

Session: Inequalities in Probability and Statistics and Boundary Crossing

Optimal Real-time Detection of a Drifting Brownian Coordinate

by

Philip Ernst
Rice University

Abstract: Consider a three-dimensional Brownian motion whose two coordinate processes are standard Brownian motions with zero drift, and the third (unknown) coordinate process is a standard Brownian motion with a non-zero drift. Given that only the position of the three-dimensional Brownian motion X is being observed, the problem is to detect, as soon as possible and with minimal probabilities of the wrong terminal decisions, which coordinate process has the non-zero drift. We solve this problem in the Bayesian formulation under any prior probabilities of the non-zero drift being in any of the three coordinates when the passage of time is penalized linearly. (Joint work with Goran Peskir and Quan Zhou).

Some New Concentration Results for Pseudo-Lipschitz Loss Functions

by

Cindy Rush
Columbia University

Abstract: Pseudo-Lipschitz continuity is an idea that generalizes Lipschitz continuity, in particular, a function f taking input in R^m with output in R is pseudo-Lipschitz of order k if $|\phi(x) - \phi(y)| \leq L(1 + \|x\|^{k-1} + \|y\|^{k-1})\|x - y\|$. Pseudo-Lipschitz loss functions, which include common loss functions like absolute and squared error loss, are popularized because of their use in the theoretical analysis of the performance of various optimization and signal reconstruction algorithms, like approximate message passing. In this talk, we introduce the idea of pseudo-Lipschitz loss and present some new concentration inequalities for pseudo-Lipschitz loss functions with Gaussian input.

On the Bias and Variance of the Odds Ratio, Relative Risk and False Discovery Proportion

by

Demissie Alemayehu
Columbia University

Abstract: We develop a method to calculate the moments of statistical ratios as functionals of Bernoulli random variables via inverse moments of binomial distributions. We derive the mean and variance formulas of the odds ratio and relative risk, and the

(positive) false discovery proportion (FDP). Similar to the positive FDP, we introduce the positive odds ratio and relative risk statistics. We provide numerical examples to illustrate the biases and variances of these statistical ratios. (Joint work with Guodong Pang, Victor de la Pena and Michael J. Klass)

Decoupling and the Price of Independence

by

**Victor de la Pena
Columbia University**

Abstract: In this talk we present a sharp decoupling inequality for sums of arbitrarily dependent (non-negative) variables. An application is provided connecting the inequality to Economics and Finance. (Joint work with Loran Chollette and Michael Klass)