MGT802 Quiz: Neural Networks

October 29, 2024

Instructions

- Do not flip over this page or read the questions on the other side of this page until the start of class.
- Your quiz will be collected after ten minutes.
- Write your netid *clearly* at the top right.
- *Unless otherwise stated*, each question has one correct answer.
- Fill in the appropriate bubble below. I will grade nothing but these bubbles. If you need to change an answer please indicate your final answer clearly.
- If a question stinks, Kyle will fix it later. I will not answer questions during the quiz.
- This quiz is closed book, closed device. You can only use your own meat computer.
- When you're done, raise your hand and an instructor will collect it.

Answers

- 1. (A) (B) (C) (D) (E)
- 2. (A) (B) (C) (D) (E)
- 3. ABODE
- 4. (A) (B) (C) (D) (E)
- 5. ABODE
- 6. ABODE
- 7. (A) (B) (C) (D) (E)
- 8. (A) (B) (C) (D) (E)
- 9. (A) (B) (C) (D) (E)
- 10. (A) (B) (C) (D) (E)
- 11. (A) (B) (C) (D) (E)
- 12. ABODE
- 13. (A) (B) (C) (D) (E)

- 1. Activations in one layer of a neural network are
 - **A.** Based on a weighted sum of the activations in the previous layer
 - **B.** Randomly determined
 - **C.** Set by the developer who is creating the neural network
 - **D.** Independent of all the other layers in the neural network
- 2. In the 2Blue1Brown videos, the author's network for recongizing hand-written digits has about 13,000 parameters. These are *roughly...*
 - **A.** The number of neurons
 - **B.** The number of connections between neurons
 - **C.** The number of inputs
 - **D.** The number of outputs
- 3. What is the significance of the "weights" and "biases" in a neural network as discussed in the video?
 - **A.** Weights determine the pixel pattern a neuron is picking up on, and biases indicate how high the weighted sum needs to be before the neuron becomes meaningfully active.
 - **B.** Weights and biases are the types of neurons present in a neural network.
 - **C.** Biases are responsible for recognizing edges while weights recognize patterns.
 - **D.** Weights and biases are external inputs required to initiate the neural network.
- 4. What is the primary purpose of the sigmoid function in the neural network described in the video?
 - A. To detect edges in the image input.
 - **B.** To multiply the weighted sum of pixel values.
 - **C.** To squish the real number line into the range between 0 & 1 for neuron activation.
 - **D.** To increase the complexity of the network for better digit recognition.
- 5. Which of the following best describes gradient descent in the context of neural networks as discussed in the video?
 - **A.** A function with 784 inputs and 10 outputs defined in terms of all of the weighted sums.
 - **B.** A method to initialize all weights and biases randomly in the network.
 - **C.** A process of repeatedly nudging an input of a function by some multiple of the negative gradient to minimize a cost function.
 - **D.** A method to visualize the weights of the connections between neurons in different layers.
- 6. What is the primary purpose of a cost or "loss" function in a neural network as described in the video?
 - **A.** To initialize the weights and biases of the network.
 - **B.** To visualize the transitions from one layer of neurons to the next.
 - **C.** To provide a measure of how well the network is performing based on training examples.
 - **D.** To categorize the output into one of the 10 digits.
- 7. According to the video, why is the concept of gradient descent crucial in the training of neural networks?
 - **A.** It allows the network to memorize the training data perfectly.

- **B.** It facilitates the minimization of a cost function to improve the network's performance.
- **C.** It randomly initializes the weights and biases to start the training process.
- **D.** It helps in visualizing the weights between different layers of neurons.
- 8. If $f(x) = (2x+3)^5$, find f'(x) using the chain rule.
 - **A.** $(2x+3)^5$
 - **B.** $2(2x+3)^4$
 - C. $10(2x+3)^4$
 - **D.** $5(2x+3)^4$
- 9. Imagine *A* is a 2x3 matrix and *B* is a 3x5 matrix. What are the dimensions of *AB*?
 - **A.** 3x3
 - **B.** 2x5
 - C. 3x5
 - **D.** 5x2
 - **E.** 5x3
- 10. How does backpropagation use individual training examples to adjust the weights and biases in a neural network?
 - **A.** By computing how each training example would like to nudge the weights and biases, then averaging these desired changes across all examples.
 - **B.** By randomly shuffling the training examples and selecting one to adjust the weights and biases.
 - **C.** By directly modifying the activations of neurons based on each training example.
 - **D.** By creating new layers in the network based on the complexity of each training example.
- 11. What is the purpose of using mini-batches in the context of stochastic gradient descent as explained in the video?
 - **A.** To ensure that the network converges to a global minimum of the cost function.
 - **B.** To increase the accuracy of the gradient calculation by considering all training examples.
 - **C.** To take steps according to a subset of training data, providing a good approximation of the gradient while speeding up computation.
 - **D.** To create a new cost function based on subdivided data.
- 12. The videos suggests that when adding more neurons to each layer of the network, what primarily changes in the backpropagation calculus?
 - **A.** The fundamental equations of backpropagation change.
 - **B.** More indices are introduced to keep track of various neurons within a layer.
 - **C.** The chain rule no longer applies in the same way.
- 13. What is the meaning of life?
 - **A.** 42
 - **B.** programming
 - C. machine learning

Answer Key

1	A
2	В
3	A
4	С
5	С
6	С
7	В
8	С
9	В
10	A
11	С
12	В
13	A, B, C