# Test 1 Suggested Questions

``Describe the method for gradient descent used to determine weights

that minimize error?''

1. What is linear regression and how is it applied in machine

learning.

2. Linear Unit Function VS Sigmoid Function.

## Fill in the blank (6)

1. Although there are formulas we can solve to find the optimal weights for \_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_ models, we must use \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_ to find the optimal weights for \_\_\_\_\_\_\_\_\_. (Solution: linear, polynomial, gradient descent, neural nets)
2. If the machine is complex (has thousands of weights), it will likely be \_\_\_\_\_\_\_\_\_fitting. If the machine is not complex enough to model the data, it will likely be \_\_\_\_\_\_\_\_\_fitting. (Solution: over, under)

## Short Answer:

Steps of Supervised Machine Learning to Process an Image.

Fill in the blank and put the statements in the right order.

1. Machine’s answers are plotted against the \_\_\_\_\_\_\_\_\_\_\_\_ answers Yd.
2. Y is determined by choosing the most \_\_\_\_\_\_\_\_\_\_\_\_ solution. Y is the machine’s best \_\_\_\_\_\_\_\_\_\_\_\_ to the training data.
3. Machine calculates z by \_\_\_\_\_\_\_\_\_\_\_\_ each \_\_\_\_\_\_\_\_\_\_\_\_ multiplied by each input vector element
4. The machine computes the probability of each possible solution occurring.
5. <fill in>
6. Fix/set the \_\_\_\_\_\_\_\_\_\_\_\_
7. Feed the \_\_\_\_\_\_\_\_\_\_\_\_ the new \_\_\_\_\_\_\_\_\_\_\_\_ without any answers.
8. Take the difference between the \_\_\_\_\_\_\_\_\_\_\_\_ answer and the \_\_\_\_\_\_\_\_\_\_\_\_’s answer, and \_\_\_\_\_\_\_\_\_\_\_\_ it.
9. \_\_\_\_\_\_\_\_\_\_\_\_ (Sigmoid) function is applied on z (or more recently, the \_\_\_\_\_\_\_\_\_\_\_\_(rectifier) function) to convert data to a curve continuous between (\_\_\_\_\_\_\_\_\_\_\_\_ , \_\_\_\_\_\_\_\_\_\_\_\_) .
10. Sum the \_\_\_\_\_\_\_\_\_\_\_\_ of all of the training data to find the \_\_\_\_\_\_\_\_\_\_\_\_ function.
11. Machine chooses arbitrary \_\_\_\_\_\_\_\_\_\_\_\_ for each pixel’s image, signifying the pixel’s importance.
12. Apply the minimization function ArgMin to find the \_\_\_\_\_\_\_\_\_\_\_\_ that minimize error
13. Give new input to the machine. This is called \_\_\_\_\_\_\_\_\_\_\_\_ data.

### Solution:

What are the steps of Supervised Machine Learning to process an image?

1. Give \_\_\_\_\_\_\_\_\_\_\_\_(training) input to the machine
2. Machine chooses arbitrary \_\_\_\_\_\_\_\_\_\_\_\_ (weight) for each pixel’s image, signifying the pixel’s importance.
3. Machine calculates z by \_\_\_\_\_\_\_\_\_\_\_\_ (summing over) each \_\_\_\_\_\_\_\_\_\_\_\_ (weight) multiplied by each input vector element
4. \_\_\_\_\_\_\_\_\_\_\_\_ (Sigmoid) function is applied on z (or more recently, the \_\_\_\_\_\_\_\_\_\_\_\_(rectifier) function) to convert data to a curve continuous between \_\_\_\_\_\_\_\_\_\_\_\_ (0) and \_\_\_\_\_\_\_\_\_\_\_\_ (1)
5. The machine computes the probability of each possible solution occurring
6. <fill in>
7. Y is determined by choosing the most \_\_\_\_\_\_\_\_\_\_\_\_ (probable) solution. Y is the machine’s best \_\_\_\_\_\_\_\_\_\_\_\_ (answer/guess) to the training data
8. Machine’s answers are plotted against the \_\_\_\_\_\_\_\_\_\_\_\_ ( supervisor’s) answers Yd.
9. Take the difference between the \_\_\_\_\_\_\_\_\_\_\_\_ (supervisor’s) answer and the \_\_\_\_\_\_\_\_\_\_\_\_’s ( machine’s) answer, and \_\_\_\_\_\_\_\_\_\_\_\_ (square) it.
10. Sum the \_\_\_\_\_\_\_\_\_\_\_\_ (errors) of all of the training data to find the \_\_\_\_\_\_\_\_\_\_\_\_ (Error) function.
11. Apply the minimization function ArgMin to find the \_\_\_\_\_\_\_\_\_\_\_\_ (weights) that minimize error
12. Fix/set the \_\_\_\_\_\_\_\_\_\_\_\_ (weights)
13. Give new input to the machine. This is called \_\_\_\_\_\_\_\_\_\_\_\_ (general)data.

2. Explain why the error is squared in the error function (2):

E(w) = ∑d = 1...D (yd - Mw(Xd))2

* To punish big errors even more
* To make error values positive without worrying about absolute value math

3. Label and draw on the graph the error of data point Xd

Error of one point = yd - Mw(Xd)



4. What does this equation mean?:

m = (epsilon)D

The number of incorrect answers expected is equal to: a very very small portion relative to the number of training datas.

5. What two values does a weight w depend on?

W i,j

The two nodes it’s connecting together

6. What is the benefits of applying the sigmoid function to z (compared to the threshold function)

* It’s differentiable for any value of z

7. What is the benefits of applying the sigmoid function to z (compared to the rectifier function)

* Derivative of the rectifier function is often zero, whereas the sigmoid function is nicely differentiable.

8. Given the following set of Md,i What is the photo I likely of?

Md,1 = 0.02 cat

Md,2 = 0.60 face

Md,3 = 0.35 dog

Md,4 = 0.03 car

Face

## True/False

If false, explain why.

1. Error can be calculated for general (new) data
   1. F, there is no supervisors answer to compare to
2. We choose a weight based on: w = ArgMinw E(w) + Complexity(Mw) Because we want the machine to minimize the error and be as complex as possible.
   1. F, we want the machine to minimize the error but be simple as possible