Stat 516 hw 1 Exercise 6

1

```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

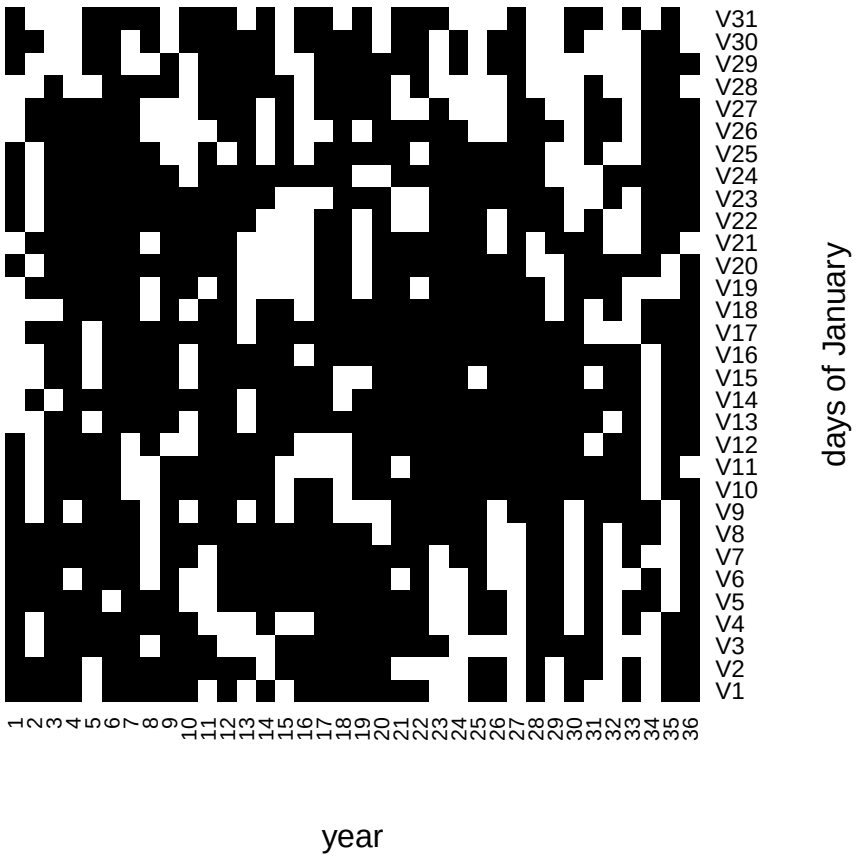
```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(ggplot2)

#wd
getwd()
setwd('/Users/dongyangwang/Desktop/UW/Stat 516/HW/HW1')
#get January data
precipitation <- read.delim('snoqualmie_falls.txt', header = FALSE, sep ='')
precipitation <- precipitation[, 1:31]

for(i in 1:nrow(precipitation)){
  for(j in 1:ncol(precipitation)){
    if ( precipitation[i,j] >0){
      precipitation[i,j] <- 1
    }
  }
}
#precipitation
attach(precipitation)
year <- c(1948:1983)
```

```
#1
heatmap(t(as.matrix(precipitation)), scale = "none", Colv = NA, Rowv = NA,
        xlab="year", ylab="days of January",col = c('white', 'black'))
```



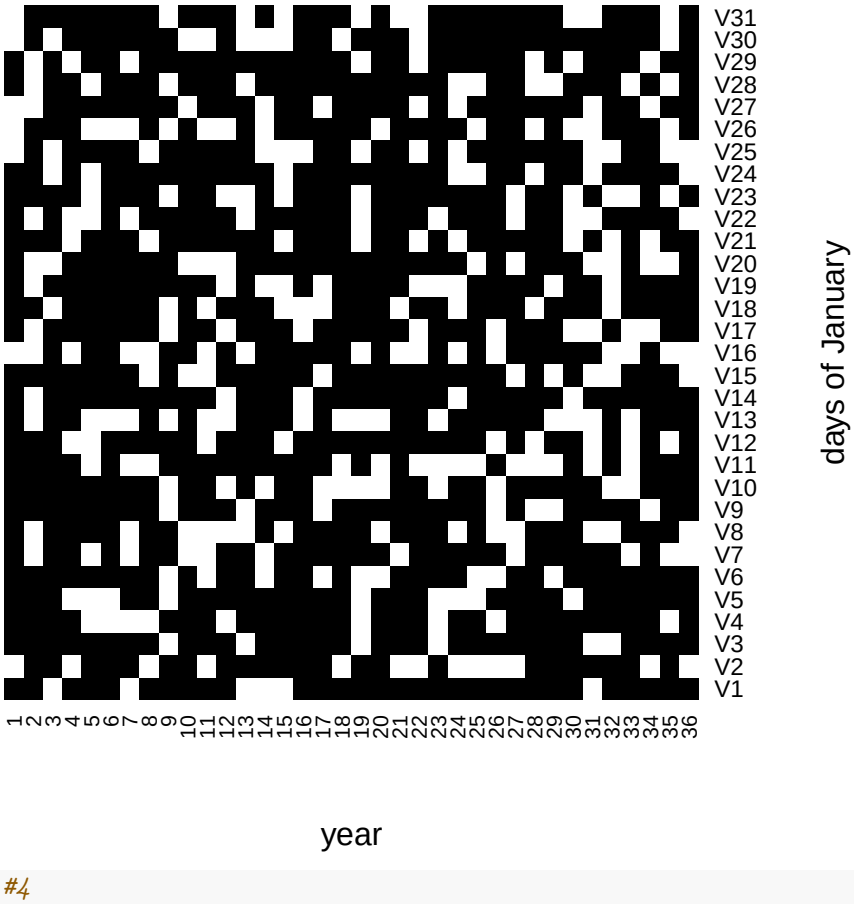

```
?heatmap
```

```
#2
no_rain = 0
total = 31*36
for(i in 1:nrow(precipitation)){
  for(j in 1:ncol(precipitation)){
    if ( precipitation[i,j] ==0){
      no_rain <- no_rain + 1
    }
  }
}
p_rain <- (total-no_rain)/total
binom.test(total-no_rain, total, p_rain)
```

```
##
##  Exact binomial test
##
## data:  total - no_rain and total
## number of successes = 791, number of trials = 1116, p-value = 1
## alternative hypothesis: true probability of success is not equal to 0.7087814
## 95 percent confidence interval:
##  0.6811522 0.7353051
## sample estimates:
## probability of success
##              0.7087814
```

p is then modeled as 0.7087814 with the 95% confidence interval [0.6811522, 0.7353051].

```r
#3
precipitation1 <- precipitation
for(i in 1:nrow(precipitation1)){
  for(j in 1:ncol(precipitation1)){
    precipitation1[i,j] = rbinom(1,1,0.7087814)
  }
}
heatmap(t(as.matrix(precipitation1)), scale = "none", Colv = NA, Rowv = NA,
        xlab="year", ylab="days of January",col = c('white', 'black'))
```




```r
#4
p00 = 0
p01 = 0
p10 = 0
p11 = 0
for(i in 1:nrow(precipitation1)){
  for(j in 2:ncol(precipitation1)){
    if(precipitation1[i,j-1] == 0){
      if(precipitation1[i,j] ==0){
        p00 = p00 +1
      }
      else{
        p01 = p01 +1
      }
    }
    if(precipitation1[i,j-1] == 1){
```

```
      if(precipitation1[i,j] ==0){
        p10 = p10 +1
      }
      else{
        p11 = p11 +1
      }
    }
  }
}
#not rain to not rain
p00
```

```
## [1] 89
```

```
#not rain to rain
p01
```

```
## [1] 219
```

```
#rain to not rain
p10
```

```
## [1] 223
```

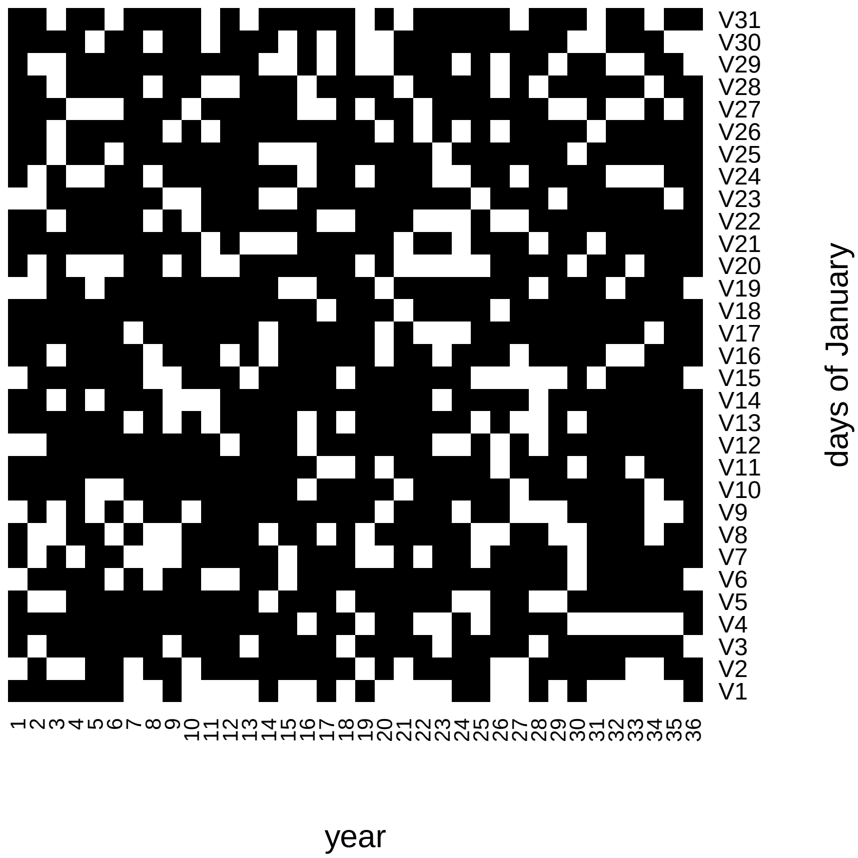
```
#rain to rain
p11
```

```
## [1] 549
```

```
tpm <- matrix(c(p00/(p00+p01), p01/(p00+p01), p10/(p10+p11), p11/(p10+p11)),
              nrow = 2, ncol = 2,byrow=TRUE)
tpm
```

```
##           [,1]      [,2]
## [1,] 0.2889610 0.7110390
## [2,] 0.2888601 0.7111399
```

```
#5
precipitation2 <- precipitation
for (i in 1:36){
  precipitation2[i,1] <- rbinom(1,1,0.5)
}
for(i in 1:nrow(precipitation2)){
  for(j in 2:ncol(precipitation1)){
    if(precipitation1[i,j-1] == 0){
      precipitation2[i,j] <- rbinom(1,1,0.7260147)
      }
    if(precipitation1[i,j-1] == 1){
      precipitation2[i,j] <- rbinom(1,1,0.7294253)
    }
  }
}
heatmap(t(as.matrix(precipitation2)), scale = "none", Colv = NA, Rowv = NA,
        xlab="year", ylab="days of January",col = c('white', 'black'))
```




```
#6
for (i in 2:20){
  tpm <- tpm %*% tpm
  print(tpm)
}
```

```
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
```

```
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
##           [,1]      [,2]
## [1,] 0.2888893 0.7111107
## [2,] 0.2888893 0.7111107
```

After the first day, the model would not be informative because the tpm will stay the same since day 2. This is probably due to that we constructed the matrix with an assumption of one step Markov chian.