GLOSSARY FOR VOTING THEORY ENTHUSIASTS

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Approval Voting: A voting method in which voters check a box for each candidate they approve of. The candidate with the most approvals wins.

Arrow's Impossibility Theorem: Arrow's Theorem states that it's impossible for any ranked voting method to pass all desirable criteria. While Arrow's Theorem does not apply to cardinal voting methods, and Score Voting and Approval Voting pass all the criteria in the theorem, the underlying point holds true that no voting method can pass all desirable criteria because some criteria are mutually exclusive.

Bayesian Regret (BR): A system used to measure the accuracy (utility) of various voting methods.

Bayesian Regret measures the amount of "avoidable human unhappiness" at the end of an election. This is the inverse of Voter Satisfaction Efficiency. Bayesian Regret is measured quantitatively by computer simulations and it can be used to measure election accuracy regardless of voters strategies or honesty. Bayesian Regret and Voter Satisfaction Efficiency are considered by many election experts to be the gold standard for measuring accuracy (utility) of various voting methods, though some people prefer to use the Condorcet Winner as a measure of accuracy. Condorcet and BR/VSE usually agree on the best winner for a given election but in some close elections Condorcet favors the majority's 1st choice and BR/VSE prefers the candidate that will make the most people as happy as possible, i.e. the best compromise.

Borda Count: a voting method in which voters rank options or candidates in order of preference. These rankings are then counted as scores. The scores are totaled and the candidate with the lowest score wins. Variations which use other formulas to turn rankings into scores exist as well. Borda count is often described as a consensus-based voting method rather than a majoritarian one.

Bullet Voting: a voting strategy that can be used in more expressive voting methods where you give only one candidate maximum support and the rest a minimum vote. This is a common strategy for less informed or more hurried voters. Ranking only your first choice and leaving others blank. Bullet voting when you honestly either love, or hate, or have no opinion on the candidates is an honest strategy that is not harmful. Bullet voting when you have a nuanced opinion or like multiple candidates may be effective in Score Voting or Approval Voting, but is a harmful strategy that may backfire in IRV or STAR Voting. In any voting method, whether or not this behavior is strategic, it can compromise the quality of election data and lead to less accurate results. An election where everyone bullet votes would be equivalent to a Plurality election.

Condorcet Criteria: A pass/fail voting method criteria which states that the Condorcet Winner, if there is one, should always win.

Condorcet Methods: Condorcet methods are any voting method where the Condorcet Winner always wins. More common examples are Ranked Pairs and Schultz Method but there are many more that have different methods for resolving ties.

Condorcet Winner: The Condorcet Winner is the candidate that would beat any other candidate in a head-to-head election. Majority rules. The Condorcet Winner is often used to show when a spoiler effect occurred and elected a candidate that was not preferred by the majority. Some voting methods are Condorcet Methods, meaning that the Condorcet Winner always wins. It is important to note that in some elections a majority winner doesn't exist because there may be a 3 way tie, (like in rock, paper, scissors) there may be no candidate that the majority supports, or there may be multiple candidates with support from different majorities (picture a venn diagram).

Though some people prefer to use the Condorcet Winner as a measure of accuracy, many election science experts prefer Bayesian Regret and Voter Satisfaction Efficiency. Condorcet and BR/VSE usually agree on the best winner for a given election but in some close elections Condorcet favors the majority's 1st choice and BR/VSE prefers the candidate that will make the most people as happy as possible, i.e. the best compromise.

A Condorcet Winner is only as accurate as the information on voter's ballots, so it cannot take into account dishonest or strategic voting. A Condorcet Winner derived from more expressive and more honest ballots will give more accurate results.

Favorite Betrayal: is a dishonest strategy where in order to prevent vote-splitting, a savvy voter realizes that it is not safe to vote for their favorite. In IRV a voter may realize that it's not safe to rank their favorite in 1st place and that they are better off ranking their favorite candidate lower or just not voting for them at all. In Score Voting, Favorite Betrayal would be any time you give your favorite a score that is less than you gave to others. This is the most harmful strategy in voting as it severely compromises the quality of the ballot data.

Favorite Betrayal Criteria: A pass/fail voting method criteria used to judge voting methods. In order to pass, it must always be safe to vote for your favorite at the highest possible level.

- Plurality voting strongly incentivizes Favorite Betrayal for all voters whose favorite isn't polling in the top two.
- IRV incentivizes Favorite Betrayal for voters whose favorite is pretty strong but is likely to be eliminated in a later round, i.e. those whose favorite will probably come in 2nd or 3rd place but not 1st.
- STAR doesn't incentivize Favorite Betrayal in practice, though it could be used in extremely rare scenarios. Doing it effectively would require knowing who was ahead in a dead tie between the 2nd and 3rd highest scoring candidates.
- Approval and Score Voting both pass Favorite Betrayal Criteria but are vulnerable to other strategies.

Passing both the Favorite Betrayal and Later No Harm criteria is impossible, and this fact underlies the fact that eliminating all strategic voting incentives in all situations is impossible. In order to ensure that it's safe to fully support one's favorite, it is by definition not always safe to support other candidates. In

reverse, ensuring that it's always safe to support other candidates means that by definition it is not necessarily safe to fully support one's favorite.

Favorite Betrayal Effect: is an effect in elections where people practice the Favorite Betrayal Strategy. This can lead to the actual favorite of the majority losing and the people having no idea that the true favorite actually had the needed level of support. (Favorite Betrayal caused Spoiler Effect). The Favorite Betrayal Effect may cause viable parties to seem un-viable even when the candidates in question didn't have the support required to actually win.

First-Past-The-Post (FPTP): The current voting method in much of the USA for voting. Otherwise known as Plurality Voting. FPTP is the oldest and most simple voting method, but there is full consensus in the electoral sciences that FPTP is the least accurate and least representative voting method. First Past The Post has been directly linked to hyper polarization and two-party domination due to extreme vote-splitting and the resulting powerful strategic incentives to vote for the "lesser of two evils".

Honest Favorite Criteria: A pass/fail voting method criteria used to judge voting methods. In order to pass, it must always be safe to vote for your favorite at the highest possible level.

Honest Favorite Criteria is another name for Favorite Betrayal Criteria. This criteria was renamed because Favorite Betrayal Criteria incorrectly makes it sound like people should betray their favorite. When talking with a technical audience Favorite Betrayal may be the most well understood term, but in an effort to reduce jargon and make election science more accessible terms should be as self explanatory as possible. Ideally, all criteria names would ideally be framed positively and describe the desired effect.

Passing both the Honest Favorite and Honest Compromise (Later No Harm) criteria is impossible, and this fact underlies the fact that eliminating all strategic voting incentives in all situations is impossible. In order to ensure that it's safe to fully support one's favorite, it is by definition not always safe to support other candidates. In reverse, ensuring that it's always safe to support other candidates means that by definition it is not necessarily safe to fully support one's favorite.

Instant Runoff Voting (IRV): the most commonly used type of Ranked Choice Voting. A voting method in which voters rank candidates 1st, 2nd, 3rd and so on. Most jurisdictions limit the maximum number of rankings to your top three, top five, or in some cases top 10. If a candidate has a majority of 1st choice votes, that candidate wins. Otherwise, the candidate with the fewest 1st choice votes is eliminated. If your 1st choice is eliminated, your vote will go to your next choice if possible. This process repeats until one candidate has a majority of remaining ballots.

In some cases a voter whose favorite is eliminated will not have their next choice counted. These are considered exhausted ballots which do not count in the final round and do not count towards the "majority":

- If a voter did not rank all the candidates and has no next choice marked on their ballot their vote will be unable to transfer.
- If a voter's lower ranked candidates were eliminated before their favorite was eliminated the vote may have nobody left to transfer to.

- If a voter's favorite is not eliminated until the final round their next choice will not be counted.

In some elections, especially those with more than three viable candidates, the uncounted rankings of voters whose ballots were exhausted may have been sufficient to have made a difference and may have shown that there was another candidate who was more preferred than the winner or who would have beaten the winner by a majority.

Later-No-Harm Criteria: A pass/fail voting method criteria used to judge voting methods. In order to pass, it must always be safe to support other candidates in addition to your favorite. Note that Later-No-Harm does not ensure that it's safe to vote for your favorite, only that it's safe to support your less preferred candidates.

Passing both the Favorite Betrayal and Later No Harm criteria is impossible, and this fact underlies the fact that eliminating all strategic voting incentives in all situations is impossible. In order to ensure that it's safe to fully support one's favorite, it is by definition not always safe to support other candidates. In reverse, ensuring that it's always safe to support other candidates means that by definition it is not necessarily safe to fully support one's favorite.

Later-No-Harm can also be called "Honest Coalition" Criteria, the opposite of the Honest Favorite (Favorite Betrayal) Criteria.

Majority Criteria: A controversial voting method criteria that states that a slim majority that agrees on it's first choice should be able to overpower another larger majority that may not agree on their first choice but who have come to a compromise. This is the inverse of Tyranny-Of-The-Majority Criteria. Majority Criteria and Tyranny-Of-The-Majority Criteria are mutually exclusive.

Nader Effect: An effect where a majority coalition can be defeated by a much smaller minority because the coalition's votes are split between two similar candidates, usually from the same side of the political spectrum or from the same party. This is also known as vote splitting. In 2000, Green Candidate Ralph Nader ran in the general election alongside Al Gore. George Bush Jr. was elected and Nader was blamed for being a spoiler though this is actually debatable for a few reasons. Regardless, the experience had a lasting effect on voters who still remain very reluctant to vote 3rd party for fear of the vote being split.

Plurality Voting: The current voting method in most of the USA. Otherwise known as First-Past-The-Post. Despite being one of the oldest and most simple options, Plurality voting is almost unanimously considered to be the least accurate and least representative voting method in the world due to pervasive vote-splitting, and resulting extreme incentives for the voters to vote for the "lesser of two evils."

Proportional Representation: The idea that representation in government should be in proportion to the demographics of the population. This term usually relates to the makeup of political bodies and councils. Proportional Representation is also a family of multi-winner voting methods which are designed to ensure that if a 25% faction of voters who vote as a block would be able to win at least one out of four available seats, for example.

In a specific election, proportional representation can be measured as the proportion of the electorate who were able to elect a candidate who represents them.

Range Voting: a voting method for single-winner elections, in which voters give each candidate a score, the scores are added (or averaged), and the candidate with the highest total is elected. Otherwise known as Score Voting

Ranked Choice Voting (RCV): a family of voting methods that use ranked ballots and voter preferences to determine a winner. Ranked Choice methods include Instant Runoff Voting, Single Transferable Vote, Condorcet methods like Ranked Pairs and Minimax, and Bucklin Voting. In 2016 FairVote rebranded Instant Runoff Voting and Single Transferable Vote as Ranked Choice Voting and in the USA the term RCV is almost exclusively used to mean Instant Runoff Voting (IRV), the most commonly used type of RCV.

Ranked Pairs: A Condorcet Voting method which starts with the strongest defeats and uses as much information as it can without creating ambiguity. Also known as the Tideman method.

Reweighted Range Voting (RRV): a proportional representation voting method for electing multiple candidates at once. RRV is based on Score Voting and uses a series of algorithms to reweight votes and allow voters to show support for minority candidates.

Schulze method: A Condorcet Voting method which repeatedly removes the weakest defeat until ambiguity is removed.

Score Runoff Voting (SRV): Score Runoff Voting was the original name for the STAR Voting method though it does not specify the 0-5 star ballot be used. Invented in 2014, SRV gained recognition when it topped the charts for accuracy as measured by Voter Satisfaction Efficiency. SRV is a hybrid of Score and Instant Runoff Voting. Voters give a score to each candidate on a scale from 0-5 (other scales can be used as well) The two highest scoring candidates advance to an instant runoff. In the runoff, your full vote goes to the one you scored higher. Score Runoff Voting is the same as STAR Voting if a 0-5 scale is used.

Proportional STAR Voting (STAR-PR): The lay-person friendly term for a proportional representation voting method using a 0-5 star ballot. Winners in Proportional STAR Voting are selected in rounds. Each round elects the candidate with the highest total score and then designates a quota worth of voters from that candidate's strongest supporters as represented. Subsequent rounds include all voters who are not yet fully represented. Proportional STAR Voting refers to the Allocated Score Voting method specifically, as this is the 5 star proportional method currently recommended by the Equal Vote Coalition.

Score voting: A voting method for single-winner elections in which voters give each candidate a score, the scores are added (or averaged), and the candidate with the highest total is elected. Otherwise known as Range Voting.

Single Non-Transferable Vote (SNTV): A semi-proportional voting method in which each voter casts one vote for one candidate in a multi-winner race. Posts are filled by the candidates with the most votes (plurality voting). Thus, in a three-seat constituency, the three candidates receiving the largest numbers of votes would win office.

Single Transferable Vote (STV): A proportional representation voting method used in Australia and Ireland. STV is based on Instant Runoff Voting but uses a complex series of algorithms to reweight votes and allow voters to show support for minority candidates. The goal of STV is to have the winners match the voter demographics.

Social Utility Efficiency: Social utility efficiency is a measurement of the utilitarian performance of voting methods—how likely they are to elect the candidate who best represents the voters' preferences. It is also known as utilitarian efficiency, voter satisfaction index or voter satisfaction efficiency

Spoiler Effect: an effect where a majority coalition can be defeated by a much smaller minority because the coalition's votes are split between two similar candidates, usually from the same side of the political spectrum or from the same party. This is well known as the "Nader Effect" from when Green Candidate Ralph Nader ran in the general election alongside Al Gore. George Bush Jr. was elected and Nader was blamed for being a spoiler. Regardless, the experience had a lasting effect on voters who still remain very reluctant to vote 3rd party for fear of the vote being split.

STAR Voting (Score Then Automatic Runoff): A voting method invented in 2014 which tops the charts for accuracy as measured by Voter Satisfaction Efficiency. STAR is a hybrid of Score and Instant Runoff Voting. Voters give a score to each candidate on a scale from 0-5. The two highest scoring candidates advance to an instant (automatic) runoff. In the runoff, your vote goes to the finalist you scored higher.

Strategic Voting: There are a number of strategies that can be used by voters to try and get the best results possible. There are 2 fundamental types of strategic voting, honest strategy and dishonest strategy. Note that in different voting methods honest and dishonest voting might be either helpful or harmful to the accuracy of the final results or for the individual voter. For example Plurality Voting strongly incentivizes dishonest strategy because it's best possible results are obtained when most voters are dishonest and strategic. A given strategy is deemed to be incentivized if the strategy will help the individual voter more often than it will backfire and harm them. It is impossible to eliminate strategic voting but some voting methods do a good job of making sure that strategic voting isn't incentivized, isn't beneficial, or that it isn't clear how or when to use a given strategy.

Dishonest strategy includes tactics like Favorite Betrayal, ranking or rating candidates in a different order than you actually prefer them, (Up Ranking or Down Ranking Strategy) Bullet Voting when you have a nuanced opinion, as well as multi voter strategic schemes like vote trading.

Honest strategies include voting your conscience as well as other strategies that would be considered honest voting in less expressive methods but require more thought in expressive voting methods. Examples of honest voting strategies include Bullet Voting when you honestly love or hate multiple candidates, and giving candidates higher or lower scores on a score ballot as long as you rank them in honest order (Up Scoring or Down Scoring.)

Supporting the Weak Opponent Strategy: A strategy where you help out some weak candidate you don't like in order to disadvantage a candidate you think can beat your favorite. Some voting methods can incentivize voters to support a weak opponent, in order that their preferred candidate win the general election. In an open partisan primary election, for example, this is a viable strategy. If your party candidate is a shoe-in to the general election, you may cast a vote for the weaker opponent candidate so that your candidate has an easier time winning.

Straw Man Argument: a deceptive debate tactic for when you can't effectively refute your opponents point so you instead refute a different point that nobody was making. This can make it look as though you won, when in fact you are off on a tangent.

Tactical Maximization is a strategy where you increase support for candidates other than your favorite because you think your favorite is weak or you want to hedge your bet. This strategy is the inverse of Tactical Minimization. In many elections both strategies could be used by different voters so the effects could cancel each other out. Vulnerability to Tactical Maximization and Tactical Minimization are the leading arguments against Score Voting though at worst this strategy would make Score Voting as or more accurate than Instant Runoff Voting or Approval Voting. This is otherwise known as Up Voting Strategy. Bullet voting is the extreme of this strategy.

Tactical Minimization is where you decrease your support for candidates other than your favorite. This strategy is the inverse of Tactical Maximization. In many elections both strategies could be used by different voters so the effects could cancel each other out. Vulnerability to Tactical Maximization and Tactical Minimization are the leading arguments against Score Voting though at worst this strategy would make Score Voting as or more accurate than Instant Runoff Voting or Approval Voting. This is otherwise known as Down Voting Strategy. Bullet voting is the extreme of this strategy.

Tyranny-Of-The-Majority Criteria: A pass/fail voting method criteria that states that a slim majority that agrees on it's first choice should not be able to overpower a larger majority that may not agree on their first choice but have come together in support of a compromise candidate. This is the inverse of Majority Criteria and the two are mutually exclusive.

Tyranny-Of-The-Majority Criteria is directly related to Favorite Betrayal Criteria and is inversely related to the Majority Criteria.

Voter Satisfaction Efficiency (VSE): VSE is a system used to measure the accuracy (utility) of various voting methods. This is a rebranding of the earlier term "Social Utility Efficiency." VSE allows for a detailed look at how different methods perform in mathematical simulations. It can also measure how well each method functions using honest voting as opposed to various strategies. VSE can be used to predict how effective a given strategy is in each voting method and how often that strategy will backfire for the given voter.

In the field of voting theory, there are many desirable criteria a given voting method may or may not pass but it's been shown that it's impossible for a method to pass all desirable criteria (Arrow's theorem), so trade-offs are necessary. VSE measures how well a method makes those tradeoffs by using outcomes. Basically, instead of asking "can a certain kind of problem ever happen?", VSE is asking "how rarely do problems of all kinds happen?".

VSE is expressed as a percentage. A voting method which could read voter's minds and always pick the candidate that would lead to the highest average happiness would have a VSE of 100%. A method which picked a candidate completely at random would have a VSE of 0%.

Voter Satisfaction Efficiency is inversely related to Warren Smith's Bayesian Regret models. VSE is explained here in depth: http://electology.github.io/vse-sim/VSE/

Vote-Splitting: an effect where a majority coalition can be defeated by a much smaller minority because the coalition's votes are split between two similar candidates, usually from the same side of the political spectrum or from the same party. This is well known as the "Nader Effect" from when Green Candidate Ralph Nader ran in the general election alongside Al Gore. George Bush Jr. was elected and Nader was blamed for being a spoiler though this is actually debatable for a few reasons in Nader's case. Regardless, the experience had a lasting effect on voters who still remain very reluctant to vote 3rd party for fear of the vote being split.

3-2-1 Voting (321V): A voting method which is highly accurate while still being quite simple. This method was invented by Jameson Quinn. Voters rate each candidate using one of three ratings: Good, OK, or Bad. There are three rounds where candidates are paired down to the top 3, the top 2, and then the winner. The 3 semifinalists are the candidates with the most "good" ratings. (No two may be from the same party, and all must have at least 15% "good".) The 2 finalists are the semi-finalists with the fewest "bad" ratings. The winner is the finalist rated higher on more ballots. If this method had a name that could be googled we'd be more excited about it.