Division of Biostatistics, IHE Medical College of Wisconsin presents



Multiple Testing in Sequential Experiments By Michael Baron, American University, Department of

Mathematics and Statistics



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## Tuesday, October 24<sup>th</sup> | 3:30pm - 4:30 pm

This problem is mostly motivated by sequential clinical trials with multiple endpoints, although testing multiple hypotheses appears in other sequential situations such as multichannel change-point detection, quality control, acceptance sampling, etc. In such studies, it is necessary to reach a statistical decision for each individual test instead of combining them and giving one answer to the composite hypothesis.

Fixed-sample methods of multiple comparisons are well developed. There are Holm, Hommel, Benjamini-Hochberg, Guo-Sarkar, and other methods that can control the familywise error rate or the false discovery rate. Sequential counterparts of these tools have been elaborated fairly recently.

Combining classical ideas of sequential testing with non-sequential stepwise methods for multiple comparisons, we elaborate procedures for conducting multiple tests sequentially. Proposed methods control both Type I and Type II familywise error rates in the strong sense, similarly to Wald's sequential probability ratio test of a single hypothesis. Techniques are developed to minimize the expected sample size, and therefore, the expected cost of a clinical trial, under these constraints. Proposed approaches include optimal error spending, weighted statistics, and equalizer rules. Asymptotic optimality is achieved under the Pitman alternative. Substantial cost reduction can be achieved by controlling generalized familywise error rates in the sense of Lehmann and Romano, which is practical in applications that involve a large number of comparisons.



## Michael Baron, PhD

Michael Baron is Professor and Chair of the Department of Mathematics and Statistics at American University. He conducts research in sequential analysis, change-point problems, and Bayesian inference, with occasional applications in epidemiology, clinical trials, insurance, energy, finance, and semiconductor manufacturing. This last application brought him to IBM T. J. Watson Research Center, where he was a oneyear Academic Visitor. He authored a probability and statistics textbook for computer scientists and co-authored a series of books studying applications of statistics in sociology and marketing, classifying and exploring lifestyles and consumer behaviors. Dr. Baron is a Fellow of the American Statistical Association and a recipient of the Abraham Wald award.

Location: WebEx | https://mcw.webex.com/mcw/j.php?MTID=m8dd406873398b017a74f31324770016d



Please contact <u>Evan Heffelfinger</u> for additional event information at <u>eheffelfinger@mcw.edu</u>.