Group#9

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Readme

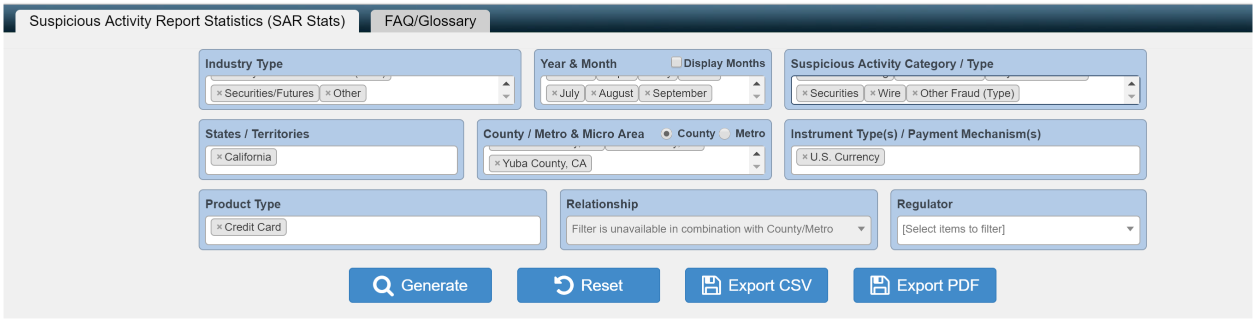
We decided to explore data on financial crimes in California, USA, for the year 2018. We narrowed down on credit card frauds that were filed with the enforcement network. The instrument involved in the frauds is U.S. currency. Our data has the different suspicious activities related to frauds in Depository Institution, Money Services Business, Casino/Card Club and Securities/Futures industries across different counties in the state of California. The data is taken from the Financial Crimes Enforcement Network website.

We are using the data from:

```
head(read.csv("SARStats.csv") )
```

```
##   Year.Month      State             Countym                Industry
## 1       2018 California Alameda County, CA Depository Institution
## 2       2018 California Alameda County, CA Depository Institution
## 3       2018 California Alameda County, CA Depository Institution
## 4       2018 California Alameda County, CA Depository Institution
## 5       2018 California Alameda County, CA Depository Institution
## 6       2018 California Alameda County, CA Depository Institution
##                 Suspicious.Activity     Product     Instrument Count
## 1                               ACH Credit Card U.S. Currency     6
## 2                             Check Credit Card U.S. Currency    10
## 3 Consumer Loan (see instructions) Credit Card U.S. Currency     2
## 4                 Credit/Debit Card Credit Card U.S. Currency    27
## 5                              Mail Credit Card U.S. Currency     2
## 6                    Mass-Marketing Credit Card U.S. Currency     6
```

This is how we generated the dataset:



Industry Type: ×Securities/Futures ×Other

Year & Month ☐ Display Months: ×July ×August ×September

Suspicious Activity Category / Type: ×Securities ×Wire ×Other Fraud (Type)

States / Territories: ×California

County / Metro & Micro Area ● County ○ Metro: ×Yuba County, CA

Instrument Type(s) / Payment Mechanism(s): ×U.S. Currency

Product Type: ×Credit Card

Relationship: Filter is unavailable in combination with County/Metro

Regulator: [Select items to filter]

Xuan’s plot

As we get a lot of regions here, it is hard to put all the information on the same plot. So I randomly picked 4 counties: (“Los Angeles County, CA”,“Santa Clara County, CA”,“Orange County, CA”,“Santa Barbara County, CA”).

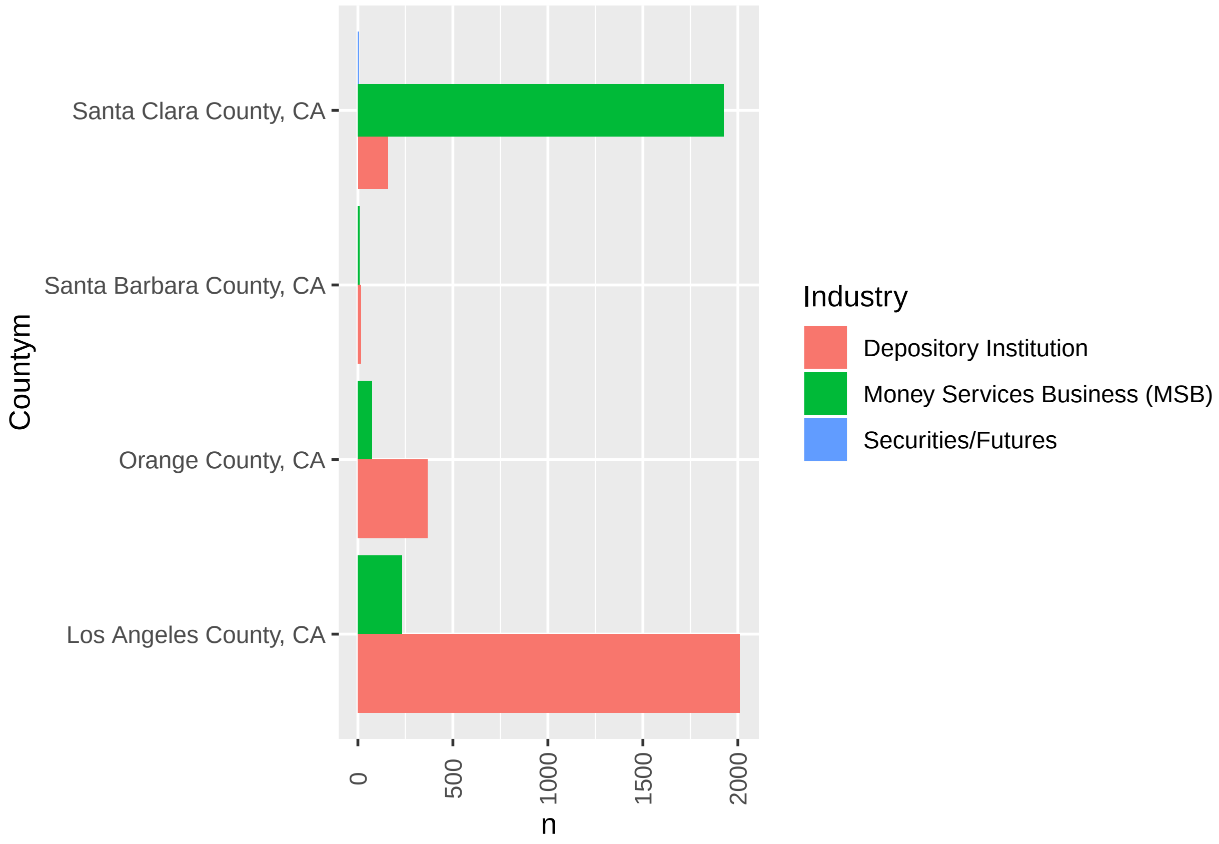
I don’t want the text to be overlapped with each other, so I switch the direction of x-axis and y-axis. Now the x-axis becomes vertical and the y-axis becomes horizontal.

Position = “dodge” places overlapping objects directly beside one another. This makes it easier to compare individual values.

```
SARStats <- read_csv("SARStats.csv")
```

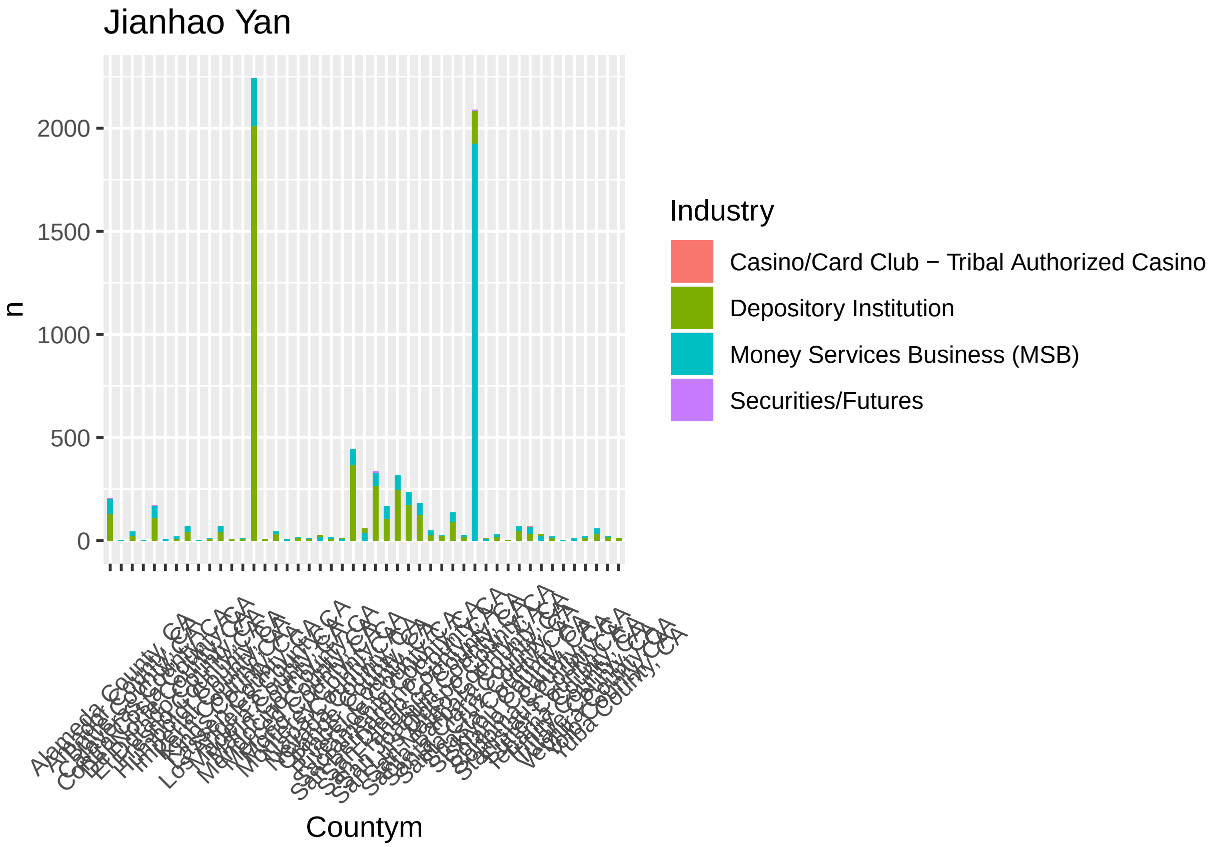
```
## Parsed with column specification:
## cols(
##   `Year Month` = col_character(),
##   State = col_character(),
##   Countym = col_character(),
##   Industry = col_character(),
##   `Suspicious Activity` = col_character(),
##   Product = col_character(),
##   Instrument = col_character(),
##   Count = col_number()
## )
```

```
SARStats$Count <- as.numeric(SARStats$Count)
xuan <-SARStats %>%
  group_by(Industry,Countym)%>%
  summarise(n=sum(Count))%>%
  filter(Industry != '[Total]' & Countym %in% c("Los Angeles County, CA","Santa Clara County, CA","Orang
  arrange(desc(n))
ggplot(data=xuan,mapping=aes(x=Countym,y=n),group=factor(1),xlab(Countym))+
          geom_bar(position = "dodge",aes(fill=Industry),stat = "Identity")+
          theme(axis.text.x = element_text(angle = 90, hjust = 0.5, vjust = 0.5))+
          coord_flip()
```



Jianhao's plot

```
data_new<-SARStats %>%
  group_by(Countym,Industry) %>%
  summarise(n=sum(Count))%>%
  filter(Countym!='[Total]')%>%
  filter(Industry!='[Total]')%>%
  arrange(desc(n))
ggplot(data_new, aes(x = Countym,y =n, group = factor(1))) +
    geom_bar(stat = "identity", width = 0.5,aes(fill=Industry))+theme(axis.text.x = element_text(angle
```



Discussion & Conclusion

From this graph, we can find that the Los Angeles County, CA has the most financial frauds, and these frauds mostly happened in depositary industry.

Guangyan's Plot

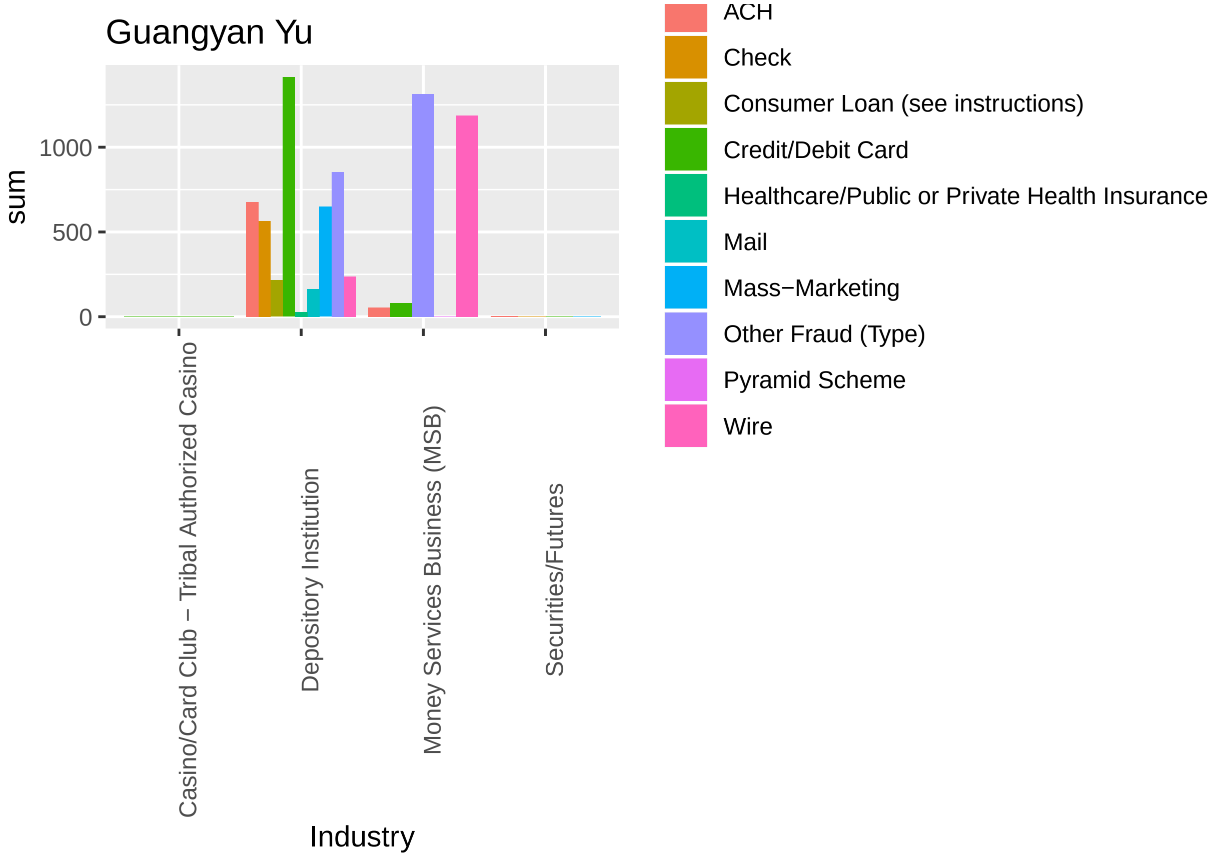
I want to figure out the relationship between Industry and Suspicious Activity, and find what is the most happening suspicious acitivity in every Industry so that we could intentionaly decrease the suspiciosu activities.

```r
library(knitr)
library(tidyverse)
data<-read.csv("SARStats.csv")
#summary(data)
data$Count <- as.numeric(data$Count)
data <- filter(data, !(str_detect(string = data$Industry,pattern = "\\[Total\\]")))
data <- filter(data, !(str_detect(string = data$Suspicious.Activity,pattern = "\\[Total\\]")))
data <- filter(data, !(str_detect(string = data$Count,pattern = "\\[Total\\]")))
data1<-data %>%
  group_by(Industry,Suspicious.Activity) %>%
  summarise(sum=sum(Count)) %>%
  group_by(Industry) %>%
  arrange(desc(sum))
kable(data1)
```

Industry	Suspicious.Activity	sum
Depository Institution	Credit/Debit Card	1413
Money Services Business (MSB)	Other Fraud (Type)	1315

Industry	Suspicious.Activity	sum
Money Services Business (MSB)	Wire	1186
Depository Institution	Other Fraud (Type)	854
Depository Institution	ACH	678
Depository Institution	Mass-Marketing	649
Depository Institution	Check	564
Depository Institution	Wire	238
Depository Institution	Consumer Loan (see instructions)	215
Depository Institution	Mail	164
Money Services Business (MSB)	Credit/Debit Card	82
Money Services Business (MSB)	ACH	54
Depository Institution	Healthcare/Public or Private Health Insurance	28
Securities/Futures	ACH	4
Securities/Futures	Check	2
Securities/Futures	Credit/Debit Card	2
Securities/Futures	Mass-Marketing	2
Casino/Card Club - Tribal Authorized Casino	Credit/Debit Card	1
Money Services Business (MSB)	Pyramid Scheme	1

```r
ggplot(data1,aes(x=Industry,y = sum,fill = Suspicious.Activity)) + geom_bar(stat="identity",position =
```



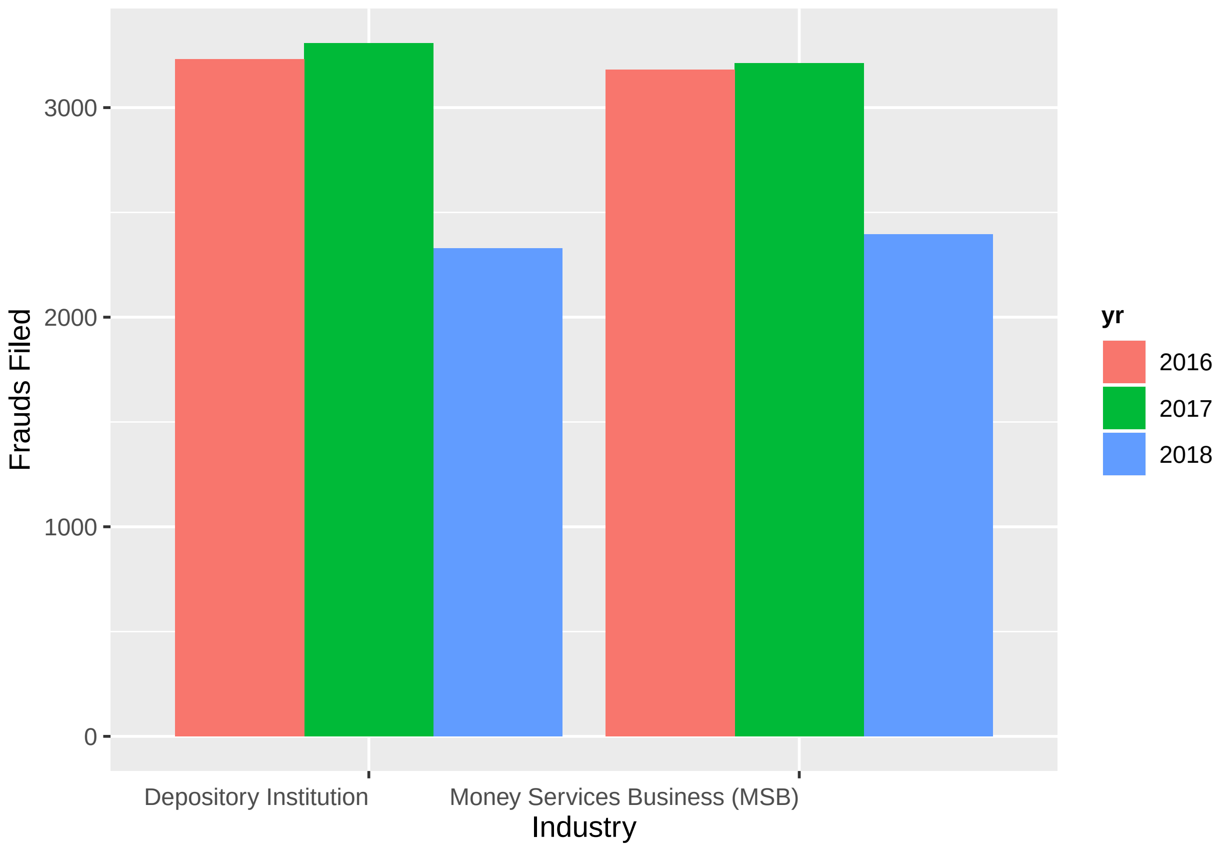
Discussion and Conclusion

Through this plot, we can know that, firstly, the two industries—-Casino/Card Club - Tribal Authorized Casino and Securities/Futures, have low suspicious activity, while Depository Institution and Money Services Business (MSB) have relatively high number of suspicious activity. Secondly, in the two high suspicious activity industry, Depository Institution has more kinds of suspicious activity than MSB. Thirdly, it is obvious that suspicious activity in Credit/Debit Card sets the most proportion in Depository Institution, and for MSB, suspicious activity in Other Fraud sets the most proportion.

Megha's Plot

Following the discussion and conclusions drawn by Xuan, Jianho and Guangyan, the maximum number of credit card frauds were in the Depository Institution and Money Services Business (MSB) industries. Taking these two industries, I plotted the frauds filed vs the two industries for 2016, 2017 and 2018. (I took data for 2016, 2017 and 2018 from the Financial Crimes Enforcement Network website)

```r
library(readxl)
library(tidyverse)
library(dplyr)
library(ggplot2)

d <- read.csv("SARStats (2).csv")
data <- as.data.frame(d)
data$Count <- as.numeric(data$Count)

#Removing the year, state, product and instrument columns since they are constant
data <- data[, -c(2,6,7)]

#Changing column names for easier interpretation
colnames(data) <- c("year","county","industry","activity","frauds")

#Filtering out the rows that contain [Total], i.e., subtotals
data <- filter(data, data$activity != "[Total]")
data <- filter(data, data$industry != "[Total]")

#Retaining only the frauds in the Depository Institution and MSB industries
data_dnew <- filter(data, data$industry == "Depository Institution")
data_mnew <- filter(data, data$industry == "Money Services Business (MSB)")

#Row-binding the data
data_f <- rbind(data_dnew, data_mnew)
rownames(data_f) <- 1:nrow(data_f)

#Grouping months into a year
library(stringr)

data_yr <-  data_f %>%
  select( year, county, industry, activity , frauds) %>%
  mutate(yr =  substr(x = data_f$year , start = 1, stop = 4 ) ) %>%
  group_by( yr, county, industry, activity ) %>%
  summarize(frauds = sum(frauds))

#Plotting the frauds filed vs industries.
ggplot(data_yr, aes(x = industry, y = frauds))+
  xlab("Industry")+
  ylab("Frauds Filed")+
  geom_bar(aes(fill = yr), stat = "identity", position = "dodge")+
  theme(axis.text.x = element_text(angle=0,hjust=1,vjust=0.5))+
  theme(legend.text = element_text(size = 9),
        legend.title = element_text(size = 9, face = "bold"),legend.position = "right")
```



Conclusion

Depository Institution and MSB industries recorded the highest number of frauds that were filed in 2018. Yet, from 2016-18, the plot above shows a decreasing trend in the credit card frauds in California, being filed with the enforcement network, for both the Depository Institution and MSB industries. Fewer frauds have been being filed with the enforcement network in 2018 than in 2017 and 2016. The filing of frauds corresponding to the Depository Institution has seen a decrease of around 27% and the one corresponding to the MSB industry, a decrease of approximately 17% from 2017 to 2018.