Smaller p-values via indirect information

Abstract: In this talk I discuss construction of frequentist p-values and confidence intervals that make use of indirect or prior information. The construction is based on a biased test statistic that is optimal on average with respect to a probability distribution that encodes indirect information, resulting in a narrower confidence interval if the indirect information is accurate. In a variety of multiparameter settings, I show how to adaptively estimate the indirect information for each parameter while still maintaining exact frequentist type I error rates and coverage probabilities. This methodology is illustrated in several data analysis scenarios, including small area inference, spatially arranged populations, interactions in linear regression, and generalized linear models.

Relevant articles:
https://doi.org/10.1093/biomet/asy009
https://projecteuclid.org/euclid.ejs/1546570943
https://doi.org/10.1093/jssam/smz010
https://arxiv.org/abs/1907.12589