



# COMPSCI 389

## Introduction to Machine Learning

**Days:** Tu/Th. **Time:** 2:30 – 3:45 **Building:** Morrill 2 **Room:** 222

### **Topic 15.0: Philosophy**

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Machine learning has had a profound impact on other fields.

Other fields have had a profound impact on machine learning.

Note: This discussion is heavily inspired by “Philosophy of Mind: A Beginner’s Guide” by Ian Ravenscroft.

# Philosophy of Mind

- Studies the nature of the mind and its relationship with the body.
- A central concept is that of **mental states**: A condition or process of the mind characterized by thoughts, feelings, beliefs, desires, and intentions.
- Examples:
  - Believing it will rain
  - Feeling pain
  - Desiring a cup of coffee
- Mental states can be conscious (e.g., being thirsty) or unconscious (e.g., underlying biases).
- Mental states include more complex sustained states like a mindset or psychological condition (e.g., a depressive state)

# The Mind-Body Problem

- Asks how the mind (including mental states) relates to the physical body and brain.
- Explores whether mental phenomena are distinct entities separate from physical processes or if they can be explained as part of these physical properties.

# Cartesian Dualism / Substance Dualism

- Named after Rene Descartes (17<sup>th</sup>-century French philosopher).
- Argues that the mind and body are fundamentally distinct entities.
- Descartes made several arguments of the form:
  - Minds can \_\_\_\_\_.
  - No physical object can \_\_\_\_\_.
  - Therefore, minds are not physical objects.
- Example 1:
  - Minds can use language
  - No physical object can use language
  - Therefore, minds are not physical objects.

# Cartesian Dualism / Substance Dualism

- Example 2:
  - Minds can engage in reasoning.
  - No physical object can engage in reasoning.
  - Therefore, minds are not physical objects.
- Related example:
  - I can doubt that I have a body.
  - I cannot doubt that I exist. “Cogito ergo sum” or “I think, therefore I am”
  - Therefore, my mind is not my body.

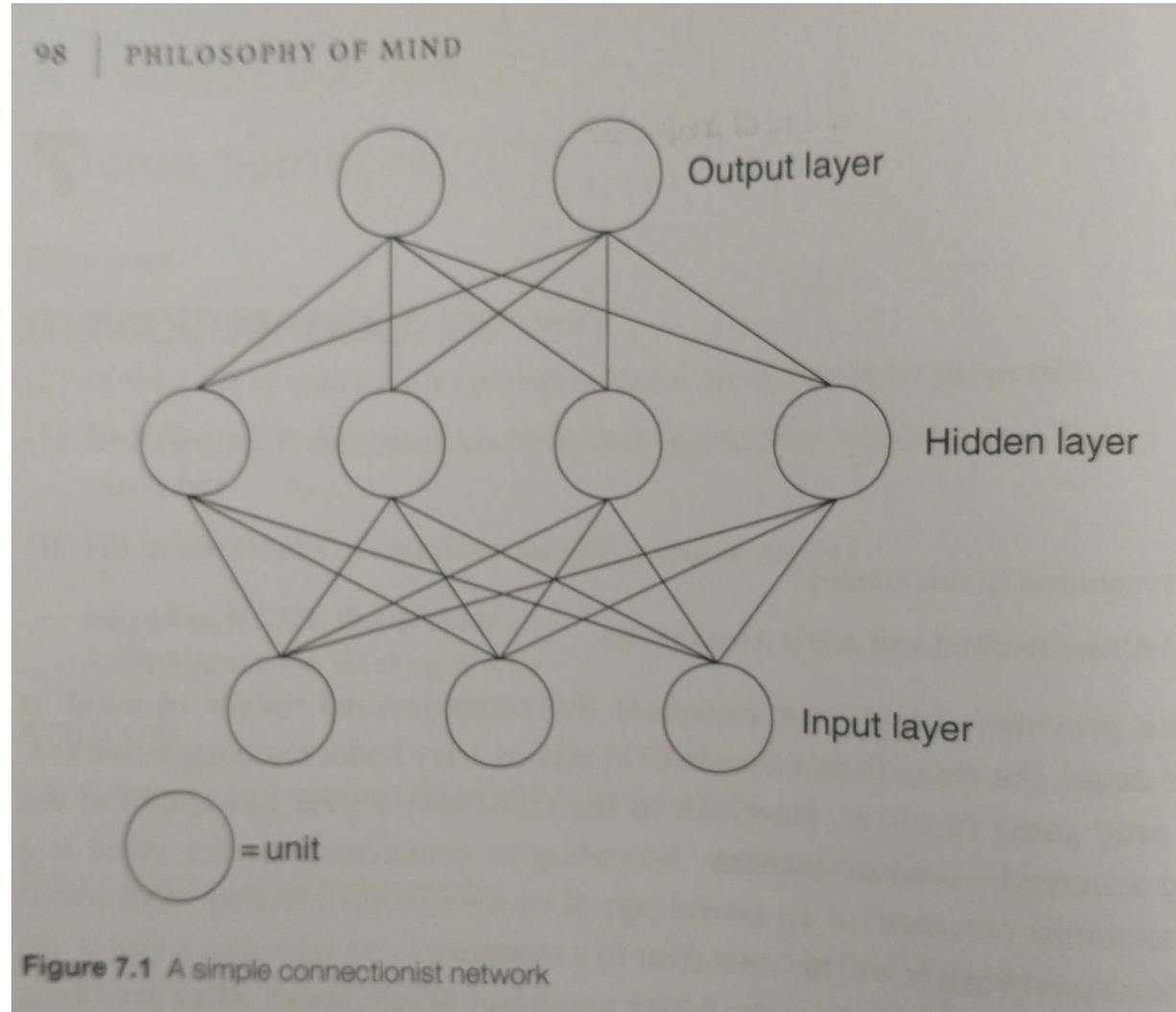
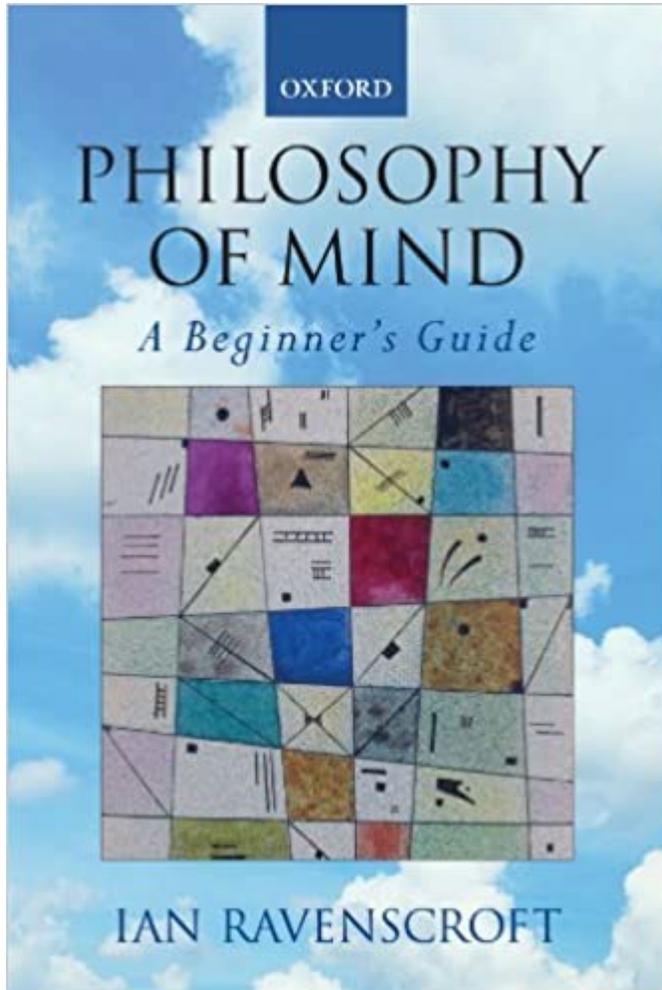
# Functionalism

- Views mental states in terms of their functional or role, rather than the substance they are made of or their internal composition or representation.
- What matters for a mental state like pain or desire is not what it is made of (brain state, computer circuit, something else) but the role it plays in the system it is part of.
- Allows for the possibility that different physical systems could have the same mental states if they perform the same function or have the same causal relationships.
  - Both a human brain and a computer could have the “state of pain” if they process information related to pain in a functionally similar way.

# Connectionism

- Philosophers noticed the development of **backpropagation** (recall: reverse mode automatic differentiation applied to fully-connected feed-forward artificial neural networks) and other methods for training artificial neural networks (ANNs) in the late 1970s and early 1980s.
- Mental phenomena could be understood in terms of networks of simple units connected by changing weights, which are modified through learning.
  - This challenged prior *symbolic* models of cognition that dominated cognitive science and psychology.
  - Symbolic models / computational theory of mind: Cognitive processes operate like a *digital* computer, processing discrete symbol-based representations through formal rules.

# A chapter devoted to connectionism!



This is another example of the clear impact that machine learning had on other fields.

# More on Philosophy of Mind

- Philosophy of mind is far too broad of a topic to give a full overview in this course.
  - Prof. Eleonore Neufeld often teaches an undergraduate course on philosophy of mind here at UMass!

