

1

Multiple Choice 1 point

How many parameters are needed to fully specify a Gaussian distribution?

- ☐ 1
- ☒ 2
- ☐ 3
- ☐ 5

$\mu, \sigma$

2

Multiple Choice 1 point

Given a statistical model and some observations, which of the following is NOT consistent with following the **maximum likelihood principle** as a way to select the model parameters?

- ☐ Maximize the probability of observations under the model parameters
- ☐ Maximize the logarithm of the probability of observations under the model parameters
- ☒ Minimize the logarithm of the probability of observations under the model parameters
- ☐ Minimize the negative logarithm of the probability of observations under the model parameters

maximize:  $p, \ln p$

minimize:  $-p, -\ln p$

3

Multiple Choice 1 point

In a linear model setup with Gaussian errors, maximum likelihood estimation turns out to be equivalent to loss minimization using which loss function?

- ☒ Squared error loss
- ☐ Absolute error loss
- ☐ Cross entropy loss
- ☐ Any non-negative loss function

MSE is BLUE

找 MSE 最佳 parameters

= minimize MSE

4

Multiple Choice 1 point

The Laplace distribution with mean  $m$  and variance  $2b^2$  has the probability density function:

$$p(x) = 1/(2b) \exp(-|x - m| / b)$$

where  $|x|$  is the absolute value of  $x$ . Consider a linear model with Laplace error distribution with mean zero and variance  $2b^2$ . Maximum likelihood estimation in this model would be equivalent to loss minimization using which loss function?

- ☒ Absolute error loss
- ☐ Squared error loss
- ☐ Cross entropy loss
- ☐ Any non-negative loss function

$$-\ln p = -\ln \frac{1}{2b} - \frac{|x-m|}{b}$$

5

Multiple Choice 1 point

input layer 不算 layers.

The input to output mapping in linear regression corresponds to a very simple neural network. How many layers does this simple neural network have?

- ☒ 1
- ☐ 2
- ☐ Depends on the dimensions of the input features
- ☐ Depends on the number of examples in the training data set

6

Multiple Choice 1 point

Which of the following best describes the relationship between an artificial neuron and a biological neuron?

- ☐ The word "neuron" is present in both by sheer accident. They have nothing to do with each other.
- ☒ An artificial neuron is an extremely simplified version of the processing a biological neuron is capable of
- ☐ An artificial neuron is an extremely precise version of the processing a biological neuron is capable of
- ☐ Real biological neurons don't compute anything whereas artificial ones do

7

Multiple Choice 1 point

Which of the following is NOT a classification problem?

- ☐ Predicting whether or not a bank customer will fail to pay the loan on time
- ☐ Assessing whether or not a credit card transaction is fraudulent
- ☒ Predicting how long a newly admitted patient will stay at the hospital
- ☐ Labeling a bird image with the scientific name of the species the bird belongs to

8

Multiple Choice 1 point

Consider a simple statistical model with a single parameter  $p$  which models the probability that a coin, when tossed, will land with HEADS up instead of TAILS. To get an observation, you pull a coin from your pocket and toss it once. It comes up HEADS. What is the maximum likelihood estimate of  $p$  given your observation?

- ☐ 0
- ☒ 1
- ☐  $1/2$
- ☐ Cannot be written down in any simple form. We will have to run an optimization algorithm to get the answer.

MLE: 求参数的值, 使得在给定  
data input 下, output 预期  
值的概率最大

9

Multiple Choice 1 point

What is cross entropy?

- ☐ It is a neural network architecture used in classification problems
- ☐ It is a neural network architecture used in regression problems
- ☐ It is a loss function used in regression problems
- ☒ It is a loss function used in classification problems

10

Multiple Choice 1 point

Consider a classification problem with 3 classes. Which of the following vectors CANNOT be the output of the softmax function?

- ☒ (0.8, 0.1, -0.1) X
- ☐ (0.4, 0.2, 0.4)
- ☐ (0.8, 0.19, 0.01)
- ☐ (0.3, 0.3, 0.4)

$(a, b, c)$

$\begin{matrix} \setminus & / & / \\ & & & \\ & & & \end{matrix}$   
 $> 0$

A  $a+b+c=1$