

Algorithmic game theory

Martin Balko

1st lecture

October 7th 2021



Basic info

Basic info

- **Webpage:** *<https://kam.mff.cuni.cz/balko/ath2122/ATH.html>*
 - lecture info, topics covered, presentations, lecture notes ...

Basic info

- **Webpage:** <https://kam.mff.cuni.cz/balko/ath2122/ATH.html>
 - lecture info, topics covered, presentations, lecture notes ...
- **Recommended literature:**
 - **M. Balko:** Algorithmic game theory: lecture notes.
 - The notes are still under construction. Comments are welcome.

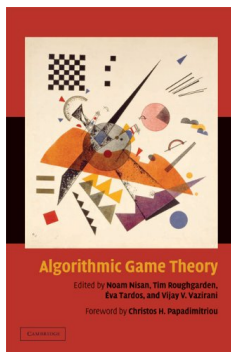


Figure: Algorithmic game theory by Nisan et al.

Source: <https://amazon.com>

Game theory

Game theory

- study of mathematical models of strategic interaction among rational decision-makers.



Zdroj: <https://quantamagazine.org>

Game theory

- study of mathematical models of strategic interaction among rational decision-makers.



Zdroj: <https://quantamagazine.org>

- We focus on the **algorithmic side** of the game theory.

Game theory

- study of mathematical models of strategic interaction among rational decision-makers.



Zdroj: <https://quantamagazine.org>

- We focus on the **algorithmic side** of the game theory.
- Several **real-word applications**.

Game theory

- study of mathematical models of strategic interaction among rational decision-makers.



Zdroj: <https://quantamagazine.org>

- We focus on the **algorithmic side** of the game theory.
- Several **real-word applications**.
- More than ten game theorists have won the **Nobel Prize** in economics.

Sylabus

Syllabus

- Preliminary plan:

Syllabus

- Preliminary plan:
 - Finding Nash equilibria
 - Nash equilibria and Nash's Theorem,
 - zero-sum games,
 - bimatrix games and the Lemke–Howson algorithm,
 - other notions of equilibria,
 - regret minimization.
 - Mechanism design,
 - auctions (Vickrey),
 - Myerson's lemma and its applications,
 - revenue maximization.

Finding Nash equilibria

Nash's Theorem

Nash's Theorem

- Every normal-form game has a Nash equilibrium.

Nash's Theorem

- Every normal-form game has a Nash equilibrium.

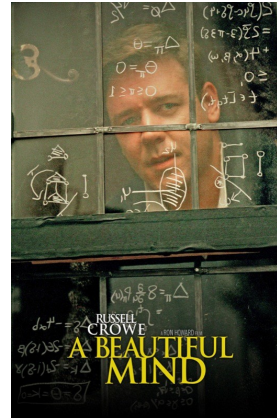


Figure: John Forbes Nash Jr. (1928–2015) and his depiction in the movie **A Beautiful mind**.





Figure: John Forbes Nash Jr. receiving a Nobel prize for economics.

Source: <https://pbs.org>



Figure: John Forbes Nash Jr. receiving a Nobel prize for economics.

Source: <https://pbs.org>

Thank you for your attention.