Week 1

Tuesday, 8 January 2019 08:56

- Frequentism
  - p-value to ensure being wrong not too often
  - Neyman-Pearson
  - Aplha and p-values
  - Fisher used p-values differently but maybe not the right way

- Likelihoods
  - how likely is it that the result you see was to happen?
  - Do use relative evidence found in data but not prior

- Bayesian
  - path of belief, why see 6 heads out of ten and not 5 as prior belief gives? Should we change belief with this data? Probably not
  - Gaining traction in the recent past

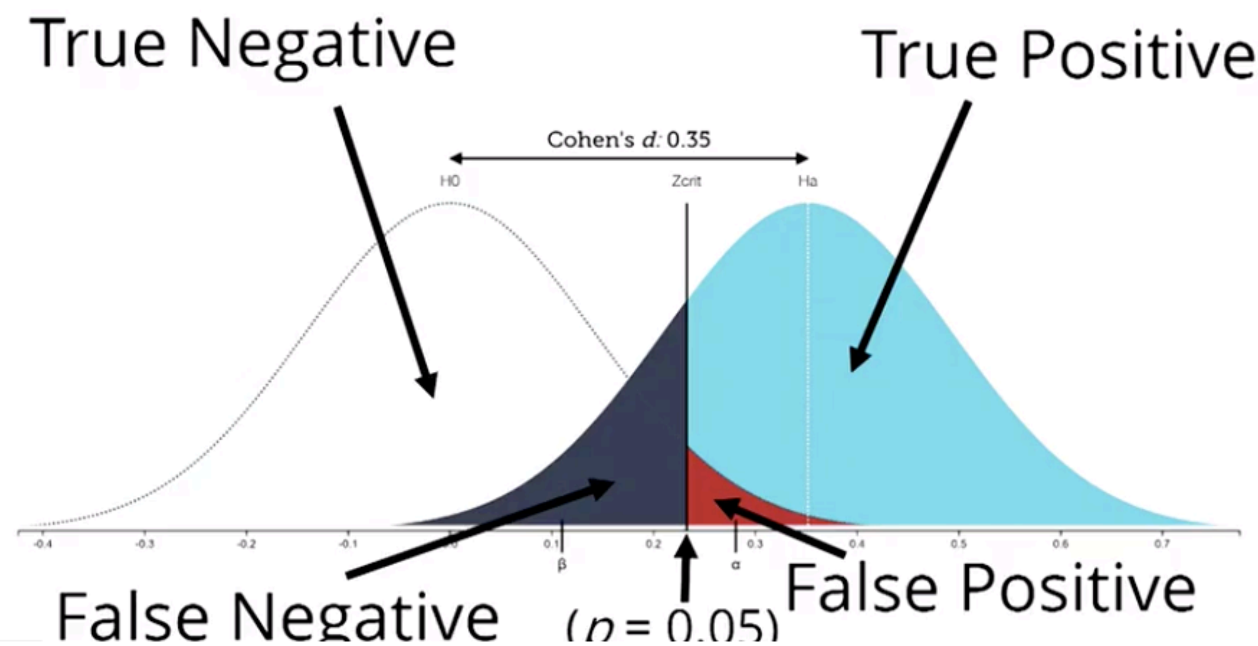
- P-values
  - Widespread use to know if the data presented is random or not
  - We assume null hypothesis, H0, i.e. not effect and see if H0 can be rejected
  - **P-value is the probability to have this data if H0 is true**
  - Usually if $p < 0.05$ H0 is rejected and there is an effect
  - If $p > 0.05$ --> MU as nothing can be deducted. Effect might still exist but need more data for example
  - For Physics in order to declare new discovery there is need for 5 sigma is used i.e. $p < 3e-7$ AND replication
  - Give info on likeliness of data been observed but not on theory being true
  - P-value distribution when there is no effect is uniformly distributed i.e. $p < 0.05$ is 5% likely to be seen
  - P-value distribution when there is an effect depends on power. Power of 50% --> 50% chance for $p < 0.05$

- Type 1 and Type 2 Errors
  - Type I : false positive
  - Type II: false negative
  - H0 null hypothesis, H1 alternative hypothesis
  - Power = 1 - beta --> probability to find effect if there is an effect to be found,

80% is typical --> True positive

- ○ Important way to have good result is P(H1) >> P(H0) but those probability are not known before study

	H0 True	H1 True
Significant Finding	False Positive (α)	True Positive (1-β)
Non-Significant Finding	True Negative (1- α)	False Negative (β)



- D=0.35 is the effect size
- Strving for high power, i.e. > 90% ismore important than reducing alpha, as H1 result more interesting than H0

- Exercise and Quizzes
  - A one-sample t-test is used to test whether a population mean is significantly different from some hypothesized value, here we create artificial data with mean 100 and a test for difference from 106 --> strong effect
  - With very high power e.g. 98% and $p < 0.05$ finding $p = 0.045$ is significant for H1 but more likely to happen for H0 --> Lindley's paradox --> using lower alpha or bayesian stats
  - C A
  - Null hypothesis test cannot be used to assert that there is no effect but only answer can I reject the null hypothesis with a desired error rate.
  - $P > 0.05$ mean either H0 is not true or we are in type I error space i.e. outlier
  - P-value does NOT give info on effect importance, can be done with cost-benefit analysis

http://shiny.ieis.tue.nl/d_p_power/