Domain Specific Reasoning: Social Contracts and Cheating

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Abstract

The idea that human rational thought was governed by content-independent logical rules/axioms was brought down by psychology experiments using the Wason Selection Task, which demonstrated that people performed better on some tasks than others, even though the tasks had the same logical structure. What determined their performance? Cosmides came up with the idea of a social contract, and demonstrated in 1989, that selection tasks pertaining to social contracts were easier for people to solve. Gigerenzer and Hug published their work in 1992, which strongly supported Cosmides' Social Contract theory, disentangled social contracts from cheating and also delved into perspective change. The goal of my project has been to replicate the striking results of Cosmides' work and that of Gigerenzer/Hug's(first part). The experiment was conducted on Institute students, and the results obtained have been mixed in nature. On a whole, social contract and cheating theories are supported by the results

Introduction

The following be an example of a Wason Selection Task.

Consider the following four cards. Each of them has a number written on one side, and a colour on the other side.

Rule: If the colour on a card is Red, the number must be even.
Find the cards you definitely need to turn over to see if the above given rule can be violated.

Contrast the above rule with the another rule which says: If someone drinks beer, he/she must be over 25 years of age. The tasks here

It turned out that during early experiments using the Wason Selection Task, that even though the above two tasks pertain to the same logical propositional rule (need to choose P and not Q conditionals), performances on the latter were far better than the former rule.
Subsequent research focused on discovering the additional factors that influence different conclusions in tasks as above. Such differences may exist in the logical structure or content.

Social Contract Theory

Cosmides, in 1989 published a paper in which she puts forward the Social Contract theory. The theory posits a modular and evolutionary view of human reasoning[1]. Modular, in the sense that it only explains human reasoning in the domain of social contracts; it is not domain-general. Cosmides defines social contracts as an exchange of 'benefits' to 'costs'. Whenever one party gets a benefit from another party, there is a price to be paid back in return. Cheating is the failure to pay a cost to which one has obliged oneself by accepting a benefit, and without which the other person would not have agreed to provide the benefit[1].
The evolutionary part of the theory says, that we have spent only a tiny fraction of our lifetime on earth as part of a civilized society; the rest we have been hunters and gatherers. In those olden times, survival rested on cooperation. Cooperation of any sort cannot be possible without the ability to distinguish a cheater from one who is cooperating. These cheating-detection algorithms were perfected over time to reach a level of efficiency. These procedures developed over time and are still with us, and

thus, are sure to affect our everday reasoning performances.

An example of a task used by Cosmides in her experiments:

Rule : If a man eats cassava root, then he must have a tattoo his face.
Context Story: There exists a tribe known as The Kaluame. Cassava root is a rare and powerful aphoridisiac, making men irrestible to women. Among the Kaluame, only married men have tattoos on their faces. The elders have established the cassava rule because they strongly disapprove of sexual relations between unmarried people. Many unmarried men, however, are tempted to cheat. You are a guard whose task it to catch persons breaking the law. Each card has information about a Kaluame man. One side tells which food the man is eating, and the other side tells whether the man has a tattoo on his face or not.
Instruction: Indicate only the card(s) you definitely need to turn over to see if any of these Kaluame men violate the rule.

Here, the context story identifies the rule as a social contract. The men in order to eat the cassava root(benefit) must pay a cost(a requirement), i.e., they must be married.

Another context story associated with the same rule avoids any reference to a social contract of any sort. It justifies the rule by saying, that men with tattoos live in the northern part of the island, where cassava root grows and those without, live in the southern part. Here, the rule is a result of constraints, and not a social contract.

Differentiating between cheater-detection algorithms and social contracts

In all the selection tasks conducted by Cosmides, she did not try to make any distinction between social contracts and cheating detection, i.e, no attempt was made to understand whether it is sufficient for a rule(like the cassava rule) to be perceived as a social contract, or is the activation of cheating-detection algorithms also necessary. One can under-stand her as saying that only the former is sufficient: “Thus, for social contract theory, the major determinant of responses is whether a rule is a social contract (SC) or descriptive”[1].

Gigerenzer and Hug's work tried to disentangle the two concepts, and find out which of the two was the crucial cognitive process. They proceeded by designing four rules, each of which had a version in which the subject was cued into the perspective of a person who was identified in the context story as one who could be cheated. Here is an example of such a task:

Rule: If someone goes on a trek, then they must attended at least 20 days of conditioning.
Context Story: As coordinator of the institute adventure club, you know that weeklong strenuous treks require a good level of fitness and mental stamina. To make sure everyone is upto the mark, there is a criteria that anyone going on such a trek should have attended at least 20 days of conditioning. But you have heard rumours that this rule is being violated and unfit people are getting a shot. Each of the four cards below represents a person; one side tells if he/she went on the trek or not and the other side his conditioning attendance.
Instruction: Indicate the card(s) you definitely need to turn over to determine if the rule was violated.

The story identifies the rule as a social contract, since to go on a trek(benefit), one must have attended more than 20 days of conditioning(cost). Moreover, it cues the subject as the trek coordinator, who'll be cheated if it turns out that the rule is not being followed. This is the cheating version, of the Trek rule.

No Cheating version:

Rule: If someone goes on a trek, then they must attended at least 20 days of conditioning.
Context Story: You're a fresher interested in going on one of the treks the institute adventure club organises each semester. But you've heard that you must undergo a tough conditioning camp before it. The unspoken rule is that only those go who have attended at least 20 days of conditioning. You want to check if this rule holds or not. Each of the four cards below represents a person; one side tells if he/she went on the trek or not and the other side his conditioning attendance.
Instruction: Indicate the card(s) you definitely need to turn over to determine if the rule was violated.

Here again, the story identifies a social contract. But, the difference lies in cueing the subject into the perspective of a curious fresher. Whether the rule is followed or not, it doesnt affect him/her in any manner.

Methodology:

A within-subjects design was used. Each subject was presented with six selection tasks. The tasks are explained in the results section.

Subjects:

Forty-one students from the Indian Institute of Technology, Kanpur participated in the experiment. 27 of them were third year undergrads, the rest were first yearites. 10 girls, 31 boys. All of them were from the engineering discipline barring two from economics(in contrast Gigerenzer/Hug conducted the experiment on 93 students from various disciplines).

Procedure:

There were a total of six selection rules, each having two versions(a cheating one, and a no cheating one). Two series of tasks were constructed. In each series, only one version of each rule was present(that makes two series of six tasks each). Each task consisted of a rule, a context story and an instruction.

Two booklets were generated from the two series of tasks. In each, the selection tasks were randomly ordered and the ordering of (pseudo)cards was also random in each task. Twenty one subjects answered the first booklet, and the rest, the other booklet.

The first two rules were the same as those used by Cosmides. The theoretical goal was to achieve a replication of her 1989 results, strongly supporting social contract theory. The other four rules, are all self-constructed based upon similar underlying logic as used by Gigerenzer and Hug in their 1992 experimental design. In each version of the rule, it is identified as a social contract but in one version, the subject is cued into the perspective of a person who can be cheated(according to the context story).

While conducting the experiment, the subjects were instructed to answer the questions in serial order, not to go back to a question they had already answered or change a previous answer. There was no limit on time.

Overview.

		Context Story/Version		
No.	Rule	Series 1	Series 2	Theoretical Goal
1	Cassava	Cheating(SC)	No Cheating(No SC)	Replication of Cosmides' (1989, Exp 1)
2	Duiker	No Cheating(No SC)	Cheating(SC)	
3	Trek	Cheating(SC)	No Cheating(SC)	Replicating Gigerenzer's findings on cheating detection
4	Admission	Cheating(SC)	No Cheating(SC)	
5	Treat	No Cheating(SC)	Cheating(SC)	
6	Bollywood	Cheating(SC)	No Cheating(SC)	

Results:

I present first the tasks pertaining to replicating Cosmides' Social Contract theory and then the results on the same.

Task 1: Cassava

SC, Cheating version:

Rule: If a man eats cassava root, then he must have a tattoo his face.
Context Story: There exists a tribe known as The Kaluame. Cassava root is a rare and powerful aphoridisiac, making men irrestible to women. Among the Kaluame, only married men have tattoos on their faces. The elders have established the cassava rule because they strongly disapprove of sexual relations between unmarried people. Many unmarried men, however, are tempted to cheat. You are a guard whose task it to catch persons breaking the law. Each card has information about a Kaluame man. One side tells which food the man is eating, and the other side tells whether the man has a tattoo on his face or not.
Instruction: Indicate only the card(s) you definitely need to turn over to see if any of these Kaluame men violate the rule.

No SC, No Cheating version:

Rule: If a man eats cassava root, then he must have a tattoo his face.
Context Story: There exists an island on which lives a tribe, known as The Kaluame. Among the Kaluame, men with tattoos live in the northern part of the island, and those without in the southern part. You are an anthropologist visiting this island, who observes that tattoed men eat cassava root, while those without eat molo nuts. Your friend suggests you the above rule, with the explanation that cassava root grows in the northern part of the island, and molo nuts grow in the southern part. Each card has information about a Kaluame man. One side tells which food the man is eating, and the other side tells whether the man has a tattoo on his face or not.
Instruction: Indicate only the card(s) you definitely need to turn over to see if Kaluame men violate the above rule.

Task 2: Duiker

SC, Cheating version:

Rule: If you eat duiker meat, then you have found an ostrich eggshell.
Context Story: You are an anthropologist studying a mountain tribe. Among them, duiker meat is desirable and scarce, and to earn the privilege of eating it a boy must have found an ostrich eggshell, which is a difficult task representing a boy's transition to manhood. You are interested in whether boys ever violate this law. Each of the four cards below contain information about a boy. One side tells if they've caught an ostrich egg or not, and the other, if they've had duiker meat or not.
Instruction: Indicate only the card(s) you definitely need to turn over to see if any of these boys violate the rule.

No SC, No Cheating version:

Rule: If you eat duiker meat, then you have found an ostrich eggshell.
Context Story: You are an anthropologist studying a mountain tribe. The rule seems to exist since duikers are small antelopes that feed on ostrich eggs and are caught while eating them. You want to find if the above rule is true. Each of the four cards below contain information about a boy. One side tells if they've caught an ostrich egg or not, and the other, if they've had duiker meat or not.
Instruction: Indicate only the card(s) you definitely need to turn over to see if any of these boys violate the rule.

The performance results on the first two tasks are given below:

Replication of Cosmides'(1989, Exp1)

	Predictions	Results(in %)		Average(Cosmides' avg)
	SC Theory	Cassava	Duiker	
P & not-Q responses				
Cheating(SC)	High	57.14	80.00	68.57(75)
No Cheating(No SC)	Low	50	47.62	48.81(21)

Discussion:

Replication of Cosmides' findings, 1989(Exp 1)

The results in the experiment done differ quantitatively from Cosmides' results. Although the average performance in No SC, No Cheating tasks is markedly higher. it goes does in the SC, Cheating tasks, resulting in a much lower difference of (around)20 percentage points as compared to a difference of 54 points(more than double) obtained by Cosmides. In addition, the difference in results is particularly due to the Duiker task; difference in the Cassava task is too little to be of any importance. Cosmides' results on both of these tasks are unavailable, but Gigerenzer/Hug's experiment replicating Cosmides' same experiment provided equally compelling results on both tasks; no bias was noticed(96/36 on cassava, 91/52 on duiker).

The two rules used in the experiment were the same as those used by Cosmides in her experiment(which makes it reasonable to compare results). In light of this fact, the results are indeed somewhat unexpected. Yet, it cannot be said that they are disapproving of the Social Contract theory. Going by the average difference in performance, it can be said that the results on the whole support Social Contract theory, albeit not as strongly as established in the literature.

Moving on to the tasks aimed at disentangling cheating-detection algorithms from social contract theory:

Rule 3: Trek

Cheating version:

Rule: If someone goes on a trek, then they must attended at least 20 days of conditioning.
Context Story: As coordinator of the institute adventure club, you know that weeklong strenuous treks require a good level of fitness and mental stamina. To make sure everyone is upto the mark, there is a criteria that anyone going on such a trek should have attended at least 20 days of conditioning. But you have heard rumours that this rule is being violated and unfit people are getting a shot. Each of the four cards below represents a person; one side tells if he/she went on the trek or not and the other side his conditioning attendance.
Instruction: Indicate the card(s) you definitely need to turn over to determine if the rule was violated.

No Cheating version:

Rule: If someone goes on a trek, then they must attended at least 20 days of conditioning.
Context Story: You're a fresher interested in going on one of the treks the institute adventure club organises each semester. But you've heard that you must undergo a tough conditioning camp before it. The unspoken rule is that only those go who have attended at least 20 days of conditioning. You want to check if this rule holds or not. Each of the four cards below represents a person; one side tells if he/she went on the trek or not and the other side his conditioning attendance.
Instruction: Indicate the card(s) you definitely need to turn over to determine if the rule was violated.

Rule 4: Admission

Cheating version:

Rule: If the parents of a candidate donate a handsome amount to the college, then the college will grant him/her admission.
Context Story: You are a candidate seeking admission in one of the many engineering colleges that have sprung up under the aegis of PTU, Punjab. There is an unofficial rule that only if you donate a handsome amount to the college, can you get admission there. However there is a rumour, that the college you're applying to sometimes cheats people by accepting the donation, and still not granting admission. Each of the four card(s) below represents such a scenario; one side telling whether there was a donation or not and the other tells whether admission was granted or not.
Instruction: Indicate the card(s) you definitely need to turn over to determine if the rule was violated.

Handsome donation	No donation	Admission granted	Admission not granted

No Cheating version:

Rule: If the parents of a candidate donate a handsome amount to the college, then the college will grant him/her admission.
Context Story: You're a journalist investigating the criterion some engineering colleges in Punjab use to grant admission to candidates. You've heard that the following rule possibly holds: If the parents of a candidate donate a handsome amount to the college, then the college will grant him/her admission. Each of the four card(s) below represents such a scenario; one side telling whether there was a donation or not and the other tells whether admission was granted or not.
Instruction: Indicate the card(s) you definitely need to turn over to determine if the rule was violated.

Handsome donation	No donation	Admission granted	Admission not granted

Rule 5: Treat

Cheating version:

Rule: If the football team wins a match, then the captain will have to treat his fellow teammates to beer.
Context Story: You are a member of the institute football team. There is a rule that if the team wins a match, your captain treats everyone to beer. There is a rumour that this rule is being breached by your captain, who is a miser. Each of the cards below represents a situation. One side tells whether the match was won or lost. The other side tells if the team was treated to beer or not.
Instruction: Indicate the card(s) you definitely need to turn over to determine if the rule was violated.

Won the match	Lost the match	Treated to beer	Not treated to beer

No Cheating version:

Rule: If the football team wins a match, then the captain will have to treat his fellow teammates to beer.
Context Story: You are a first yearite who has two of his friends in the institue football team. You want to find out the reason how your friends get to have so much beer. Another friend suggests that if the team wins a match, the captain treats everyone to beer. Each of the cards below represents a situation. One side tells whether the match was won or lost. The other side tells if the team was treated to beer or not.
Instruction: Indicate the card(s) you definitely need to turn over to determine if the rule was violated.

Won the match	Lost the match	Treated to beer	Not treated to beer

Rule 6: Bollywood

Cheating version:

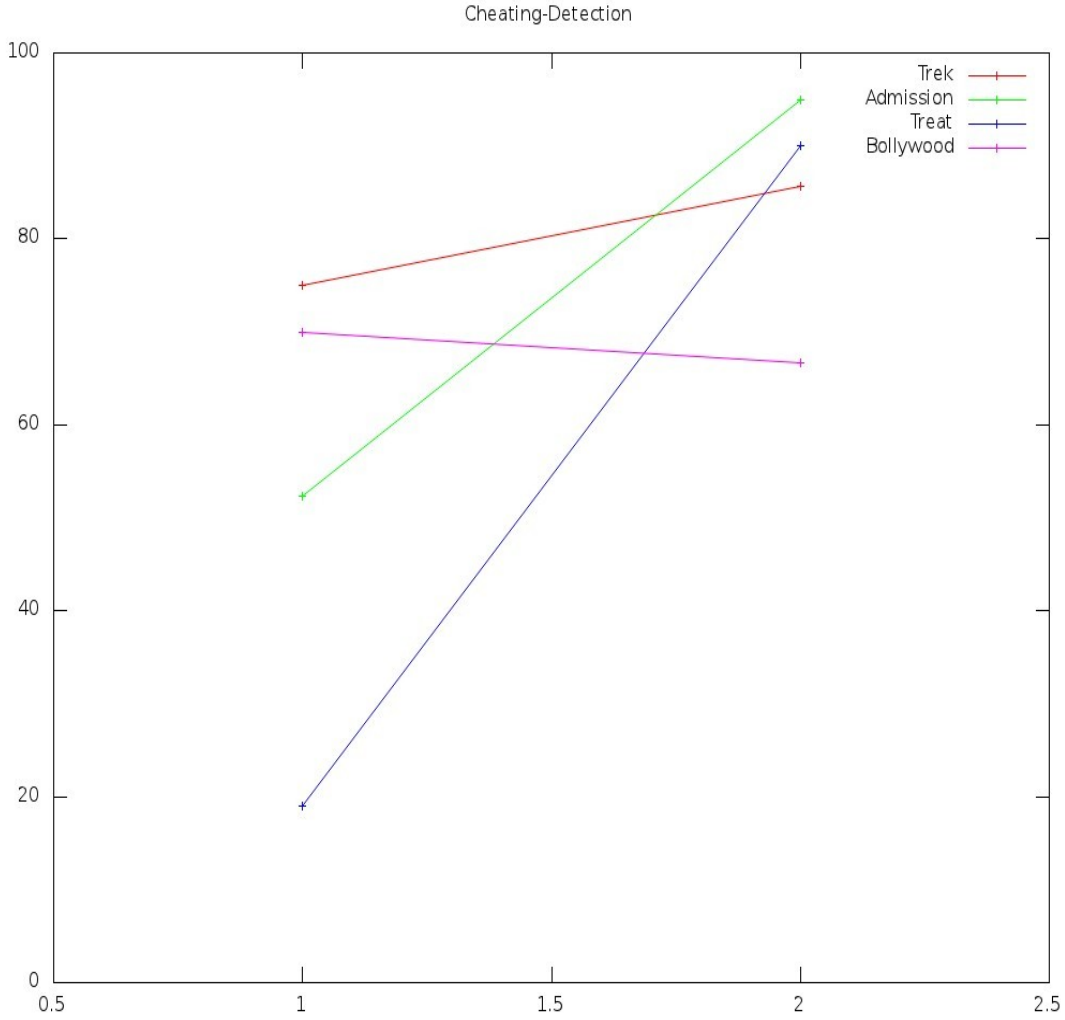
Rule: If a Bollywood movie has Salman Khan in it, it will be a blockbuster.
Context Story: You are a film director who's unsure of whom to cast in his next movie. You have been advised by some of your crew to cast Salman Khan, who say that then the movie will surely be a hit. But, as a director, you know that there is a cost involved; Salman Khan charges too much. Also, there is a rumor that Salman is no longer worth the money. Each of the cards below represents a movie. One side tells whether it had Salman or not. The other side tells if it was a blockbuster or not.
Instruction: Indicate the card(s) you definitely need to turn over to determine if the rule was violated.

No Cheating version:

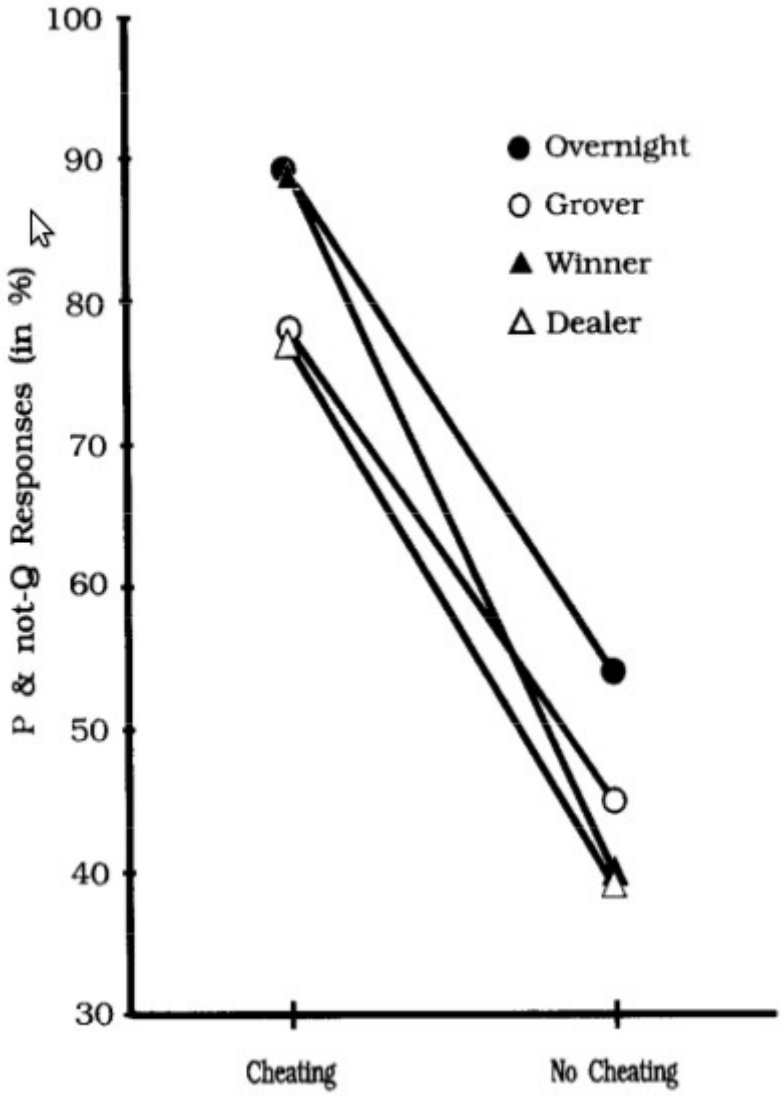
Rule: If a Bollywood movie has Salman Khan in it, it will be a blockbuster.
Context Story: You are a US national on an India tour, curious as to Bollywood. You wonder how some seemingly stupid movies do such good business. One person suggests that India loves Salman, and if a movie has him, its bound to succeed. Each of the cards below represents a movie. One side tells whether it had Salman or not. The other side tells if it was a blockbuster or not.
Instruction: Indicate the card(s) you definitely need to turn over to determine if the rule was violated.

1 - No Cheating
2 - Cheating

The performance results obtained on the four tasks above are depicted in the image:



Correspondingly, Gigerenzer/Hug obtained the following results on their selection tasks:



Discussion:

Differentiating between cheating-detection and social contracts

Before beginning a comparison between the performance results obtained in the present study and by Gigerenzer/Hug, it should be first kept in mind, that the selection tasks used although similar in their logical structure, defining rules as social contracts and subject perspectives, the actual content differed.

Gigerenzer/Hug reported sharp performance improvements of cheating cases over no cheating cases; the differences in their four tasks all lying in the range: 35 – 50 percentage points.

In contrast, the results obtained here have been varied.

- Trek task shows a difference of 8 points.
- Admission task – 40 points
- Treat task – 70 points
- Bollywood task - -3 points
- Averages - ~85 points on the cheating tasks
  ~55 points on the no cheating tasks

Statistics tell that on the whole, we might safely conclude that cheating-detection is a crucial component in human rational thought. The average diffence in performance is in agreement with the results of Gigerenzer/Hug, but the deviation are far too non-uniform. Results range from a tiny anomaly to a massive difference of 70 points.

Cosmides' Social Contrast theory by itself is not sufficient to obtain the striking results obtained in the SC tasks before(especially duiker). In fact the average performance in No SC, No Cheating tasks(48%) and SC, No Cheating tasks(55%) sit pretty tight together, adding further weight to the above conclusion.

Summarizing the results, the present study suppots Social Contract theory and asserts that the activation of cheating-detection algorithms is central to improved performances in social contract tasks.

Shortcomings:

1) A purely Wason selection task experiment was not conducted. Actual cards were not used. Instead, figures resembling cards were used.
2) Subjects all belonged to the same discipline. Ideally, a good mix of subjects should have been used.

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References:

1. Gigerenzer, G./Hug, K. 1992. Domain-specific reasoning, social contracts, cheating, and perspective change. Cognition 43: 127-171