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M E D I C I N E | Biomedical Data Science

DBDS Workshop in Biostatistics
Remote Access Only:
Contact kkanagaw@stanford.edu for Zoom dial-in details.

DATE:	September 24, 2020
TIME:	2:30-3:50pm
TITLE:	Evidence-Based Elections
SPEAKER:	**Philip Stark** Professor, Associate Dean of Mathematical and Physical Sciences University of California, Berkeley

Abstract:

Elections rely on people, hardware, and software, all of which are fallible and subject to manipulation. Well resourced nation-states continue to attack U.S. elections and domestic election fraud is not unheard of. Voting equipment is built by private vendors--some foreign, but all using foreign parts. Many states even oursource election reporting to foreign firms. How can we conduct and check elections in a way that provides evidence that the reported winners really won--despite malfunctions and malfeasance? Evidence-based elections require voter-verified (generally, hand-marked) paper ballots kept demonstrably secure throughout the canvass and manual audits of election results against the trustworthy paper trail. Hand-marked paper ballots are far more trustworthy than machine-marked ballots for a variety of reasons. Two kinds of audits are required to provide affirmative evidence that outcomes are correct: _compliance audits_ to establish whether the paper trail is complete and trustworthy, and _risk-limiting audits_ (RLAs). RLAs test the hypothesis that an accurate manual tabulation of the votes would find that one or more reported winners did not win. To reject that hypothesis means there is convincing evidence that a full hand tally would confirm the reported results. For a broad variety of social choice functions, including plurality, multi-winner plurality, supermajority, proportional representation rules such as D'Hondt, Borda count, approval voting, and instant-runoff voting (aka ranked-choice voting), the hypothesis that one or more outcomes is wrong can be reduced to the hypothesis that the means of one or more lists of nonnegative numbers is not greater than $1/2$. Martingale methods for testing such nonparametric hypotheses sequentially are especially practical. RLAs are in law in several states and have been piloted in more than a dozen; there have been roughly 60 pilots in jurisdictions of all sizes, including roughly 10 audits of statewide contests. Open-source software to support RLAs is available.

Suggested Readings:
- "Sets of Half-Average Nulls Generate Risk-Limiting Audits: SHANGRLA"
- "Ballot-marking devices cannot assure the will of the voters"
- "Evidence-Based Elections: Create a Meaningful Paper Trail, Then Audit"
- "Testing Cannot Tell Whether Ballot-Marking Devices Alter Election Outcomes"