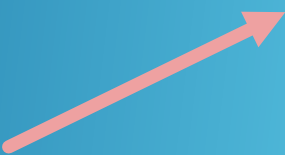
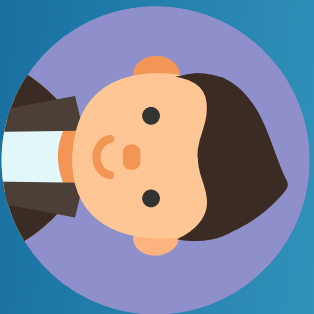


THEORY OF VOTING*

CMSC828M – Spring 2018

*social choice functions

MAJORITY RULES



- ▶ **Resolute:** single winner
- ▶ **Neutral:** “Treats all candidates fairly”
- ▶ **Anonymous:** roles of voters should be interchangeable
- ▶ **Pareto:** if everyone favors x to y , y cannot win
- ▶ **Monotonic:** adding votes to the winner shouldn't change winner
- ▶ **Responsive:** if tied, and a voter switches, should be unique winner

POTENTIAL WISHLIST

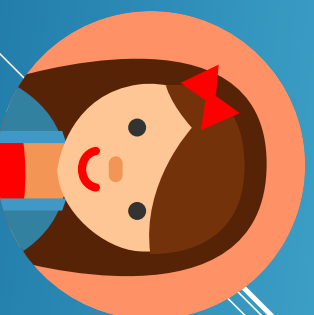
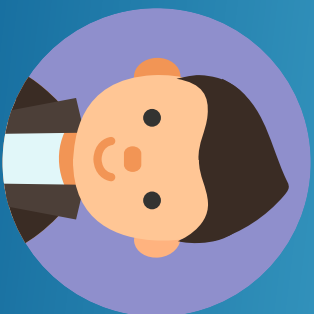
Not really...

- ▶ **Should constitutional amendment require a simple majority?**
- ▶ **What about electing committees? Pick progressively lower vote counts?**

DO WE HAVE TO SATISFY THEM ALL?



MAJORITY RULES



- ▶ **Fixed Ordering of Alternatives:** breaks neutrality
- ▶ **Designated Voter?:** breaks anonymity
- ▶ **Randomized:** indeterminate voting rules
- ▶ **Directly deal with Sets:** prioritize individuals?
- ▶ **La-la-la-la:** fine for narrow proofs, not elections

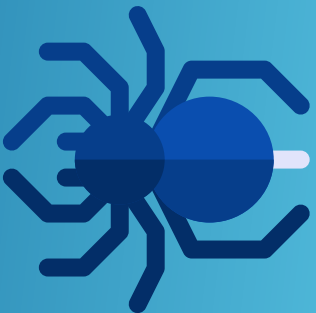
HANDLING TIES

- ▶ Every voter plays an equal role
- ▶ Every alternative is treated equally
- ▶ There are only 2 alternatives *we'll relax this

	Odd	Even
Resolute	✓	
Anonymous	✓	✓
Neutral	✓	✓
Monotonic	✓	
Responsive		✓

May's Theorem (1952):
only reasonable
approach is **majority rule**

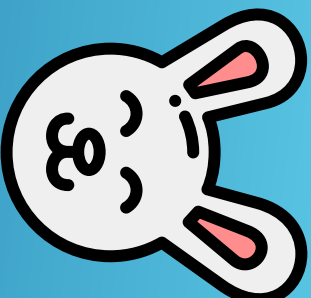
LET'S MAKE SOME ASSUMPTIONS



6

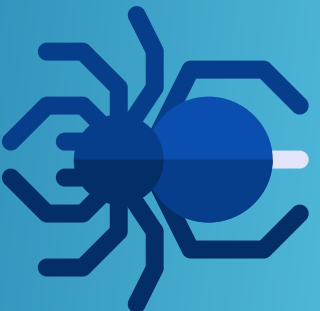


5



4

MORE SUBTLE PROBLEMS



6

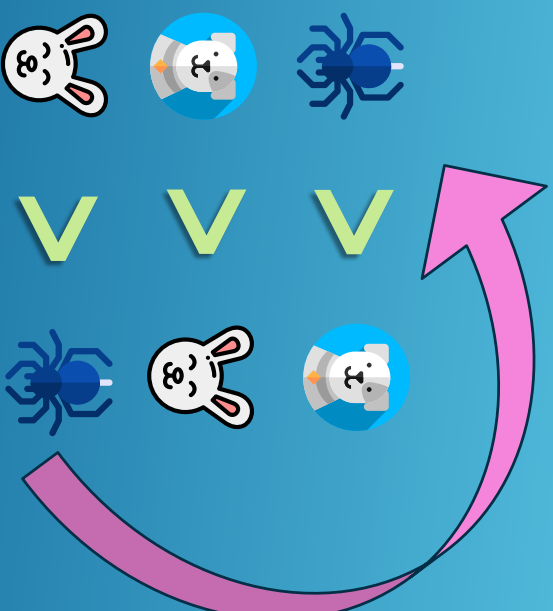
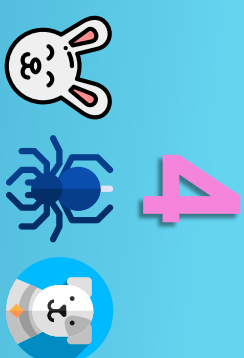
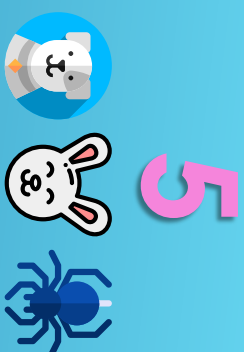
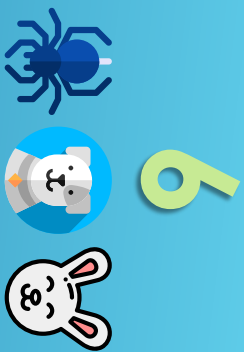
40%

9

60%

MORE SUBTLE PROBLEMS

Plurality != Majority



MORE SUBTLE PROBLEMS



Majority Preference
is not Transitive Condorcet (1785)

Not guaranteed

▶ Winner must win majority of the vote in all head-to-head matches against other candidates



CONDORCET WINNER

Arrow's Impossibility Theorem (1951)

Given 3 alternatives. There is no rule that is simultaneously:

- ▶ **Pareto efficient** (if all voters prefer X to Y, the rule prefers X to Y)
- ▶ **Non-dictatorial** (there is no single voter whose rankings are always followed)
- ▶ **Independent of Irrelevant Alternatives**
 - ▶ Assume $X > Y$
 - ▶ Change votes, but not relative ordering of X and Y
 - ▶ $X > Y$ must still be true



IT GETS WORSE

Last place gets one point, 2nd to last 2 points, ...

Most points wins.

Pros:

All candidates you support get credit.

Every vote matters

Cons:

Tends to elect “acceptable” candidates rather than majority-approved

Encourages insincere voting... You can still harm your first choice

Rarely used



BORDA COUNT (1435)

Order candidates by pairwise **victories** minus **defeats**

Best score wins.

Pros:

Easy to calculate

Familiar to populous
(round robin tournaments)

Cons:

Often leads to ties

Doesn't account for **magnitude** of victory or defeat, only **number**



COPELAND'S METHOD (1299)

RANKED CHOICE VOTING



Maine Secretary of State proceeds with plans for ranked-choice voting in state primaries

Politics > Posted April 18 | Updated April 18

Senate Republicans, who unsuccessfully asked a court to block the system, now say they will introduce a bill to require Maine State Police to transport any ballots needed for retabulation, if necessary.

BY SCOTT THIBSTLE STAFF WRITER

Share    



Maine Secretary of State Matt Dunlap talks to reporters about the Maine Supreme Judicial Court's ruling on ranked-choice voting on Wednesday at the Maine State House in Augusta. Staff photo by Joe Pridemore

WASHINGTON — Maine Secretary of State Matt Dunlap said Wednesday that ranked-choice voting will be used in the June 12 primaries when Democrats and Republicans pick nominees for governor and two other races.

Dunlap's announcement came a day after the state supreme court refused to overrule the election system passed by state voters in November 2016. The court took the case up last Friday but moved quickly to issue an opinion with the primary less than two months away.

- BROWSE MORE IN NEWS**
- LOCAL & STATE
 - NEW ENGLAND
 - NATION & WORLD
 - COPS & COURTS
 - HEALTH CARE
 - SCHOOLS & EDUCATION

WAKE UP TO THE LOCAL NEWS YOU NEED

Enter your email and our daily headlines will be delivered to your inbox each morning.

Email address

I understand the [Terms of Service](#).

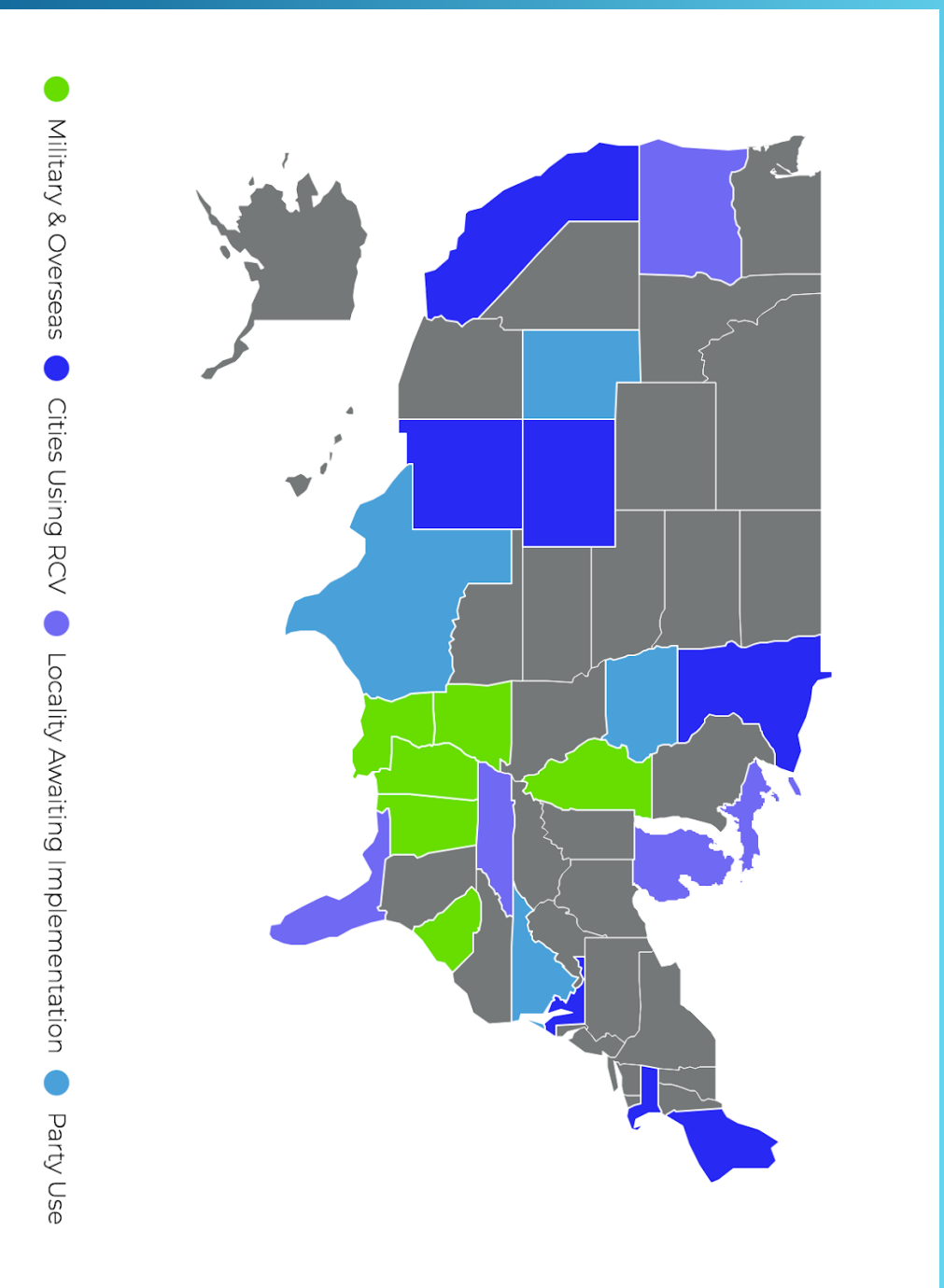
SUBMIT

MOST READ STORIES

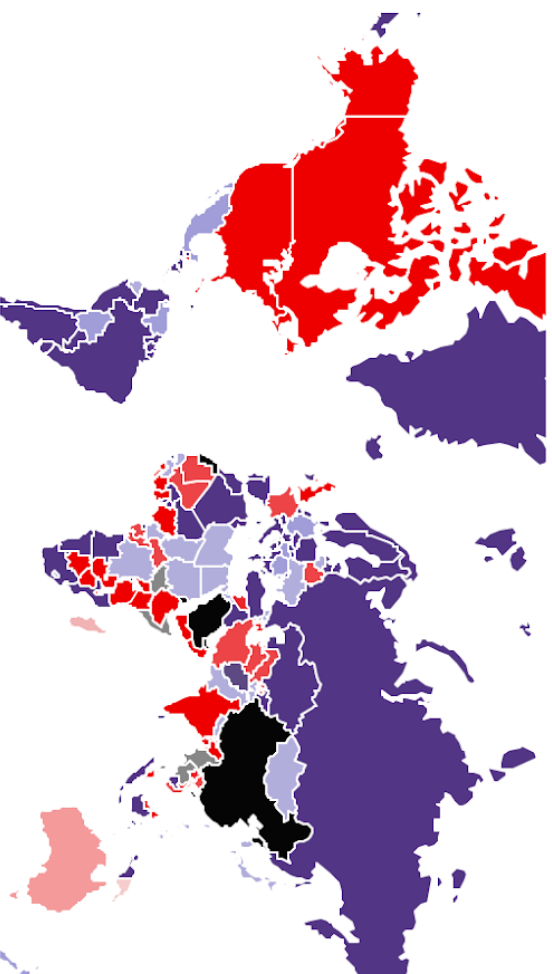
1 [FIVE women arrested during state primary in Augusta](#)

INCREASE FONT SIZE 

RANKED CHOICE VOTING



Electoral Systems of the World



- List Proportional Representation
- Multi-winner Ranked Choice Voting
- Other Proportional System
- Mixed Member Proportional
- Mixed PR and winner-take-all
- Plurality
- Block Voting
- Two Round System
- Single-winner RCV
- Other Winner-take-all
- Other (Limited RCV)
- Other (Modified Borda Count)
- In transition
- Not applicable

- ▶ **Promotes majority support** - undermines Gerrymandering since candidates have to get at least 50% of the vote or are progressively eliminated
- ▶ **Discourages negative campaigning** - based on poll of user sentiment
- ▶ **Provides more voter choice** - more can compete without fear of splitting the vote
- ▶ **Minimize strategic voting** - don't have to bank on "lesser of two evils"
- ▶ **Lower costs all around** - no need for primaries, increases viability of grass-roots campaigning
- ▶ **Reflective representation** - 2.7x turnout in some municipalities

RANKED CHOICE VOTING - BENEFITS

- ▶ **Computational Complexity** – NP-Hard (applied to hundreds of millions of votes?)
- ▶ **Spatial Complexity** – What if topics are interrelated, not independent? Exponentially growing space
- ▶ **Human Factors** – Do you have to rank all? What is the difference between 4th and 5th place?
- ▶ **Model Applicability** – How would this apply to abstract votes?

RANKED CHOICE VOTING - ISSUES

/* */
||
??