Bayesian Hypothesis Evaluation

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https://informative-hypotheses.sites.uu.nl/software/bain/

Abstract

Since Cohen's (1994) paper "the earth is round, p< .05" there is increasing awareness that the null-hypothesis, e.g., H0: m1=m2=m3, where the m's denote the means in three independent groups, only rarely represents the expectations that researchers have.. Informative hypotheses restrict model parameters using equality and inequality constraints to formally represent researcher's expectations. Two examples are: H1: m1 > m2 > m3 and H2: m1 < m2 = m3. Since each of H0, H1 and H2 may be wrong, it is customary to add Hc: "neither H0, not H1 or H2" to the set of hypotheses of interest.

Informative hypotheses can be evaluated by means of the Bayes factor (Hoijtink et al., 2019). The Bayes factor quantifies the support in the data for a pair of hypotheses based on the fit and the complexity of the hypotheses. If, for example, BF12 = 8, the support in the data for H1 is 8 times larger than the support for H2. Bayes factors can be translated into so-called posterior model probabilities. E.g. PMP0 = .1, PMP1 = .8, PMP2 = .0, and PMPc = .1 implies that a preference for H1 comes with a Bayesian error of .1 + .1 = .2.

This workshop will be executed using the following format **(course materials can be downloaded from the bottom of the page of the website given above from the 1st of July 2023 onwards)**:

Morning program:

- Getting re-acquainted with the p-value
- Introduction to informative hypotheses
- Introduction to the Bayes factor
- Introduction to Posterior Model Probabilities
- Introduction to Bayesian updating

Afternoon program:

- Elaboration of the computation of the Bayes factor (using figures not equations)
- Consequences of the approach used to compute the Bayes factor (including sensitivity analysis)
- Hands on lab meeting with JASP or R – bring your laptop!
- Wrap up and comparison of null hypothesis significance testing with Bayesian hypothesis evaluation

References

Cohen, J. (1994). The earth is round, p< .05. *American Psychologist, 49*, 997-1003.

Hoijtink, H., Mulder, J., van Lissa, C., and Gu, X. (2019). A tutorial on testing hypotheses using the Bayes factor. Psychological Methods, 24, 539-556. DOI: 10.1037/met0000201