Sample-size reduction by order constraints

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Suggested talk duration (15-60 minutes)

30 minutes

Summary (max. 500 words)

Researchers often have substantive research questions that involve informative hypotheses. Consider, for example the hypothesis that cognitive behavioral therapy (CBT) in combination with drugs is *more* effective against depression than CBT only. This hypothesis is called informative because it includes a directional expectation about the ordering of the parameters. This prior knowledge originates from previous research (i.e. theory) or academic reasoning and can be translated into an order-constrained hypothesis by means of imposing order constraints (i.e. ≤, ≥, =) on the model parameters. Thus, in statistical symbols this informative hypothesis might be expressed as the following order-constrained hypothesis H_1: $\mu_{\text{new drug}} \leq \mu_{\text{old drug}} \leq \mu_{\text{no drug}}$, where μ reflects the population mean for depression in each group.

In this presentation, we present a method to evaluate an informative hypothesis against its complement H_c, (H_c: not H_1) using the generalized order-restricted information criterion (GORIC). Confirmatory approaches such as the GORIC have proven to be more `powerful' (higher probability of choosing the best hypothesis) than exploratory approaches such as the AIC. Consequently, smaller samples are needed to detect effects. In addition, we show how an informative hypothesis can be evaluated against its complement using the available software tools.

Keywords (max. 3)

Informative hypotheses, model selection, power