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CSC 180-01

Final Exam

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Question #1

1. False
2. True
3. True
4. False
5. True
6. True
7. False
8. True
9. True
10. False

Question #2

- Batch Size: The number of samples per update (default 32)
- Step/Iteration: At each step/iteration a single batch has been processed.
- Epoch: At each epoch, The entire training set was passed over once.

Question #3

- The output will be a 2x2 image

4	3
2	4

$$1 + 1 + 1 + 1 = 4$$

$$1 + 1 + 1 = 3$$

$$1 + 1 = 2$$

$$1 + 1 + 1 + 1 = 4$$

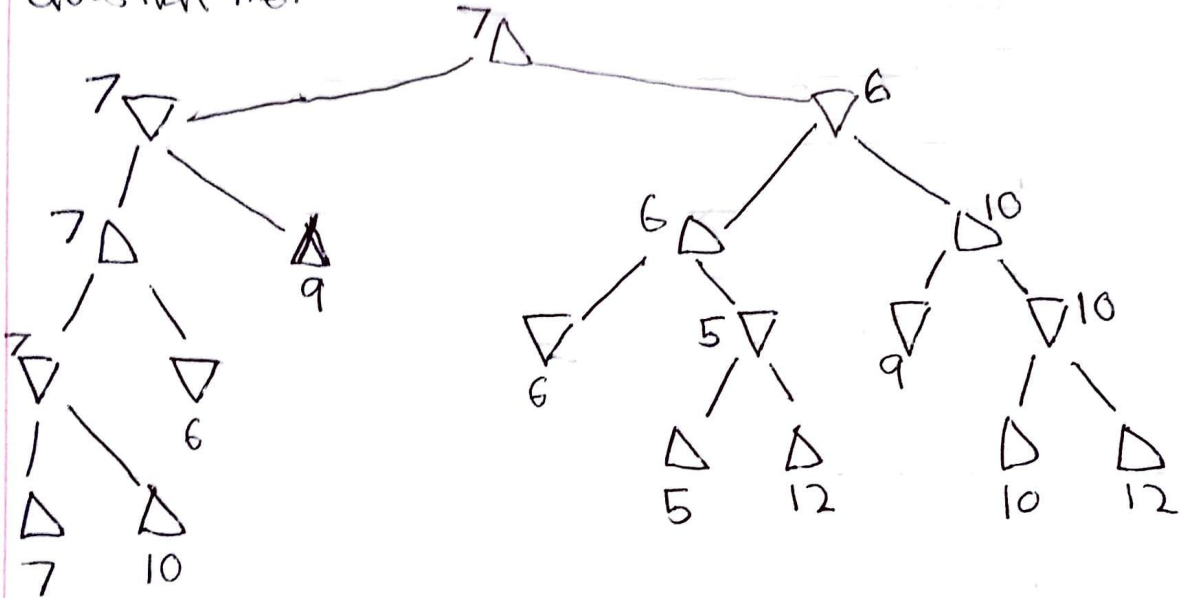
Question #4

1. Dijkstra: Orders all nodes by their $G(N)$ values or distance travelled.
2. Greedy: Orders all nodes by their $H(N)$ values or distance remaining. Neither complete nor optimal.
3. A^* : Balances the above, using $F(N) = G(N) + H(N)$ to order all nodes. Complete & optimal if heuristic is admissible.

Question #5

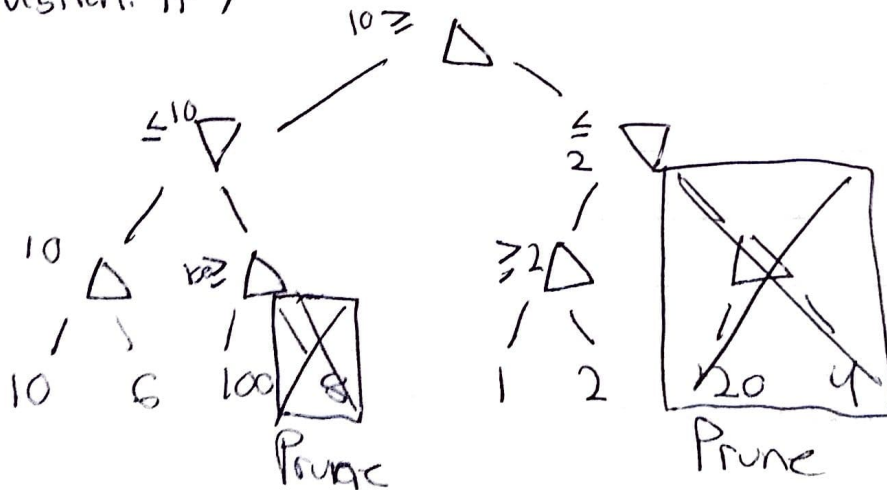
- a. ~~BFS~~ BFS: $A \rightarrow D$
- b. DFS: $A \rightarrow B \rightarrow F$
- c. Greedy: $A \rightarrow D$
- d. A^* : $A \rightarrow C \rightarrow G$

Question #6:



Action: The root node will choose the left action (child) as it guarantees a greater reward.

Question: # 7



Question #8

1. $10_{10} \rightarrow 1010_2$

1

$$1+0=1$$

$$0+1=1$$

$$1+0=1$$

1111

2. $15_{10} \rightarrow 1111$

1

$$1+1=0$$

$$1+1=0$$

$$1+1=0$$

1000

Question #9

$$3. P(A, B, C) = P(A)P(B|A)P(C|A, B)$$

Question #10

1. $P(W=\text{Sun} | T=\text{hot})$

$$= P(W=\text{Sun}, T=\text{hot}) / P(T=\text{hot})$$

$$= 0.4 / (0.4 + 0.1) = 0.8$$

2. $P(W=\text{Sun} | T=\text{cold})$

$$= P(W=\text{Sun}, T=\text{cold}) / P(T=\text{cold})$$

$$= 0.2 / (0.2 + 0.3) = 0.4$$

Question #11

1. Who are young or tall persons? (Union)

$$A \cup B = \left\{ \frac{0.4}{\text{Alice}} + \frac{0.6}{\text{Bob}} + \frac{0.9}{\text{Charles}} + \frac{1.0}{\text{Eric}} + \frac{1.0}{\text{William}} \right\}$$

2. Who are the young & tall persons? (Intersection)

$$A \cap B = \left\{ \frac{0.3}{\text{Alice}} + \frac{0.5}{\text{Bob}} + \frac{0.8}{\text{Charles}} + \frac{0.6}{\text{Eric}} + \frac{0.9}{\text{William}} \right\}$$

3. Who are tall and old (Intersection & Complement)

$$\bar{A} = \left\{ \frac{0.6}{\text{Alice}} + \frac{0.4}{\text{Bob}} + \frac{0.2}{\text{Charles}} + \frac{0}{\text{Eric}} + \frac{0.1}{\text{Williams}} \right\}$$

$$\bar{A} \cap B = \left\{ \frac{0.3}{\text{Alice}} + \frac{0.4}{\text{Bob}} + \frac{0.2}{\text{Charles}} + \frac{0}{\text{Eric}} + \frac{0.1}{\text{Williams}} \right\}$$

Question #12:

1. Input shape (64, 64, 3) means that the model expects to receive an image of size 64x64 with 3 channels (RGB)

2. Early stopping is used to help prevent overfitting on our train data. This produces a more generalized model.

3. The shape should be: (10,000, 2)

4.

Error #1: The output layer should have 2 neurons since this is a classification problem with 2 classes

`cnm.add(Dense(1))` → `cnm.add(Dense(2))`

Error #2: The activation function for the output layer should be softmax

`cnm.add(Dense(2))` → `cnm.add(Dense(2, activation='softmax'))`

Error #3: The loss function should be "categorical_crossentropy"

`cnm.compile(loss='mean-squared-error', optimizer='adam')`

↓

`cnm.compile(loss='categorical_crossentropy', optimizer='adam')`