Chapter 4: Who, What, When, Where, Why
→ Reading/Mining/Discussion Assignment

Please ...

1. Read "Chapter 4: Who, What, When, Where, Why" of Melanie Mitchell's "Artificial Intelligence: A Guide for Thinking Humans" book.
2. With respect to the "25 Questions" presented for the "Chapter 4: Who, What, When, Where, Why" reading, construct a document containing 25 question/answer pairs, feeling free to simply lift answers, when appropriate, from Melanie Mitchell's text. Save your document as a **pdf** file.
3. Post your question/answer document to your Web worksite.
4. Do your best to internalize your twenty question/answer pairs in some sort of semantic sense, so that the answers are likely to come back to you when prompted by the questions.
5. Come to class for the discussion of "Chapter 4: Who, What, When, Where, Why," when the time rolls around, prepared to participate in the discussion.
6. Please do all of this within one week of the "distribution" of this assignment.

The Questions ...

1. Why do you think that Melanie Mitchell titled this chapter "Who, What, When, Where, Why?" Please do your best to articulate what you believe she was trying to convey with this title.

2. TRUE or FALSE: We humans perform vast amounts of information processing in hardly any time at all, and we have very little, if any, conscious awareness of what we're doing or how we do it.

3. What *ability* does Melanie Mitchell suggest would be one of the first things we would require for genarl human-level intelligence?

4. Describe the "object recognition" problem?

5. TRUE or FALSE: Object recognition is typically so immediate and effortless for us as humans that it didn't seem as though it would be a particularly hard problem for computers, until AI researchers actually tried to get computers to do it.

6. TRUE or FALSE: Prior to the deep-learning revolution, the major job of computer-vision researchers was to develop specialized image-processing algorithms that would identify "invariant features" of objects that could be used in their recognition.

7. TRUE or FALSE: The ability of machines to recognize objects in images and videos underwent a quantum leap in the 2010s due to advances in the area called deep learning.

8. TRUE or FALSE: The "traditional" multilayer neural networks were inspired by the brain, but their structure is very un-brain-like. In contrast, the neural networks dominating deep learning are directly modeled after discoveries in neuroscience.

9. In just a few sentences, say something about David Hubel and Torsten Wiesel, and their contribution to the topic of this chapter.

10. In just a few sentences, say something about Kunihiko Fukushima, and his contribution to the topic of this chapter.

11. In just a few sentences, say something about Yann LeCun, and his contribution to the topic of this chapter.

12. TRUE or FALSE: Like the neocognitron, the design of ConvNets is based on several key insights about the brain's visual system that were discovered by Hubel and Wiesel in the 1950s and 60s.

13. Layers in a traditional deep learning network consist of a list of simulated neurons (units). Not so with a convolutional neural network. Describe a layer in a convolutional neural network.

14. What do you think is the most salient similarity between object rectognition in the brain and in convolutional neural networks?

15. Describe the "receptive field" of a simulated neuron (unit) in a convolutional neural network.

16. How do you calculate the "convolution" associated with simulated neuron (unit) in a convolutional neural network.

17. TRUE or FALSE: An "activation map" in a convolutional neural network is constructed by computing the convolution for each simulated neuron (unit) in the map with respect to some "magically determined" feature. (For this question, think of magic as so many science fiction writers do, as "anything enabling actions beyond our current capability to understand them.")

18. What **analogy** does Melanie Mitchell explore in the text by way of illustrating the the ideas associated with "maps" in convolutional neural networks?

19. TRUE or FALSE: A convolutional neural network, like the brain, represents the visual scene as a collection of maps, each reflecting the specific "interests" of a set of feature detectors.

20. TRUE or FALSE: Determining the number of "layers" in a ConvNet and the number of "maps" in a layer of a ConvNet is part of the art of getting these complex networks to work for a given task.

21. Melanie Mitchell recalls I. J. Good's vision of a future "intelligence explosion" in which machines themselves create increasingly intelligent machines, and then proceeds to mention that with respect to convolutional neural networks we are not there yet. What do *you* think of the idea of using genetic algoroithms as an "AI vehicle" by which to get us there? That is, what do you thing of the possibility of employing a genetic algorithm to play the role of "ConvNet artist" in determining the architecture of a convolutional neural network to solve a particular problem?

22. Describe the "classification module" for a convolutional neural network.

23. Describe the process of **training** a convolutional neural network.

24. TRUE or FALSE: Even though convolutional neral networks are not constrained by a programmer to learn to detect any particular feature, when trained on large sets of real-world photographs, they indeed seem to learn a hierarchy of feature detectors similar to what Hubel and Wiesel found int the brain's visual system.

25. What concurrent technological revolution made possible the extraordinary ascent of convolutional neural networks from relative obscurity to near-complete dominance in machine vision?