer: 11

```
ncol(mvt)
```

```
[1] 11
```

1.3: Using the "max" function, what is the maximum value of the variable "ID"?
Answer: 9181151

```
max(mvt$ID)
```

```
[1] 9181151
```

1.4: What is the minimum value of the variable "Beat"?
Answer: 111

```
min(mvt$Beat)
```

```
[1] 111
```

1.5: How many observations have value TRUE in the Arrest variable (this is the number of crimes for which an arrest was made)?
Answer: 15536

```
sum(mvt$Arrest)
```

```
[1] 15536
```

1.6: How many observations have a LocationDescription value of ALLEY?
Answer: 2308

```
sum(mvt$LocationDescription == "ALLEY")
```

```
[1] 2308
```

2.1: In what format are the entries in the variable Date?
Answer: Month/Day/Year Hour:Minute

```
mvt$Date[1]
```

```
[1] "12/31/12 23:15"
```

2.2: What is the month and year of the median date in our dataset? Enter your answer as "Month Year", without the quotes.
Answer: May 2006

```
DateConvert = as.Date(strptime(mvt$Date, "%m/%d/%y %H:%M"))
#summary(DateConvert)
median(DateConvert)
```

```
[1] "2006-05-21"
```

2.3: In which month did the fewest motor vehicle thefts occur?
Answer: February

```
mvt$Month = months(DateConvert)
mvt$Weekday = weekdays(DateConvert)
mvt$Date = DateConvert
table(mvt$Month)
```

```
  April    August  December  February   January      July      June     March
  15280     16572     16426     13511     16047     16801     16002     15758
    May  November   October September
  16035     16063     17086     16060
```

2.4: On which weekday did the most motor vehicle thefts occur?
Answer: Friday

```
table(mvt$Weekday)
```

```
 Friday    Monday  Saturday    Sunday  Thursday   Tuesday Wednesday
  29284     27397     27118     26316     27319     26791     27416
```

2.5: Which month has the largest number of motor vehicle thefts for which an arrest was made?
Answer: January

```
table(mvt$Month, mvt$Arrest)
```

```
          FALSE  TRUE
April     14028  1252
August    15243  1329
December  15029  1397
```

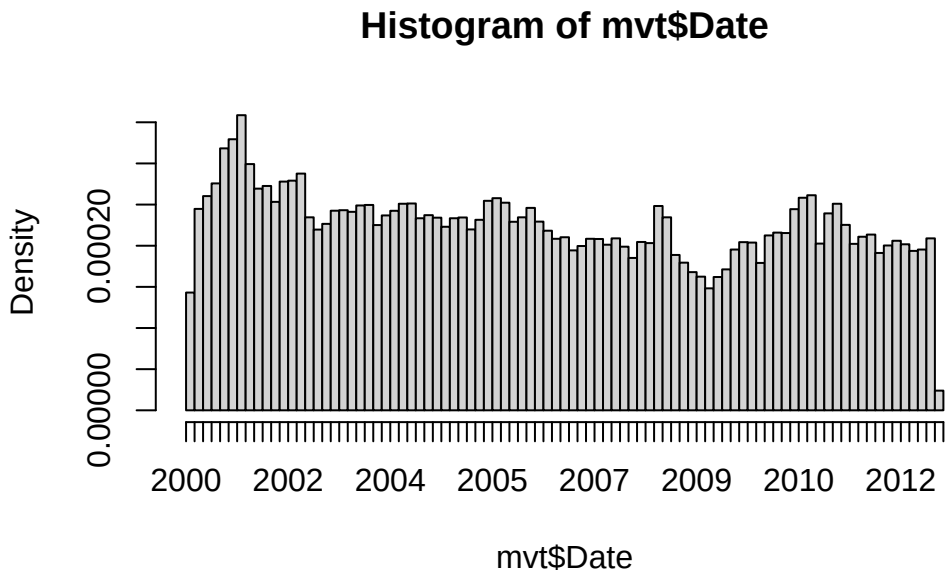
```
February  12273  1238
January   14612  1435
July      15477  1324
June      14772  1230
March     14460  1298
May       14848  1187
November  14807  1256
October   15744  1342
September 14812  1248
```

3.1.1: In general, does it look like crime increases or decreases from 2002 - 2012?
Answer: Decreases

3.1.2: In general, does it look like crime increases or decreases from 2005 - 2008?
Answer: Decreases

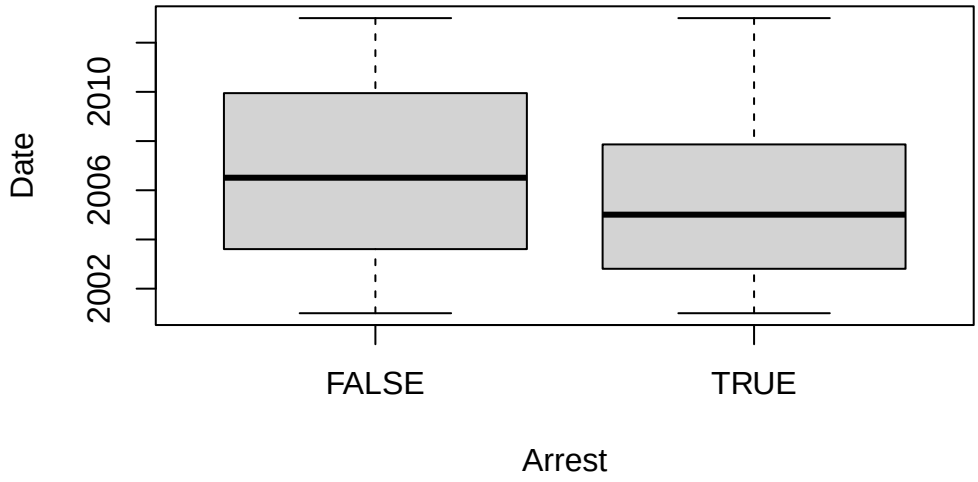
3.1.3: In general, does it look like crime increases or decreases from 2009 - 2011?
Answer: Increases

```
hist(mvt$Date, breaks=100)
```



3.2: Does it look like there were more crimes for which arrests were made in the first half of the time period or the second half of the time period?
Answer: First half

```
boxplot(Date ~ Arrest, data = mvt)
```



3.3: For what proportion of motor vehicle thefts in 2001 was an arrest made?
Answer: 0.1041173

```
table(mvt$Year, mvt$Arrest)
```

```
      FALSE  TRUE
  2001 18517  2152
  2002 16638  2115
  2003 14859  1798
  2004 15169  1693
  2005 14956  1528
  2006 14796  1302
  2007 13068  1212
  2008 13425  1020
  2009 11327   840
  2010 14796   701
  2011 15012   625
  2012 13542   550
```

```
2152/(18517+2152)
```

```
[1] 0.1041173
```

3.4: For what proportion of motor vehicle thefts in 2007 was an arrest made?
Answer: 0.08487395

```
table(mvt$Year, mvt$Arrest)
```

```
      FALSE  TRUE
  2001 18517  2152
  2002 16638  2115
  2003 14859  1798
  2004 15169  1693
  2005 14956  1528
  2006 14796  1302
  2007 13068  1212
  2008 13425  1020
  2009 11327   840
  2010 14796   701
  2011 15012   625
  2012 13542   550
```

```
1212/(13068+1212)
```

```
[1] 0.08487395
```

3.5: For what proportion of motor vehicle thefts in 2012 was an arrest made?
Answer: 0.03902924

```
table(mvt$Year, mvt$Arrest)
```

```
      FALSE  TRUE
  2001 18517  2152
  2002 16638  2115
  2003 14859  1798
  2004 15169  1693
  2005 14956  1528
  2006 14796  1302
  2007 13068  1212
  2008 13425  1020
  2009 11327   840
  2010 14796   701
```

```
2011 15012   625
2012 13542   550
```

```
550/(13542+550)
```

```
[1] 0.03902924
```

4.1: Which locations are the top five locations for motor vehicle thefts, excluding the "Other" category?
Answer: STREET, PARKING LOT/GARAGE(NON.RESID.), ALLEY, GAS STATION, DRIVEWAY - RESIDENTIAL

```
sort(table(mvt$LocationDescription))
```

```
                AIRPORT BUILDING NON-TERMINAL - SECURE AREA
                                                          1
                            AIRPORT EXTERIOR - SECURE AREA
                                                          1
                                       ANIMAL HOSPITAL
                                                          1
                                       APPLIANCE STORE
                                                          1
                                            CTA TRAIN
                                                          1
                                 JAIL / LOCK-UP FACILITY
                                                          1
                                            NEWSSTAND
                                                          1
                                               BRIDGE
                                                          2
                          COLLEGE/UNIVERSITY RESIDENCE HALL
                                                          2
                                 CURRENCY EXCHANGE
                                                          2
                                    BOWLING ALLEY
                                                          3
                                   CLEANING STORE
                                                          3
                               MEDICAL/DENTAL OFFICE
                                                          3
```

ABANDONED BUILDING	4
AIRPORT BUILDING NON-TERMINAL - NON-SECURE AREA	4
BARBERSHOP	4
LAKEFRONT/WATERFRONT/RIVERBANK	4
LIBRARY	4
SAVINGS AND LOAN	4
AIRPORT TERMINAL UPPER LEVEL - NON-SECURE AREA	5
CHA APARTMENT	5
DAY CARE CENTER	5
FIRE STATION	5
FOREST PRESERVE	6
BANK	7
CONVENIENCE STORE	7
DRUG STORE	8
OTHER COMMERCIAL TRANSPORTATION	8
ATHLETIC CLUB	9
AIRPORT VENDING ESTABLISHMENT	10
AIRPORT PARKING LOT	11
SCHOOL, PRIVATE, BUILDING	14
TAVERN/LIQUOR STORE	14
FACTORY/MANUFACTURING BUILDING	16
BAR OR TAVERN	

17
WAREHOUSE
17
MOVIE HOUSE/THEATER
18
RESIDENCE PORCH/HALLWAY
18
NURSING HOME/RETIREMENT HOME
21
TAXICAB
21
DEPARTMENT STORE
22
HIGHWAY/EXPRESSWAY
22
SCHOOL, PRIVATE, GROUNDS
23
VEHICLE-COMMERCIAL
23
AIRPORT EXTERIOR - NON-SECURE AREA
24
OTHER RAILROAD PROP / TRAIN DEPOT
28
SMALL RETAIL STORE
33
CONSTRUCTION SITE
35
CAR WASH
44
COLLEGE/UNIVERSITY GROUNDS
47
GOVERNMENT BUILDING/PROPERTY
48
RESTAURANT
49
CHURCH/SYNAGOGUE/PLACE OF WORSHIP
56
GROCERY FOOD STORE
80
HOSPITAL BUILDING/GROUNDS
101
SCHOOL, PUBLIC, BUILDING
114

HOTEL/MOTEL
124
COMMERCIAL / BUSINESS OFFICE
126
CTA GARAGE / OTHER PROPERTY
148
SPORTS ARENA/STADIUM
166
APARTMENT
184
SCHOOL, PUBLIC, GROUNDS
206
PARK PROPERTY
255
POLICE FACILITY/VEH PARKING LOT
266
AIRPORT/AIRCRAFT
363
CHA PARKING LOT/GROUNDS
405
SIDEWALK
462
VEHICLE NON-COMMERCIAL
817
VACANT LOT/LAND
985
RESIDENCE-GARAGE
1176
RESIDENCE
1302
RESIDENTIAL YARD (FRONT/BACK)
1536
DRIVEWAY - RESIDENTIAL
1675
GAS STATION
2111
ALLEY
2308
OTHER
4573
PARKING LOT/GARAGE(NON.RESID.)
14852
STREET

```
156564
```

Create a subset of your data, only taking observations for which the theft happened in one of these five locations, and call this new data set "Top5".

```
Top5 <- subset(mvt, mvt$LocationDescription == "STREET"
       | mvt$LocationDescription == "PARKING LOT/GARAGE(NON.RESID.)"
       | mvt$LocationDescription == "ALLEY"
       | mvt$LocationDescription == "GAS STATION"
       | mvt$LocationDescription == "DRIVEWAY - RESIDENTIAL")
```

4.2: How many observations are in Top5?
Answer: 177510

```
nrow(Top5)
```

```
[1] 177510
```

4.3: One of the locations has a much higher arrest rate than the other locations. Which is it?
Answer: Gas Station (Check percentages)

```
Top5$LocationDescription = factor(Top5$LocationDescription)
table(Top5$LocationDescription, Top5$Arrest)
```

```
                                FALSE   TRUE
ALLEY                            2059    249
DRIVEWAY - RESIDENTIAL           1543    132
GAS STATION                      1672    439
PARKING LOT/GARAGE(NON.RESID.)  13249   1603
STREET                         144969  11595
```

4.4: On which day of the week do the most motor vehicle thefts at gas stations happen?
Answer: Saturday

```
table(Top5$LocationDescription == "GAS STATION", Top5$Weekday)
```

```
       Friday Monday Saturday Sunday Thursday Tuesday Wednesday
FALSE  26746  25008    24917  24220    24956   24527     25025
TRUE     332    280      338    336      282     270       273
```

4.5: On which day of the week do the fewest motor vehicle thefts in residential driveways happen?
Answer: Saturday

```r
table(Top5$LocationDescription == "DRIVEWAY - RESIDENTIAL", Top5$Weekday)
```

```
       Friday Monday Saturday Sunday Thursday Tuesday Wednesday
FALSE  26821  25033    25053  24335    24975   24554     25064
TRUE     257    255      202    221      263     243       234
```