What Is Logic Good for?

Marcello Di Bello

Introduction to Logic

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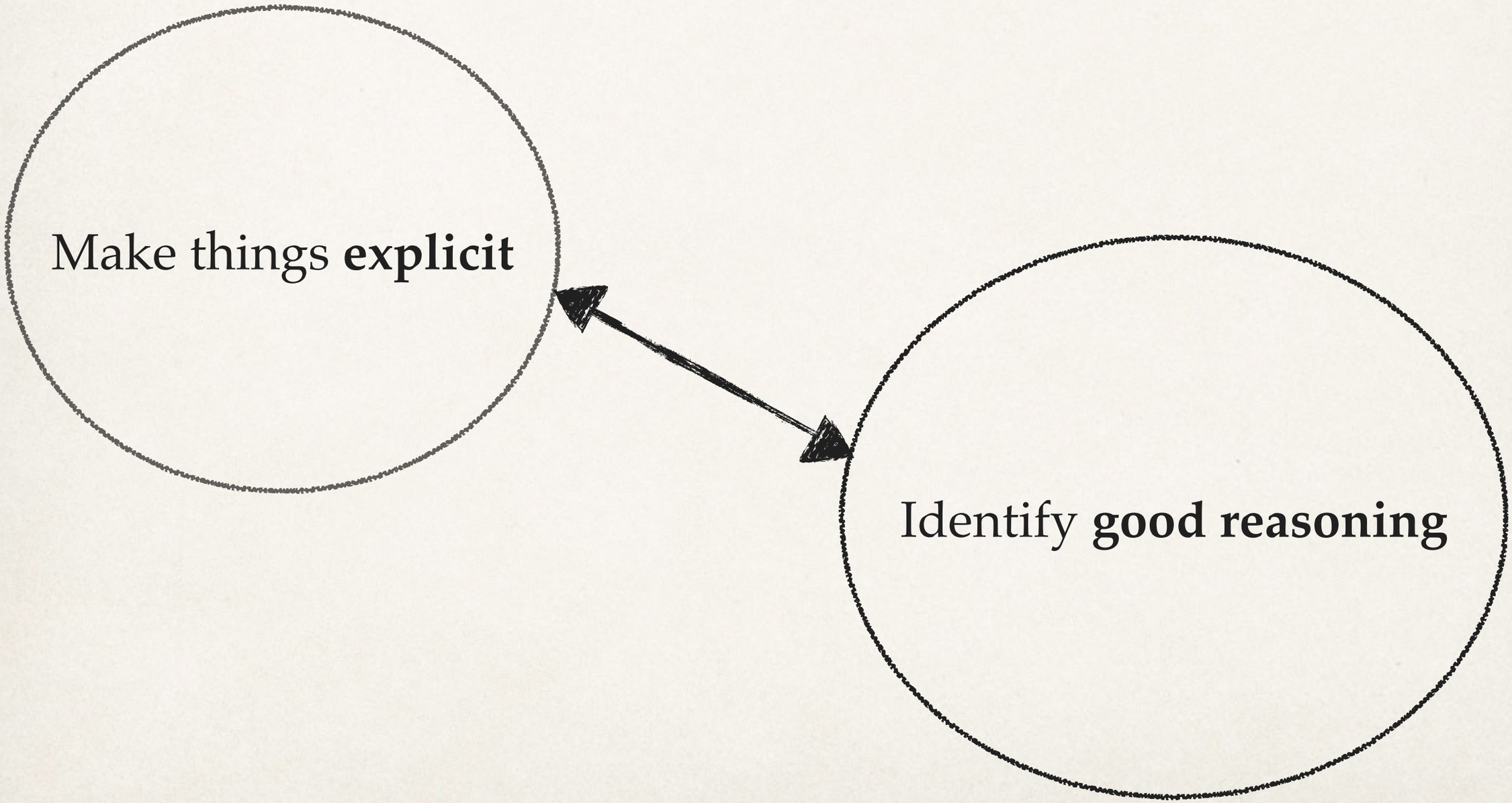


Making Things Explicit

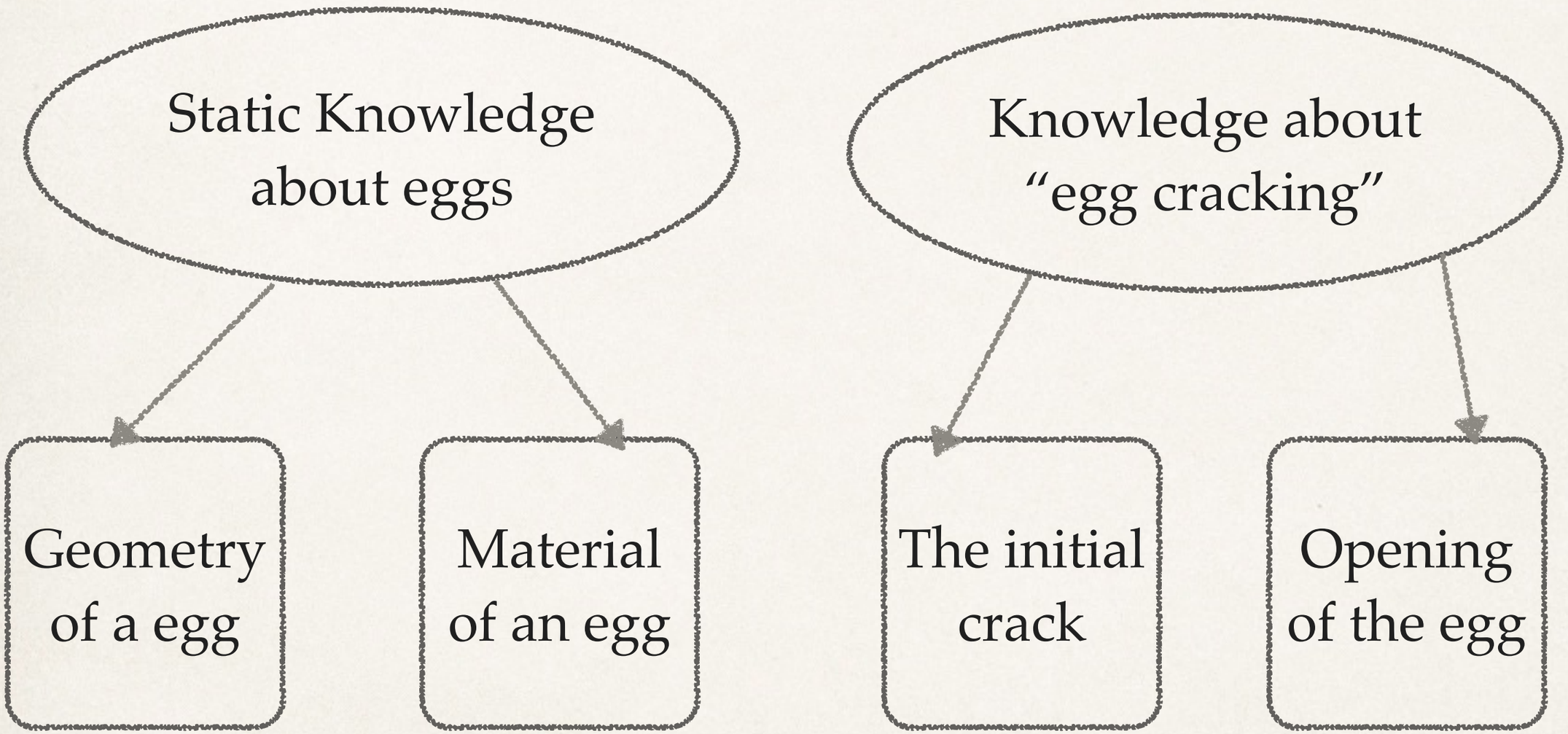
How Difficult Can it Be to Crack an Egg?

A Standard Problem in Artificial Intelligence

"A cook is cracking a raw egg against a glass bowl. Properly performed, the impact of the egg against the edge of the bowl will crack the eggshell in half. Holding the egg over the bowl, the cook will then separate the two halves of the shell with his fingers, enlarging the crack, and the contents of the egg will fall gently into the bowl. The end result is that the entire contents of the egg will be in the bowl, with the yolk unbroken, and that the two halves of the shell are held in the cook's fingers."

Source: http://www-formal.stanford.edu/leora/commonsense/

Cracking an Egg Isn't That Easy!



By making this knowledge explicit, we can instruct a computer

How to Identify Good Reasoning

Modus Ponens:

If A, then B
A

B

Modus Tollens:

If A, then B
not-B

---

not-A

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Good Reasoning (1)

Premise 1: If you take the medication, then you will get better
Premise 2: You are taking the medication

Conclusion: You will get better

Modus Ponens:

If A, then B
A

B

Good Reasoning (2)

Premise 1: If you take the medication, then you will get better
Premise 2: You are NOT getting better

Conclusion: You are NOT taking the medication

Modus Tollens:

If A, then B
not-B

---

not-A

Good reasoning is reasoning that conforms to a **good reasoning pattern**

Monetarist Politics

Let's assume, given our knowledge of the US economy, that if the money supply were to increase at less than 5%, the rate of inflation would come down. Now, since the money supply is increasing at a rate well above 10%, we must conclude that inflation will not come down.

Is this a good piece of reasoning?

Good Reasoning?

Premise 1: If the money supply increases by less than 5%, inflation will decrease
Premise 2: The money supply does NOT increase by less than 5%

Conclusion: Inflation will NOT decrease

If A, then B
not-A

---

not-B

This reasoning does **not** seem to conform to a **good reasoning pattern**

Which Patterns Are Good? (1)

If A, then B
A

B

If A, then B
not-B
---
not-A

If A, then B
not-A
---
not-B

If A, then B
B

A

Good

(Typically considered) **Bad**

Which Patterns Are Good? (2)

If A, then B
If B, then C
If C, then D
A

D

If A, then B
If C, then D
A and C

B and D

If A, then B
If C, then D
not-B and not-D

---

not-A and not-C

There is an infinite number of good reasoning patterns.
We cannot list them all!

Is There Another Way to Identify Good Reasoning? Yes, the *Semantic Approach*