CSC 520-001/601

Introduction to Artificial Intelligence

Fall 2015

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Outline

1. Scenario 1
2. Types of Reasoning
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The actual science of logic is conversant at present only with things either certain, impossible, or entirely doubtful, none of which (fortunately) we have to reason on. Therefore the true logic for this world is the calculus of Probabilities, which takes account of the magnitude of the probability which is, or ought to be, in a reasonable man's mind.
- James Clerk Maxwell [1850]

Scenario 1

Suppose we observe a driver weaving down the road. We would like an intelligent agent to produce sensible answers to questions such as:

1. What is the chance the driver is drunk, given no evidence?
2. What is the chance the driver is drunk, given evidence of weaving?
3. What is our answer to Question 2, given our answer to Question 1?

Answers to questions like these are not arrived at via logical deduction, but by another means of reasoning called **abduction**.

Types of Reasoning

	Input	Input	Output	Examples
Deduction	FORALL X drunk(X) => weave(X)	drunk(john)	weave(john)	Resolution, Knowledge-based Systems, Expert Systems,...
Abduction	FORALL X drunk(X) => weave(X)	weave(john)	drunk(john)	Explanations, Probabilistic Reasoning,....

Scenario 2

Holmes and Watson are mediocre drivers. Either one may have an accident any time they are on the road. The roads may be icy. Either Holmes or Watson (or both) may or may not be sleepy at any given time.

We would like an intelligent agent to produce sensible answers to questions such as:

1. What are the chances Holmes has an accident, given no evidence?
2. What are the chances Holmes has an accident, given that the roads are icy?
3. If we find out the roads are icy, does our assessment of the likelihood of Holmes' accident go up or down from what it was before?
4. What are the chances that the roads are icy, given that Holmes has had an accident?
5. What happens to our assessment of the chances the roads are icy, given that Holmes has an accident and we subsequently find out that Holmes is sleepy?
6. What are the chances Holmes has an accident, given that Holmes is sleepy and the roads are icy?
7. Is that assessment greater than, less than, or the same as the chances Holmes has an accident AND Holmes is sleepy AND the roads are icy?
8. If Watson has an accident and we find out that the roads are icy, does our assessment that Watson was sleepy increase, decrease, or stay the same?
9. What are the chances Holmes has an accident, given that we know Watson has had an accident?
10. What are the chances that both Holmes and Watson have had an accident, given that Holmes is sleepy?

etc, etc.

The approach will again be abductive reasoning, quantified by probability. But note that we are not talking about repeated trials, such as coin flipping or card dealing. Instead, we will be talking about probabilities in a different way entirely: as measures of subjective degrees of belief.

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