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Business Analytics & Machine Learning
Homework sheet 1: Statistics

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Exercise H1.1 *Gas consumption*

According to the information supplied by the manufacturer of a certain type of car, its gas consumption in city traffic is approximately normally distributed with expected value $\mu = 9.5\,\ell/100km$. The standard deviation $\sigma = 2.5\,\ell/100km$ is commonly known (to the general public and the manufacturer). In order to review the manufacturers prediction, a consumer organization has performed a test on 25 cars which yielded the following result:

$$\text{Average gas consumption: } \bar{x} = 10.5\,\ell/100km.$$

Check the manufacturers statement with a suitable test for significance levels $\alpha = 0.05$ and $\alpha = 0.01$.

Exercise H1.2 *Caloric intake*

32 individuals take part in a study about nutritional behavior. One aspect of the study is comparing carnivore diets to non-carnivore diets in terms of daily caloric intake. The research hypothesis states, that the daily average caloric intake of individuals following a non-carnivore diet is lower, compared to individuals following a carnivore diet. Out of 32 participants, 12 adhere to a non-carnivore diet, yielding an average caloric intake of $\bar{x}_1 = 1780$ kcal. In contrast, the remaining 20 participants following a carnivore diet average to $\bar{x}_2 = 1900$ kcal per day. The respective estimated standard deviations result in $s_1 = 230$, and $s_2 = 250$. The daily caloric intake of an individual is assumed to be a normally distributed variable.

a) Give a 95% confidence interval of the average daily caloric intake for each of the groups.

b) Which conclusions can be drawn from the computed confidence intervals?

c) Identify and apply a suitable hypothesis test using a significance level of $\alpha = 0.05$.

Exercise H1.3 *Population mean*

Determine (with $\alpha = 0.05$) if the following sample was obtained from a population with zero mean:

$$2, 3, 2, 4, 2, 4, 5, 2, 1, 4, 3, 0, 3, 2, 4, 5, 3, 3, 0, 1.$$