The Role of Deception in Games

CMPUT 654

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Agenda

- Social psychology (FAE)
  - Example: Kasparov vs. Deep Blue
- Overview of deception research
  - Poker
  - 2x2 games
  - Voting games
  - Repeated games
    - Reputation & Credibility
- Other topics
  - Consequences
  - Guilt
  - Lying by telling the truth
  - Gender and deception
- Future research

Underlying social psychology concept

Fundamental Attribution Error

(Ettinger & Jehiel, 2010)

Fun(ny) example

1997 rematch: IBM's Deep Blue vs. Garry Kasparov

Figure 1: IBM's Deep Blue. Retrieved from https://en.wikipedia.org/wiki/Deep_Blue_versus_Garry_Kasparov

Figure 2: Garry Kasparov. Retrieved from https://en.wikipedia.org/wiki/Deep_Blue_versus_Garry_Kasparov

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Observed behaviour: The program is taking more time than usual to make its next move.

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Fun(ny) example

1997 rematch: IBM's Deep Blue vs. Garry Kasparov

Observed behaviour: The program is taking more time than usual to make its next move.

Attribution error: This program is not as capable as a grandmaster.

(Fry, 2018)

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Figure 2: Garry Kasparov. Retrieved from https://en.wikipedia.org/wiki/Deep_Blue_versus_Garry_Kasparov

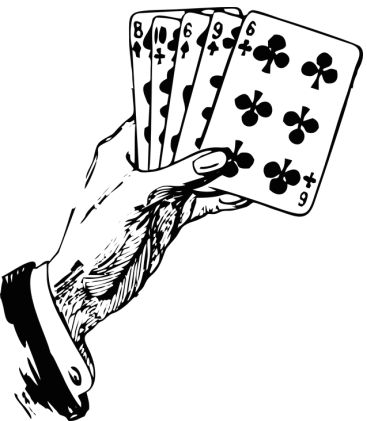
Figure 3: Deep Blue defeats Kasparov. 1997. Retrieved from https://cdn.theatlantic.com/static/mt/assets/science/kasparov615.jpg

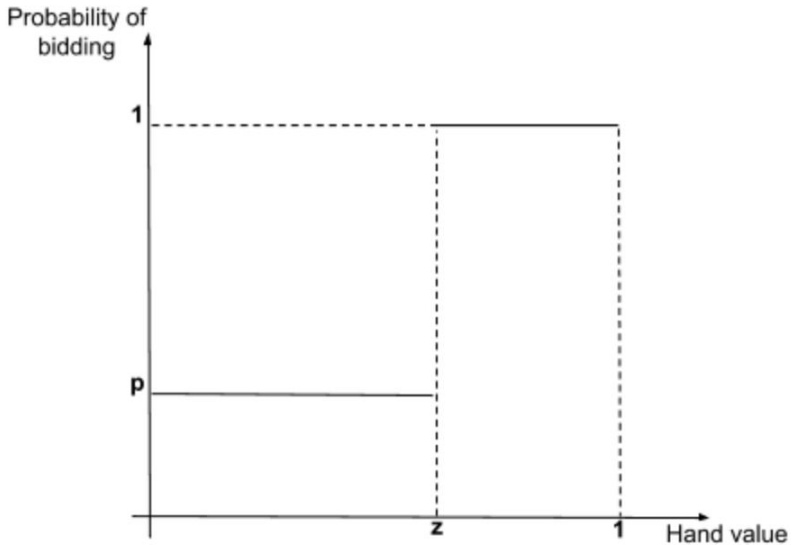
Theory of Games and Economic Behavior

Bluffing in poker

(Von Neumann & Morgenstern, 1944)

Theory of Games and Economic Behavior





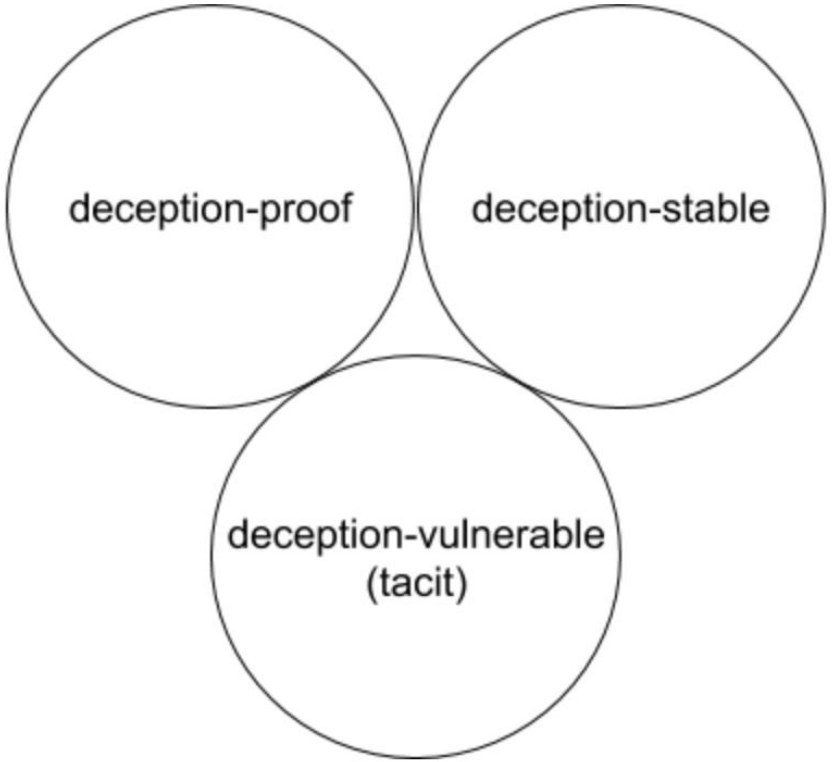
(Von Neumann & Morgenstern, 1944)

Deception in 2 x 2 Games

- Went through 78 distinct 2x2 games
- One agent is the **deceiver**
  - Complete information
- The other agent is the **deceived**
  - Incomplete information

(Brams, 1977)

Deception in 2 x 2 Games



(Brams, 1977)

Deception in 2 x 2 Games

- Deception-vulnerable (tacit)
  - “A game is deception-vulnerable (tacit) iff at least one player, as **deceiver**, can ensure as the rational outcome an outcome better than his next worst (2) only by announcing preferences different from his (true) preferences.” (Brams, 1977)

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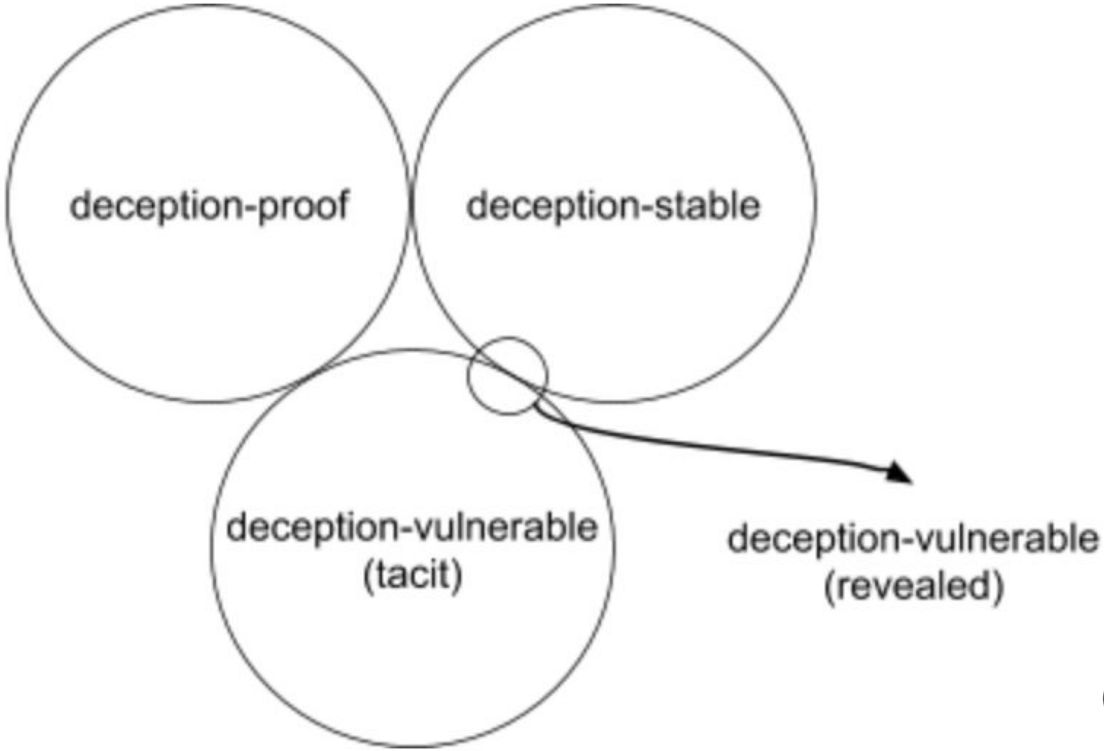
	A	B
a	(4, 1)	(2, 2)
b	(3, 2)	(1, 1)

(Brams, 1977)

Deception in 2 x 2 Games



(Brams, 1977)

Deception in 2 x 2 Games

- Deception-vulnerable (revealed)
  - “A game is deception-vulnerable (revealed) iff it is not deception-proof and (tacit) **deceiver** is not satisfied by the rational outcome.” (Brams, 1977)

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Deception in 2 x 2 Games

- Deception-vulnerable (revealed)
  - “A game is deception-vulnerable (revealed) iff it is not deception-proof and (tacit) **deceiver** is not satisfied by the rational outcome.” (Brams, 1977)

	A	B
a	(2, 4)	(3, 1)
b	(4, 2)	(1, 3)

(Brams, 1977)

Deception in Simple Voting Games

- Three-person voting game
  - One deceiver
    - Complete information
    - Chairman
  - Two deceived
    - Incomplete information

(Brams & Zagare, 1977)

Deception in Simple Voting Games

	Preference order		
Agent 1	a	b	c
Agent 2	b	c	a
Agent 3	c	a	b

(Brams & Zagare, 1977)

Deception in Simple Voting Games

	Preference order		
Agent 1	**a**	b	c
Agent 2	b	**c**	a
Agent 3	**c**	a	b

In a game with perfect information, **c** is chosen.

(Brams & Zagare, 1977)

Deception in Simple Voting Games

Agent 1, as the deceiver, announces that it is voting b.

	Preference order		
Agent 1	a	**b**	c
Agent 2	**b**	c	a
Agent 3	c	a	b

(Brams & Zagare, 1977)

Deception in Simple Voting Games

Agent 1, as the deceiver, announces that it is voting b.

	Preference order		
Agent 1	a	**b**	c
Agent 2	**b**	c	a
Agent 3	c	a	b

Tacit deception.

(Brams & Zagare, 1977)

Deception in Simple Voting Games

Agent 1, as the deceiver, announces that it is voting b, but actually votes a.

	Preference order		
Agent 1	**a**	b	c
Agent 2	**b**	c	a
Agent 3	c	a	b

Agent 3’s vote doesn’t matter.

(Brams & Zagare, 1977)

Deception in Simple Voting Games

Agent 1, as the deceiver, announces that it is voting b, but actually votes a.

	Preference order		
Agent 1	**a**	b	c
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Agent 3’s vote doesn’t matter.

Revealed deception.

(Brams & Zagare, 1977)

Reputation and Imperfect Information

- Imperfect information assumption
- Reputation effect
- Reputation is fragile and breaking it often has irreversible consequences

(Kreps & Wilson, 1982)

A Theory of Credibility

- Two-agent repeated game
  - A Sender (Spy)
  - A Receiver (Decision maker)

- The players can either be friends or enemies

- The game payoff increases along with the number of games played
  - There is incentive for deception

(Sobel, 1985)

The Role of Deception in Decision Theory

"... first shot at a decision theory framework for deception"

- Decision under risk

$$E'_i = \sum_{j=1}^{N} q_j P_{ij}$$

- "Deception causes the decision maker to misperceive the true q values"

(Greenberg, 1982)

The Role of Deception in Decision Theory

- Deception in an information theory context
  - False signal
  - Noise

- Normandy Invasion

(Greenberg, 1982)

Deception in Non-Cooperative Games with Partial Information

- Deception technique = information manipulation

(Hespanha et al., 2000)

Deception in Non-Cooperative Games with Partial Information

- “... when the degree of possible manipulation is high, deception becomes useless against an intelligent opponent since it will simply ignore the information that has potentially been manipulated.” (Hespanha et al., 2000)

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Other topics

- Deception: The Role of Consequences (Gneezy, 2005)
- Deception: The role of guilt (Battigalli et al., 2013)
- Deception through telling the truth?! Experimental evidence from individuals and teams (Sutter, 2009)
- The value of a smile: Game theory with a human face (Scharlemann et al., 2001)
    - 
- Gender differences in deception (Dreber et al., 2008)

Future research

- Do agents allow second chances?
  - Is losing one’s reputation really irreversible?

- How different cultures face deception?

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