Chapter 2: Neural Networks and the Ascent of Machine Learning → Reading/Mining/Discussion Assignment

Please ...

1. Read "Chapter 2: Neural Networks and the Ascent of Machine Learning" of Melanie Mitchell's "Artificial Intelligence: A Guide for Thinking Humans" book.
2. With respect to the "20 Questions" presented for the "Chapter 2: Neural Networks and the Ascent of Machine Learning" reading, construct a document containing 20 question/answer pairs, where the answers, with just a few exceptions (most notably with respect to the last question), are simply lifted 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 2: Neural Networks and the Ascent of Machine Learning," 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. TRUE or FALSE: Multilayer Neural networks – the extension of perceptrons that was dismissed by Minsky and Papert as likely to be "steril" – have instead turned out to form the foundation of much of modern artificial intelligence.

2. What is a *network*?

3. In very direct way, answer this question: How do you distinguish a *social* network, from a *computer* network from a *neural* network?

4. What does it mean for a unit of a multilayer neural network to be a *hidden unit*?

5. What phrase is used to designate a network that has more than one layer of hidden units?

6. What is the difference, **with respect to processing**, of each "unit" of a *perceptron* and each "unit" of a multilayered neural network?

7. Define the term "classification" with respect to a multilayered neural network.

8. How do most neural network researchers determine how many layers of hidden units are needed, or how many hidden units should be included in a layer, for a network to perform well on a given task?

9. In their book *Perceptrons*, Minsky and Papert were skeptical that a successful algorithm could be designed for learning the weights in a multilayer neural network. Their skepticism (along with doubts from others in the symbolic AI community) was largely responsible for the sharp decrease in funding for neural network research in the 1970s. But despite the chilling effect of Minsky and Papert's book on the field, a small core of neural network researchers persisted, especially in Frank Rosenblatt's own field of cognitive psychology. And by the late 1970s and early '80s, several of these groups had definitively rebutted Minsky and Papert's speculations on the "sterility" of multilayer neural networks by developing a general learning algorithm for training these networks. What is the name of this algorithm?

10. Describe, in just a few sentences, how the standard multilayer network learning algorithm works.

11. To what sorts of applications have neural networks been applied?

12. In the 1980s, the most visible group working on neural networks was a team at the University of California at San Diego headed by two psychologists. What were their names? What adjective (other than neural) did they use to refer to the networks which constituted the focus of their attention, and why did they use this qualifier? What was the name of the two-volume treatise that these researchers published in 1986?

13. TRUE or FALSE: Over the last six decades of AI research, people have repeatedly debated the relative advantages and disadvantages of symbolic and subsymbolic approaches.

14. Select the best answer: Symbolic systems ...

    (a) can be engineered by humans, be imbued with human knowledge, and use human-understandable reasoning to solve problems.

    (b) tend to be brittle, in that they are error-prone and often unable to generalize or adapt when presented with new situations.

    (c) both of the above.

15. In a relatively short paragraph, answer the question: What is MYCIN?

16. Select the best answer: Subsymbolic systems ...

    (a) tend to be hard to interpret, and no one knows how to directly program complex human knowledge or logic into these systems.

    (b) tend to be better than symbolic systems at perceptual or motor tasks for which humans can't easily define rules.

    (c) both of the above.

17. How did the philosopher Andy Clark characterize the nature of sybsymbolic systems?

18. TRUE or FALSE: Inspired by statistics and probability theory, AI researchers developed numerous algorithms that enable computers to learn from data, and the field of machine learning became its own independent subdiscipline of AI, intentionally separate from symbolic AI.

19. Fill in the blank: In rejecting symbolic AI methods, and hoping to lure others to reject them as well, machine

learning researchers disparagingly referred to symbolic AI as *BLANK*.

20. Identify a bit of knowledge presented in this chapter that you found to be particularly interesting, describe that bit of knowledge, and provide a few words pertaining to why you found the knowledge to be particularly interesting.