Evidence-Based Elections: NSF Research Agenda Input

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Lessons Learned:
Navigating a Presidential Election Through a Pandemic

Background

My background is in computer science, security, data science, voting standards, election auditing, via Bell Labs, Internet2, Free & Fair, DemocracyWorks, etc.

Improving audits in Colorado since 2003, by serving as precinct election judge, piloting local audits, legislation advocacy, working on Colorado's open source auditing software etc.

Member of Verified Voting advisory board.

Decades of study and advocacy of improved voting methods (Approval Voting, Proportional Representation), to better represent voters wishes.

2020 Expanded opportunities in many ways

Good news from 2020 elections: expanded interest in election integrity, auditing, transparency. Even here in Colorado with many best-in-class practices!

Ongoing high-profile multi-partisan multi-stakeholder support for further improvements in Colorado elections evident at day-long Legislative Audit Committee hearing on election integrity, 2020-12-15 (despite more partisan wrangling at beginning and end)

But need to work past growing partisanship. Easier to work on that with local election officials than more politicized legislatures.

See my testimony on remaining work for transparent Colorado RLAs

Overview of my view of research priorities

Expanded transparency, data collection and analysis

Evidence-Based Elections: improved auditing efficiency, uptake by states, coverage within states, transparency

Voter Confidence via election methods that ensure fewer votes lost, e.g. via Proportional Representation, spoiler-resistant voting methods

Open-source tools to support election administrators

Competitions to drive innovation in robustness, methodology, efficiency

Colorado status

Successes

- Efficiently-auditable tabulation
- Data on All contests in all coordinated elections, but not all reviewed
- Open Source Software developed for ballot-level RLAs
- Publicly verifiable random selection
- Officials could check risk measurements

Colorado - Remaining work

- Publish data to be audited before rolling dice. At least hashes of the data - no downside!!
- Improve auditing, standardization and transparency around eligibility determination (signature verifiacation) ballot reconciliation, chain-of-custody etc.
- Drop SOS responsibility (especially as a candidate) for choosing audited contests
- Target the most interesting, closest contests, to a larger risk limit if necessary, and target all remaining contests with a reasonable estimated workload
- Share results for opportunistic audits.
- Allow public RLA oversight (publish CVRs, rla_export data, images)
  - Requires addressing anonymity issues better
- Handle non-voter-verifiable ballots properly (e.g., received by email)

Research to support transparency

Critical to publish Cast Vote Records for ballots while maintaining separation between voter identity and ballot choices

We need research and tools to ensure and automate that.

Cast Vote Records are a gold mine of information on voter preferences: how did voters who voted on proposition X vote in the city council race? See Proportional Representation Voting Methods, Data, and Auditing

Recycle results into other research on auditing, voting methods, political science etc.

Expanding robust auditing to more states

GA, VA and PA expanding audits. Next hurdle: expanding transparency and auditing more contests

Largest obstacle is efficiency: most states use ballot-polling audits, or batch-comparison audits, rather than much more efficient ballot-level comparison audits.

Why? ballots scanned in-precinct can be linked to voters if the order they were scanned is preserved, so we lose crucial link between paper ballot and cast vote record.

Desperately need creative approaches and tools for resolving that problem.

Ballot-level comparison audits are efficient both for auditing tighter margins, and for auditing more contests.

Evidence-Based Elections - eligibility, chain-of-custody, compliance audits

Robust, transparent auditing of more phases of election

Research on audits of eligibility: signature verification or other more secure and auditable approaches leveraging state online digital ID (mobile drivers license apps)

Release of digitally signed, timestamped ballot images and CVRs to enhance chain-of-custody and improve transparency. Research and tools needed to automatically remove identifying marks and other linkability issues

Imprinting unique ids on ballots after casting helps with both chain-of-custody and auditing efficiency

End-to-End auditable voting systems like Scantegrity and ElectionGuard (both open source) can help address all these issues forward for in-person voting. But usability research is critical!

Funding for data collection, repositories

Science and progress thrives on data. Good sources:

- Verified Voting for voting equipment per jurisdiction and laws on auditing and recounting

- Real-time data on election results, crucial for auditing, is shockingly difficult to obtain. Data on undervotes and overvotes is crucial. See Stephanie Singer's work on this problem, and leveraging of results. Solve this, then incorporate in with tools like Arlo for easy smart design and setup of an audit.

- Data on auditing and analysis results is not well organized.

- Fund pilot audit experimentation with good real-time data collection and publication requirements

Voter confidence: better voting methods are critical

In many jurisdictions, half or more of the population are unsatisfied with results due to our antiquated "vote for one, plurality" voting method.

Gerrymandering exaccerbates that dramatically.

We need multi-winner districts for local, state, and national representation in city and county councils and legislatures. And voting methods that result in proportional representation. See Fair Representation Act, HR 4000 in last congress.

Like most of the world, where gerrymandering just isn't an issue, and fewer votes are wasted.

How to audit proportional representation?

Two more research problems!

Single-transferrable vote (multi-winner rule with ranked choice ballots) - still no efficient audits

Proportional Approval Voting: easy to show that the set of winners is much better than current approaches generate, but in some cases harder to show that exact winning combination was optimal, in the face of small numbers of potentially manipulated ballots.

Competitions

The world loves a good competition. Capture the flag, applied to attacking and defending many election-related spaces, from voting systems to disinformation

Come up with good metrics

Checking software independence of audits software independence: see e.g. Public RLA Oversight Protocol

Funding resources

Leverage bipartisan support for amazing 2021 National Security Commission on Artificial Intelligence report noting need for billions of dollars in AI research, research infrastructure and development funding, testbed support, a Digital Service Academy to train government tech workers to modernize and defend critical infrastructure, infusing democrative values and ethical approaches at every step, and much more.

Conclusions

History has been full of knee-jerk reactions after crises, throwing money at equipment before it is ready.

Need long-term, sustained research and development effort

Resources

- Colorado Risk-Limiting Audit Project (CORLA)
- Principles and Best Practices for Post Election Tabulation Audits - 2018
- Harvie Branscomb's Election Quality website

This presentation is online at
https://bcn.boulder.co.us/~neal/elections/ebe-agenda-mcburnett/