The Big 4 Methods in the Cognitive and Information Sciences

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Symsys 130

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Method type	Courses	Goals	Markers
philosophical (analytical)	Intro Phil, Phil 80, Phil 160s and 180s	Define concepts, refine understanding, persuade, question conventional thinking, “quicken the sense of the queer”, “say things that are true but annoying”	claims, arguments; evidence based on introspection or common knowledge
formal (axiomatic)	Phil 150, 151, CS 154, Stat 116	Represent propositions and arguments rigorously enough so that no rational person could disagree that the conclusion follows from the premises; prove consistency, independence, soundness, completeness	definitions, axioms, theorems, proofs; mathematical and logical symbols
computational	CS 106, 107, 124, 220s	Automate the derivation of output data from input data; process information; simulate a process; find efficient algorithms	program code, descriptions of procedures/algorithms and of data, analysis of algorithms and computational complexity analysis
empirical			
• experimental	Psych 45, 50	Test hypotheses or possibilities in a way that allows for causal inferences	random assignment into conditions
• observational	Ling 1, 140	Collect and classify data from naturally occurring phenomena in which no variables are under the researchers' control	analysis of data generated by a natural process
[[hybrid methods	Ling 120, CS 103, Psych 209, Symsys 100	Combine two or more methods in order to answer a question better than can be done with a single type of method	presence of markers from more than one of the above]]

Philosophical Analysis – The *Meno*

Jowett, Dialogues of Plato, Vol. II, Macmillan, third ed., 1892

Socrates and the boy. 43

Meno.

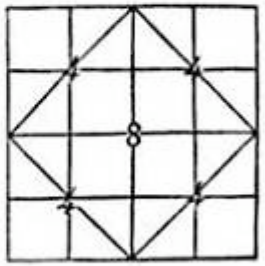
SOCRATES, MENO'S SLAVE.

Soc. Let us describe such a figure: Would you not say that this is the figure of eight feet?

Boy. Yes.

Soc. And are there not these four divisions in the figure, each of which is equal to the figure of four feet?

Boy. True.



Soc. And is not that four times four?

Boy. Certainly.

Soc. And four times is not double?

Boy. No, indeed.

Soc. But how much?

Boy. Four times as much.

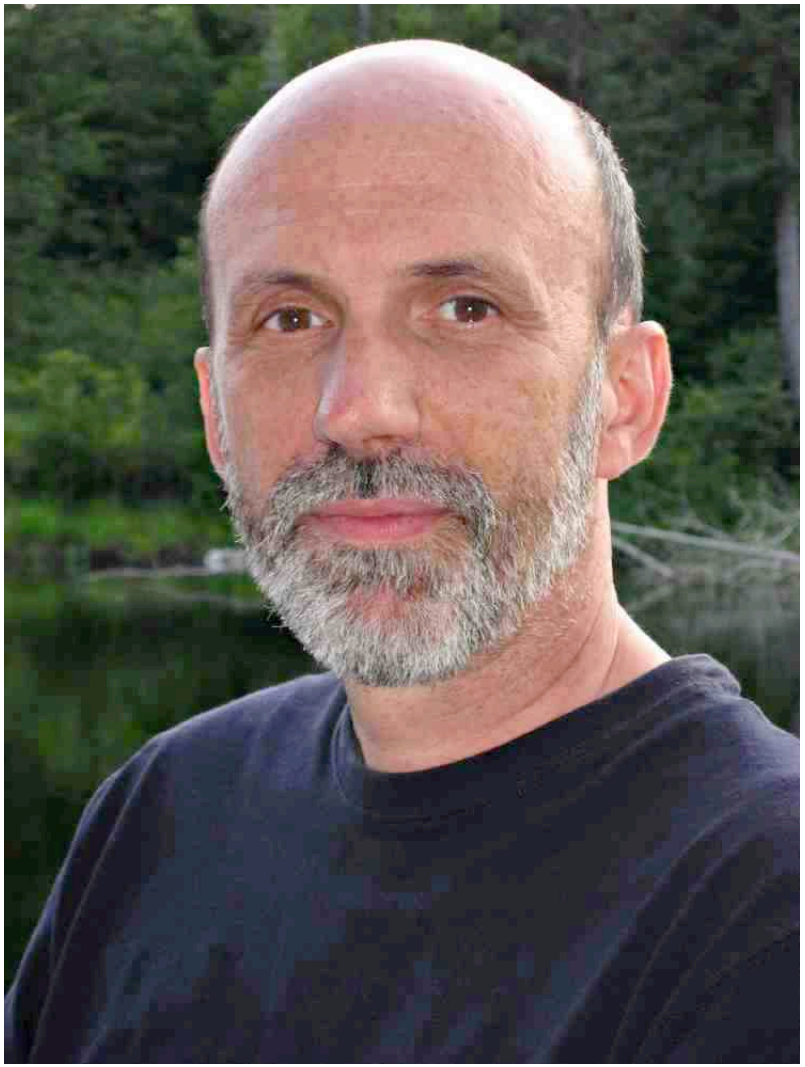
Soc. Therefore the double line, boy, has given a space, not twice, but four times as much.

Boy. True.

Soc. Four times four are sixteen — are they not?

Boy. Yes.

Formal Analysis – Epistemic Logic



Hector J. Levesque, *A Logic of Implicit and Explicit Belief*, 1984

Computational Analysis – Completeness and Complexity

Joseph Y. Halpern and Yoram Moses, “A Guide to Completeness and Complexity for Modal Logics of Knowledge and Belief”, 1992

Empirical Analysis – Wason (1966)

WASON CARD SELECTION TASK

Each of these cards has a letter on one side and a number on the other. Which two cards should you turn over to allow you to decide if the following statement is true:

"If there is a D on one side, there is a 5 on the other"?

A More Transparent Version:

To enforce the “over 21” law, which patron needs to be checked at a bar?