Assignment 1

Group 69

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Assignment 1

Exercise 1

Exercise 2. Cholesterol

A study tested whether cholesterol was reduced after using a certain brand of margarine as part of a low fat low cholesterol diet. The data set cholesterol.txtcontains information on 18 people using margarine to reduce cholesterol: columns Before and After8weeks contain the cholesterol level (mmol/L) respectively before the diet and after 8 weeks on the diet.

a) Make some relevant plots of this data set, comment on normality. Are there any inconsistencies in the data? Investigate whether the columns Before and After8weeks are correlated.

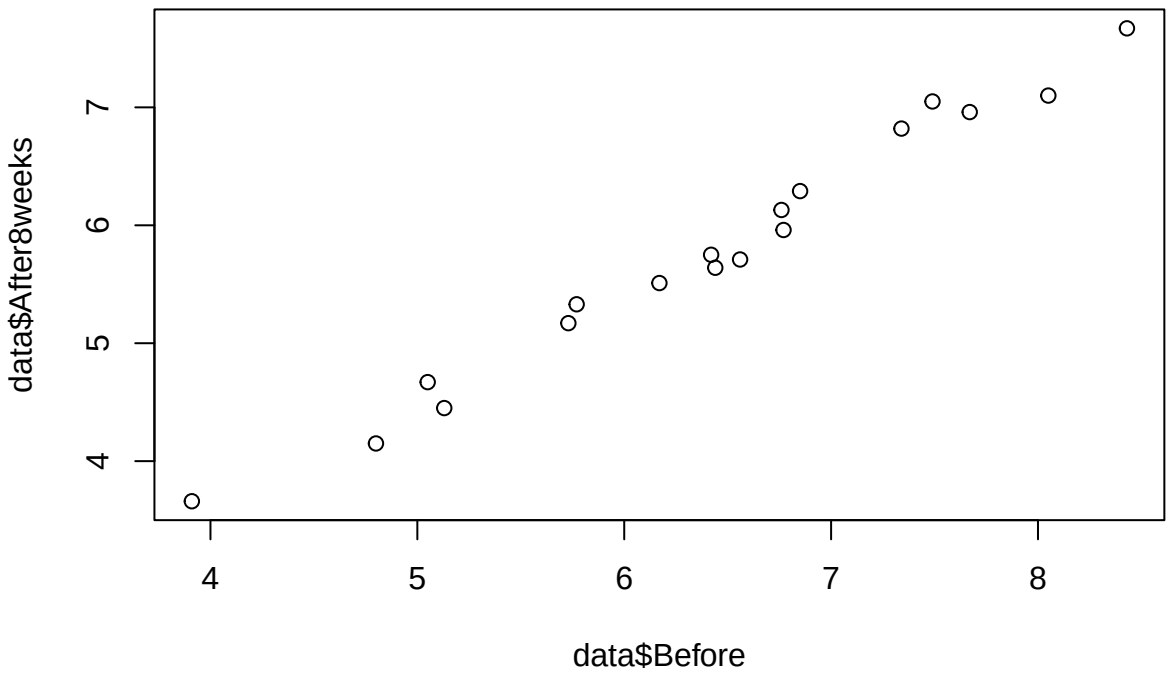
```
data = read.table("cholesterol.txt")
head(data)
```

```
##   Before After8weeks
## 1   6.42        5.75
## 2   6.76        6.13
## 3   6.56        5.71
## 4   4.80        4.15
## 5   8.43        7.67
## 6   7.49        7.05
```

```
cor(data$Before, data$After8weeks)
```

```
## [1] 0.9908885
```

```
plot(data$Before, data$After8weeks)
```



b) Apply two relevant tests (cf. Lectures 2, 3) to verify whether the diet with low fat margarine has an effect (argue whether the data are paired or not). Is a permutation test applicable?

c) Let $X_1, \ldots, X_{18}$ *be the column After8weeks. Assume* $X_1, \ldots, X_{18} \sim \text{Unif}[3, \theta]$, then use the central limit theorem to find an estimate $\hat{\theta}$ *for* θ *and construct a 95%-CI for* θ*. Can you improve this CI?*

d) By using a bootstrap test with test statistic $T=\max(X_1,\ldots,X_{18})$, determine those $\theta\in[3,12]$, for which the hypothesis $X_1, \ldots, X_{18} \sim \text{Unif}[3, \theta]$ *is not rejected. Can the Kolmogorov-Smirnov test be also applied for this situation?*

e) Using an appropriate test, verify whether the median cholesterol level after 8 weeks of low fat diet is less than 6. Next, design and perform a test to check whether the fraction of the cholesterol levels after 8 weeks of low fat diet less than 4.5 is at most 25%.

Exercise 3

Exercise 4