

# CRiSM Seminar

Wednesday, April 26

1pm – MB0.07

## Rank-transformed subsampling: Inference for multiple data splitting and exchangeable p-values

Many testing problems are readily amenable to randomised tests such as those employing data splitting, which divide the data into disjoint parts for separate purposes. However despite their usefulness in principle, randomised tests have obvious drawbacks. Firstly, two analyses of the same dataset may lead to different results. Secondly, the test typically loses power because it does not fully utilise the entire sample. As a remedy to these drawbacks, we study how to combine the test statistics or p-values resulting from multiple random realisations such as through random data splits.

We introduce rank-transformed subsampling as a general method for delivering large sample inference about the combined statistic or p-value under mild assumptions. We apply our methodology to a range of problems, including testing unimodality in high-dimensional data, testing goodness-of-fit of parametric quantile regression models, testing no direct effect in a sequentially randomised trial and calibrating cross-fit double machine learning confidence intervals. For the latter, our method improves coverage in finite samples and for the testing problems, our method is able to derandomise and improve power. Moreover, in contrast to existing p-value aggregation schemes that can be highly conservative, our method enjoys type-I error control that asymptotically approaches the nominal level.

This is joint work with Richard Guo. A preprint is available at <https://arxiv.org/pdf/2301.02739.pdf>.

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