Glossary of Elections Terminology (2020)

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Note: This essay is a work in progress. Some items listed below will be expanded in updated versions.

In studying elections using mathematical modeling ideas, it turns out that a moderate amount of technical vocabulary has emerged. This terminology involves names for different commonly looked at methods of deciding elections, names for fairness/consistency axioms that various election methods obey as well as other terms.

This glossary is designed to help interested students, teachers and researchers look at the existing literature about voting and elections with greater ease. Furthermore, some of the discussion groups about elections take for granted that people who subscribed to these "lists" are steeped in some of what has been done in the past.

Some specialized terms are treated at the start but then the glossary is divided into two parts, one for fairness/consistency axioms and one for election methods.

Cardinal ballot

Cardinal ballots allow a voter to use a scale to grade the choices made available on that scale. This allows intensity of "preference" to be expressed. The scale used can be qualitative (very poor, poor, neutral, good, very good) or quantitative (0 to 99 with 99 highest).

Ordinal or ranking ballot

An ordinal or ranking ballot requires the voter to determine which candidates or choices are preferred, allowing for the possibility of indifference among choices. Figures 1 and 2 show commonly used notation for ordinal/ranking ballots.

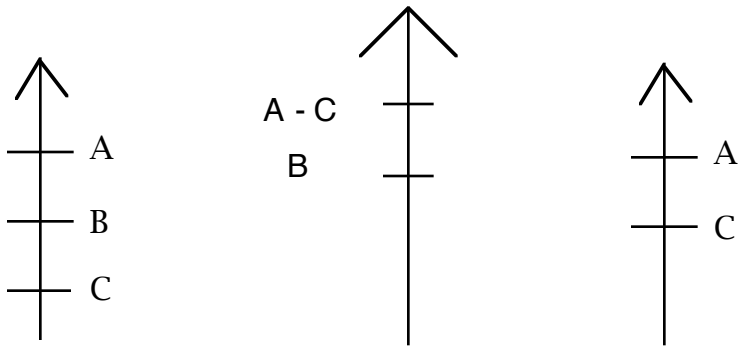

Figure 1 (ordinal/ranking ballots. Left, all three choices A, B, and C are ranked with A preferred to B and C, and B preferred to C; Middle: The voter is indifferent between A and C but prefers both to B; Right: The voter prefers A to B but has chosen for whatever reason, perhaps lack of knowledge of choice B, to not list B on his/her ballot. Doing this, not ranking all of the candidates is referred to as truncation.)

A > B > C	A = C > B	A > C
(a)	(b)	(c)

Figure 2 (Ordinal ballots, more preferred candidates listed further to the left. (a) A is preferred to B is preferred to C. (b) A nd C are equally preferred but both of these candidates are preferred to B. (c) A is preferred to C but the voter offers no information about candidate B.)

Smith Set (Named for John H. Smith)

The Smith Set consists of those candidates (if any) who form the smallest collection of candidates who can beat the candidates outside of the set by a majority in two-way races.

Note: When there is a Condorcet winner, the Smith Set will consist of a single candidate, the Condorcet winner.

Standard ballot

The voter indicates his/her preference by voting for exactly one candidate regardless of how many choices/candidates there are.

Truncation

For ballots with more than one choice which are either cardinal or ordinal when the voter chooses not to have all of the choices available appear on the ballot. (Truncation is sometimes done because the voter is not familiar with some of the choices but also, sometimes voters vote "strategically" by purposefully not listing candidates/choices on their ballot.

Two-way race

Given any two candidates, say X and Y, compute the number of voters who prefer X to Y and the number of voters who prefer Y to X. Whichever count is larger determines the winner of the "two-way race" election. (A tie is possible.)

When an ordinal ballot is used and there are m candidates (choices) the voter might want to have all of the candidates appear on the ballot or not. When the voter chooses not to rank one or more candidates the ballot produced is sometimes referred to as a truncated ballot. Similarly, for cardinal ballots where the voter grades the candidates, the voter might truncate his/her ballot by not giving a grade to all the choices that are available.

Election Decision Methods (based on ordinal/ranked ballots)

1. Anti-plurality

The candidate with fewest last-place votes is the winner.

2. Baldwin (Named for Joseph Baldwin (1878-1943), an Australian.)

Compute the Borda Count for each candidate. The candidate with the lowest Borda count is eliminated and the ballots modified to reflect this. Compute new Borda Count and repeat until one candidate emerges as the winner.

3. Beat path (Developed by Markus Schulze, 1997)

4. Black's method (Named for the Scottish economist and political scientist (1908-1991))

If some candidate can beat all other candidates in a two-way race, this candidate is the winner. If there is no such candidate, the winner is the candidate who wins using the Borda Count.

5. Borda Count (Named for Jean-de-Charles Borda, (1733-1799))

Given a particular voter's ballot, candidate X is given points for that ballot by counting the number of candidates below X on the ballot. The Borda Count for each candidate is the sum of the number of points that candidate gets from all of the ballots cast. The candidate with the highest Borda Count wins.

6. Bucklin (named for James W. Bucklin (1856-1919))

If a candidate has a majority counting first-place votes, declare that candidate the winner. If not, for each candidate add the number of first-place and second-place votes. If some candidate has a majority, this candidate is the winner. Note there may be several candidates with a majority at this point. If so, the candidate with the largest majority wins. Repeat until a single candidate wins.

7. Condorcet (Named for the Marquis de Condorcet (Nicholas de Coridat, (1743-1794)))

If a candidate can beat all of the other candidates in a two-way race, that candidate wins. (For some collections of ballots there is no person who can win two-way races against all of the other candidates.)

8. Combs Named for Clyde Combs (1912-1988))

If a candidate has a majority, that candidate is declared the winner. If no candidate has a majority, the candidate with the largest number of last-place votes is eliminated. Repeat this until one candidate wins.

9. Plurality

The candidate with the largest number of first place votes win.

10. Run-off

If no candidate has a majority, select the two candidates with the largest number of first-place votes. The winner of the race between these two candidates is the winner.

11. Sequential run-off (IRV)

If no candidate has a majority, eliminate the candidate with the smallest number of first-place votes. Repeat this process until there is a single candidate left.

12. Nanson

Compute the Borda Count for each candidate and sum the candidate totals. Divide the result by the number of candidates to get the mean (average) value. Eliminate all candidates at or below the average. If a single candidate remains, that candidate is the winner. If not, delete the candidates' names from the voter ballots who were at or below the mean and repeat the procedure until a single winner emerges.

Axioms and properties that election methods might obey:

Condorcet:

If there is a candidate who can beat all of the other candidates in a two-way race, this candidate will win the election.

Condorcet loser

If there is a candidate who loses to every other candidate in a two-way race, this candidate cannot win the election.

Ranks equal:

Ranks greater than 2:

Polytime:

Resolvable:

Majority 1

If a candidate has a majority of first-place votes, this candidate should win.

Majority 2

If a majority of voters prefer candidate C over every other candidate X, then candidate C should win the election.

if a majority of voters prefers every other candidate X over candidate C, then C should not win the election.

Mutual majority:

Smith/ISDA

LIIA

IIA

Cloneproof

Monotone

Consistency

Reversal symmetry

Reversal symmetry occurs if a method which produces a certain ranking based on the given collection of ballots gives rise to the ranking it initially obtained in reverse order when all of the ballots of the individual voters are reversed.

Later no harm

Later no help

Burying

Participation

No favorite betrayal

Summable: O(N!)