NY flights

April 16, 2023

[2]:
```
library(nycflights13)
library(ggplot2)
library(tidyverse)

# 1.1)
# create a new column in "flights" with the date of departure
flights$date <- as.Date(with(flights, paste(day, month, year, sep="-")),␣
 ↪"%d-%m-%Y")
```

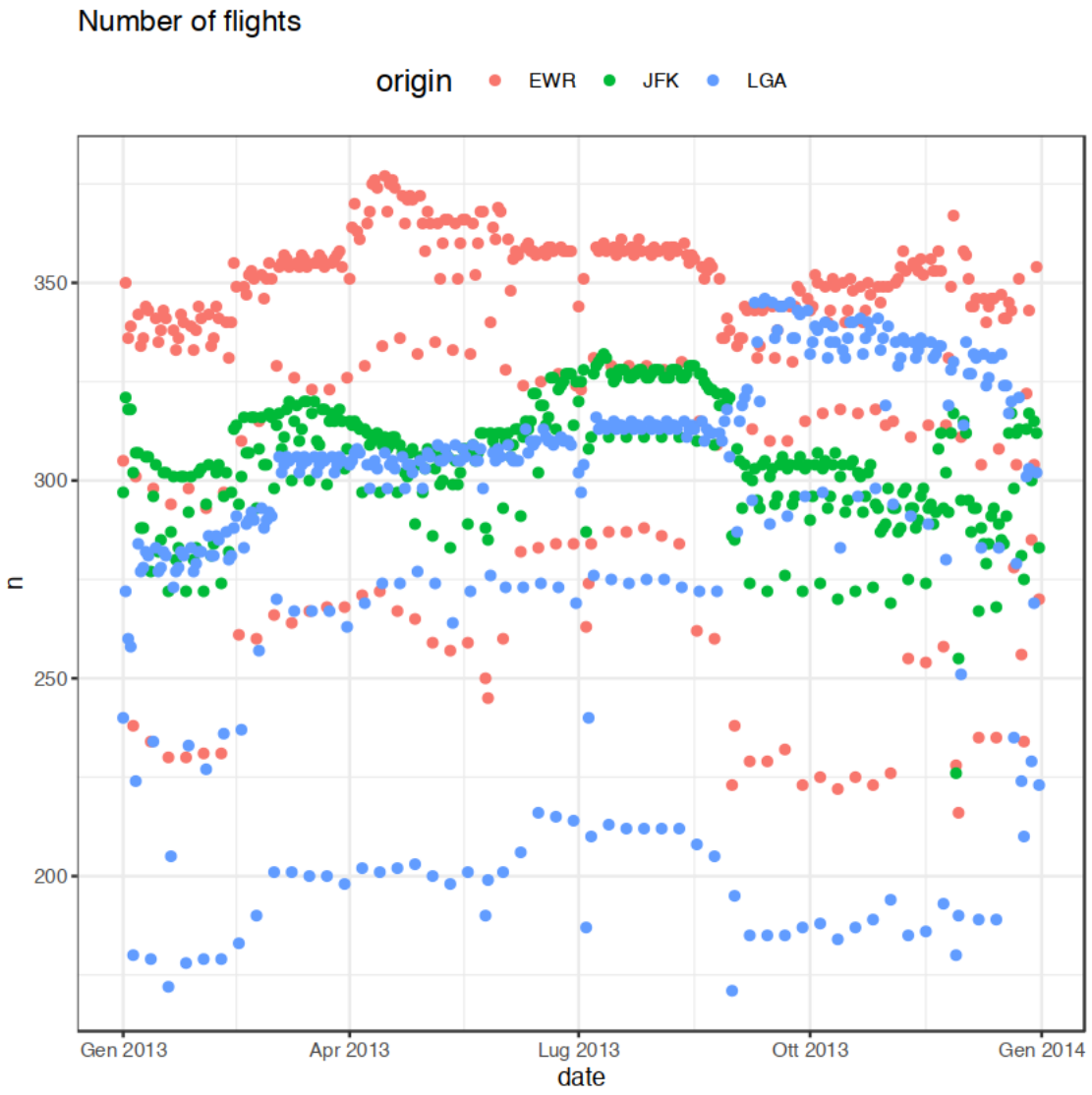
```
  Attaching core tidyverse packages                      tidyverse
2.0.0
 dplyr     1.1.0      readr     2.1.4
 forcats   1.0.0      stringr   1.5.0
 lubridate 1.9.2      tibble    3.2.0
 purrr     1.0.1      tidyr     1.3.0
  Conflicts
tidyverse_conflicts()
 dplyr::filter() masks stats::filter()
 dplyr::lag()    masks stats::lag()
 Use the conflicted package
(<http://conflicted.r-lib.org/>) to force all conflicts to
become errors
```

[3]:
```
# create a new data.frame with 3 columns: origin airport, date and number of␣
 ↪flights
from_ny <- flights %>% count(origin, date)

head(from_ny)
```

A tibble: 6 × 3

origin <chr>	date <date>	n <int>
EWR	2013-01-01	305
EWR	2013-01-02	350
EWR	2013-01-03	336
EWR	2013-01-04	339
EWR	2013-01-05	238
EWR	2013-01-06	301

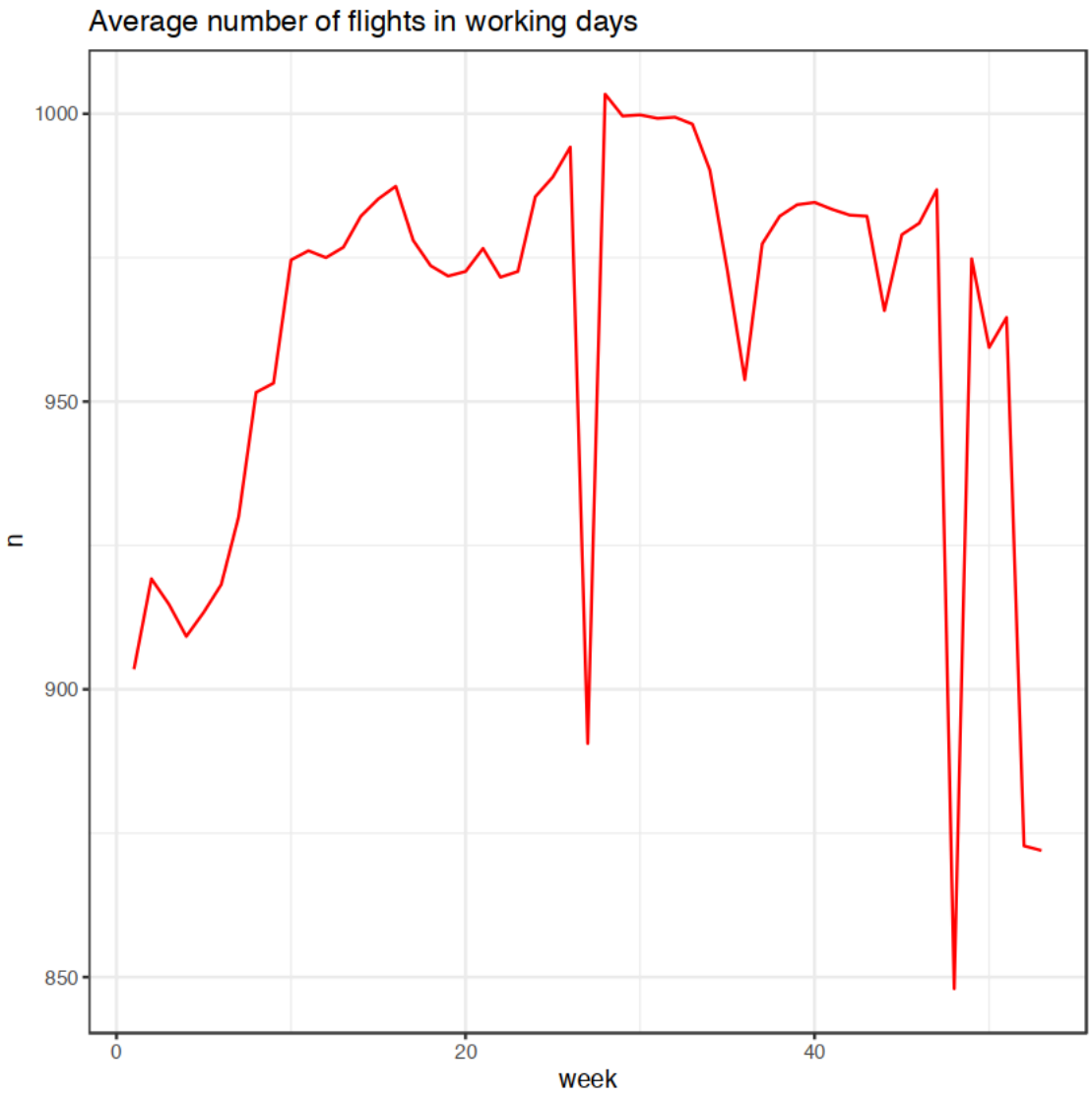
[4]:
```
# plot of the total number of flights departed from each of the three NYC␣
 ↪airports as a function of time
ggp_from_ny <- ggplot(from_ny, aes(date, n, col = origin)) + geom_point() +␣
 ↪theme_bw() + theme(legend.position = "top") + theme(legend.title =␣
 ↪element_text(size=14, face = "bold")) + ggtitle("Number of flights") +␣
 ↪labs(y = "n", x = "date")

ggp_from_ny
```

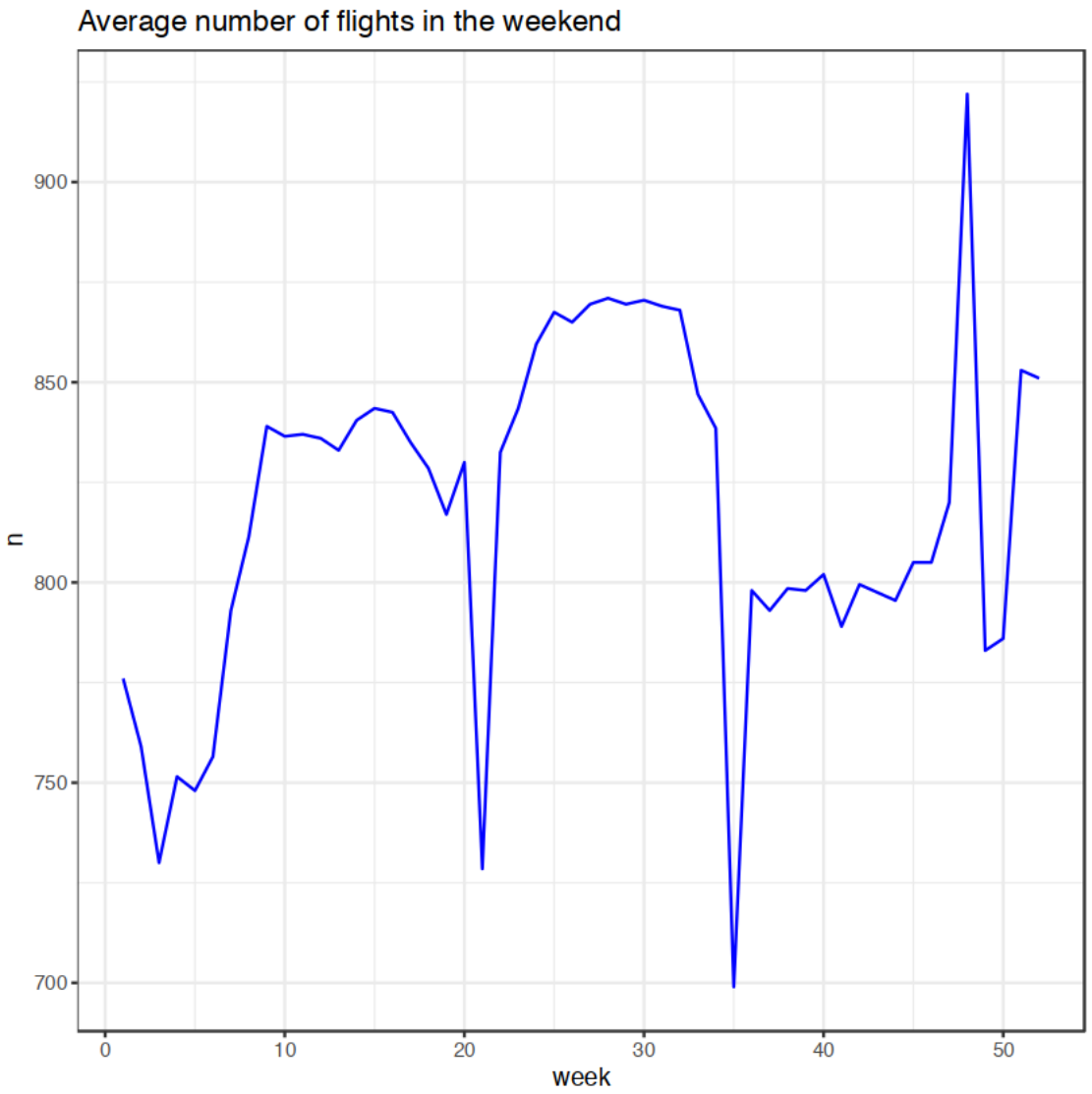


[5]:
```
# 1.2)
# create a function that gives the number of the week from the date
count_week <- function(x){
    n <- rep(0, length(x))
```

```
    for (i in 1:length(x)) {
        if (x[i] == "2013-12-30" || x[i] == "2013-12-31"){
            n[i] <- 53
        }
        else {
            n[i] <- isoweek(x[i])
        }
    }
    return(n)
}


# create 2 new columns in "flights" with the number of the day and the number␣
 ↪of the week
flights$weekday <- wday(flights$date, week_start = 1)
flights$week_num <- count_week(flights$date)
```

[6]:
```
#divide the working days from the weekend
working_day <- filter(flights, weekday %in% c(1,2,3,4,5))
weekend_day <- filter(flights, weekday %in% c(6,7))

# calculate the mean number of flights for every week
working_day <- working_day %>% count(week_num, weekday) %>% group_by(week_num)␣
 ↪%>% summarise(mean=mean(n), .groups = 'drop')
weekend_day <- weekend_day %>% count(week_num, weekday) %>% group_by(week_num)␣
 ↪%>% summarise(mean=mean(n), .groups = 'drop')

# create plot
ggp_average_working <- ggplot(working_day, aes(week_num, mean)) +␣
 ↪geom_line(color = "red") + theme_bw() + ggtitle("Average number of flights␣
 ↪in working days") + labs(y = "n", x = "week")
ggp_average_weekend <- ggplot(weekend_day, aes(week_num, mean)) +␣
 ↪geom_line(color = "blue") + theme_bw() + ggtitle("Average number of flights␣
 ↪in the weekend") + labs(y = "n", x = "week")
ggp_average_working
ggp_average_weekend
```

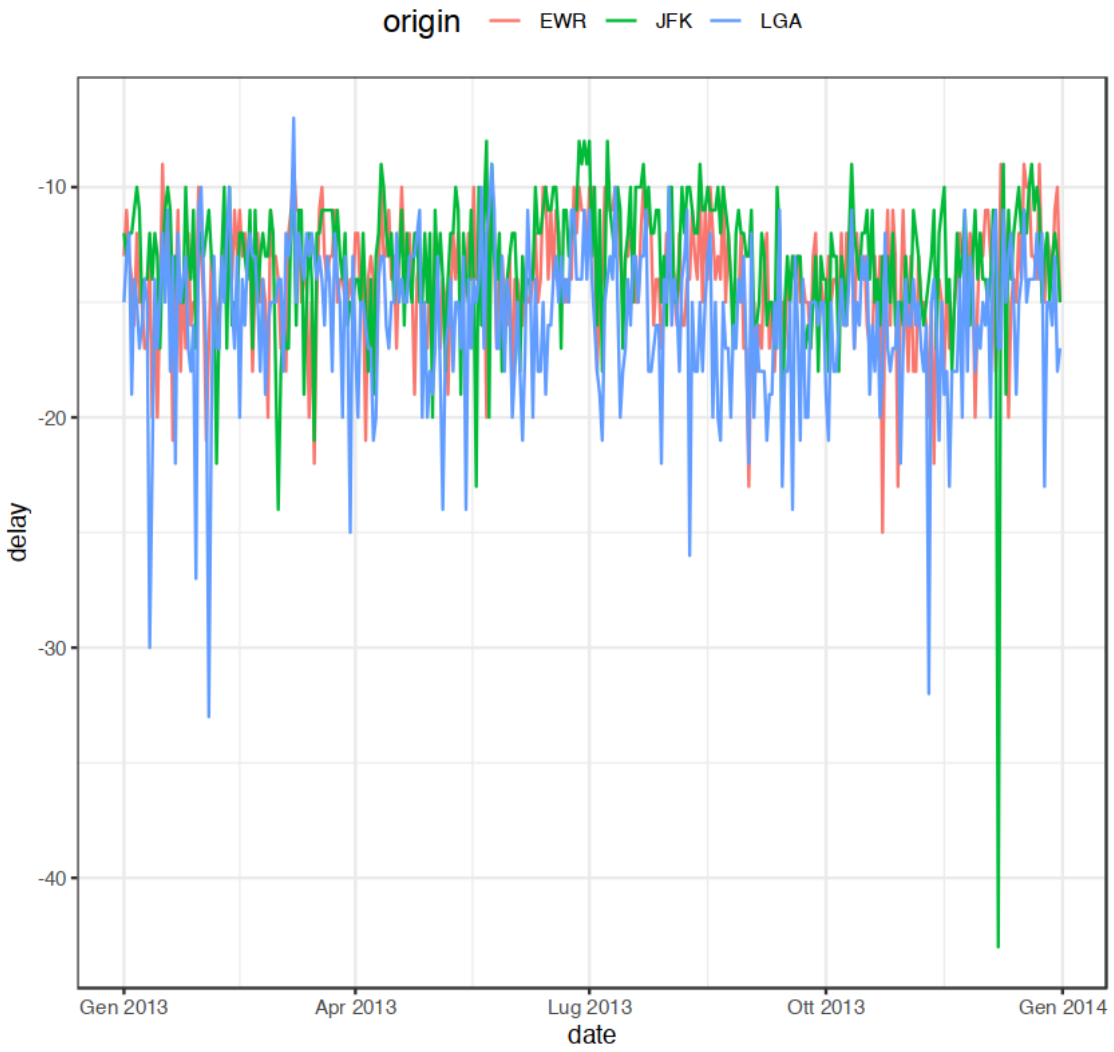

Average number of flights in working days
1000
950
900
850
n
0
20
40
week

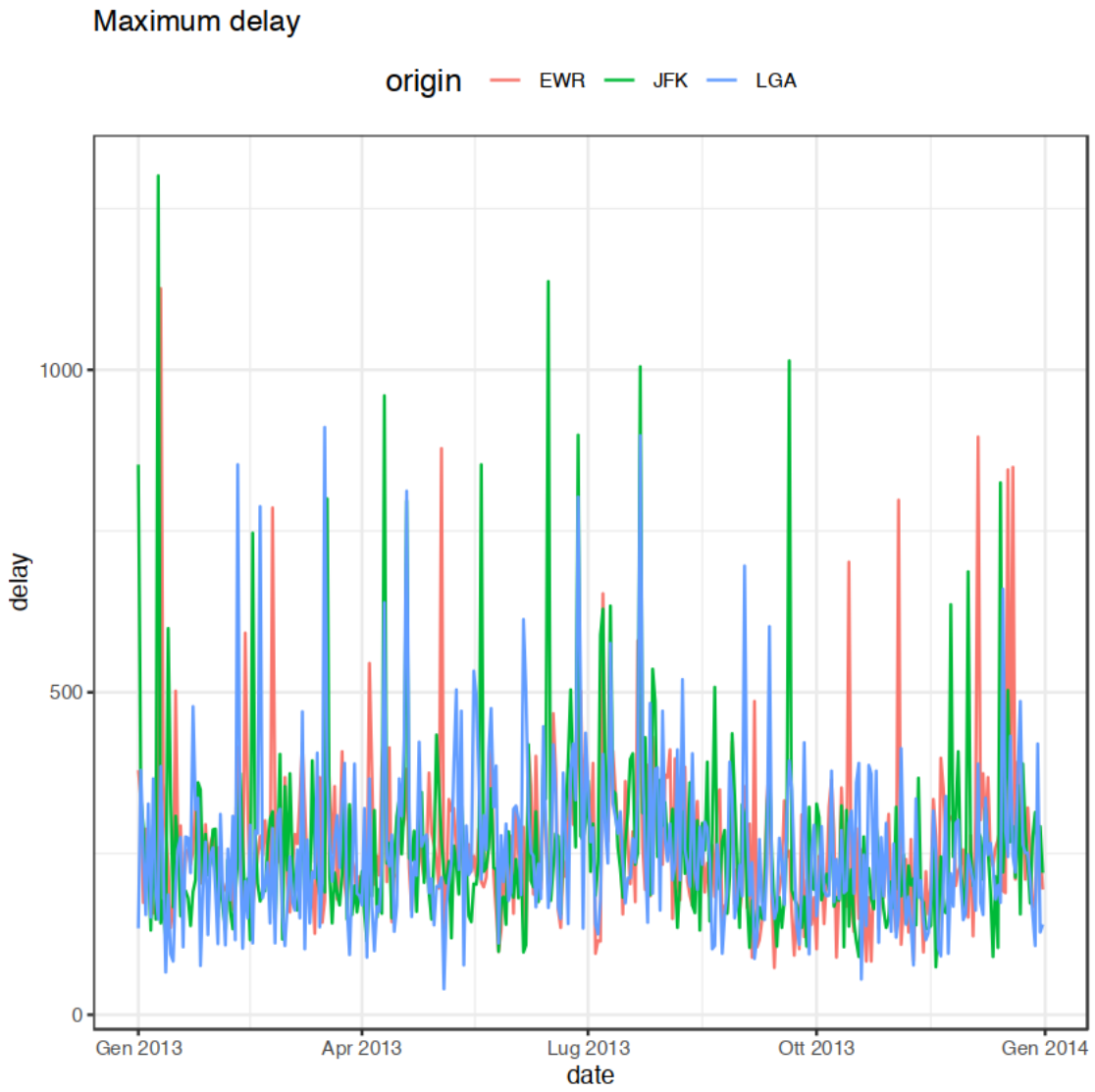


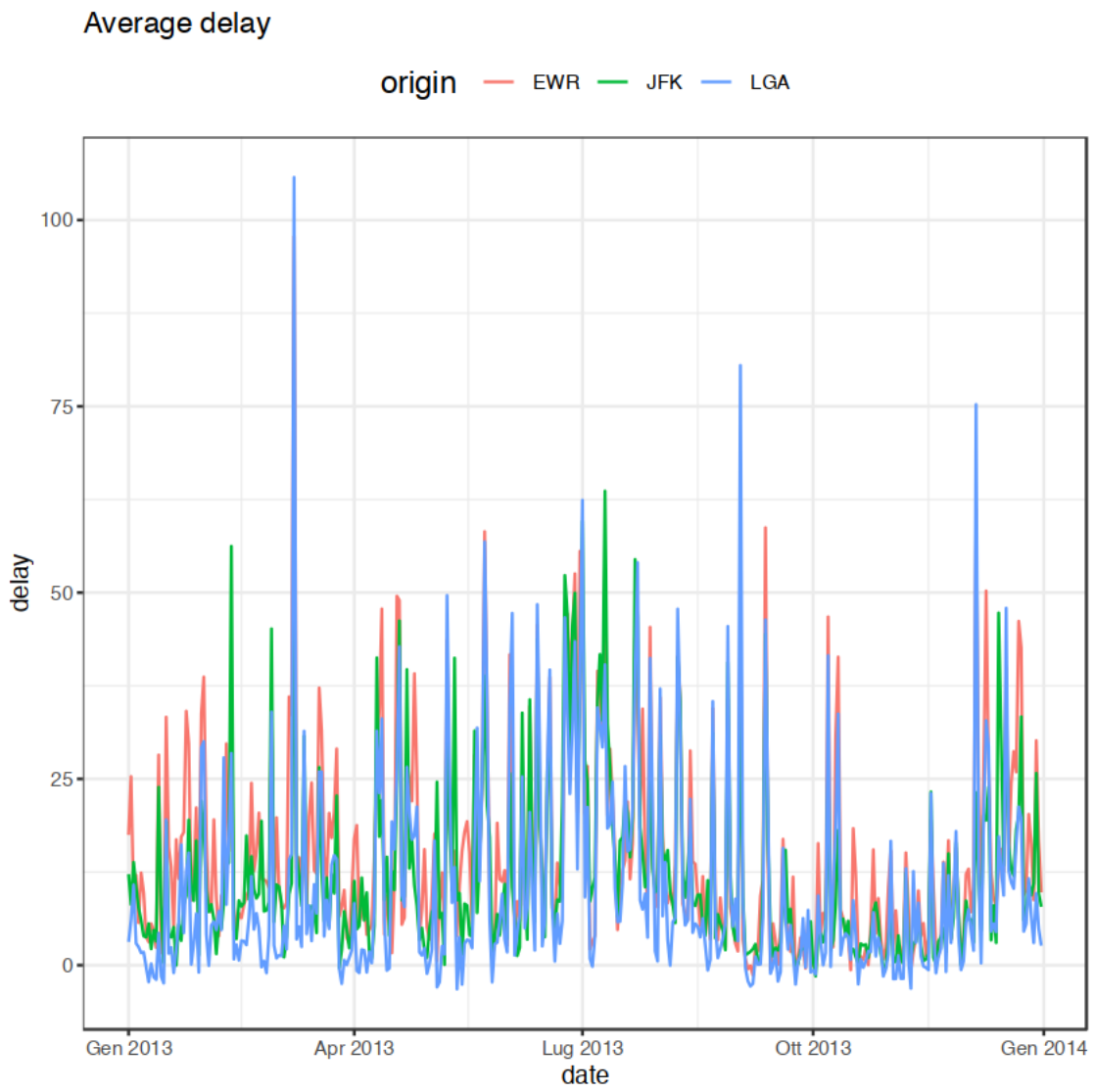
[46]:
```
# 2.1)
# create 3 new tibbles with 3 columns: date, origin airport and min/max/average␣
 ↪delay
min_delay <- flights %>% group_by(date, origin) %>% summarise(min =␣
 ↪dep_delay[which.min(dep_delay)], .groups = 'drop')
max_delay <- flights %>% group_by(date, origin) %>% summarise(max =␣
 ↪dep_delay[which.max(dep_delay)], .groups = 'drop')
average_delay <- flights %>% group_by(date, origin) %>% summarise(average =␣
 ↪mean(dep_delay, na.rm = TRUE), .groups = 'drop')

# create plot
```

```r
ggp_min_delay <- ggplot(min_delay, aes(date, min, col = origin)) + geom_line()␣
↪+ theme_bw() + theme(legend.position = "top") + theme(legend.title =␣
↪element_text(size=14, face = "bold")) + ggtitle("Minimun delay") + labs(y =␣
↪"delay", x = "date")
ggp_max_delay <- ggplot(max_delay, aes(date, max, col = origin)) + geom_line()␣
↪+ theme_bw() + theme(legend.position="top") + theme(legend.title =␣
↪element_text(size=14, face = "bold")) + ggtitle("Maximum delay") + labs(y =␣
↪"delay", x = "date")
ggp_average_delay <- ggplot(average_delay, aes(date, average, col = origin)) +␣
↪geom_line() + theme_bw() + theme(legend.position="top") + theme(legend.title␣
↪= element_text(size = 14, face = "bold")) + ggtitle("Average delay") +␣
↪labs(y = "delay", x = "date")

ggp_min_delay
ggp_max_delay
ggp_average_delay
```

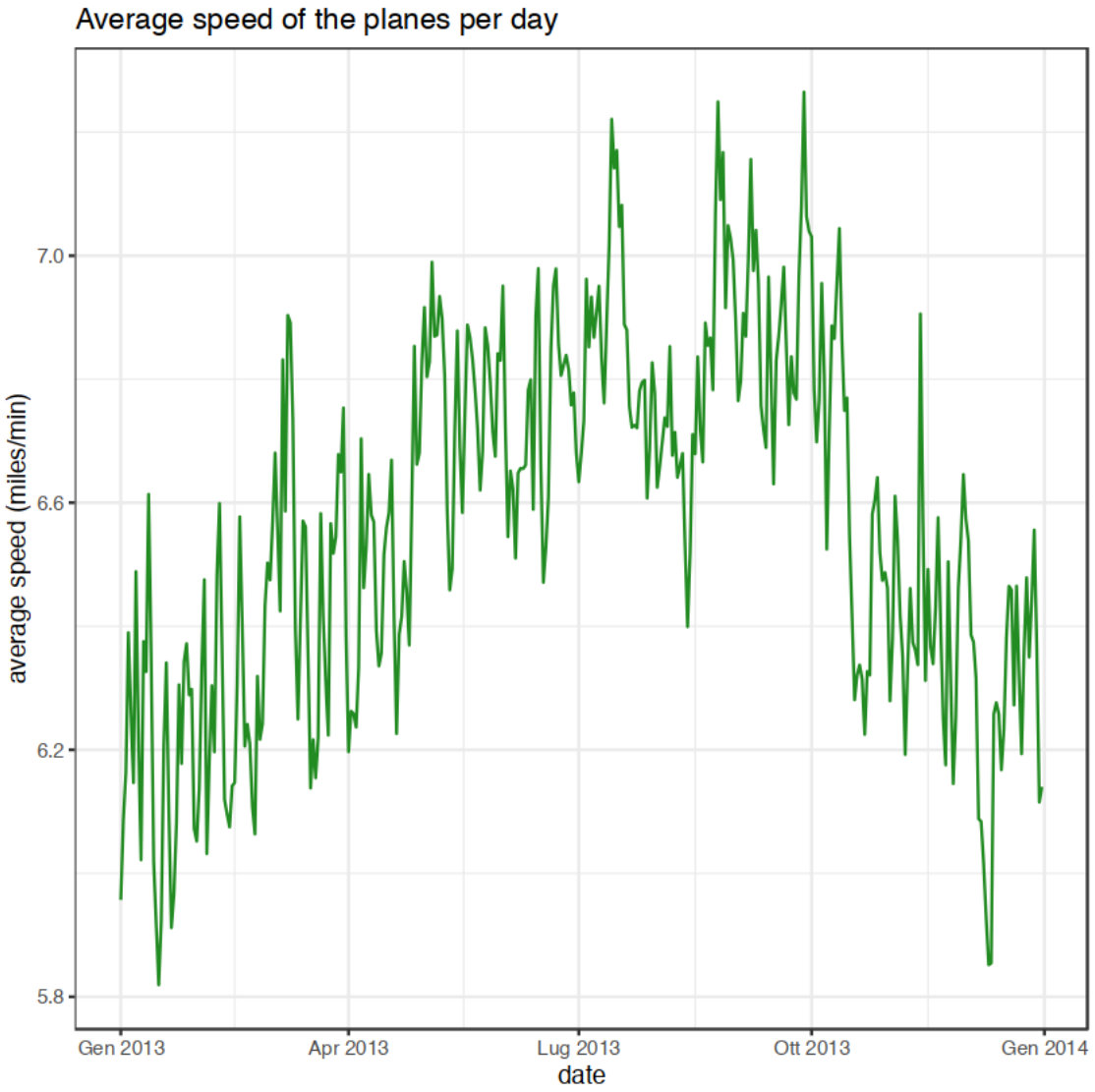
Minimun delay




Maximum delay
origin
EWR
JFK
LGA
1000
500
0
delay
Gen 2013
Apr 2013
Lug 2013
Ott 2013
Gen 2014
date



[10]:
```
# 3)
# add a new column with the average speed (miles/min) of every flight and␣
 ↪calculate the mean for every day
flights$speed <- flights$distance / flights$air_time
speed <- flights %>% group_by(date) %>% summarise(average = mean(speed, na.rm =␣
 ↪TRUE), .groups = 'drop')

# create plot
ggp_speed <- ggplot(speed, aes(date, average)) + geom_line(color = "forest␣
 ↪green") + theme_bw() + ggtitle("Average speed of the planes per day") +␣
 ↪labs(y = "average speed (miles/min)", x = "date")
ggp_speed
```



[12]:
```
# 4.1)
# create two tibbles with date/number of the week, company and number of␣
 ↪flights of every company per day/week
company_day <- subset(flights, select = c(carrier, date)) %>% count(carrier,␣
 ↪date)
company_day <- company_day[with(company_day, order(date, n)),]

company_week <- subset(flights, select = c(carrier, week_num)) %>%␣
 ↪count(carrier, week_num)
company_week <- company_week[with(company_week, order(week_num, n)),]

head(company_day)
head(company_week)
```

A tibble: 6 × 3

carrier <chr>	date <date>	n <int>
HA	2013-01-01	1
AS	2013-01-01	2
F9	2013-01-01	2
FL	2013-01-01	10
VX	2013-01-01	12
WN	2013-01-01	27

A tibble: 6 × 3

carrier <chr>	week_num <dbl>	n <int>
YV	1	5
HA	1	6
AS	1	12
F9	1	12
FL	1	62
VX	1	72

[13]:
```
# create 2 new tibbles with 4 columns: date/number of the week, largest two␣
 ↪numbers of flights and corresponding airports
first_two_per_day <- company_day %>% group_by(date) %>% summarise(max_2 =␣
 ↪n[length(n) - 1], company_2 = carrier[length(n) - 1], max = n[length(n) ],␣
 ↪company= carrier[length(n)], .groups = 'drop')
first_two_per_week <- company_week %>% group_by(week_num) %>% summarise(max_2 =␣
 ↪n[length(n) - 1], company_2 = carrier[length(n) - 1], max = n[length(n)],␣
 ↪company= carrier[length(n)], .groups = 'drop')

head(first_two_per_day)
head(first_two_per_week)
```

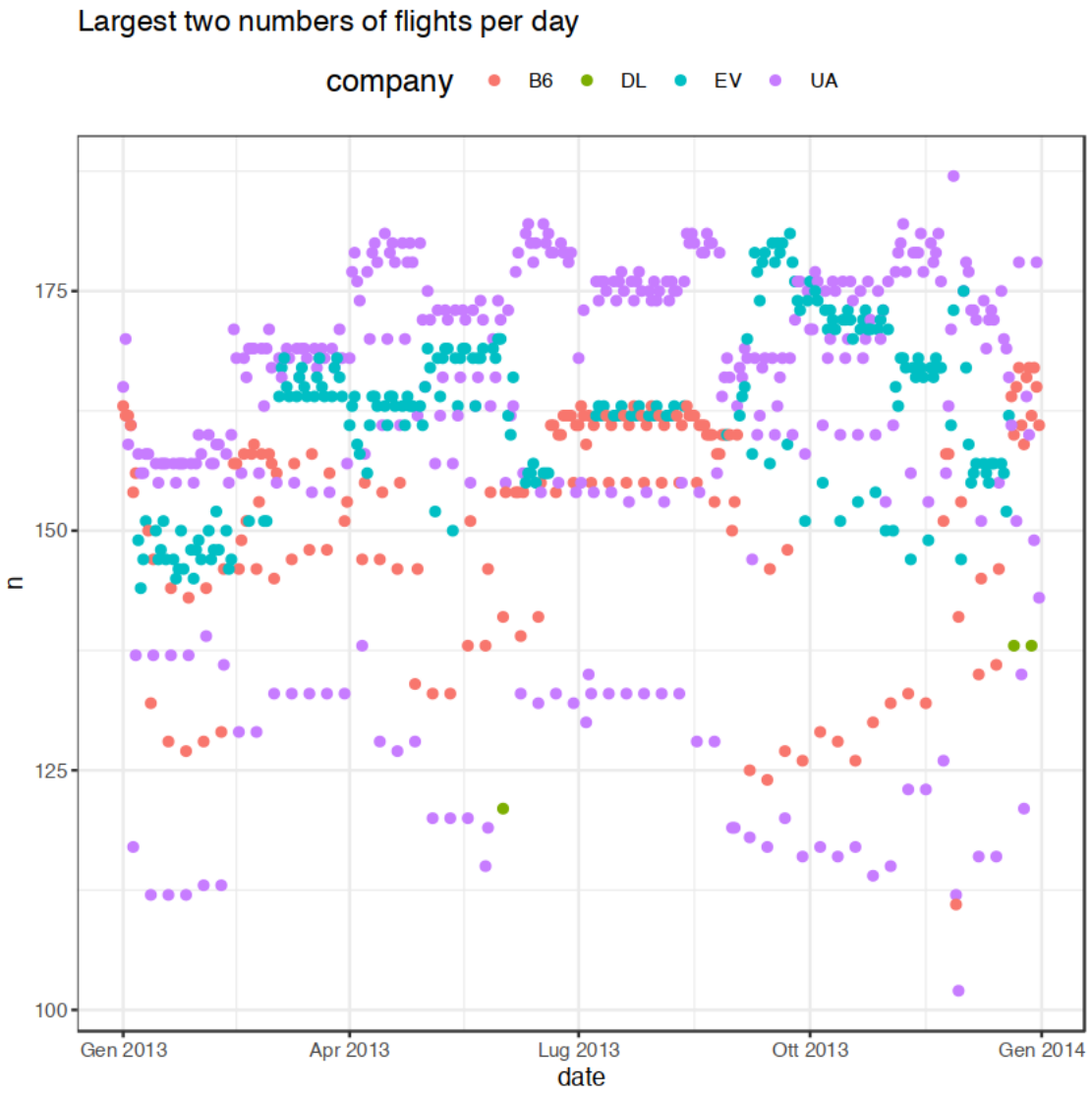
A tibble: 6 × 5

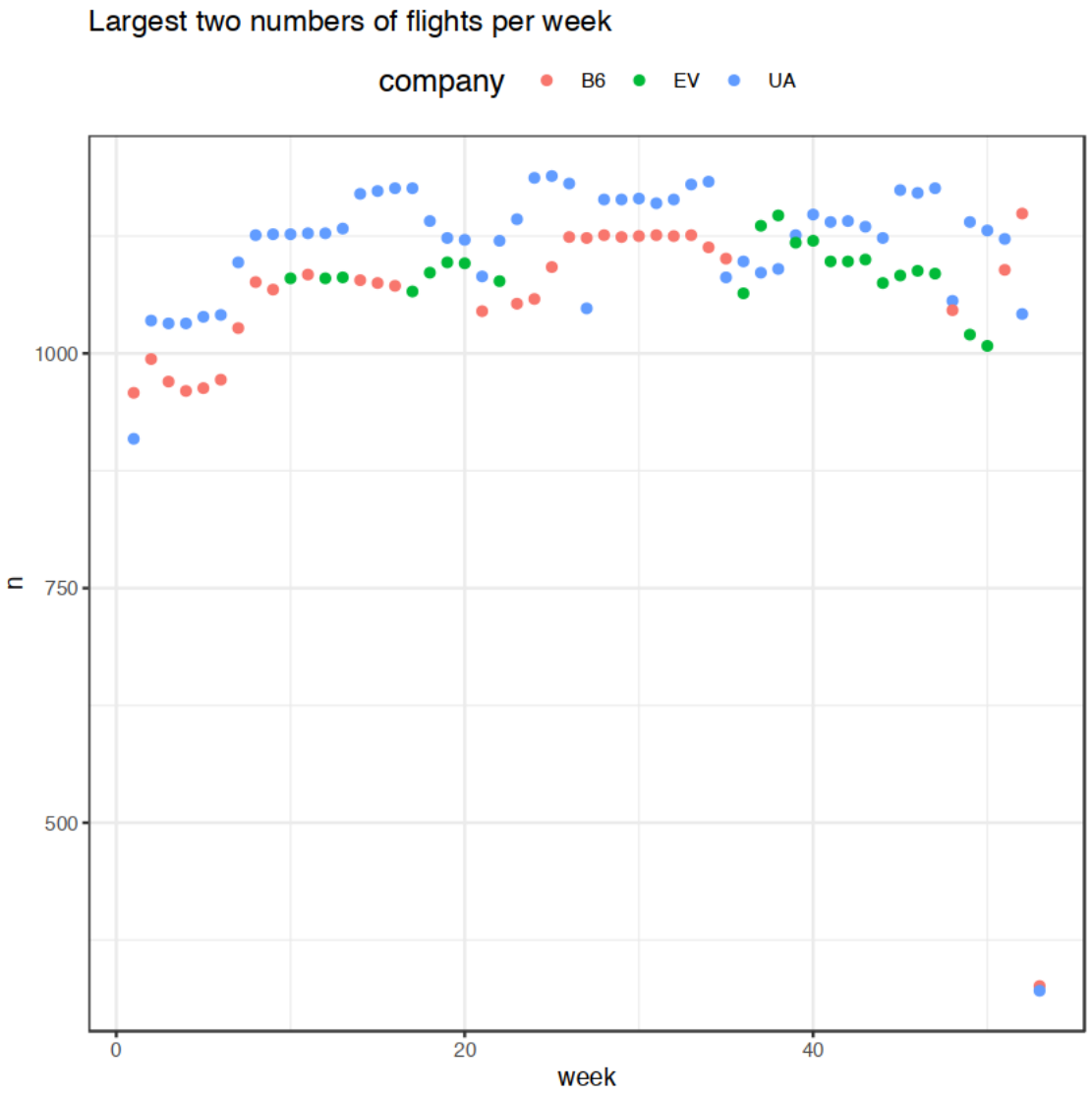
date <date>	max_2 <int>	company_2 <chr>	max <int>	company <chr>
2013-01-01	163	B6	165	UA
2013-01-02	162	B6	170	UA
2013-01-03	159	UA	162	B6
2013-01-04	161	B6	161	UA
2013-01-05	117	UA	154	B6
2013-01-06	137	UA	156	B6

A tibble: 6 × 5

week_num <dbl>	max_2 <int>	company_2 <chr>	max <int>	company <chr>
1	909	UA	958	B6
2	994	B6	1035	UA
3	970	B6	1032	UA
4	960	B6	1032	UA
5	963	B6	1039	UA
6	972	B6	1041	UA

[14]:
```
# new data frames to create a single plot
first_two_per_day <- data.frame(date = first_two_per_day$date,
                      max_two = c(first_two_per_day$max,␣
 ↪first_two_per_day$max_2),
                      company = c(first_two_per_day$company,␣
 ↪first_two_per_day$company_2))
first_two_per_week <- data.frame(week = first_two_per_week$week_num,
                      max_two = c(first_two_per_week$max,␣
 ↪first_two_per_week$max_2),
                      company = c(first_two_per_week$company,␣
 ↪first_two_per_week$company_2))

# create plot
ggp_first_two_per_day <- ggplot(first_two_per_day, aes(date, max_two, col =␣
 ↪company)) + geom_point() + theme_bw() + theme(legend.position="top") +␣
 ↪theme(legend.title = element_text(size=14, face = "bold")) +␣
 ↪ggtitle("Largest two numbers of flights per day") + labs(y = "n", x = "date")
ggp_first_two_per_week <- ggplot(first_two_per_week, aes(week, max_two, col =␣
 ↪company)) + geom_point() + theme_bw() + theme(legend.position="top") +␣
 ↪theme(legend.title = element_text(size=14, face = "bold")) +␣
 ↪ggtitle("Largest two numbers of flights per week") + labs(y = "n", x =␣
 ↪"week")
ggp_first_two_per_day
ggp_first_two_per_week
```


Largest two numbers of flights per day
company
B6
DL
EV
UA
175
150
125
100
n
Gen 2013
Apr 2013
Lug 2013
Ott 2013
Gen 2014
date

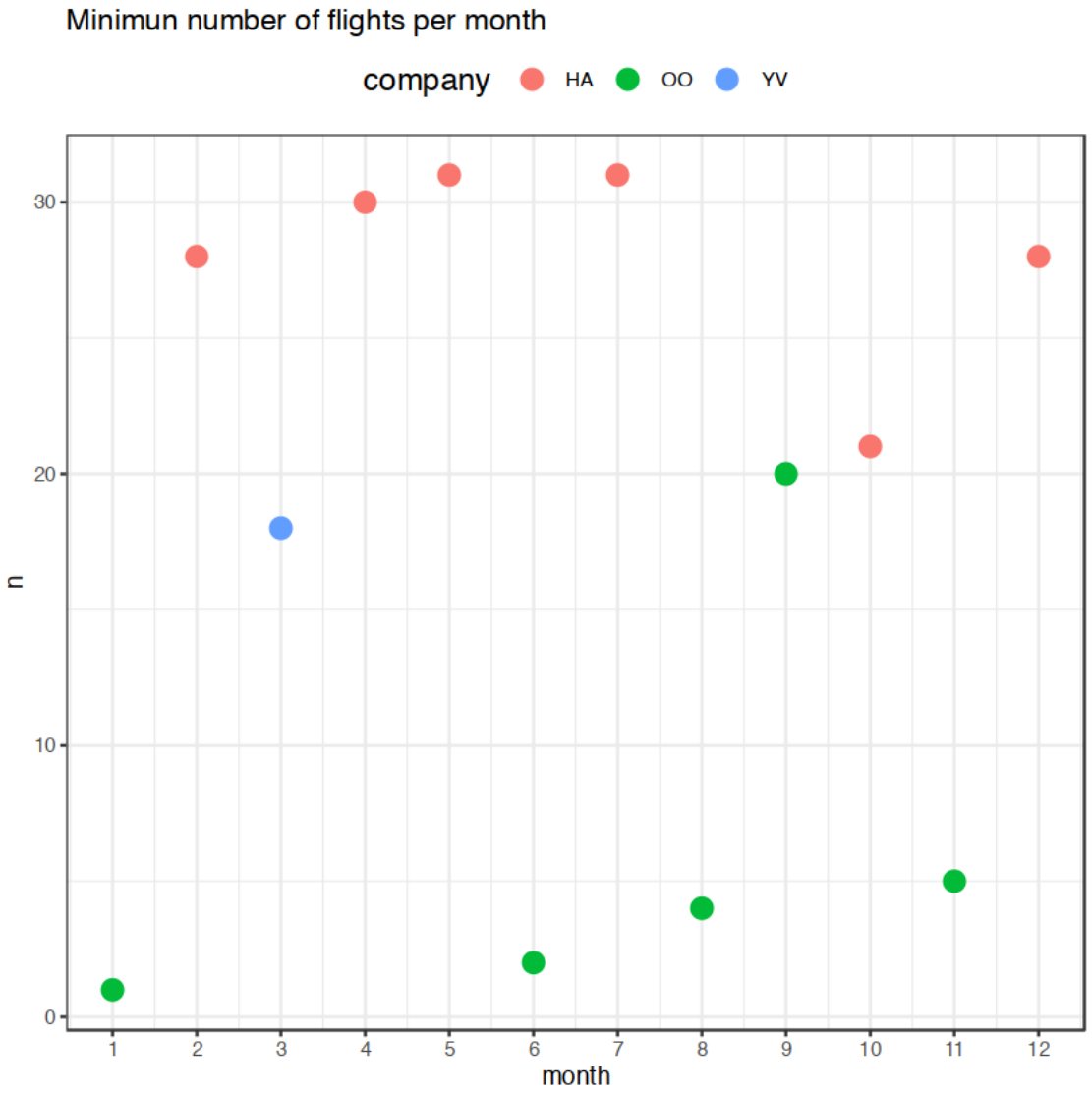


[15]:
```
# 4.2)
# create a new data.frame with 3 columns: month, company and number of flights
company_month <- flights %>% count(month, carrier)

head(company_month)
```

A tibble: 6 × 3

month <int>	carrier <chr>	n <int>
1	9E	1573
1	AA	2794
1	AS	62
1	B6	4427
1	DL	3690
1	EV	4171

[24]:
```
# create a new tibble with 3 columns: month, company and minimum number of␣
 ↪flights
min_per_month <- company_month %>% group_by(month) %>% summarise(min = n[which.
 ↪min(n)], company = carrier[which.min(n)], .groups = 'drop')

# create plot
ggp_min_per_month <- ggplot(min_per_month, aes(month, min, col = company)) +␣
 ↪geom_point(size = 4) + theme_bw() + theme(legend.position="top") +␣
 ↪theme(legend.title = element_text(size=14, face = "bold")) +␣
 ↪ggtitle("Minimun number of flights per month") + labs(y = "n", x = "month")␣
 ↪+ scale_x_continuous(breaks = scales::pretty_breaks(n = 12))
ggp_min_per_month
```



[48]:
```
# 4.3)
# create a new tibble with month, maximum distance and company
distance_month <- subset(flights, select = c(carrier, month, distance))
distance_month<- distance_month %>% group_by(month) %>% summarise(max_distance
 ↪= distance[which.max(distance)], company = carrier[which.max(distance)], .
 ↪groups = 'drop')

distance_month
```

A tibble: 12 × 3

month <int>	max_distance <dbl>	company <chr>
1	4983	HA
2	4983	HA
3	4983	HA
4	4983	HA
5	4983	HA
6	4983	HA
7	4983	HA
8	4983	HA
9	4983	HA
10	4983	HA
11	4983	HA
12	4983	HA