

MGT802 Quiz: Neural Networks

October 27, 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. ☐ A ☐ B ☐ C ☐ D ☐ E
4. ☐ A ☐ B ☐ C ☐ D ☐ E
5. ☐ A ☐ B ☐ C ☐ D ☐ E
6. ☐ A ☐ B ☐ C ☐ D ☐ E
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. ☐ A ☐ B ☐ C ☐ D ☐ E
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 recognizing 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 2×3 matrix and B is a 3×5 matrix. What are the dimensions of AB ?
 - A. 3×3
 - B. 2×5
 - C. 3×5
 - D. 5×2
 - E. 5×3
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	B
3	A
4	C
5	C
6	C
7	B
8	C
9	B
10	A
11	C
12	B
13	A, B, C