

A THREE-COMPONENT COGNITIVE THEORY

Francisco J. Arjonilla

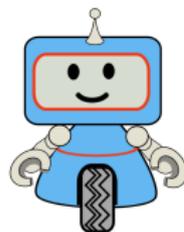
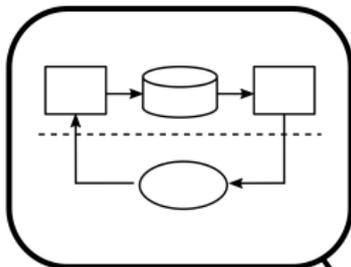
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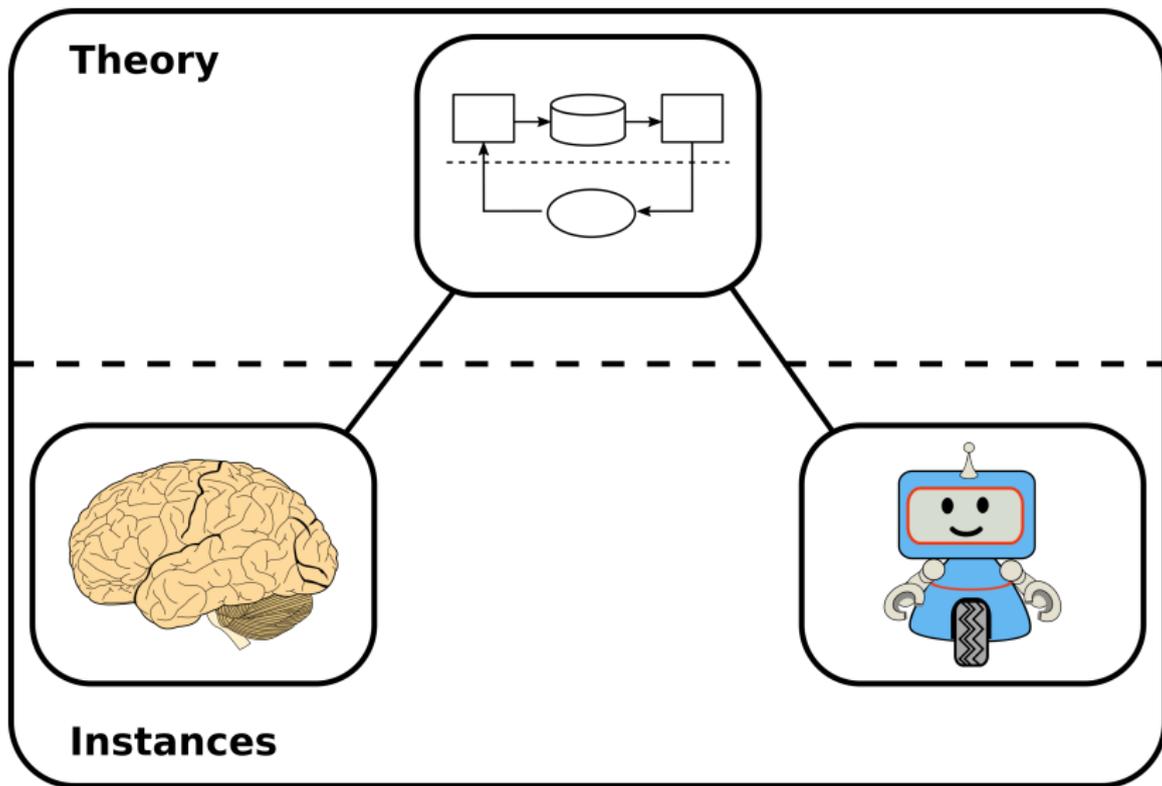
ARTIFICIAL INTELLIGENCE

Theory



Instances

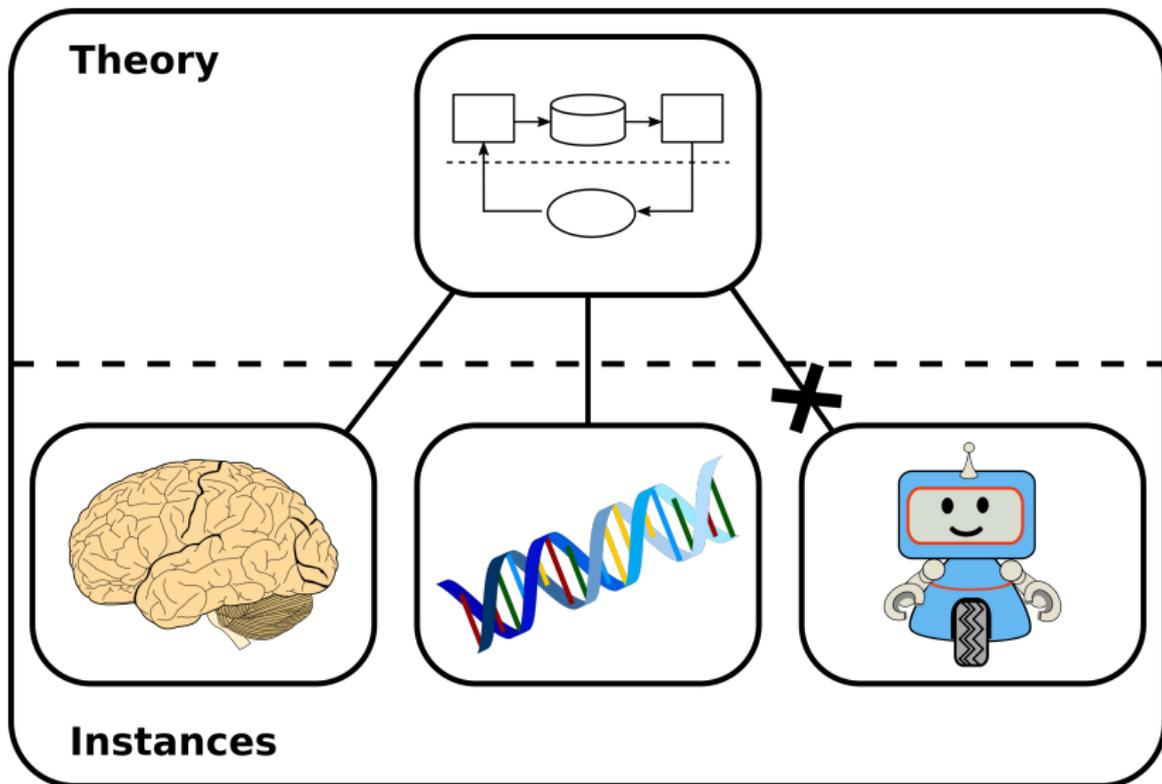
COGNITIVE THEORIES



RESEARCH GOAL

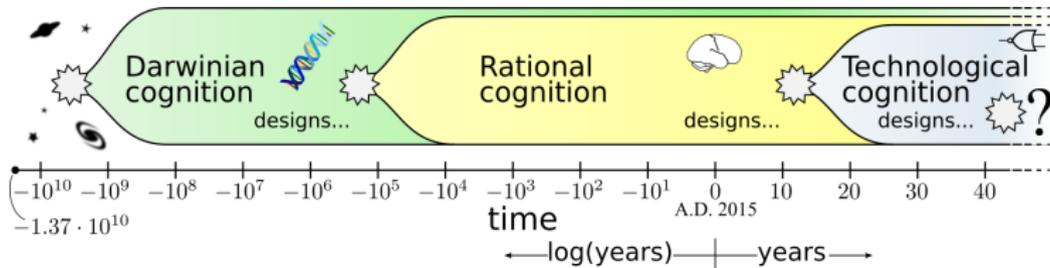
- What are the basic building blocks of any cognition, and how do they combine?
 - What qualifies as a cognitive system?
-
- Should explain all systems with intelligent behavior.
 - Should predict a novel cognitive architecture.

GLOBAL VIEW OF COGNITIVE SYSTEMS



TEMPORAL VIEW OF COGNITIVE SYSTEMS

- Sequence of cognitive emergences.
- Three cognitive families.



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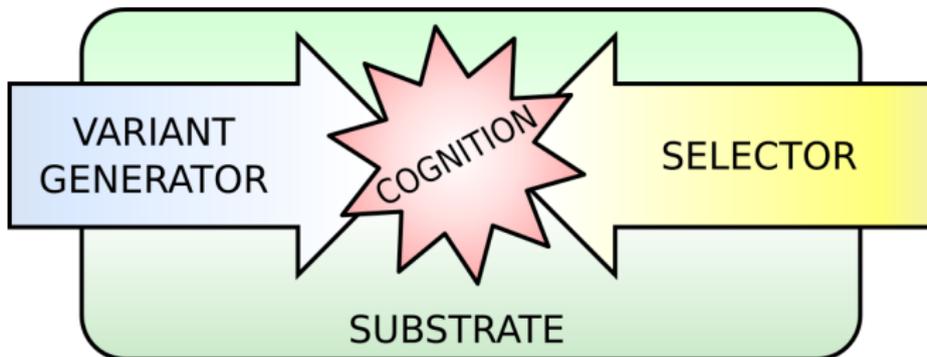
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- Purely cognitive systems: RNA strands.
- Learning to ride a bicycle.

THE THEORY: TRIAL AND ERROR

- Assessment of the effects on the environment
- The goal is fulfilled: No more trials needed.
- Otherwise: Keep trying until one trial is successful
- Each trial is a variant.



SUBSTRATE AND VARIANTS

- The variants define what is tried.
- Substrate holds the variants and interprets them.

DARWINIAN

- DNA and RNA
- Genetic code

RATIONAL

- Representations
- Neural modules

TECHNOLOGICAL

- Bit sequence
- Turing machine

GENERATOR

- Supplies variants.
 - Known to be successful.
 - Tentative solutions.
- Heuristics
 - Random
 - Perfect
 - Guided by goals

DARWINIAN

- Mutations
- Recombination

RATIONAL

- Variant recall
- Plasticity

TECHNOLOGICAL

- Subject to interpretation
- Perfect generators

SELECTOR

- Assesses the effect of variants in the environment.
- Decides what variants are correct.
- Abstract goals require sophisticated assessment methods.

DARWINIAN

- Natural selection

RATIONAL

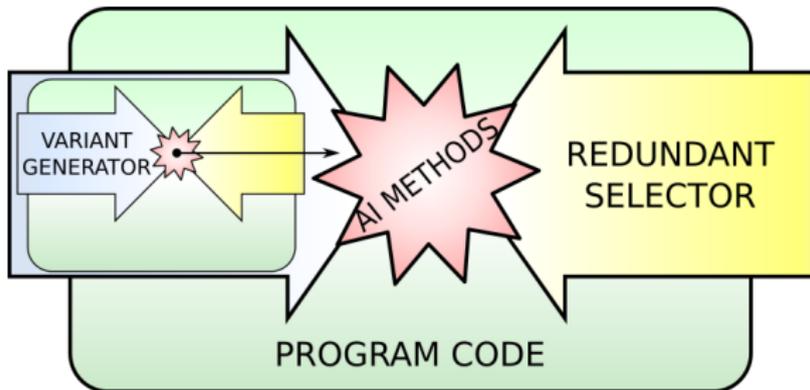
- Attention
- Module disengagement

TECHNOLOGICAL

- Subject to interpretation
- Redundant

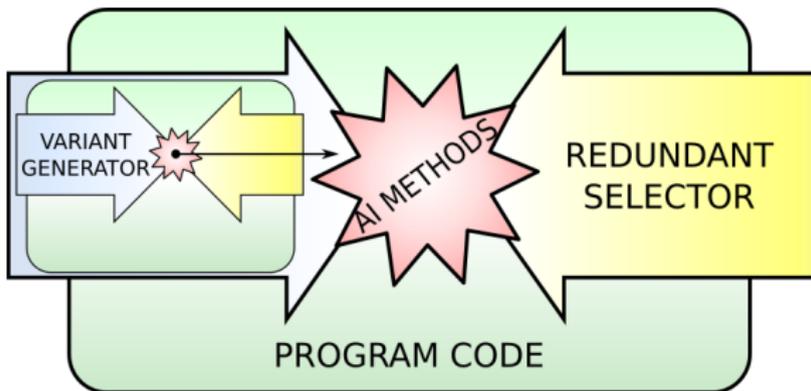
INTELLIGENCE IN COGNITIVE COMPONENTS

- Cognitive components are made up of intelligent methods.
- Intelligence is devised by cognitive systems.
- Recursion!



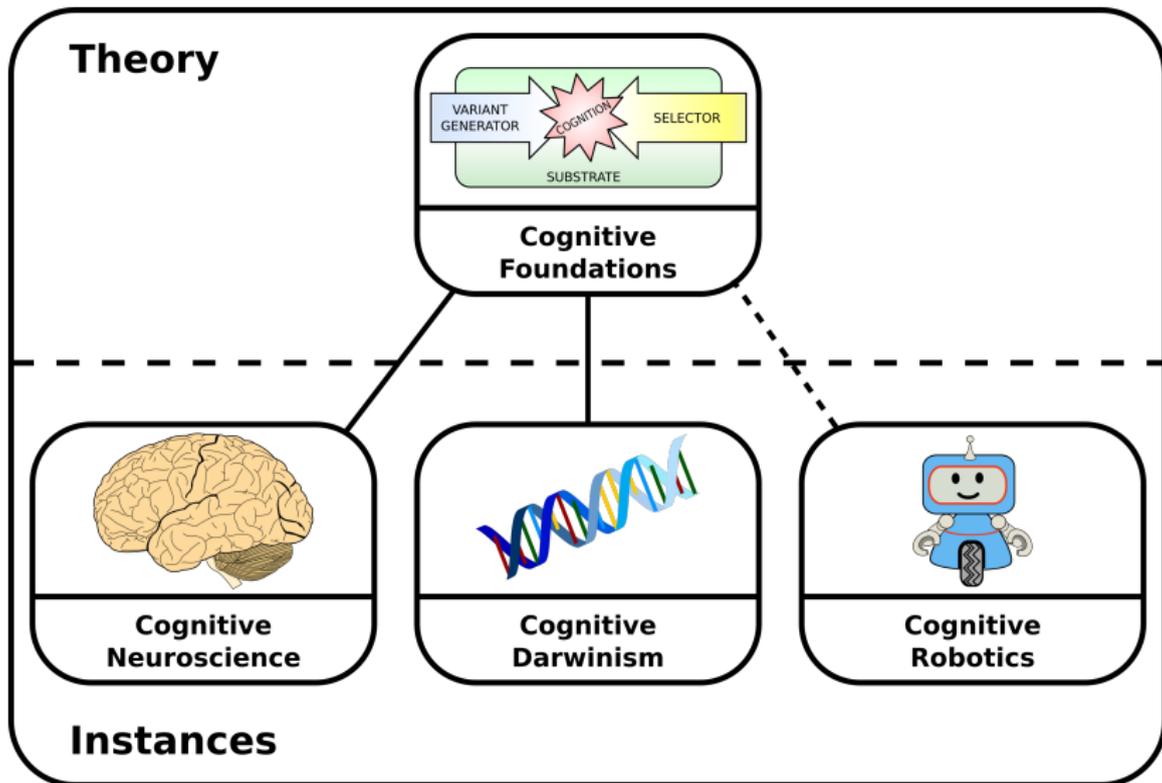
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- Self-reference in the cognitive components.

SUMMARY



WEAKNESSES

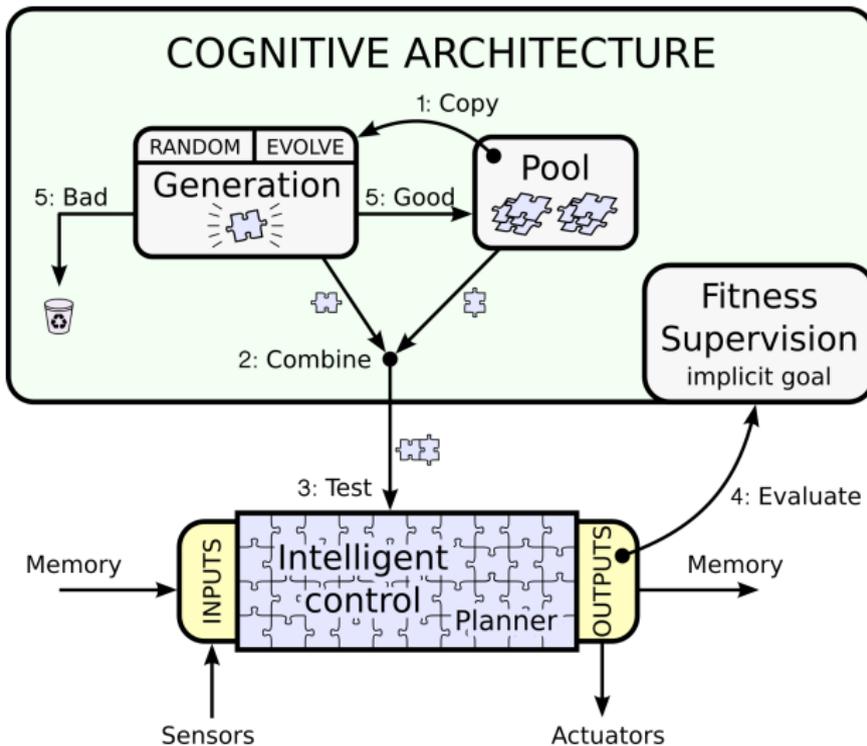
INCONCLUSIVE INTERPRETATIONS

- Correspondence between theory and cognitive instances is subjective.
- Quantitative description

DIFFICULT TO ATTEMPT FALSIFICATION

- Darwinian cognition: Prior belief that evolution is intelligent.
- Rational cognition: Neuroscience is in its infancy.
- Technological cognition: Artificial general intelligence is not available yet.

PREDICTION: EPISTEMIC COGNITIVE ARCHITECTURE



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Q & A