Non-deductive Arguments

Three Examples: enumerative induction, argument by analogy, and abduction

Day 5 – Philosophical Method

Non-deductive arguments

- Many different kinds of non-deductive (or inductive) argument have been identified

- See, for example, the Wikipedia article on inductive reasoning at https://en.wikipedia.org/wiki/Inductive_reasoning#Types

Three types of induction

We’ll look at just three of these:

- Enumerative induction
- Abduction
- Argument by analogy

Enumerative induction

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- Let $P(\mathbf{H_k} \mid \boldsymbol{e})$ stand for the probability that $\mathbf{H_k}$ is true, given that ***e*** is true

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$\mathbf{H}_0$ **=** 0% of all SVGS students have this preference

$\mathbf{H}_1$ **=** 1% of all SVGS students have this preference

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$\mathbf{H}_{100}$ **=** 100% of all SVGS students have this preference

Enumerative induction

Which hypothesis is most likely to be true, given ***e*** ?

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H_{25} = 25% of all SVGS students have this preference

Enumerative induction

The argument itself:

In a random sample of 20 SVGS students, 5 said they prefer Cinnamon Pop-Tarts to Lance Whole Grain Cracker Sandwiches with Cheddar Cheese.

25% of all SVGS students have this preference.

Abduction

inference to best explanation

Abduction seeks to choose an hypothesis (which we'll view as the conclusion of an argument) which gives the best explanation of the evidence we have.

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- Let ***e*** stand for existing evidence
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- Let $P(\boldsymbol{e} \mid \mathbf{H}_k)$ stand for the probability that ***e*** is true, given that $\mathbf{H}_k$ is true

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- Let ***e*** stand for existing evidence
- Let **Hk** stand for hypothesis number k
- Let P(***e*** |**Hk**) stand for the probability that ***e*** is true, given that **Hk** is true

Abduction concludes that $\mathbf{H}_k$ is true if and only if

$P(\boldsymbol{e} \mid \mathbf{H}_k) \geq P(\boldsymbol{e} \mid \mathbf{H}_i)$ for all $i \neq k$.

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Example:

e = Allowed to breed feely with adequate food, water, shelter, and space, the observed number of breeding pairs of rabbits (in successive months) over a 7 month period were 1, 1, 2, 3, 6, 8, and 12.

$\mathbf{H}_1$ = Number of pairs doubles each month

$\mathbf{H}_2$ = Number of pairs increases exponentially with the number of months

$\mathbf{H}_3$ = Number of pairs each month follows the Fibonacci Sequence

Abduction

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Abduction concludes that $\mathbf{H}_k$ is true if and only if

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Example:

e = observed number pairs of rabbits (in successive months) were 1, 1, 2, 3, 6, 8, and 12

$\mathbf{H}_1$ = 1, 2, 4, 8, 16, 32, and 64

$\mathbf{H}_2$ = 3, 7, 20, 55, 148, 403, and 1097

$\mathbf{H}_3$ = 1, 1, 2, 3, 5, 8, and 13

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$\mathbf{H}_1$ = 1, 2, 4, 8, 16, 32, and 64

error: 0+1+2+5+10+52 = 70

$\mathbf{H}_2$ = 3, 7, 20, 55, 148, 403, and 1097 error:

$\mathbf{H}_3$ = 1, 1, 2, 3, 5, 8, and 13

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$\mathbf{H}_2$ = 3, 7, 20, 55, 148, 403, and 1097

error: 2+6+18+52+142+395+1033 = 1748

$\mathbf{H}_3$ = 1, 1, 2, 3, 5, 8, and 13

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error: 0+0+0+0+1+0+1 = 2

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Example:

e = observed number pairs of rabbits (in successive months)

were 1, 1, 2, 3, 6, 8, and 12

$\mathbf{H}_3$ = Number of pairs each month follows the Fibonacci Sequence

Abduction

inference to best explanation

The argument itself

Allowed to breed feely with adequate food, water, shelter, and space, the observed number of breeding pairs of rabbits (in successive months) over a 7 month period were 1, 1, 2, 3, 6, 8, and 12.

Allowed to breed feely with adequate food, water, shelter, and space, the observed number of breeding pairs of rabbits each month follows the Fibonacci sequence.

Argument by Analogy

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- The strength of an argument by analogy (the probability that object B also has property X) is measured by the similarity between objects A and B
- The more similar B is to A, the more probably it is that object B also has property X.
- Form of an argument by analogy:

Object A has property X.

Object A and object B are similar.

Object B has property X.

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An argument by analogy appeals to the fact that object A has property X and object B is similar to object A. Therefore, object B probably also has property X.

Example:

A fine watch is created by an intelligent designer.

The motions of the sun and planets are reliably predictable, like the mechanism of a fine watch.

The solar system was probably created by an intelligent designer.