Algorithmic game theory

Martin Balko

2nd lecture

October 15th 2020



Proof of Nash's Theorem

Nash's Theorem

• Every normal-form game has a Nash equilibrium.





Figure: John Forbes Nash Jr. (1928–2015) and his depiction in the movie A Beautiful mind.

Pareto optimality

• an Italian engineer, sociologist, economist, political scientist, and philosopher.

- an Italian engineer, sociologist, economist, political scientist, and philosopher.
- Pareto principle: for many outcomes roughly 80% of consequences come from 20% of the causes.

- an Italian engineer, sociologist, economist, political scientist, and philosopher.
- Pareto principle: for many outcomes roughly 80% of consequences come from 20% of the causes.



Figure: Vilfredo Pareto (1848–1923).

Sources: https://en.wikipedia.org

Zero-sum games

• Implies that we can efficiently compute Nash equilibria in zero-sum games.

- Implies that we can efficiently compute Nash equilibria in zero-sum games.
- Proved by John von Neumann in 1928.

- Implies that we can efficiently compute Nash equilibria in zero-sum games.
- Proved by John von Neumann in 1928.





Figure: John von Neumann (1903–1957) and Oskar Morgenstern (1902–1977).

Sources: https://en.wikiquote.org and https://austriainusa.org



Source: https://czthomas.files.wordpress.com

Thank you for your attention.