

Emerging Challenges at the Tripartite Interface of Computation, Economics, and Inference

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Joint work with

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Sequential hypothesis testing is often formulated as the design of stochastic processes that are nonnegative supermartingales under the null hypothesis. Modern challenges in this area involve nonparametric, composite hypotheses, both for the null and the alternative. I present a general theorem delineating a class of nonnegative supermartingales that have optimal power against composite alternatives. The characterization is based on a deterministic quantity known as the "portfolio regret"—I show that any process exhibiting sublinear portfolio regret is adaptively, asymptotically, and almost surely log-optimal. In the second half of the talk I present an application of these ideas to an emerging area at the intersection of statistical inference and economic mechanism design. Specifically, I discuss a game-theoretic problem involving a Principal who wishes to perform tests of hypotheses, where the choice of hypotheses is made by a strategic, self-interested Agent. I show that incentive compatibility in this game is assured if and only if the contract provided by the Principal to the Agent is comprised of a set of nonnegative supermartingales.

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