Introduction to Cognitive Science:

Envoi: Is Computational Cognitive Science Complete?

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Where Cognitive Science came from

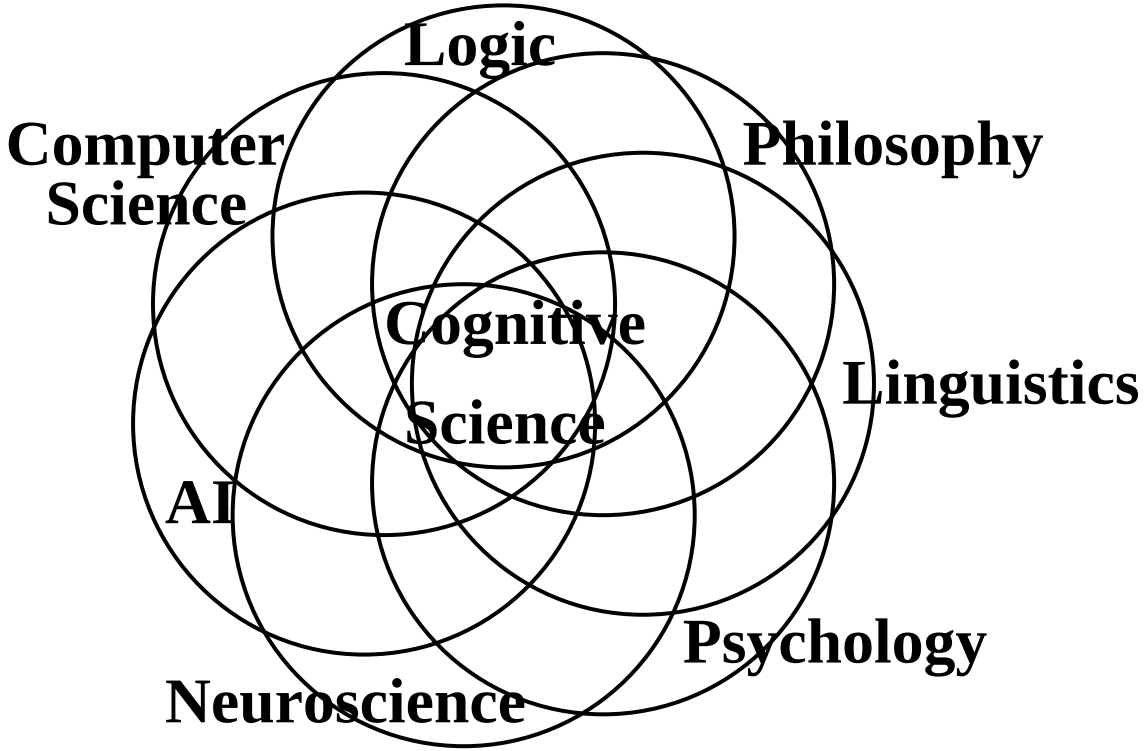

Figure 1: Contributions to Cognitive Science

What Cognitive Science is About

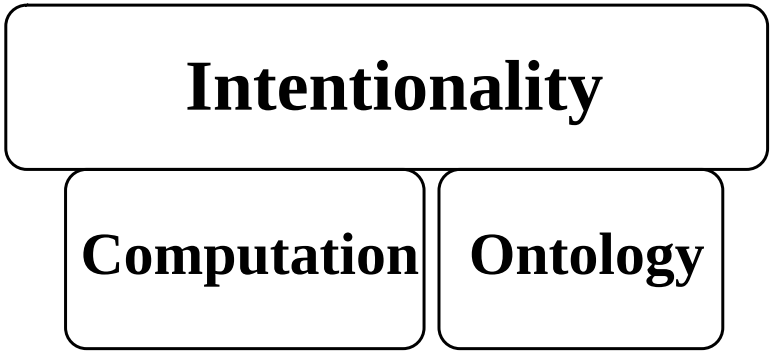

Figure 2: Cognitive Science as the Theory of “Intentionality”

- Intentionality is the property of systems whose actions are contingent on internal representations as well as the external world. (Thermostats are not intentional, but bats are, and so are we.)
- Computation is manipulation of symbols.
- Ontology is concerned with what those symbols represent.

Are we leaving anything out?

Turing 1950

- Turing (1950) argues on the basis of two assumptions—a) that the human mind is a phenomenon of a physical brain, and b) that digital computers are universal machines—that computation can in principle represent *all* properties of mind and intentionality. He discusses the following common objections to this claim.

  1. The Theological Objection
  2. The Heads-in-the-Sand objection.
  3. The Mathematical Objection
  4. The Argument from Consciousness
  5. The Argument from Various Disabilities
  6. Lady Lovelace's Objection
  7. The Argument from Continuity in the Nervous System
  8. The Argument from Informality of Behaviour
  9. The Argument from Extra-sensory Perception

The Turing Test

Turing offers a “thought experiment” often called the “Turing Test,” which he seems to have intended as a way to avoid the trap of the Argument from Various Disabilities, and especially the Argument from Consciousness.

- In one variant of the Turing test a sceptical user is invited to decide by interrogation whether an agent is a machine or a human. If the agent is a machine, it is assumed to be programmed to try to mislead the user.
- Example 1.

Q: Please write me a sonnet on the subject of the Forth Bridge.
A: Count me out on this one. I never could write poetry.
Q: Add 34957 to 70764
A: *(Pause of about 30 secs)* 105621
Q: Do you play chess?
A: Yes
Q: I have K at my K1, and no other pieces. You have only K at your K6 and R at R1. Your move.
A: *(Pause of about 15 secs*) R-R8 mate.

The Turing Test

- Example 2.

  Q: In the first line of the sonnet that reads “Shall I compare thee to a summer’s day,” wouldn’t “a spring day” be better?
  A: It wouldn’t scan.
  Q: How about “a winter’s day?” That would scan all right.
  A: Yes, but nobody wants to be compared to a winter’s day.
  Q: Would you say Mr Pickwick reminded you of Christmas?
  A: In a way.
  Q: Yet Christmas is a winter’s day, and I don’t think Mr Pickwick would mind the comparison.
  A: I don’t think you’re serious. By “a winter’s day” one means a typical winter’s day, rather than a special one like Christmas.

- The point here is that if we want to use words like “intelligent” at all, then we have no justification for *not* applying it to this imaginary machine.

- This is a way of saying that the question “Can machines think?” is meaningless.

The Chinese Room: Searle (1990)

It is *not* a goal of AI to create a machine that passes Turing's "test".

- Searle has recently proposed that there is a flaw in Turing's argument.
- His argument is based on an example of a man in a soundproof room who has the job of producing responses in written Chinese to messages also written in Chinese.

The man doesn't know Chinese. But he has a vast book of instructions that allows him to determine the form of an appropriate response without ever understanding it himself. The man is so quick and this book is so effective that the most sceptical people outside cannot tell whether the man knows Chinese or not.

- The room is a computer. The man is the CPU, and the book is both the program and the memory. They have survived the Turing test.

Escaping the Chinese Room

- Searle asks whether we are happy to say they are intelligent.
- He argues we shouldn't be, because the room, like computers, is " syntactic", whereas we are "semantic".
- Spot the hidden assumption. (Hint: think about the Argument from Mathematics, and the Argument from Various Disabilities.)
- Turing would say, whether we want to call it intelligent or not isn't the point. Once we get past the distracting details, the Chinese room is just another thought experiment that shows the question is meaningless.
- There is just one more thing to say about this example. It would be great to get our hands on that book/program. It would answer just about every meaningful question we have about language and the mind.

References

Searle, John, 1990. “Is the Brain’s Mind a Computer?” *Scientific American* 262:26–32.

Turing, Alan, 1950. “Computing Machinery and Intelligence.” *Mind* 59:433–460.