Alex Iacob

Prof. Borrelli

CSCI 331 Section 1

June 2, 2021

Homework 1

1) *Describe and explain the difference between*

a) Strong and Weak AI

Strong AI is the view that any sufficiently programmed computer can be intelligent and conscious. These versions of AI would be able to think the same way that a human would, and examples of such are what is currently represented in modern-day sci-fi. Weak AI is the strict use of methods which is modeled on intelligent behavior that prioritizes efficiency.

b) Strong and Weak methods

Weak methods are approaches to a problem that applies inadequate information about the problem domain. An example of such weak methods includes having general methods meant to solve broader classes of problems. Stronger methods stray from the general solution to create more specific solutions for more specific situations.

c) Neats and Scruffies

Neats believe that AI theories should be rooted in mathematical rigor and strive for an elegant solution. An example of such is the GPS. Scruffies are those who would instead rely on trial and error, then assess the best solution pragmatically. An example of such is the HCI.

2) *Many of the computational models of cognitive activities that have been proposed involve quite complex mathematical operations, such as convolving an image with a Gaussian or finding a minimum of the entropy function. Most human (and certainly all animals) never learn this kind of mathematics at all, almost no one learns it before college, and almost no one can compute the convolution of a function with a Gaussian in their head. What sense does it make to say that the "vision system" is doing this kind of mathematics, whereas the actual person has no idea how to do it?*

Computer vision operations rely on a vast amount of mathematics and complex equations to perform any task involving identifying an object in an image. However, humans can make this identification innately without considering any degree of mathematics or complex equations.

3) *"Surely computers cannot be intelligent — they can only do what their programmers tell them." Is the latter statement true, and does it imply the former?*

The latter statement is true because programmers must program computers. However, this all depends on what we consider to be intelligent. If the program is fed information from models, the computer might try to do something that the programmer did not explicitly tell it to do.

4) *"Surely animals cannot be intelligent — they can only do what their genes tell them." Is the latter statement true, and does it imply the former?*

The latter statement is true because its genetics determines the animal's behavior and nature. However, animals also must interact with their environment to survive. This

form of adaptive behavior results from the animal's genetic programming; however, this does not mean that this genetic programming is intelligent. Animals can be intelligent to a degree by their genes to be intelligent.

5) *Briefly describe the issue of intractability (NP-completeness, or "difficult" computational problems) as related to Artificial Intelligence.*

Intractability implies that the given problem is very difficult to manage or control. In AI, problems like these would make the solution overly complicated and likely require the programmer to put in more effort than necessary to reach the solution. There are ways to lessen this negative quality to make the solutions more reasonably solved.

6) *List and describe at least five techniques that can be used to cope with intractability (they do not have to be AI techniques per se) and for each technique, explain the advantages and disadvantages of the approach.*

- **Brute Force:** this tries to solve the problem by using every possible solution. The advantage of using brute force is that a solution is guaranteed. The disadvantage is that this requires large amounts of computing to solve.
- **Restrict the Problem:** this narrows down the problem domain so that only a smaller amount of inputs must be considered. The advantage of using this technique is that this works well for more minor problems. The disadvantage of this technique is that it does not scale for more significant problems.

- **Heuristic:** this allows brute force to be applied in a more reasonable amount of time. The advantage of this technique is that it is faster than brute force under certain conditions. The disadvantage is that this does not guarantee a solution.
- **Randomization:** this uses pure randomness to attain a solution. The advantage is that the answer could be found immediately (by chance). The disadvantage is that the solution time is unknown and could theoretically take longer than brute force.
- **Approximation:** this uses an approximation method to find a solution that is "close enough." The advantage of this is that the solution range has broadened and could be found quicker. The disadvantage of this is that the solution you get might not be accurate enough.

7) *Describe the "Turing Test" for intelligence.*

The Turing Test for intelligence is a test in which a machine is tested to appear indistinguishable from a human to an experimenter. In this test, the standard view of intelligence is shown by maintaining communication between humans and machines. Also, various aspects of the test can be run independently from each other; the only element which must remain is the act of the interrogator determining the computer versus the human.

8) *I.J. Good (and others) make the claim that intelligence is the most important quality, and that building ultra-intelligent machines will change everything. A sentient cheetah counters that "Actually speed is more important; if we could build ultrafast machines,*

that would change everything," and a sentient elephant claims "You're both wrong; what we need is ultrastrong machines." What do you think of these arguments?

As for each of these arguments, each can be made reasonable via their own argument. As for my own opinion, considering the claim that intelligence is the most essential quality, ultra-intelligent machines can allow ultra-strong and fast machines to be made afterward. However, if either of the other two is made before ultra-intelligent machines, then there will be a significant period of time before the ultra-intelligent machines are created.

9) *Some critics object that AI is impossible, while others object that it is inevitable and that ultra-intelligent machines pose a threat. Which of these objections do you think is more likely? Would it be a contradiction for someone to hold both positions?*

Of these two objections, I believe that the development of AI is inevitable. As we progress, the more complicated issues arise that can be solved with various degrees of AI. With this increasing problem complexities, the closer ultra-intelligent machines are to reality. Although this has been commonly depicted in Sci-Fi movies as ultra-intelligent machines begin to have a mind of their own, this does not seem feasible. Holding both positions would only contradict depending on how the person defines AI. If the person views AI as strictly a benefit, then they would not view the ultra-intelligent machines as a threat. However, if the person views AI as strictly a drawback, then they would agree that beneficial AI is impossible and that the threat that ultra-intelligent machines will bringwill be inevitable.