# Analysis of annual incomes and spending capacity depending on gender

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## Contents

### Intro

The main purpose of this analysis is to understand if there is some connections between "spending money capacity" and gender. For resolving this issue, data was taken from resource: https://www.kaggle.com/ [1]

Here you can see how the header of data looks like:

```
##   CustomerID Gender Age annual_income spending_score
## 1          1   Male  19            15             39
## 2          2   Male  21            15             81
## 3          3 Female  20            16              6
## 4          4 Female  23            16             77
## 5          5 Female  31            17             40
## 6          6 Female  22            17             76
```

### Analyzing part

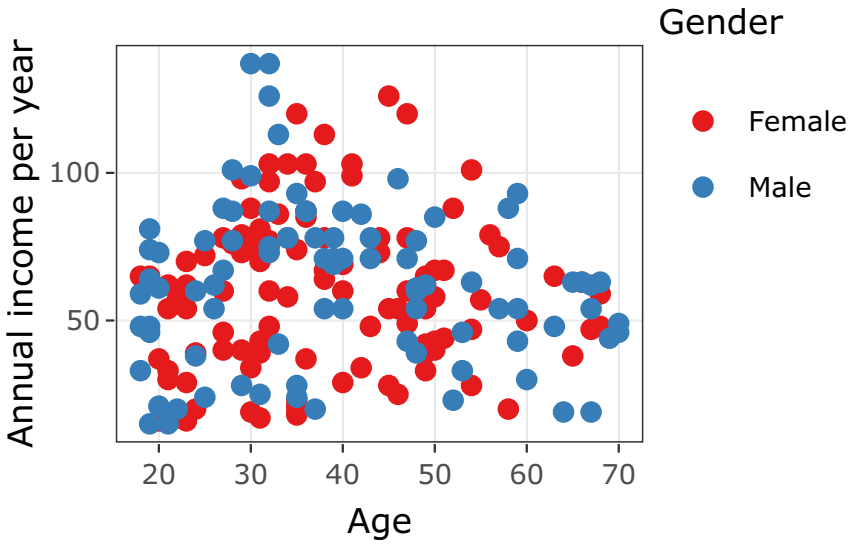
**Correlation between gender and annual income** Let's take a look to our data set. First of all, we want to understand quantity of Female & Male in our data and how age in each group is distributed.

Here is summary of data:

```
## # A tibble: 2 x 6
##   Gender quantity max_age mean_age min_age mean_income
##   <chr>     <int>   <int>    <dbl>   <int>       <dbl>
## 1 Female      112      68     38.1      18        59.2
## 2 Male         88      70     39.8      18        62.2
```

From this tibble we can see that all indicators are almost equal. We also can see that mean age in male and female groups also equal, the same situation with income, etc. Only a small difference in quantity of participants, but it's no so huge. That's why we can carry on with our analysis. Despite the fact that we saw the summary table, it's better to visualize our data.

[1] Direct link for downloading file




From this graph we can see that in our data there is no correlation between income and age that people gained per year. Also there is no difference in both groupes: male and female.

Finally let's try to prove this hypotesis with **ANOVA analysis**.

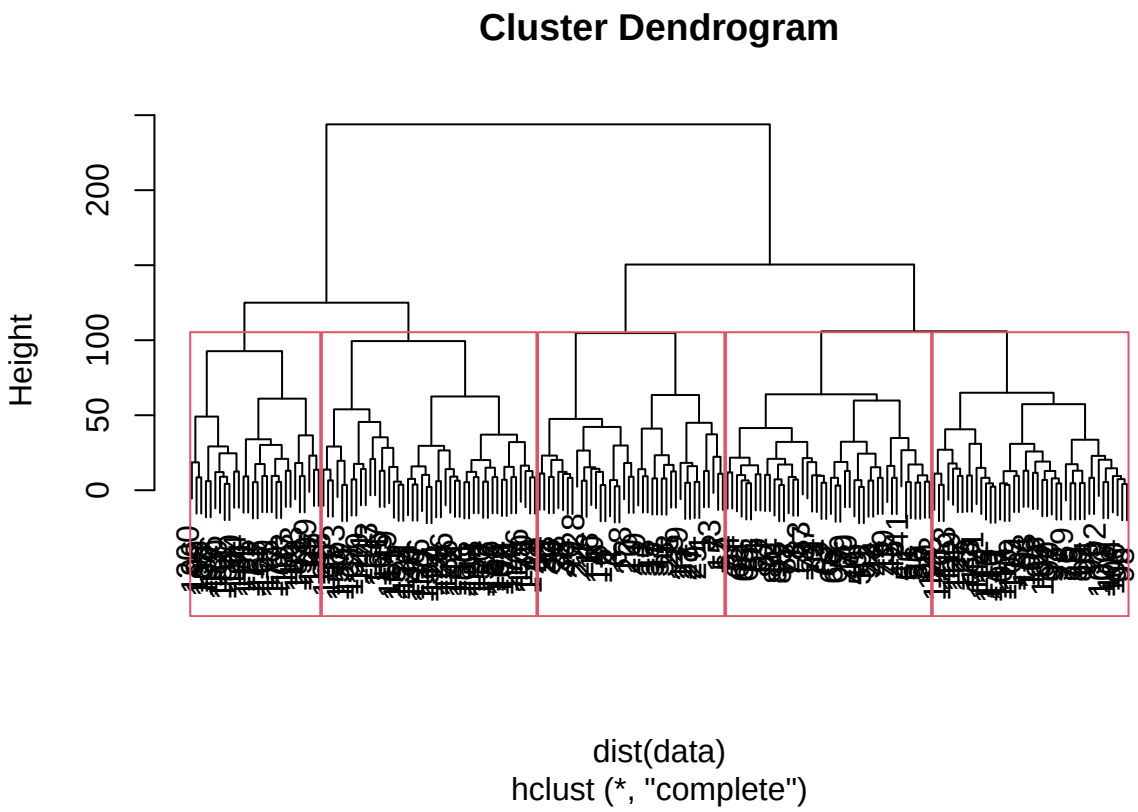
```
##              Df Sum Sq Mean Sq F value Pr(>F)
## Gender        1    437   436.8   0.632  0.428
## Residuals   198 136840   691.1
```

We received P-value = 0.428 that tell us that we can accept this hypotesis, telling us that people in two groups (Female and Male) don't have differences in their incomes.

**Clusterizing** The next step, which help us to understand our data better is to split customers to different groups, which will be different, in comparison with Gender characteristics.

First of all we should choose what amounts of clusters we want to pick out. Let's do this with hierarchical clusterization.

Consider this graph:



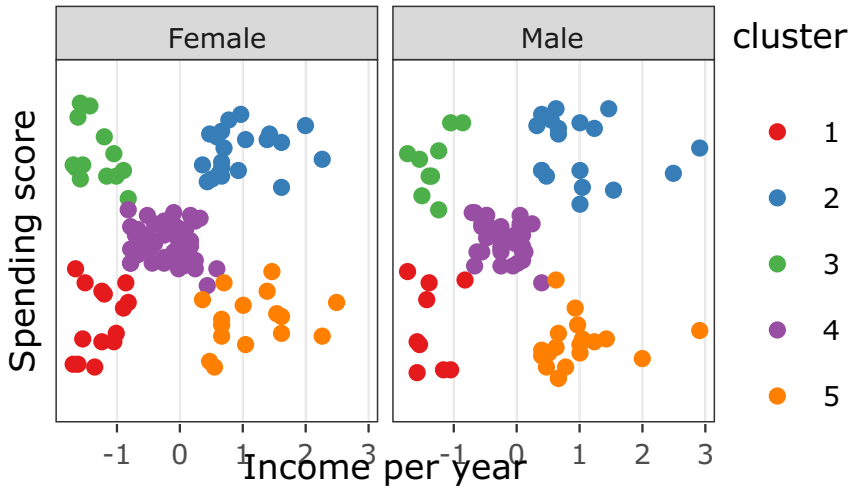

Analyzing this graph, it will be optimally to choose 5 clusters. Let's assign all customers to specific cluster and we will do this, using K-Means Model. Before clustering, I will normalize data, using Z-score method.

```
##   CustomerID Gender        Age annual_income spending_score cluster
## 1          1   Male -1.4210029     -1.734646     -0.4337131       1
## 2          2   Male -1.2778288     -1.734646      1.1927111       3
## 3          3 Female -1.3494159     -1.696572     -1.7116178       1
## 4          4 Female -1.1346547     -1.696572      1.0378135       3
## 5          5 Female -0.5619583     -1.658498     -0.3949887       1
## 6          6 Female -1.2062418     -1.658498      0.9990891       3
```

Here we can see the beggining of table with normalized numeric variables and assigned number of cluster.

**Analyzing of spending money** Well, now we can look at graph and see what behaviour of "spending money capacity" for all 5 subgroups of customers.

```
## Warning: `group_by_()` is deprecated as of dplyr 0.7.0.
## Please use `group_by()` instead.
## See vignette('programming') for more help
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_warnings()` to see where this warning was generated.
```




Here we can see no difference in behaviour of spending money eather it female or male. We only can see difference depending on cluster, which we assigned to each customer.

**Conclusion**

So, in conclusion we can claim:

1. There is no difference in "spending money capacity" between genders.
2. There is an existing difference in "spending money capacity", depending on subgroups (clusters), which we can assign based on annual incomes and spending score.