In Class Exercise 1

Oytun Gungor

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Import and install required libraries

```
library("tidyverse")
library("nycflights13")
library("ggplot2")
library("dplyr")
```

Analyzing the data structure

```
head(planes)
```

```
## # A tibble: 6 x 9
##   tailnum  year type                  manuf~1 model engines seats speed engine
##   <chr>   <int> <chr>                 <chr>   <chr>   <int> <int> <int> <chr>
## 1 N10156   2004 Fixed wing multi engine EMBRAER EMB-~       2    55    NA Turbo~
## 2 N102UW   1998 Fixed wing multi engine AIRBUS~ A320~       2   182    NA Turbo~
## 3 N103US   1999 Fixed wing multi engine AIRBUS~ A320~       2   182    NA Turbo~
## 4 N104UW   1999 Fixed wing multi engine AIRBUS~ A320~       2   182    NA Turbo~
## 5 N10575   2002 Fixed wing multi engine EMBRAER EMB-~       2    55    NA Turbo~
## 6 N105UW   1999 Fixed wing multi engine AIRBUS~ A320~       2   182    NA Turbo~
## # ... with abbreviated variable name 1: manufacturer
```

```
str(planes)
```

```
## tibble [3,322 x 9] (S3: tbl_df/tbl/data.frame)
##  $ tailnum     : chr [1:3322] "N10156" "N102UW" "N103US" "N104UW" ...
##  $ year        : int [1:3322] 2004 1998 1999 1999 2002 1999 1999 1999 1999 1999 ...
##  $ type        : chr [1:3322] "Fixed wing multi engine" "Fixed wing multi engine" "Fixed wing multi e
##  $ manufacturer: chr [1:3322] "EMBRAER" "AIRBUS INDUSTRIE" "AIRBUS INDUSTRIE" "AIRBUS INDUSTRIE" ...
##  $ model       : chr [1:3322] "EMB-145XR" "A320-214" "A320-214" "A320-214" ...
##  $ engines     : int [1:3322] 2 2 2 2 2 2 2 2 2 2 ...
##  $ seats       : int [1:3322] 55 182 182 182 55 182 182 182 182 182 ...
##  $ speed       : int [1:3322] NA NA NA NA NA NA NA NA NA NA ...
##  $ engine      : chr [1:3322] "Turbo-fan" "Turbo-fan" "Turbo-fan" "Turbo-fan" ...
```

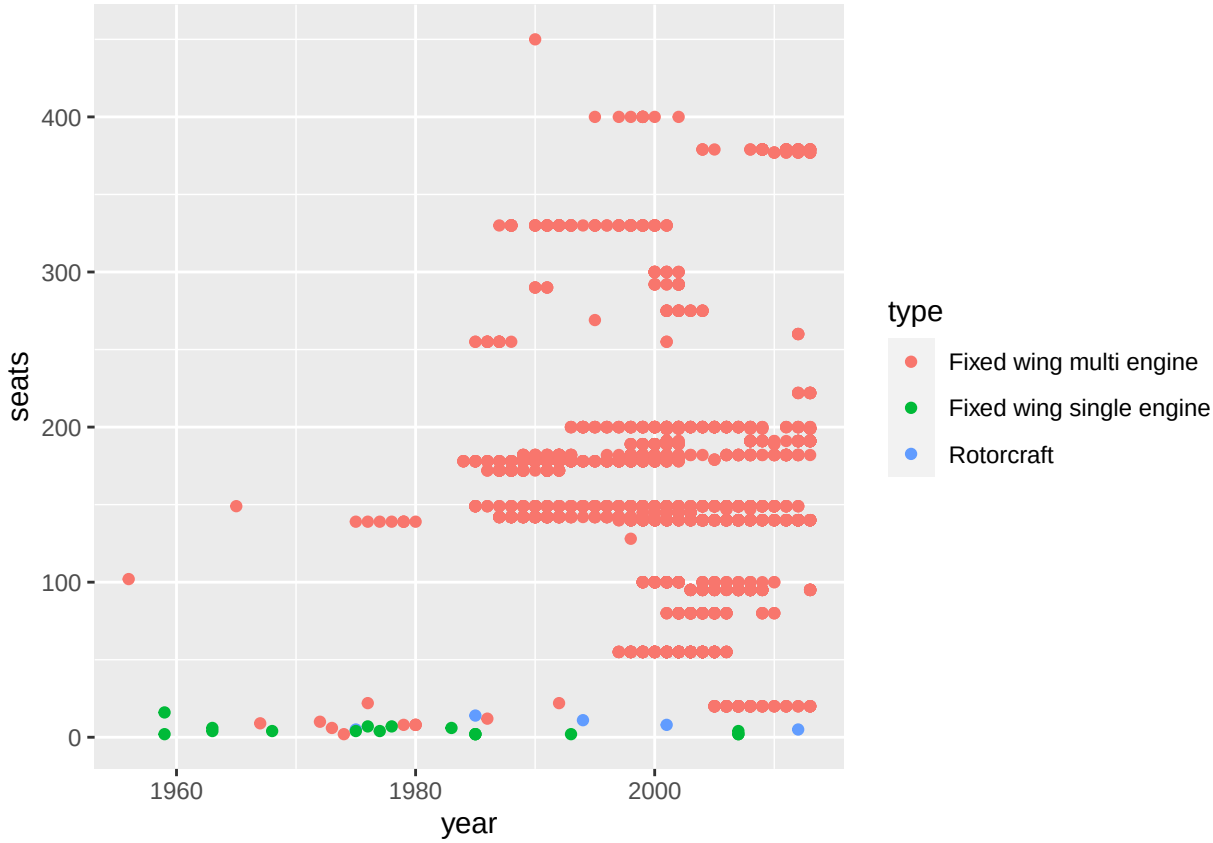
Creating new df for looking relations between model year, seats number and motor type.

```
df_ys <- planes %>%
  select(year,seats,type)%>%
    arrange(desc(year))
## Cleaning na values
na.omit(df_ys)
```

```
## # A tibble: 3,252 x 3
##     year seats type
##    <int> <int> <chr>
##  1  2013   199 Fixed wing multi engine
##  2  2013   199 Fixed wing multi engine
##  3  2013   199 Fixed wing multi engine
##  4  2013   199 Fixed wing multi engine
##  5  2013   199 Fixed wing multi engine
##  6  2013   199 Fixed wing multi engine
##  7  2013   199 Fixed wing multi engine
##  8  2013   199 Fixed wing multi engine
##  9  2013   199 Fixed wing multi engine
## 10  2013   199 Fixed wing multi engine
## # ... with 3,242 more rows
```

```
ggplot(df_ys, aes(x = year, y= seats, color = type))+
     geom_point()
```

```
## Warning: Removed 70 rows containing missing values (`geom_point()`).
```



According to the data and scatter plot, there is a correlation between seat number and product year. You can see that before the 1980' there is no plane with 200+ seat capability.

In addition to this, the capability of all single-engine and rotorcraft planes has under 100 seats. There is another correlation between moto-type and the number of seats.

As a summary you need big planes you need multi engine moto-type.

Creating new df for looking relations between model year, seats number and engine type.

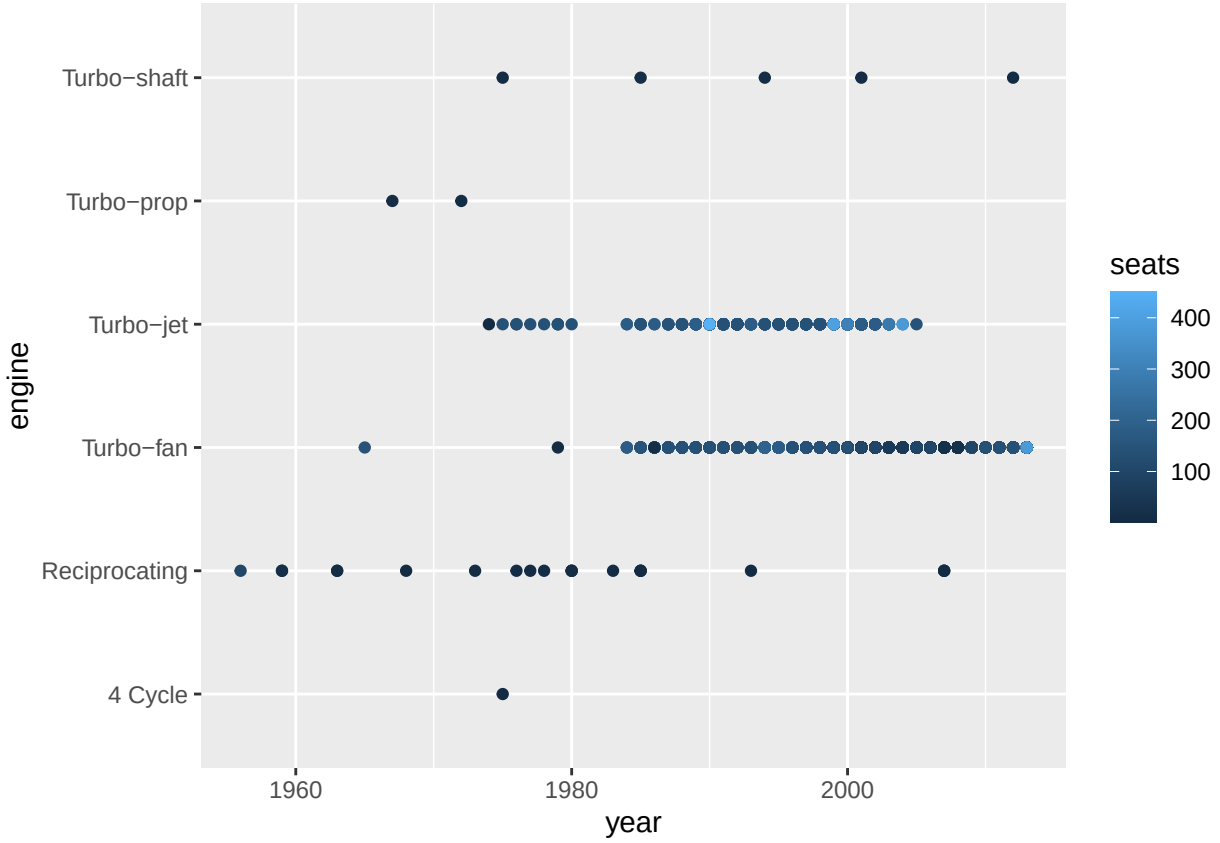
```
my_planes <- planes %>%
  select(year,engine,seats)%>%
  group_by(year)%>%
  arrange(engine)
na.omit(my_planes)
```

```
## # A tibble: 3,252 x 3
## # Groups:   year [46]
##     year engine        seats
##    <int> <chr>         <int>
##  1  1975 4 Cycle           4
##  2  1959 Reciprocating     2
##  3  1980 Reciprocating     8
##  4  1980 Reciprocating     8
##  5  1973 Reciprocating     6
```

```
##  6  1978 Reciprocating     7
##  7  1963 Reciprocating     4
##  8  1956 Reciprocating   102
##  9  2007 Reciprocating     2
## 10  1985 Reciprocating     2
## # ... with 3,242 more rows
```

```
ggplot(my_planes, aes(x = year, y= engine,color = seats))+
  geom_point()
```

```
## Warning: Removed 70 rows containing missing values (`geom_point()`).
```



According to the data and plot, we can some insights about engine technology. There is inferences below

- Turbo jet and turbo fan is using after 1980' in general
- 4 cycle engine was used once at middle of 1970'
- Turbo jet and turbo fan technologies using by airlines companies