Lecture 11

Philosophy 109

Caley Howland

March 23, 2020

Administrative Stuff

- Reading for Next time:
  - Skyrms Chapter 2 (Optional, but highly recommended)
  - Hacking Chapter 2
- We are starting with the new unit on inductive reasoning/probability.

Inductive Logic

- Intuitively, not all good arguments are deductively valid.

Boring Class

The professor put me to sleep the first lecture.
The professor put me to sleep the second lecture.

$\vdots$

The professor put me to sleep the seventeenth lecture.

$\therefore$ The professor will put me to sleep the eighteenth lecture.

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- Inductive logic aims (in part) to study *the strength* to which an argument's premises support its conclusion.
- It's inductive argument that's behind *nearly all of science*!
- It's also the kind of inference that you make most in your everyday life.

- Recall: If the premises of a **valid argument** are all true, the the conclusion is guaranteed to be true.
- Inductively strong arguments don't need this feature. But:
  - If the premises of an **inductively strong argument** are all true, then they make it probable that the conclusion is also true.

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- Obviously, this scenario is improbable, but it's not impossible.
  - So, it's possible that the premises of the original argument are all true but the conclusion false.

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  - The type of probability that grades the inductive strength of arguments—we shall call it *inductive probability*—does not depend on the probability of the premises alone or on the probability of the conclusion alone, but on the *evidential relation between* the premises and the conclusion.

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  - Remember, we encountered some "strange/fringe cases" of validity that did not seem to involve any sort of *evidential support* at all.
  - Any argument with contradictory premises is valid, and any argument with a tautological conclusion is valid. But, these do not involve any relations of evidential support between premises and conclusion.

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  - Any argument with contradictory premises is valid, and any argument with a tautological conclusion is valid. But, these do not involve any relations of evidential support between premises and conclusion.
- In the case of inductive arguments, there should be some degree of relevance between the premises and conclusion.

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- Let us also treat P as a variable, which stands for the conjunction of a set of premises.
- So we can express a generic argument as: $P \therefore C$.

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  - **Proposal 1**: An argument $P \therefore C$ is *inductively strong* just in case the claim $P \wedge \neg C$ is *improbable*.
- **Proposal 1 won't work!** Let P="There's a 2000-year-old man in Cleveland" and C="There's a 2000-year-old man in Cleveland who has 3 heads."
  - Is $P \wedge \neg C$ improbable? **Yes!**
  - Is $P \therefore C$ actually a strong argument? **No!**

- Intuitively, the argument $P \therefore C$ is *not* strong. That's because P **does not evidentially support** C.

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  - If there *were* a 2000 year old man in Cleveland, then it would be highly likely that he would have only one head.
- So, $P \wedge \neg C$ is improbable *but only because P is improbable.*

- There are also examples in which $P \wedge \neg C$ is improbable *merely because* C *is probable* (independently of C's relationship to P).
  - Let P="A fair coin will land heads", and C="No man will live to be 2000".

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  - Let P="A fair coin will land heads", and C="No man will live to be 2000".
- **Moral**: Looking at the (im)probability of the claim $P \wedge \neg C$ does not (in general) tell us the degree to which an argument is inductively strong.

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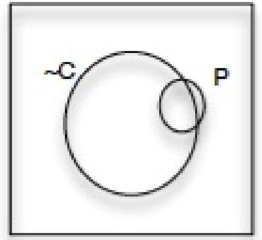
- A diagram may help:



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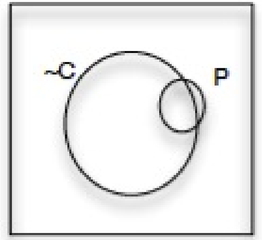
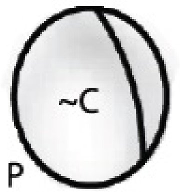


- In this diagram (where area is proportional to probability), the probability of $P \wedge \neg C$ is low, but the probability of $\neg C$ given that P is high. Why?

- If we zoom-in on the P-circle, we get the following picture:



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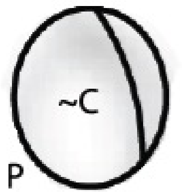

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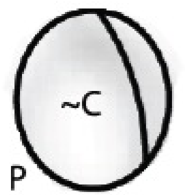

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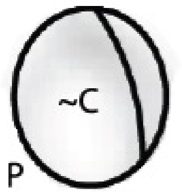
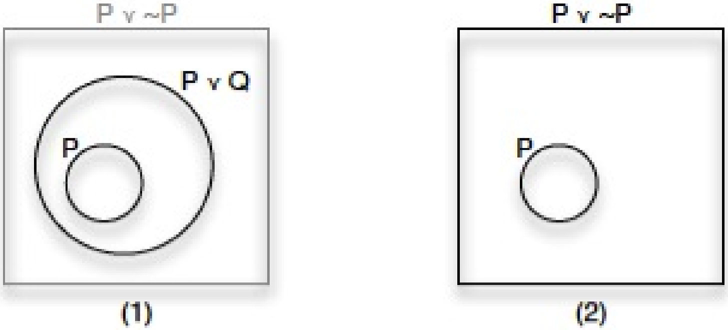


- Notice that—within the P-circle—*most of the area is occupied by* $\neg C$.
- Therefore, $\neg C$ is probable, given that P is true.
- So, when evaluating an inductive argument $P \therefore C$, we need to think about **how probable** C **is, *given that*** P. The more probable C is (i.e., the less probable $\neg C$ is)—given that P—the stronger the argument is.

Two Arguments

Let's compare the strength of (1) $P \vee Q \therefore P$ with (2) $P \vee \neg P \therefore P$ using the method of the last slide.

- We can picture them as follows:



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- Therefore, the *proportion of* P *within* $P \vee Q$ must be greater than *the proportion of* P *within* $P \vee \neg P$.
- So, (1) must be stronger than (2).

- Next, consider this example (borrowed from Skyrms):
  - (P) There is a 2000-year-old man in Cleveland.
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    $\therefore$ (C) No man will live to be 2000 years old.
- Let's do some inferential reasoning.

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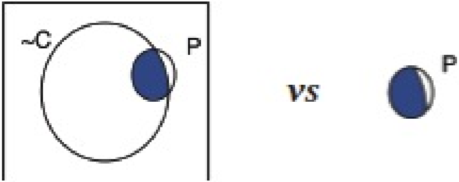
  - **Proposal #2.** An argument P $\therefore$ C is inductively strong just in case C is probable, *given that* P is true, i.e., if most P-worlds are C-worlds.

- Proposal #1 looks at the size of the shaded region, ***relative to the size of the box*** *(of all possible worlds)*. Proposal #2 looks at the size of the shaded region, ***relative to the size of the P-circle*** *(of just the P-worlds)*.



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- Suppose I'm going to pick a card c at random from a standard deck.
  - Let P = "c is a black card", and C = "c is a spade".

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  - The probability of $\neg C$, given that P = the proportion of black cards that are clubs = 1/2. So, Proposal #2 says that "P $\therefore$ C" is not strong.

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  - **Proposal #3** "P ∴ C" is strong just in case (1) the probability of $\neg C$ given that P is low, and (2) P is *positively relevant* to C — i.e., the probability of $\neg C$ given that P is lower than the probability of $\neg C$.

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Proposal 3 and Relevance

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- This is not low (i.e., it is not less than 1/2). But, it is *lower* than the probability that c is not a spade (i.e., the probability of $\neg C$), which is 3/4.

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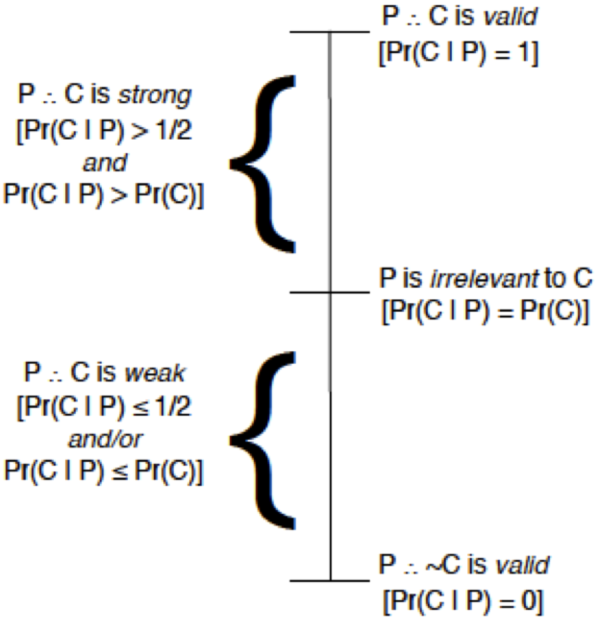
  - The probability ofC given that P = 1/2, which is greater than the probability of C = 1/4).
- Thus, the argument "P ∴ C" does not come out strong on proposal #3 (because it fails the low conditional probability requirement). But this argument does satisfy the positive relevance requirement.
- With proposal #3 in hand, we can now explain how our "scale" of argument strength works.
  - It depends on $Pr(C|P)$ and $Pr(C|P) > Pr(C)$.


P ∴ C is *valid*
[Pr(C | P) = 1]
P ∴ C is *strong*
[Pr(C | P) > 1/2
and
Pr(C | P) > Pr(C)]
P is *irrelevant* to C
[Pr(C | P) = Pr(C)]
P ∴ C is *weak*
[Pr(C | P) ≤ 1/2
and/or
Pr(C | P) ≤ Pr(C)]
P ∴ ~C is *valid*
[Pr(C | P) = 0]