

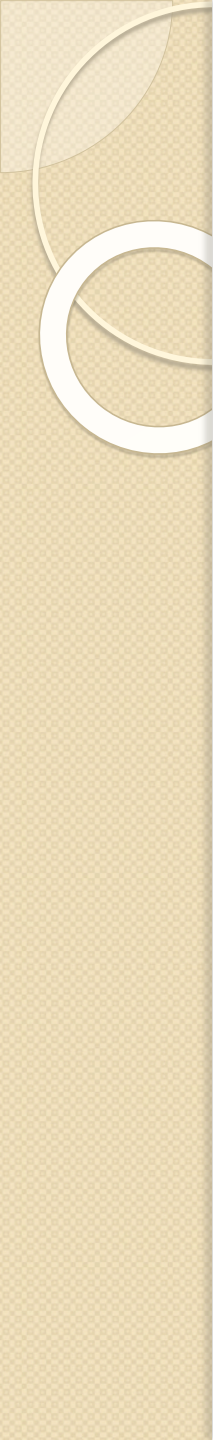


# Election Methods

## Is It Possible to Choose the Winner?

Will Best

October 2, 2020

- 
- Draws heavily on...
    - A talk by Dr. Donald Saari
    - A presentation by Michael Buescher

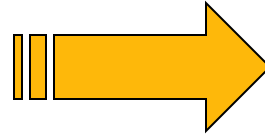
# Plurality

- Vote for your favorite candidate.  
Whoever gets the most votes wins.
- Currently used: most American elections,  
many other countries.

# Plurality

- Advantages
  - Simple to vote
  - Simple to tally
- Disadvantages
  - Winner can have less than 50%
  - Susceptible to strategic voting
- Tends to create only two-party systems
  - Occasional “spoiler” candidates

# Minnesota Gubernatorial Election, 1998



Jesse "The Body" Ventura (Reform): 37.0%

Norm Coleman (Republican): 34.3%

Hubert Humphrey III (Democrat): 28.1%

# Hawaii Gubernatorial Election, 1994

Ben Cayetano	36.6%
Frank Fasi	30.7%
Pat Saiki	29.2%
Keoni Dudley	3.5%

(voter turnout just over 40%)

# Non-majority Presidential winners

- 1992

- Bill Clinton **43.0%**
- George H.W. Bush 37.5%
- Ross Perot 18.9%

- 1996

- Bill Clinton **49.2%**
- Bob Dole 40.7%
- Ross Perot 8.4%

- 2000

- George W. Bush **47.9%**
- Al Gore 48.4%
- Ralph Nader 2.7%

- 2016

- Donald Trump **45.9%**
- Hilary Clinton 48.0%
- Gary Johnson 3.3%

# American Presidential Elections

- Each state has a “popular vote” (plurality.)
- Winner of each state gets a set number of Electoral College votes.
  - Equal to # of reps + senators
  - DC gets 3
- Winner of majority of Electoral College votes becomes president.
  - Must be an absolute majority.
  - If not, the vote goes to the House, then the Senate.



# 2000 Presidential Election

States where winning candidate did not receive a majority of the vote

- Florida
- Iowa
- Maine
- Minnesota
- Nevada
- New Hampshire
- New Mexico
- Ohio
- Oregon
- Wisconsin

**George W. Bush loses the popular vote, but wins the Electoral College vote and thus becomes President.**

# 1992 Presidential Election

States where winning candidate did not receive a majority of the vote

- Alabama
- Alaska
- Arizona
- California
- Colorado
- Connecticut
- Delaware
- Florida
- Georgia
- Hawaii
- Idaho
- Illinois
- Indiana
- Iowa
- Kansas
- Kentucky
- Louisiana
- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Mississippi
- Missouri
- Montana
- Nebraska
- Nevada
- New Hampshire
- New Jersey
- New Mexico
- New York
- North Carolina
- North Dakota
- Ohio
- Oklahoma
- Oregon
- Pennsylvania
- Rhode Island
- South Carolina
- South Dakota
- Tennessee
- Texas
- Utah
- Vermont
- Virginia
- Washington
- West Virginia
- Wisconsin
- Wyoming

# Top-Two Runoff

- Extension of a plurality election.
- If no one gets a majority, the top two have another election.
- Currently used: many European countries, Texas primary elections, others.
- Helps avoid dominance by only two parties (a little)

# Borda Count

- Each voter ranks  $n$  choices.
- On each ballot, 1<sup>st</sup> choice gets  $n$  points, 2<sup>nd</sup> gets  $n-1$  points, etc.
- Most points wins.
- Currently used:
  - sports polls and awards, private organizations

# Borda Count

- Advantage:
  - More complete picture of voter preferences.
- Disadvantages:
  - More complicated
  - Susceptible to strategic voting
- Tends to elect broadly acceptable candidates

# Instant Runoff Voting (IRV)

(Ranked Choice Voting)

- Voters rank candidates.
  - May not be required to rank all candidates.
- If one candidate has majority of 1<sup>st</sup> place votes, that's the winner.
- If not, remove the candidate with the fewest 1<sup>st</sup> place votes from all ballots, and count again.
- Repeat until someone has a majority of 1<sup>st</sup> place votes.

# Instant Runoff Voting (IRV)

- Currently used: Australia, Fiji, Irish President, Maine, some American cities.
- Advantages:
  - More complete picture of voter preferences.
  - Protects against vote splitting (e.g. 1992, 2000).
  - Accomplishes runoff with only one round.
- Disadvantages:
  - Harder to understand/believe
  - Susceptible to strategic voting
- Compromise candidates get eliminated early

# Condorcet

- Look at head-to-head preferences on each ballot.
- If one choice wins the head-to-head competition against all other choices, it's the winner.
- Currently used: some private organizations.



# Condorcet

- Advantage:
  - A Condorcet winner is a clear favorite.
- Disadvantage:
  - There may not be a winner!
  - Susceptible to strategic voting

# Arrow's Theorem

- Dr. Kenneth Arrow, 1951 (Ph.D. thesis)
  - Won Nobel Prize in Economics
- Discussed several reasonable-sounding criteria for a fair election involving three or more candidates in which all voters can freely choose.
- Proved a surprising theorem.

# I. Majority Criterion (Pareto)

- If a majority of people prefer candidate A, then A should win.
- Pass: plurality, Condorcet, IRV
- Fail: Borda
- Electoral College also fails

## 2. Monotonicity Criterion

- If voters change their mind and rank candidate  $A$  higher than they used to, it should not hurt  $A$ .
- Pass: Condorcet, Borda, plurality, Electoral College
- Fail: IRV

## 2. Monotonicity Criterion

- How can IRV fail?

Preference		Voters
1st	2nd	
Right	Center	28
Right	Left	5
Left	Center	30
Left	Right	5
<del>Center</del>	Left	16
<del>Center</del>	Right	16

}  $33 + 16 = 49$

}  $35 + 16 = 51$  Left wins!

} ~~32~~

## 2. Monotonicity Criterion

- How can IRV fail?

Preference		Voters
1st	2nd	
<del>Right</del>	Center	28
<del>Right</del>	Left	<del>X</del> 3
Left	Center	30
Left	Right	<del>X</del> 7
Center	Left	16
Center	Right	16

} ~~31~~

}  $37 + 3 = 40$

}  $32 + 28 = 60$  Center wins!

### 3. Condorcet Criterion

- If candidate  $A$  is preferred in all head-to-head contests, then  $A$  should win.
- Pass: Condorcet
- Fail: Borda, plurality, IRV, Electoral College

## 4. Independence of Irrelevant Alternatives

- Adding or removing a non-winning candidate should not change the result.
- Pass: none!
- Fail: Condorcet, Borda, IRV, Plurality, Electoral College (1992, 2000)



# France 2002

## **The Rules:**

Vote for your favorite candidate. If no candidate receives a majority, there is a runoff between the top two vote-getters.

## **The Polls:**

Widely expected: runoff between Jacques Chirac (incumbent) and Lionel Jospin; Jospin heavily favored to win the runoff.

## **First Round Results:**

<b>Jacques Chirac</b>	<b>19.9 %</b>
<b>Jean-Marie Le Pen</b>	<b>16.9 %</b>
<b>Lionel Jospin</b>	<b>16.2 %</b>

## **Second Round Results:**

<b>Jacques Chirac</b>	<b>82.2%</b>
<b>Jean-Marie Le Pen</b>	<b>17.8%</b>

# Arrow's Theorem

- No voting system involving three or more candidates can satisfy all of these criteria!
- ...Except for a DICTATORSHIP (only one person votes)
- “Clear community-wide ranked preferences cannot be determined by converting individuals’ preferences from a fair ranked-voting electoral system”

# Some Resources

- <http://wiki.electorama.com/>
- Saari, Donald G. *Chaotic Elections and Decisions and Elections*
- For a sample instant run-off vote (2000 election), see <http://www.chrisgates.net/irv/>

## Historical Election Data:

- <http://www.uselectionatlas.org/> -- a truly excellent site.  
(red/blue is Democrat/Republican)