Comparison of Election Methods

In most U. S. jurisdictions, candidates are elected based on plurality (also called "First Past The Post"): each voter chooses a single candidate, and the candidate with the most votes wins. This method is simple, but often elects candidates with much less than majority support. The table below presents some proposed alternative methods for single-winner elections.

Name	Description	Analysis
Plurality	Vote for one candidate. Winner has the most votes.	Simple. Allows partial results. Winner may have less support than other candidates who split votes of mutual supporters.
RCV/IRV (Ranked-Choice Voting/ Instant Runoff Voting)	Ranked ballots with successive elimination of weakest candidates. Commonly misleadingly referred to simply as "ranked choice voting".	Very complicated tabulation (use of additional rankings depends on which candidates are eliminated). Ballots treated unequally. Partial results are unreliable since the winner depends on the order of candidate eliminations. Winner may have less support than other candidates who split first and second rankings by mutual supporters.
Bucklin	Ranked ballots with additional choices added in rounds until winner has a majority (or choices are exhausted).	Slightly complicated (multiple rankings). Allows partial results. Ranking multiple candidates decreases the chance of a voter's first choice winning.
Approval	Vote for multiple candidates. Winner has the most votes.	Simple. Allows partial results. Ranking multiple candidates decreases the chance of a voter's first choice winning.
Score	Voters score or rate candidates on a scale. Winner has highest average score. "Borda" method is similar but uses rankings.	Slightly complicated (score multiple candidates). Allows partial results. Scoring multiple candidates above zero can decrease the chance of a voter's first choice winning.
STAR (Score Then Automatic Runoff)	Voters score or rate candidates on a scale of 0 to 5. Winner decided by runoff between two candidates with the highest average score.	Slightly complicated (score multiple candidates). Allows partial results. Scoring multiple candidates above zero can decrease the chance of a voter's first choice winning (but safer than with simple scoring).
Condorcet Minimax	Ranked or scored ballots with round robin tabulation of all head-to-head runoff results. Minimax winner has the best runoff result against their strongest opponent (also called a "Condorcet" winner if each opponent is defeated).	Slightly complicated (multiple rankings or scorings). Allows partial results in a table of runoff results for each candidate versus each opponent. Winner is the closest to having majority support versus each other candidate.

Let's look at a hypothetical sample election. Suppose 100 voters rank candidates as follows:

41 pick Celia first, Abe second, Bing third
39 pick Bing first, Abe second, Celia third
12 pick Abe first, Bing second, Celia third
8 pick Abe first, Celia second, Bing third

The sample ballot markings are shown in the table below. Ballots should not be rejected for tied rankings between candidates (no problem) or multiple rankings for a single candidate (count the lowest ranking, which is still better than being unranked).

Sample Ballot Markings for 100 Voters

Number of Ballots:	41 Ballots			39 Ballots			12 Ballots			8 Ballots		
Candidate	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Abe	○	●	○	○	●	○	●	○	○	●	○	○
Bing	○	○	●	●	○	○	○	●	○	○	○	●
Celia	●	○	○	○	○	●	○	○	●	○	●	○

Assume that for Approval voting, each voter approves their top two choices. Assume that for Score or STAR voting, 1st, 2nd, and 3rd choices correspond to scores of 5, 3, and 0 in that order. The table below shows the winning candidate and margin of victory for each method:

Winners of Different Election Methods (100 voters)

Method:	Plurality	RCV/IRV	Bucklin	Approval	Score	STAR	Condorcet Minimax
Winner:	Celia	Bing	Abe	Abe	Abe	Abe	Abe
Runner-up: (margin)	Bing (2)	Celia (2)	Bing (49)	Bing (49)	Bing (N/A)	Bing (22)	Celia (18)

Explanation of each method:

Plurality: Celia wins with two more 1st choice rankings than Bing, and 21 more than Abe. Celia wins with only 41% of the vote. Plurality winners often do not have majority support.

RCV/IRV:
Round 1: Abe is eliminated with the fewest 1st choice rankings.
Round 2: Bing defeats Celia 51 to 49 in the final runoff, which includes 2nd choices from ballots that ranked Abe first.
Second choices were counted from ballots ranking Abe first, but not from ballots ranking Celia first. See Condorcet Minimax to count all ballots equally.

Bucklin: (51 votes needed for majority support)

Round 1: Celia 41, Bing 39, Abe 20
Round 2: Abe 100, Bing 51, Celia 49. Abe wins.
Bing would have won 51 to 49 over Celia (with Abe far behind) if supporters of both had "bullet voted" for their favorite candidate. Voters can harm their favorite candidate by ranking additional candidates.

Approval (assume votes for top two choices): Abe 100, Bing 51, Celia 49. Abe wins (same as second round of Bucklin). Bing would have won 51 to 49 over Celia (with Abe far behind either) if supporters of both had "bullet voted" for their favorite candidate. Voters can harm their favorite candidate by ranking additional candidates.

Score (assume 1st, 2nd, 3rd rankings scored as 5, 3, 0 points): Abe wins with an average score of (20*5 +80*3)/100 = 3.40. Bing has an average score of (39*5+12*3)/100 = 2.31. Celia has an average score of (41*5 + 8*3)/100 = 2.29.
If all supporters of Bing had "bullet voted" by scoring Bing only, then Bing would have won with average scores: Bing 2.31, Celia 2.29, Abe 2.23. Voters can harm their favorite candidate by scoring additional candidates.

STAR (assume 1st, 2nd, 3rd rankings scored as 5, 3, 0 points): Abe defeats Bing 61 to 39 in the final runoff between the two top-scoring candidates.
If all supporters of Bing had "bullet voted" by scoring Bing only, then Abe (average score 2.23) would have been eliminated and Bing (average score 2.31) would have defeated Celia (average score 2.29) by 51 to 49 in the final runoff between the two top-scoring candidates. Voters can harm their favorite candidate by scoring additional candidates.

Condorcet Minimax: The table of voter preferences below shows the number of ballots indicating preference for the candidate (row) versus the opponent (column). Thus 49 voters prefer Celia to Bing, 51 voters prefer Bing to Celia, etc. A fictitious "Other" candidate is added to include anyone else who might have received votes (e.g. write-ins).

Condorcet Minimax Sample Table of Preferences (100 voters)

	Opponents:	Celia	Bing	Abe	Other
Candidates:	Celia	-------	49	41	100
	Bing	51	--------	39	100
	Abe	59	61	--------	100
	Other	0	0	0	--------

The runoff scores are as follows:

Bing 51, Celia 49. Bing defeats Celia by 51 – 49 = 2 votes.
Abe 59, Celia 41. Abe defeats Celia by 59 – 41 = 18 votes.
Abe 61, Bing 39. Abe defeats Bing by 61 – 39 = 22 votes.
All three named candidates defeat "Other" by 100 votes.

Abe is the Condorcet Minimax winner who defeats all others in head-to head runoffs, and consequently has the best margin against the strongest opponent (+18 vs. Celia was Abe's worst head-to-head margin). A majority of voters prefer Abe to each other *individual* candidate, but not to *all* other candidates combined as required for an absolute majority. Note that "bullet voting" by a candidate's supporters would not help that candidate since it would not change any head-to-head runoff results involving that candidate. Academic studies have shown that the Condorcet Minimax method does not generally reward strategic voting.*

Choosing a Single-Winner Election Method

Consider this statement: *If a majority of voters prefer a particular losing candidate to the winning candidate, then that is a bad election result*. Do you agree?

If we agree with that definition of a bad result, then the best possible election method is the one that is the least bad: *it minimizes voter preference for any losing candidate over the winner*. The method that does this is called the "Condorcet Minimax" method. In mathematical terms, it minimizes the maximum opposition to the winner. In plain English, it selects the candidate whose worst head-to-head runoff result is the best of all the candidates. This guarantees that *any losing candidate has the least possible grounds for claiming that they should have won instead*. In other words, it optimizes acceptance of the election result. Either a majority of voters prefers the winner to the loser, or the loser would lose to a different candidate by more votes than they would defeat the winner.

The Condorcet Minimax method uses ranked choice ballots to perform a round robin of runoffs between each pair of candidates. The candidate whose worst runoff result is better than that of any other candidate is elected. If that candidate's worst runoff result is a victory, then that candidate would defeat all others head-to-head and is called a "Condorcet" winner. Of the methods listed in the table, only the Minimax method will always elect a Condorcet winner if one exists.

The Minimax method is ideal for selecting candidates with majority support. It also allows for partial results to be continuously updated in a simple format, even at the precinct level. It is best used in general elections with limited numbers of candidates (e.g. following a Top-4 or Top-5 primary) so that the number of head-to-head runoffs is not too large and voters are not overwhelmed with choices. Write-in candidates can be lumped together as "Other" unless "Other" is winning, in which case the top write-in candidate(s) should be named. Because Minimax only considers head-to-head runoffs, it is more resistant to manipulation than other proposed methods.

If you would like to learn more about election methods, a good interactive resource is the Smart Voting Simulator at https://www.smartvotesim.com/ . For more comprehensive analysis, try the Electo Wiki website: https://electowiki.org/wiki/Main_Page. You can try out different election methods at the Condorcet Internet Voting Service (CIVS).

* See Darlington, Richard B., "Are Condorcet and Minimax Voting Systems the Best?" https://arxiv-export3.library.cornell.edu › pdf › 1807.01366v10 (2018), and references therein.

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