

Unit 9

Question 1

[5 marks] Suppose the eight-puzzle was extended to a four-by-four tray containing 11 tiles with the solved puzzle appearing as below.

```
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15
```

What problem would occur if our heuristic search (using the-number-of-tiles-out-of-place) was applied to solve the puzzle start from the configuration below? How could that problem be overcome?

```
1 11 15 12
5 6 7 8
9 10 2 3
13 14 4
```

In using a heuristic search a value for the next possible positions is calculated and the state that has the lowest value is selected. The algorithm used in the text chooses the leftmost leaf node with the smallest heuristic value. The next three possible moves result in the same heuristic value. If this algorithm goes with the leftmost option that could mean 14 will moved one space to the right. If this is done, the algorithm will then determine 14 ought to be moved one space left. The program will become stuck in a loop. This problem could be overcome by altering the algorithm. You could change the algorithm so that when it thinks to repeat a move it has already attempted; it instead tries one of the other 2 moves. If it tries a different move it has a chance of reaching the solution instead of becoming stuck.

Question 2

[2 marks] How does the process of “programming” an artificial neural network differ from the traditional programming process?

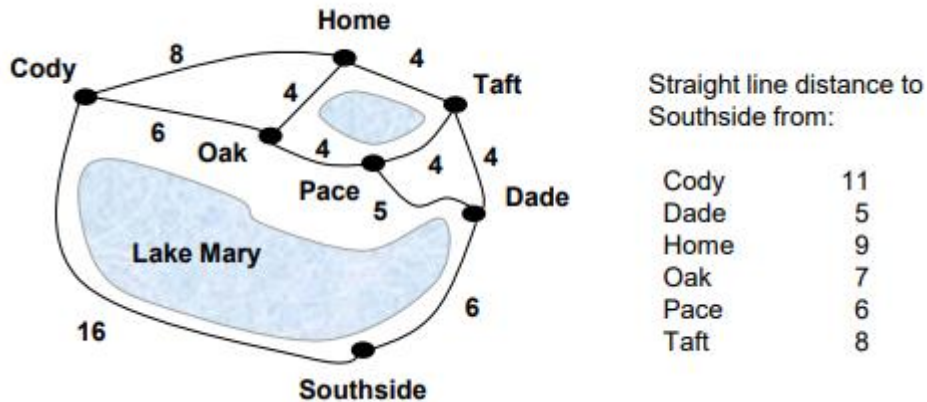
In the traditional programming process, one would create code and algorithms to make a program. However, for artificial neural networks you cannot program them. Rather one must train them. The programmer doesn't determine the values needed to solve a problem but instead the artificial neural network undergoes repetitive processes called supervised training. In supervised training the neural network it put through tests and then its values are adjusted incrementally until the desired goal is reached.

Question 3

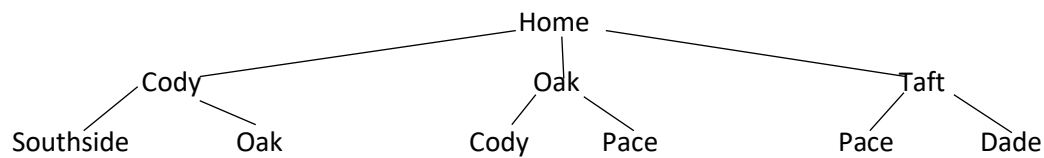
[3 marks] When trying to understand a natural language, what are the distinctions between syntactic analysis, semantic analysis, and contextual analysis?

Syntactic analysis is all about parsing. It goes through the process of analyzing group of symbols into its parts. For example, in syntactic analysis the subject of a sentence would be discovered. Semantic analysis discovers the grammatical role of any given word. It finds things like the object, action, and the thing doing the action. Contextual analysis is all about going through the understanding process. Through contextual analysis the context of a sentence is observed and its true meaning is derived.

Question 4
[10 marks] For the following map:

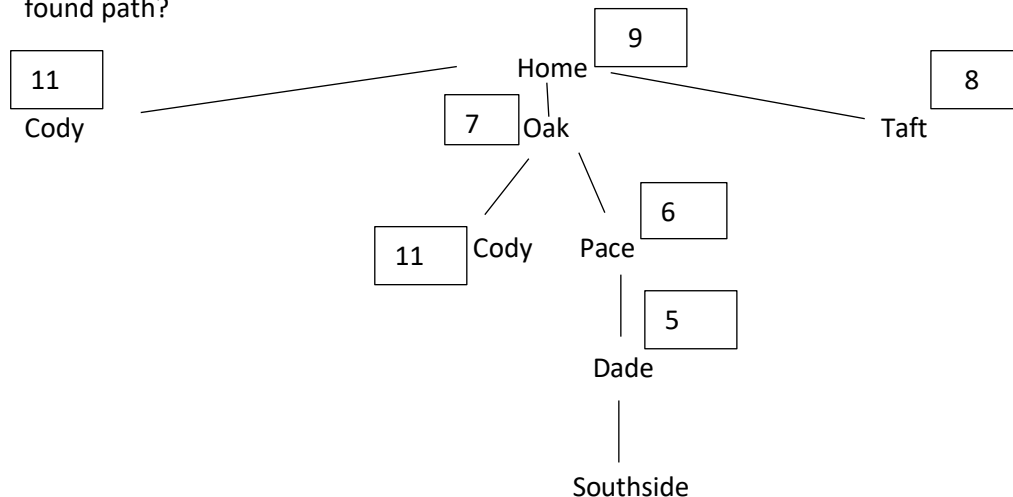


- A. Draw the search tree generated by a breadth-first search in finding a path from home to Southside. What is the found path?



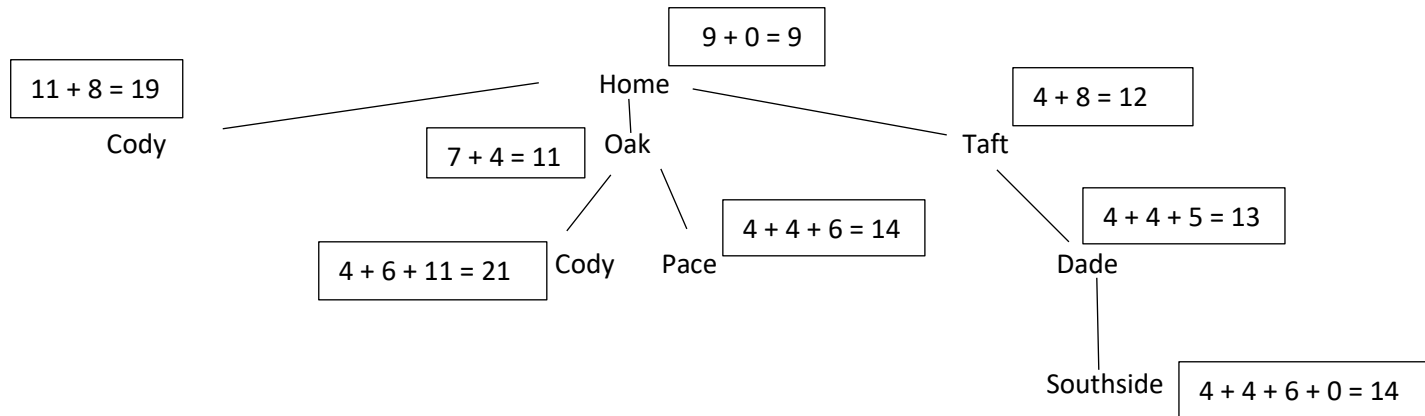
The goal state occurs in the last level of the search tree and since Southside has already been observed by the third level the found path is Home -> Cody -> Southside.

- B. Draw the search tree generated by a best-fit search in finding a path from Home to Southside assuming that "the straight-line distance to Southside" were used as the heuristic. What is the found path?



This type of tree explores the path of least value. The found path to Southside is Home -> Oak -> Pace -> Dade -> Southside.

- C. Draw the search tree generated by the A* algorithm in finding the path from Home to Southside assuming that “the straight-line distance to Southside” were used as the heuristic. What is the found path?



The A* algorithm chooses a path based on the estimated total cost of travel. In this case the found path is Home -> Taft -> Dade -> Southside.