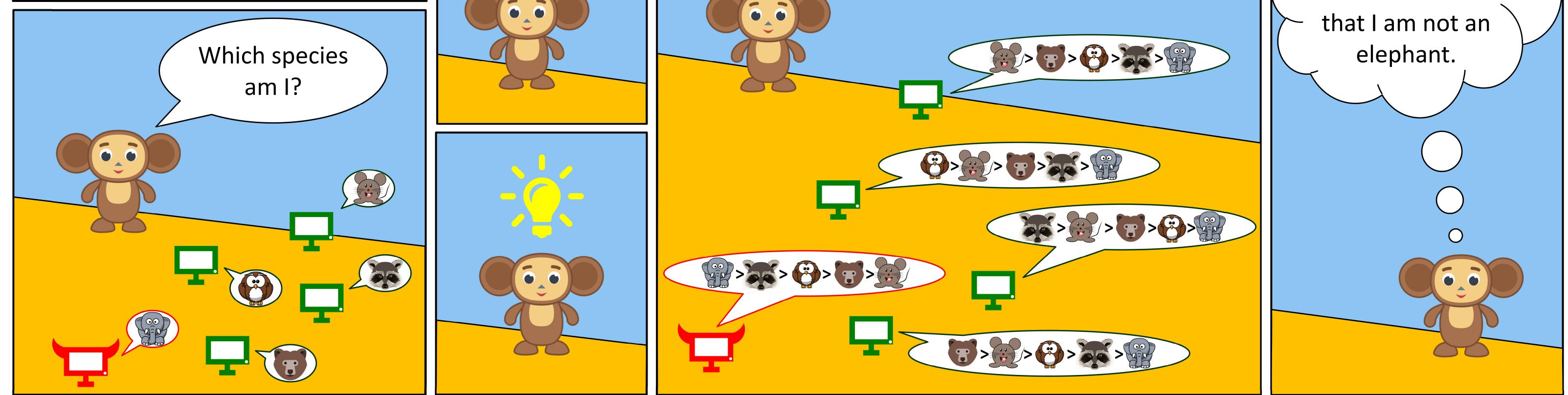
Byzantine Preferential Voting



Eidgenössische Technische Hochschule Zürich Swiss Federal Institute of Technology Zurich

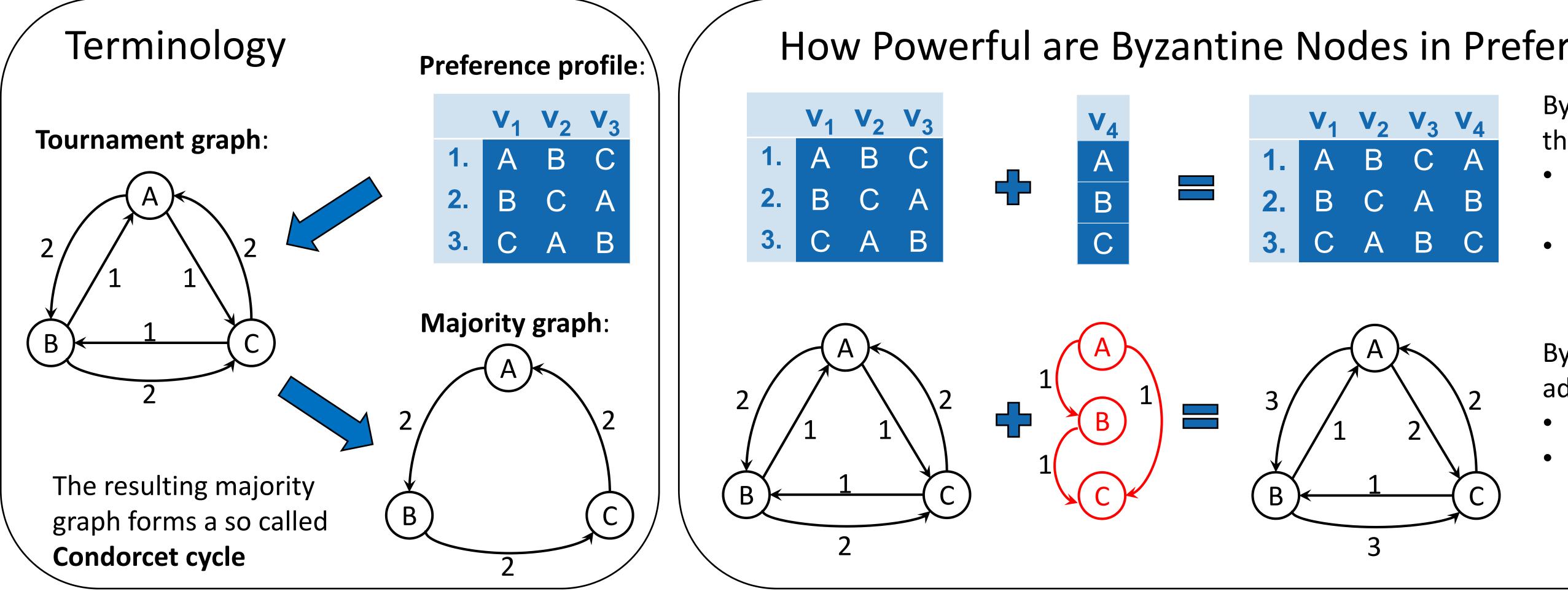
Cheburashka is trying to find out which species he is and asks his friends. But one of his friends is Byzantine and constantly gives mean answers.



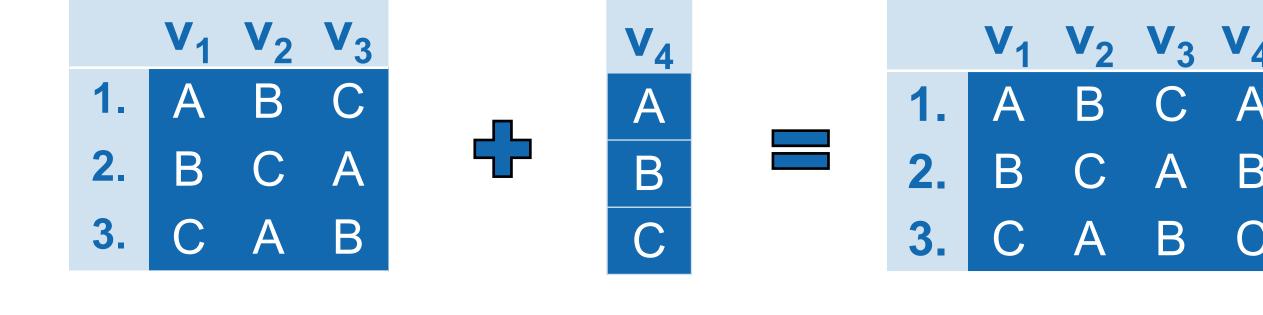


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Insights into Voting Theory



How Powerful are Byzantine Nodes in Preference Profiles?



Byzantine nodes can manipulate the vote by...

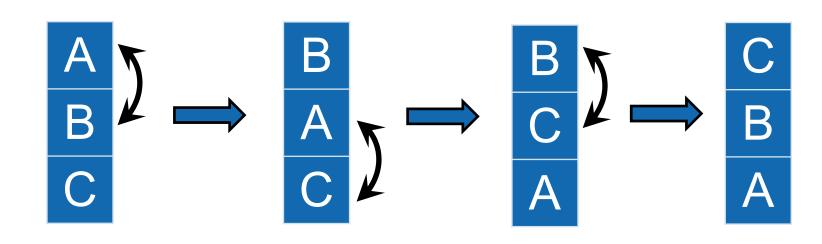
- redirecting majority preferences
- breaking ties in Condorcet cycles

- Byzantine are restricted to adding...
- a transitive directed graph
- a graph which satisfies the triangle inequality on directed edges

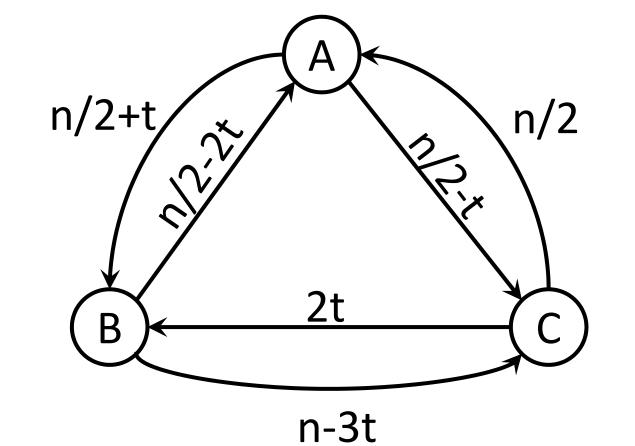
Agreement on the Kemeny Median

What is a Kemeny Median?

Kendall's tau distance between two rankings is the minimum number of pairwise swaps to get from one ranking to the other. The distance from A > B > C to C > B > A is 3:

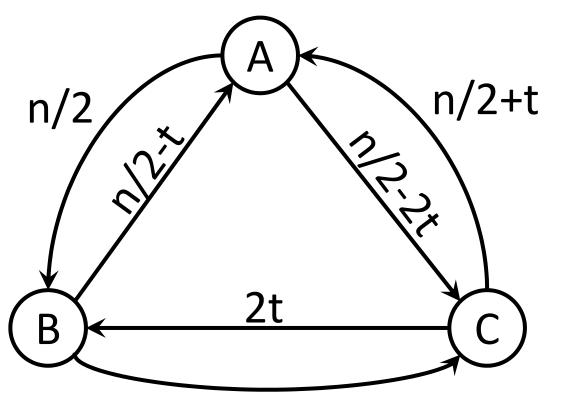


Indistinguishable Views for the Kemeny Median

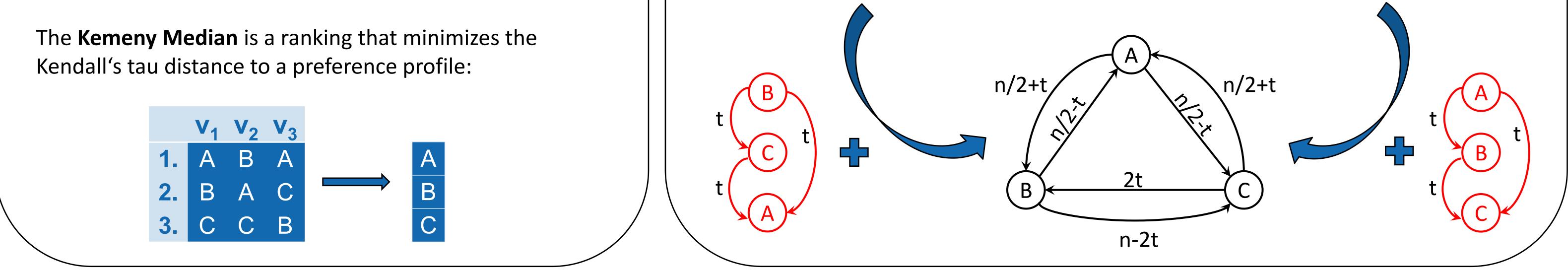


Different Kemeny median,

but indistinguishable after Byzantine manipulation



n-3t



References: [Arrow, 1951]: Social Choice and Individual Values, [Berman et al., FOCS 1989]: Towards Optimal Distributed Consensus, [Brandt et al., Cambridge University Press 2016]: Handbook of Computational Social Choice, [Lamport et al., ACM Transactions on Programming Languages and Systems]: The Byzantine Generals Problem, [Mendes et al., Distributed Computing 2015]: Multidimensional Agreement in Byzantine Systems.