

Clear Thinking in an Uncertain World: Human Reasoning and its Foundations

Lecture 1

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September 2, 2013

Practicalities

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- ▶ Course website on ELMS
 - Weekly readings will be posted
 - Slides will be posted
 - Pay attention to the schedule (midterm, canceled classes, etc.)

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- ▶ Office Hours: Tuesdays 1-2 PM
- ▶ Office: Skinner 1103A

Practicalities: Grading

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1. Participation & weekly writing (20%)
 - short (at most 1 page!) observations (comments, questions) about the current week's readings
 - do not simply summarize the paper/chapter
 - hand in before class on Wednesday

Practicalities: Grading

2. Midterm exam (30%)

- Some questions testing comprehension, short essay questions
- Take-home exam **Due: October, 21, 2013** (will be made available around October 14, 2013)

3. Final exam (30%)

- In-class exam given during finals week
- Short answers, multiple choice, longer essay questions

Practicalities: Grading

4. Student Presentation (20%)
 - On a topic of your choosing
 - I need to approve the topic. Prepare a short (1-2 page) outline of your presentation before **Nov. 11, 2013**
 - The presentation will be around 20-25 minutes with 5-10 minutes for discussion

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- ▶ J. Adler and L. Ripps (eds.), *Reasoning: Studies of Human Inference and its Foundations*, Cambridge University Press, 2008 (especially the introductory survey by Jonathan Adler, pgs. 1 - 34).
- ▶ K. Stenning and M. van Lambalgen, *Human Reasoning and Cognitive Science*, The MIT Press, 2008
- ▶ D. Kahneman, *Thinking, Fast and Slow* by Daniel Kahneman, Farrar, Straus and Giroux, 2011

Setting the Stage: Reasoning

Reasoning is a “transition in thought, where some beliefs (or thoughts) provide the ground or reasons for coming to another”

J. Adler. *Introduction: Philosophical Foundations (Sections 1 - 4)*. in *Reasoning: Studies in Human Inference and its Foundations*, Cambridge University Press, 2008.

(1) Ann believes that Bill's final grade is either an A or a B.

(2) Ann believes that Bill's final grade is not a B.

So, (3) Ann believes that Bill's final grade is a A.

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(2') Bill's final grade is not a B.

So, (3') Bill's final grade is a A.

(1) Bill brought his backpack to class every day of the semester.

So, [probably] (2) Bill will bring it to the next class.

(1) I need to pick up my daughter at 3:30 PM

Oh, (2) I better put the slides on the website.

What is the course about?

What are the rules or formal constraints that govern *rational* transitions in thought?

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What does it mean to be *rational* or *reasonable* as opposed to *irrational* or unreasonable?

Setting the Stage: Theoretical vs. Practical Reasoning

G. Harman. *Rationality*. In Reasoning, Meaning and Mind (1999).

Theoretical Reasoning

(1) I want a bagel.

(2) The closest bagel shop is *Bagel Palace* on Rt. 1.

(3) There are no barriers to my going there.

So, (4) I should now go to *Bagel Palace*.

[Alternatively, (4) I shall/intend to now go....]

Example: Giving in to Temptation

Jane very much wants to do well in history. There is a crucial test tomorrow and she needs to study tonight if she is to do well on the test....Jane knows that if she goes to the party, she will really regret it. But she goes to the party anyway.

Example: Refusing to take a Remedial Course

Bob, a college freshman, takes a test designed to indicate whether students should take a useful remedial writing course. Students do not write their names on their exam books but write an identification number instead, so graders cannot identify the students. Bob does poorly on the test and is required to take a remedial course. He objects to this advice, attributing a low test score to bias on the part of the grader, and does not take a remedial writing course.

Practical Rationality vs. Theoretical Rationality

- ▶ Jane's irrationality is manifested in *a decision to do something*

Practical Rationality vs. Theoretical Rationality

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- ▶ Bob's irrationality is manifested in *his belief*

Examples: Making a Mistake

Confusing two Philosophers:

Frieda is having trouble in her introductory philosophy course. Because of a similarity in their names, she confuses the medieval philosopher Thomas Aquinas with the 20th century philosopher W. V. Quine.

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Calculating Mistakes:

Sam makes an adding mistake when he prepares his budget for next year.

Theoretical vs. Practical Rationality

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Arbitrary Belief

Jane is trying to decide which route Albert took to work this morning. She knows that in the past Albert has taken Route A about half the time and Route B about half the time. Her other evidence does not support one of these conclusions over the other. So, Jane arbitrarily decides that Albert took Route A.

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Arbitrary Intention

Albert is trying to decide how to get to work this morning. He could take either Route A or Route B. Taking either of the routes will get him to work at about the same time and the balance of reasons does not favor going one way over going the other way. So, Albert arbitrarily forms the intention of taking Route A.

Theoretical vs. Practical Rationality

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Wishful Practical Thinking

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Wishful Theoretical Thinking

After Jane has taken the exam and before she has learned what her grade is, her desire to get a good grade on the exam leads her to conclude that she did get a good grade.

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G. E. M. Anscombe. *Intention*. Harvard University Press, 1957.

Rationality: Two Themes

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- ▶ The rationality of act α depends on the *reason for doing α*

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Rationality is a matter of **reliability**:

- ▶ A rational belief is one that is arrived at through a process that reliably produces beliefs that are true.
- ▶ An act is rational if it is arrived at through a process that reliably achieves specified goals.

Rationality: Two Themes

“Neither theme alone exhausts our notion of rationality. Reasons without reliability seem empty, reliability without reasons seems blind. In tandem these make a powerful unit, but how exactly are they related and why?” (Nozick, pg. 64)

R. Nozick. *The Nature of Rationality*. Princeton University Press, 1993.

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But, what is **good thinking**?

- ▶ classical logic (modus ponens, modus tollens, etc.)
- ▶ non-monotonic/default logic
- ▶ closed-world reasoning
- ▶ induction (induction from examples)
- ▶ Abduction (inference to the best explanation)
- ▶ Bayesian inference
- ▶ case-based reasoning/reasoning by analogy
- ▶ fast and frugal heuristics
- ▶ ...

Classical Logic and Rational Beliefs

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$P \wedge Q$ “ P and Q ”

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(denoted $P_1, \dots, P_n \vdash P_1 \wedge \dots \wedge P_n$)

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A set of formulas is **inconsistent** if there is no way of making all of the formulas true

1. Ann recognizes that $\{P, Q, R\}$ are inconsistent
2. $\{P, Q, R\}$ are inconsistent

Rationality versus genius

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A, B, C imply D . Sam believes A, B and C . But some does nto realize that A, B, C imply D . In fact, it would take a genius to recognize that $A, B, C \vdash D$. And Sam, although a rational man, is far from a genius.

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From “It is raining in College Park” to “It is raining in College Park or Lily is at school” is a valid inference. In fact, there are infinitely many such trivial consequences (P , $P \vee Q$, $P \wedge P$, $P \rightarrow P$, $P \vee Q \vee R$, etc.), but these will just “clutter the mind”.

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Also, if one “loses” the origination of this disjunctive belief, one may be misled to think that there is a special reason to believe Lily is at school or there is a special connection between rain in College Park and Lily being at school.

Discovering a Contradiction

Sally believes A, B, C and has just come to realize that $A, B, C \vdash D$. Unfortunately, she also believes for very good reasons that D is false. So she now has reason to stop believing A, B or C , rather than a reason to believe D .

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She concludes that she will become an atheist.

But although MP gives Ann a reason to believe the conclusion, it does not decide that she will believe it. Instead of believing the conclusion, she may decide to drop her belief in the conditional.

Reasoning

“Reasoning is not the conscious rehearsal of argument; it is a process in which antecedent beliefs and intentions are minimally modified, by addition and subtraction, in the interests of explanatory coherence and the satisfaction of intrinsic desires.”
(G. Harman, pg. 56, “Practical Reasoning”)

Taking Stock

- ✓ Cognitive limitations: rationality \neq genius
- ✓ Are logically omniscient agents rational? No.
- ✓ Deduction reasoning may lead to *revising*
 - ▶ Two challenges:
 - Foundational problems
 - Ordinary language challenges

Foundational Problem: Epistemic Closure

Epistemic Closure EC: If i knows that P and i knows that P implies Q , then i knows that Q .

Foundational Problem: Epistemic Closure

Epistemic Closure EC: If *i* knows that *P* and *i* knows that *P* implies *Q*, then *i* knows that *Q*.

- (1) The animal I am looking at is a zebra.
- (2) If the animal I am looking at is a zebra, then it is not a mule cleverly disguised to look like a zebra.
- (3) The animal I am looking at is not a mule cleverly disguised to look like a zebra.

S. Luper. *The Epistemic Closure Principle*. Stanford Encyclopedia of Philosophy: <http://plato.stanford.edu/entries/closure-epistemic/>.

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1. If you tutor me in logic, I'll pay you \$50.
 2. If you don't tutor me, I won't pay you \$50.

Ordinary Language Challenges: Gricean Implicature

He [the speaker] has said that p ; there is no reason to suppose that he is not observing the maxims, or at least the Cooperative Principle; he could not be doing this unless he thought that q ; he knows (and knows that I know that he knows) that I can see the supposition that he thinks that q is required....he intends me to think...that q ; and so he has implicated q .

Cooperative Principle: The speaker intends his contribution to be informative, warranted, relevant and well formed.

H. P. Grice. *Studies in the Way of Words*. Harvard University Press, 1989.

Methodological Issues

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Interdisciplinary

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- ▶ make use of ideas and results from other areas,

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Normative vs. Description Theories

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Normative vs. Description Theories: How can/should we incorporate *empirical data* into our *normative* theory of rationality? (reflective equilibrium)

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- ▶ *Normative*: reasoning as it should be, ideally
- ▶ *Descriptive*: reasoning as it is actually practiced
- ▶ *Prescriptive*: take into account bounded rationality (computational limitations, storage limitations)

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- ▶ Actual human reasoning falls short of prescriptive standards, so there is room for improvement by suitable education
- ▶ Reasoning rarely happens in real life: we have developed “fast and frugal algorithms” which allow us to take quick decisions which are optimal given constraints of time and energy.

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J. Hintikka. *Inquiry as Inquiry*. Kluwer Academic Publishers, 1999.

Next

- ▶ A crash course in logic
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