

Game Theory

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strategic interactions

A **strategic** environment is a situation in which

1. Different agents are to make decisions
2. Each agent may care about the choices of others

- Different from markets where only aggregates matter (e.g. prices)
- Strategic agents must consider how others make their decisions
- Hopefully better than this guy — [youtube.com/watch?v=rMz7JBRbmNo](https://www.youtube.com/watch?v=rMz7JBRbmNo)

- In economics
 - Oligopolies, entry, R&D, marketing
 - Principal-agent problems, teamwork, experts, unions
 - Allocation problems, auctions, procurement, matching
 - Bank-runs, speculative trading, monetary policy

- In other fields
 - Parlor games, gambling, sports
 - Social conventions, urban-planning, traffic, resources
 - Lobbying, voting, media manipulation, legislative bargaining
 - Elections, international relations, revolts
 - Judicial procedures, contract enforcement, law enforcement
 - Natural selection, population dynamics, mating
 - Software management, artificial intelligence

- Maintained behavior assumption: rationality

Rational agents

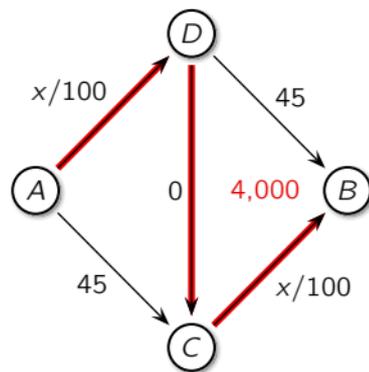
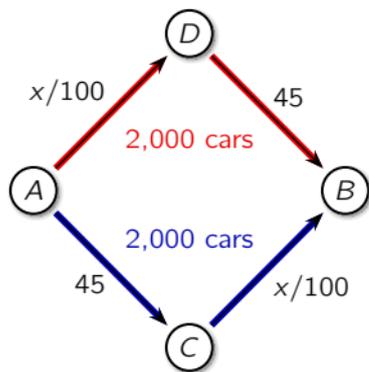
- Behave as to maximize well formulated preferences
- Can do whatever computations/deductions are necessary to determine optimal choices

- Full rationality is a rough approximation
- Can be relaxed in different ways, many insights are robust
- Not that restrictive. Does **not** imply selfishness
- “As if” assumption on choice congruence
- More details on [Decision Theory I](#)

uses of the theory

1. Language to communicate and reason about strategic interactions
2. Qualitative predictions that can be traced to specific assumptions
3. Measure structural parameters that are not identified by available data alone
4. Insights on how to behave better in strategic situations
5. Design of institutions and mechanisms leading to desirable outcomes

Braess' paradox



- 4,000 drivers need to go from A to B
- Each driver chooses the fastest route taking traffic into account
- As a result, half the drivers take each route and takes 65 min
- A bridge connecting D to C is built
- Now, all cars take the route ADCB and take 80 min!



Real life instances of Braess' paradox in Stuttgart (1969), NYC (1990), San Francisco (1989), Seoul (2005), Paris (2016), Rochester?

- Introduction
 - Extensive form games and strategic form games
 - Rationality and dominance
- Solution Concepts
 - Common knowledge and rationalizability
 - Equilibrium in pure and mixed strategies
 - Backward induction and perfection
- Moral hazard
 - Pareto efficiency and moral hazard
 - Contracts and principal-agent problems
 - Repeated interactions
- Private Information
 - Bayesian games
 - Mechanism design
 - Adverse selection and auctions
 - Signaling games
 - Matching