In-class exercise week 4 Topic: hypothesis tests, p-value

1) Statistical tests, p-values, confidence intervals

Which of the following statements are correct?

,	significant (i.e. $p < \alpha$, with e.g. $\alpha = 0.05$), means that the data shows the Null hypothesis and one rejects H_0 . False
,	est for detecting a truly existing effect, it is more likely that the tests en using a larger sample. □ False
c) If a test does not	get significant, one can conclude that there is no effect. □ False
d) The confidence i contain the mean o	•
	the population mean are determined from two independent samples e intervals do not overlap, then a two-sample t-test will provide a □ False

2) Hypothesis tests

- a) A randomized clinical study with 500 patients in each of the two treatment groups, A and B, should check if a newly developed drug B leads to a better pain reduction for arthritis patients than the gold standard treatment drug A. We abbreviate the expected value of pain reduction with drug A or B with μ_A or μ_B .
- Is it a paired (dependent) or unpaired (independent) study design?
- Formulate the \mathcal{H}_0 and \mathcal{H}_A for this clinical study
- Name the statistical test, which you plan to use, to test your hypothesis.
- Write down the test statistic T (which can be derived from the data)
- What is the distribution of the test statistic T under H_0 ?
- b) Reaction times on 500 patients in the morning (t_m) and in the evening (t_e) were measured, to investigate if the reaction time changes with the time of day.
- Is it a paired (dependent) or unpaired (independent) study design?
- Formulate the H_0 and H_A for this study We compute first for each patient the difference in reaction time $d_i=t_{e_i}-t_{m_i}$ and from these numbers we compute the mean \bar{d}
- Name the statistical test, which you plan to use, to test your Hypothesis.
- Write down the test statistic T (which can be derived from the data)

$$T = \frac{d}{se(\bar{d})} \sim t_{n-1}$$

- What is the distribution of the test statistic T under H_0 ?