KU Leuven Open Science Day

Interpreting the multiverse

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Abstract

To test scientific hypotheses in the social sciences the substantive hypothesis is formulated together with auxiliary hypotheses, so that predictions about observable quantities can be logically derived from their conjunction - the complete hypothesis. Auxiliary hypotheses are statistical and theoretical claims about the variables of interest. For instance, beliefs about how the observed data were generated, the cause of extreme values or missing data, and how we can measure certain constructs. Often, multiple sets of auxiliary hypotheses seem about equally (im)plausible to the researcher, yet, standard practice has been to arbitrarily pick (or worse, to cherry-pick) one of those sets resulting in one arbitrary data analysis and, subsequently, in arbitrary inference about the substantive hypothesis. To transparently assess the impact of various plausible auxiliary hypotheses on scientific inference, researchers could deviate from this approach and instead conduct multiple data analyses to test the same substantive hypothesis with varying auxiliary assumptions, and report on all resulting inferences (e.g., effect size estimates, p -values). With researchers craving for more transparent workflows, these so-called Multiverse methods recently gained in popularity. However, not much is known about how to (dis)corroborate the theory core with the set of inferences generated by the multiverse.

We attempt to summarize and interpret the inferences of a multiverse analysis by subdividing the multiverse into clusters with similar inferences, and by gauging the amount that the different sets of auxiliary assumptions can be differentiated with the dataset at hand. To achieve the latter, one must differentiate variation in inferences that stem from differences in the auxiliary assumptions from variations due to sampling error.

Author biographies

[Aline Claesen](#) (KU Leuven) works as a doctoral student at the research group of Quantitative Psychology and Individual Differences, and is supervised by Francis Tuerlinckx and Wolf Vanpaemel. The focus of her doctoral project is reproducibility in psychology and meta-science.

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