

# Reading Assignment from Melanie Mitchell's "Artificial Intelligence: A Guide for Thinking Humans"

## Assignment by Carrie Corcoran

### Chapter 10: Beyond Games

1. TRUE/FALSE - Over the past decade, reinforcement learning has transformed from a relatively obscure branch of AI to one of the field's most exciting (and heavily funded) approaches.

True

2. TRUE/FALSE - Developing superhuman game-playing programs is, for most AI researchers, an end in and of itself.

False

3. MM quotes him as saying: "Games are just our development platform .... It's the fastest way to develop these AI algorithms and test them, but ultimately we want to use them so they apply to real-world problems and have a huge impact on things like healthcare and science. The whole point is that it's general AI—it's learning how to do things based on its own experience and its own data."

Who is he?

Demis Hassabis

4. TRUE/FALSE - In stark contrast with humans, most "learning" in current-day AI is not transferable between related tasks. In this regard, the field is still far from what Hassabis calls "general AI." While the topic of transfer learning is one of the most active areas of research for machine-learning practitioners, progress on this front is still nascent.

True

5. TRUE/FALSE - The results of AlphaGo Zero comprehensively demonstrate that a pure reinforcement learning approach is fully feasible, even in the most challenging of domains: it is possible to train to superhuman level, without human examples or guidance, given no knowledge of the domain beyond basic rules.

False

6. In just a sentence or two, defend your answer to the previous question.

Reinforcement learning is not feasible in many real world situations. In game playing, all the variables are known, including the desired outcome. This does not translate well universally.

7. TRUE/FALSE - Many things we humans consider quite easy are extremely challenging for computers. Conversely, many things we humans would find terrifically challenging, computers can do in a split second with a one-line program.

True

8. TRUE/FALSE - A corollary to the proposition presented in the previous question is that the question of what is considered to be a “most challenging domain” is not universally well-defined.

True

9. What example did psychologist and AI researcher Gary Marcus propose as a human game that would prove to be significantly more challenging for an AI than the game of Go, because it requires sophisticated visual, linguistic, and social understanding far beyond the abilities of any current AI system.

Charades

10. TRUE/FALSE - Deep Q-learning systems have achieved superhuman performance in some narrow domains, but they are lacking something absolutely fundamental to human intelligence. Whether it is called abstraction, domain generalization, or transfer learning, imbuing systems with this ability is still one of AI’s most important open problems.

True

11. Provide two lines of evidence that support the conclusion that deep Q-learning systems (sophisticated reinforcement learning systems), like supervised-learning systems, do not learn humanlike concepts or come to understand their domains in the ways that humans do.

When playing Breakout, the system doesn’t actually understand the concepts of “paddle” or “wall”. Likewise, knowledge from one game doesn’t translate well to another, even if the games are very similar such as pong and breakout.

12. TRUE/FALSE - For humans, a crucial part of intelligence is, rather than being able to learn any particular skill, being able to learn to think and to then apply our thinking flexibly to whatever situations or challenges we encounter.

True

13. Other than differences in machine/human architecture or machine/human substrate, what do you think is the most essential difference between how deep Q-learning systems learn to play games like checkers, chess, and Go, and the way that humans learn to play games like checkers, chess, and Go.

Humans are able to learn from their experience playing different games, such as checkers knowledge helping to learn chess. Machines have no such ability.

14. TRUE/FALSE - Deep reinforcement learning was named one of 2017's "10 Breakthrough Technologies" by MIT's Technology Review magazine.

True

15. What does MM have to say about Demis Hassabis's statement that the ultimate goal of DeepMind's work on reinforcement learning AI system is to "use them so they apply to real-world problems and have a huge impact on things like healthcare and science."?

MM believes that it's possible for this to one day be the case, but there's a long way to go still.

16. The need for transfer learning is one obstacle to achieving Hassabis's goal of applying the AI methods championed by DeepMind to real world problems. What is another significant impediment?

Real life situations offer a great deal more complexity than game playing.

17. What chore does MM use to illustrate the problems involved in using deep Q-learning to train a robot to do a real world task?

Loading the dishwasher

18. What does Andrej Karpathy, Tesla's director of AI, have to say about applying deep Q-learning to real-world tasks?

He says that every strategy AlphaGo learns would be violated by real-world tasks, and any successful approach would look extremely different.