

Stanford University
Department of Statistics

DEPARTMENTAL SEMINAR

4:30pm, Tuesday, October 23, 2018
Sloan Mathematics Center Room 380C

Refreshments served at 4pm in Sequoia Lounge.

Speaker: Art Owen, *Stanford Statistics*

Title: **Optimizing the tie-breaker regression discontinuity design**

Abstract:

A customer loyalty plan for an airline or hotel or e-commerce company awards a benefit to some top ranked customers. The causal impact can be estimated by a regression discontinuity design (RDD) comparing those who barely got the benefit to those who barely missed out. The impact could be better estimated by an experiment but that involves a non-monotone distribution of the benefits which brings less value to the company. We study tie-breaker designs in which the top customers get the benefit, the bottom ones do not, and the middle fraction $\Delta \in (0, 1)$ of customers are randomized to receive the benefit or not. We quantify the statistical efficiency of this design as a function of Δ . In a two line regression, statistical efficiency increases monotonically with Δ , so efficiency is maximized by an RCT. That same regression model quantifies the short term value of the treatment allocation and this comparison favors smaller Δ with the RDD being best. We solve for the optimal tradeoff between these exploration and exploitation goals. The usual tie-breaker design experiments on the middle Δ subjects according to the ranking variable. We quantify the efficiency of other designs such as experimenting only in the second decile from the top. We also consider more general regression models.

This is joint work with Hal Varian of Google.