

Chapter 1: The Roots of Artificial Intelligence → Reading/Mining/Discussion Assignment

1. Most people in artificial intelligence trace the field's official founding to a small workshop in 1956 at Dartmouth College organized by a young mathematician. Who was this organizer?

- The organizer was John McCarthy.

2. Which of the following were outcomes of the Dartmouth conference?

- (a) The field itself was named.
 - (b) The general goals of the field were outlined.
 - (c) The soon-to-be "big four" pioneers of the field – McCarthy, Minsky, Allen Newell, and Herbert Simon – met and did some planning for the future.
 - (d) McCarthy, Minsky, Newell and Simon came out of the conference with tremendous optimism for the field.
 - (e) All of the above.
- (e) All of the above.

3. Who coined the phrase "suitcase word" for terms like intelligence and its many cousins, such as thinking, cognition, consciousness, and emotion – each of which is packed like a suitcase with a jumble of different meanings?

- Marvin Minsky coined the phrase.

4. True or False: Artificial Intelligence is a suitcase word.

- False

5. In a notable 2016 report on a study of the current state of AI being conducted at Stanford University (AI100, for short), a committee of prominent researchers:

- (a) Defined the field as "a branch of computer science that studies the properties of intelligence by synthesizing intelligence."
- (b) Admitted that it's hard to define the field, but suggested that may be a good thing: "The lack of a precise, universally accepted definition of AI probably has helped the field to grow, blossom, and advance at an ever-accelerating pace."
- (c) Noted that: "Practitioners, researchers, and developers of AI are instead guided by a rough

sense of direction and an imperative to 'get on with it.'"

(d) All of the above.

- (d) All of the above.

6. True or False: After observing that the diverse approaches to AI promoted at the Dartmouth conference (deductive reasoning, induction grounded in data, biologically inspired work) persist to this day, MM referenced an AI survey paper which suggested that: "Because we don't deeply understand intelligence or know how to produce general AI, rather than cutting off any avenues of exploration, to truly make progress we should embrace AI's 'anarchy of methods.'"

- True

7. True or False: Since the 2010s, one family of AI methods – collectively called deep learning (or deep neural networks) – has risen above the anarchy to become the dominant AI paradigm. In fact, in much of the popular media, the term artificial intelligence itself has come to mean "deep learning." This is an unfortunate inaccuracy. AI is a field that includes a broad set of approaches, with the goal of creating machines with intelligence. Deep learning is only one such approach. Deep learning is itself one method among many in the field of machine learning, a subfield of AI in which machines "learn" from data or from their own "experiences."

- True.

8. What is symbolic AI? Simply characterize symbolic AI by describing the essential nature of a symbolic AI program.

- It consists of words or phrases that are understood by humans and follows rules by which the program can combine and process these symbols in order to perform its assigned task.

9. True or False: The creators of the General Problem Solver, the cognitive scientists Herbert Simon and Allen Newell, had recorded several students "thinking out loud" while solving this ((Missionaries and Cannibals)) and other logic puzzles. Simon and Newell then designed their program to mimic what they believed were the students' thought processes.

- True.

10. How did GPS do its thing? That is, what was its procedure of operation?

- It would initialize the world of Missionaries and Cannibals with a current state of all the three missionaries, three cannibals and a boat being on the left bank. The desired state would have all 3 missionaries, 3 cannibals and a boat on the right bank. Then it would want to change its start every time by taking some missionaries and/or cannibals from one bank to another. Before making a move, it would look through the rules to check if the move was valid or if the balance of missionaries and cannibals was off where if there were more cannibals on a bank than missionaries then the problem would be forfeit because the cannibals would have eaten the missionaries.

11. Symbolic AI was originally inspired by mathematical logic as well as by the way people described their conscious thought processes. What, in contrast, inspired subsymbolic AI?

- It took inspiration from neuroscience and sought to capture the sometimes unconscious thought process underlying what some have called fast perception, such as recognizing faces or identifying spoken words.

12. How does MM characterize a subsymbolic AI program?

- It is a stack of equations – a thicket of often hard-to-interpret operations on numbers.

13. True or False: The perceptron was an early example of a subsymbolic, brain-inspired AI program, was an important milestone in AI, and was the influential great-grandparent of modern AI's most successful tool, deep neural networks.

- True.

14. A perceptron is a simple program that makes a yes-or-no (1 or 0) decision based on whether the sum of its weighted inputs meets a threshold value. What real life example is provided in the text as an analog the inner workings of a perceptron?

- You might get input from several friends on how much they liked a particular movie, but you trust some of those friends' taste in movies more than others.' If the total amount of 'friend enthusiasm' – giving more weight to your more trusted friends- is high enough, you decide to go to the movie.

15. What example of visual perception via perceptron is explored in the pages of this chapter?

- The example was a perceptron that would scan a number that was drawn and determine if it was an 8 or not an 8 depending on the signature of the ink markings.

16. All of the “knowledge” of a perceptron is encoded in the numbers making up its weights and threshold. How did Rosenblatt suggest that these numbers be determined? He proposed that the perceptron should learn these values on its own. Please elaborate on this, telling a story that involves behavioral psychology and supervised learning.

- By taking a 32 x 32 grid and putting the number in the grid. Each square would have a weight to it and if the program got the number wrong the weight would be adjusted for the inaccuracies it had to make it easier for the program to get the input right. When you join the military and go to basic training you have your own thoughts and feelings. During the training you are broken down mentally, physically, and emotionally. After the first phase of training, usually 3 weeks, you are then being reshaped into the image of what the military believes would be a person of many skills in the art of combat. Here you are rewarded with extra physical training if someone in the group did something that was out of line. If this did not happen the extra training would not have been given. This is an example of supervised learning as well. From the Drill Sergeants perspective they are training the recruits for things they will perhaps encounter in the field. So they are strict with punishments to recalibrate the unit for everybody to work as a unit.

17. What was Frank Rosenblatt’s primary contribution to AI? (Please be more specific than to simply answer “the perceptron.”)

- Frank Rosenblatt’s primary contributions was a specific algorithm. The perceptron-learning algorithm trained from examples to determine weights and threshold that would produce correct answers.

18. Please REACT in two or three sentences to the following rather long passage that I have lifted from the text. “One might make a rough analogy between perceptrons and the human brain. If I could open up your head and watch some subset of your hundred billion neurons firing, I would likely not get any insight into what you were thinking or the ‘rules’ you used to make a particular decision. However, the human brain has given rise to language, which allows you to use symbols (words and phrases) to tell me – often imperfectly – what your thoughts are about or why you did a certain thing. In this sense, our neural firings can be considered subsymbolic, in that they underlie the symbols our

brains somehow create. Perceptrons, as well as more complicated networks of simulated neurons, have been dubbed 'subsymbolic' in analogy to the brain. Their advocates believe that to achieve artificial intelligence, language-like symbols and the rules that govern symbol processing cannot be programmed directly, as was done in the General Problem Solver, but must emerge from neurallike architectures similar to the way that intelligent symbol processing emerges from the brain."

- With many things in the Artificial Intelligence, the ideas we have about it are always compared with what is in the physical world. AI is only as smart as it is made to be but the more understanding we learn about ourselves the closer we can replicate what is going on within our brains. This leads to only being able to make a program do what we tell it to still until it can learn to write code itself and process why it is necessary.

19. True or False: It wasn't Minsky and Papert's mathematics that put the final nail in the perceptron's coffin; rather, it was their speculation on multilayer neural networks: "[The perceptron] has many features to attract attention: its linearity; its intriguing learning theorem; its clear paradigmatic simplicity as a kind of parallel computation. There is no reason to suppose that any of these virtues carry over to the many-layered version. Nevertheless, we consider it to be an important research problem to elucidate (or reject) our intuitive judgment that the extension is sterile."

- True

20. Who said "in general, we're least aware of what our minds do best" in support of his admonition that "easy things" for humans "are hard" for machines, and in focusing on this paradox illuminated the fact that the attempt to create AI has, at the very least, helped to elucidate how complex and subtle are our own minds?

- Marvin Minsky.