Overview of current research for CMSS

Mark C. Wilson

Department of Computer Science
University of Auckland
www.cs.auckland.ac.nz/~mcw/

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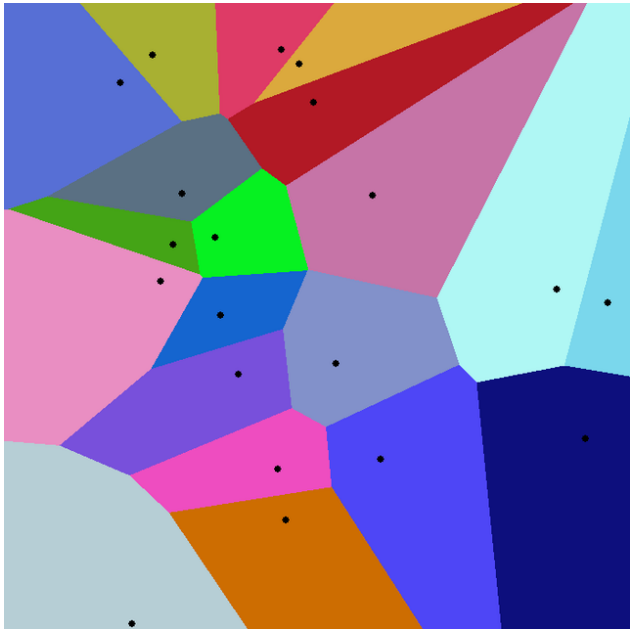
Speaker background

- PhD from Wisconsin-Madison (Mathematics), worked in UoA Computer Science Department since 2001. Main research is now in mathematical/computational social sciences.
- Relevant interests: voting rules, electoral systems, matching algorithms, learning on networks, wisdom of crowds, scientometrics.
- Other research interests: asymptotic combinatorics, generating functions.
- Founding member of CMSS, 14 seminar/workshop talks.

Too many aggregation rules, too many properties



Think of an aggregation rule quite generally, as a mapping from an input profile of preferences to an outcome. Some subsets of the profile space yield an uncontroversial (consensus) outcome. For other input profiles, we minimize their distance to a consensus set and choose the corresponding outcome. This allows us to derive properties of the resulting rule $\mathcal{R}(\mathcal{K}, d)$ from properties of the consensus $\mathcal{K}$ and distance d. Of course, we still need to agree on those!

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- Intend to work next on multi-winner elections, social dichotomy rules, ...

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- Applications include: on-campus housing for university students, public schools for students, offices for staff, kidneys for transplant patients, military postings for soldiers, hospitals for medical residents.
- It is tricky because of common preferences — the easiest case for voting is the hardest for resource allocation.

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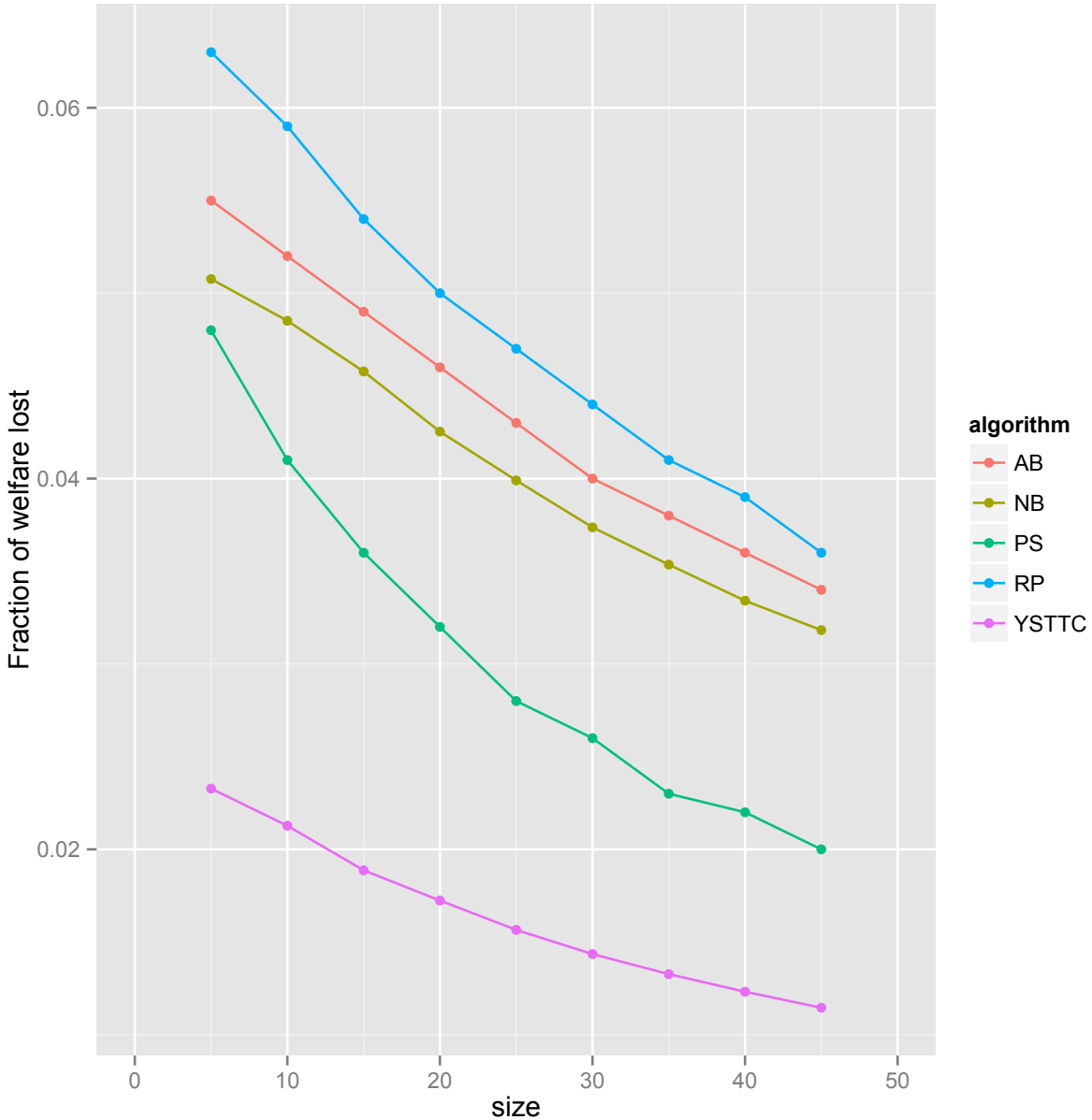
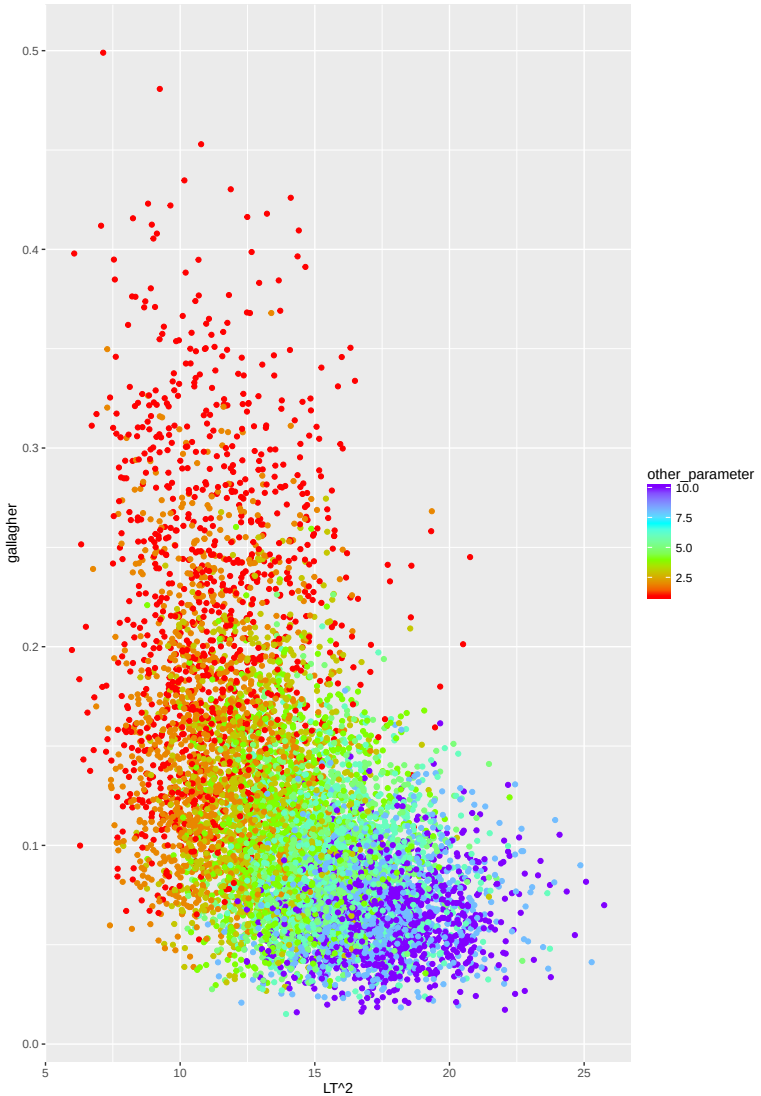
- (next) analytic results for welfare under Impartial Culture; distance-based rules.


Fraction of welfare lost
0.06
0.04
0.02
0
10
20
30
40
50
size
algorithm
AB
NB
PS
RP
YSTTC

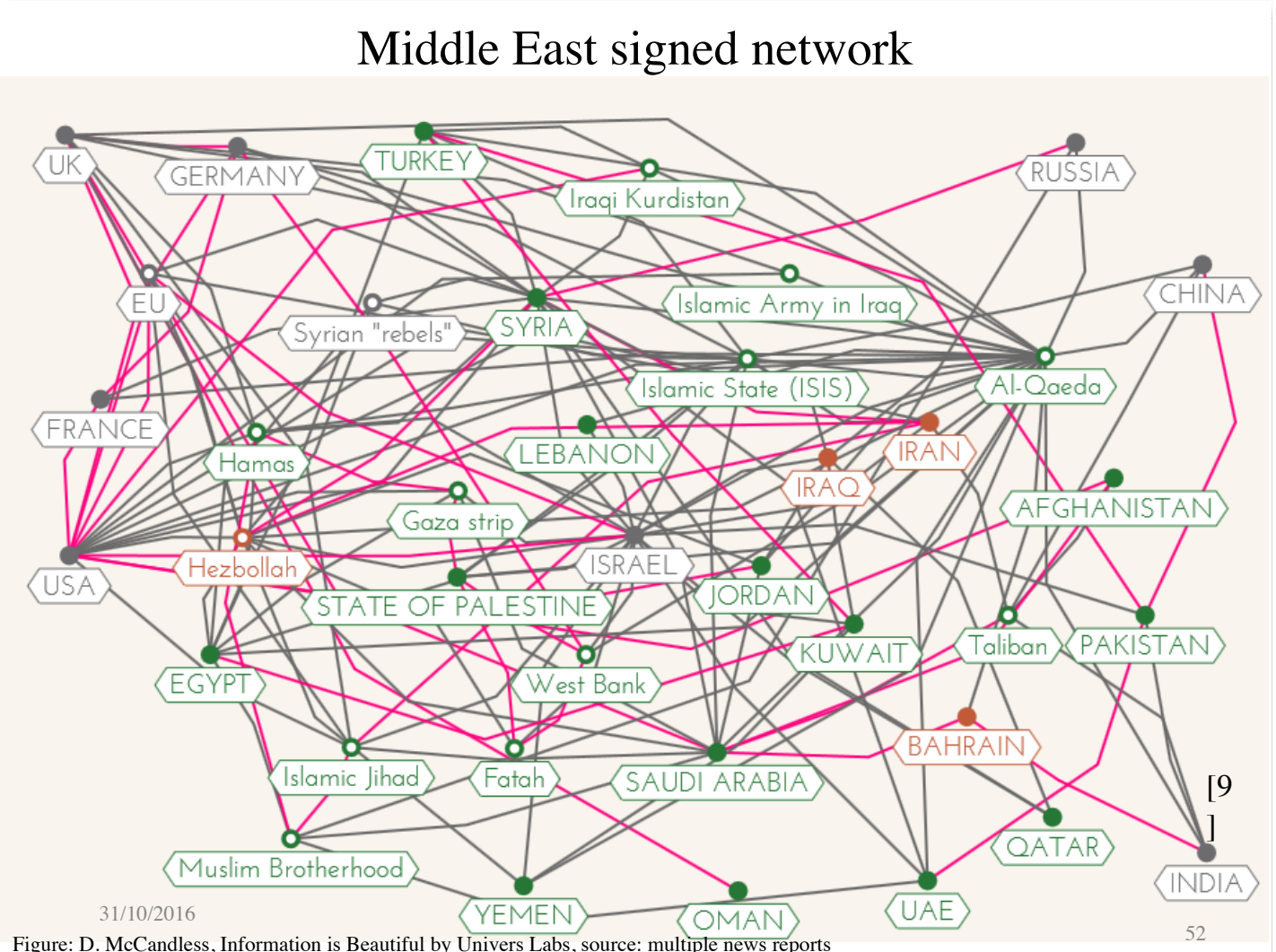

Chicago Daily Tribune
DEWEY DEFEATS TRUM


gallagher
LT^2
other_parameter
10.0
7.5
5.0
2.5
0.0
0.1
0.2
0.3
0.4
0.5
5
10
15
20
25

Research on electoral systems

- (2011-12) Submission to NZ government review of MMP, online simulator for MMP referendum (with Geoff Pritchard, CMSS);
- (now) Generating artificial voting data using multi-district Pólya urn models (with Geoff Pritchard, CMSS);
- (2014-now) Predicting plurality elections; models of inter-election swing (with Bernard Grofman, UC Irvine);
- (next) followup to Carey & Hix (2010, American Journal of Political Science): the tradeoff between decisiveness and proportionality.

Is this balanced? How can we tell?



[9]

Figure: D. McCandless, Information is Beautiful by Univers Labs, source: multiple news reports

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- With PhD student Neda Sakhaee, citation network derived from NZ legislation, Proceedings of JURIX 2016.
- Next: algorithms for computation of frustration index in signed networks; application of NZ law network to legal history; models of diffusion inspired by experiment.

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- I will speak in the CMSS seminar in 2017 — you decide the topic.