

Department of Applied and Computational Mathematics and Statistics Colloquium



Ryan Martin

Department of Statistics
North Carolina State University

False confidence, non-additive beliefs, and valid statistical inference

Statistics has made tremendous advances since the times of Fisher, Neyman, Jeffreys, and others, but the fundamental questions about probability and inference that puzzled our founding fathers still exist and might even be more relevant today. To overcome these challenges, I propose to forget, at least momentarily, about the two dominating schools of thought and ask what do scientists need out of statistics, do the existing frameworks meet these needs, and, if not, how to fill the void? To the first question, I contend that scientists seek to convert their data, posited statistical model, etc., into calibrated degrees of belief about quantities of interest. To the second question, I show that any framework returning additive beliefs, i.e., probabilities, necessarily suffers from false confidence---certain false hypotheses tend to be assigned high probability---and, therefore, risks making systematically misleading conclusions. This reveals the fundamental importance of non-additive beliefs in the context of statistical inference. But non-additivity alone is not enough so, to the third question, I offer a sufficient condition for avoiding false confidence, and present a framework, based on random sets and belief functions, that provably meets this condition. I will give examples throughout to illustrate the key concepts and results.

Friday, February 8, 2019
4:15 PM – 5:15 PM
127 Hayes-Healy Center

Colloquium Tea 3:45 PM to 4:15 PM 101A Crowley Commons Room