

# Summary of Statistics paradoxes

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## Statistics paradoxes:

- **Gerrymandering**

Recognize that different ways of grouping data might give different results

- **Simpson's paradox**

Be careful when people give conclusions with “data” to back up their claims.

- Apportionment paradoxes: **Hamilton method**

- Alabama Paradox
- Population Paradox
- New state Paradox

Recognize reasonable methods have limitations

## Statistics Paradoxes:

- **Voting methods** (preference schedule)
  - Plurality Method
  - Plurality with Elimination Method
  - Borda Count Method
  - Pairwise Comparisons Method

Fairness criteria can not be met! Other voting methods:  
approval; how to vote a pope

- Correlation and Causation on **Spurious correlation**  
Be careful when reading graphs: coincidence or real correlation

# What is the gain in this process?

## Resolution

- Different interpretation of data can result different conclusion
- Conclusion based on data as presented to you might be unreliable
- Make sure to obtain more information before you jump to conclusions

## Basic concepts

- Vertex (node)
- Edge
- Face
- Euler's characteristic:  $V - E + F = 2$

## The friendship paradox:

On average, your friends have more friends than you do.

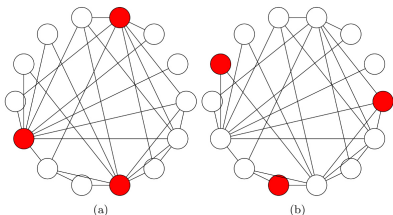


FIG. 1. An illustration of the “majority illusion” paradox. The two networks are identical, except for which three nodes are colored. These are the “active” nodes and the rest are “inactive.” In the network on the left, all “inactive” nodes observe that at least half of their neighbors are “active,” while in the network on the right, no “inactive” node makes this observation.

- Kevin Bacon number
- Erdős number
- Six degrees of separation!

- Prisoner's delimma
- Golden balls
- Nuclear strategy