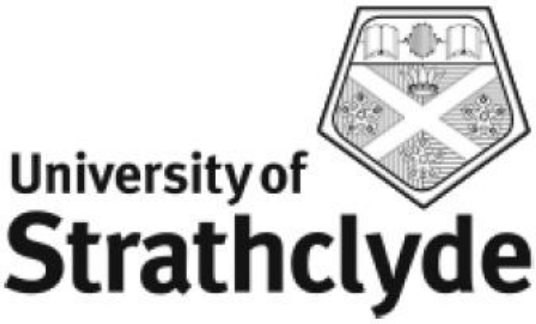


Department of Computer & Information Sciences

CS212 Topics in Computing 2

Term 2, 2019, Second Half

Duration: 1 hour

Calculators are NOT permitted.

Disclaimer: This is a sample of possible test questions. The number of test questions and marks awarded may be different on the actual test. Some types of questions may be taken off and some may be added based on the remaining lectures and lab exercises. Each question carries 1 mark unless specified otherwise.

Approximate time allowed for the test: 1 hour.

1**.** A model predicts

A. independent variables based on dependent variables.

B. dependent variables based on independent variables.

C. weights based on inputs

D. all of the above

2. Training a system proceeds by

A. minimizing the differences between what the system predicts and what it should predict

B. telling the system what to do and what not to do

C. programming the system

D. all of the above

3. In order to implement a bias we

A. Add one more input that is always 1.
B. Don't need to do anything
C. Start with zero weights
D. Start with all weights equal 1.
E. All of the above

4. An epoch is

A. Complete presentation of the training data set
B. Complete training of the model until it converges
C. Complete training of the model until it produces no errors
D. All of the above

5. We need a testing set

A. To simulate real-life conditions when your trained system will encounter new data
B. To have more data
C. To have different data
D. All of the above

6. How many pixels in an MNIST image?

7. How many output classes does MNIST task have?

8. Fill in the blanks in the following code implementing the prediction function of a binary perceptron (**2 marks**):

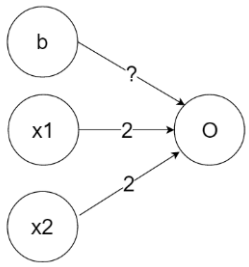
```
public static int output(double X[]) {

       double a = W[0]*X[0] + W[1]*X[1] + W[2]*X[2];
       if (__________)
           return _______;
       else
           return _______;

}
```

9. Below are the truth table for a boolean AND function and a perceptron that has learned it.

x1	x2	y
0	0	0
1	0	0
0	1	0
1	1	1



What is the possible range of values for the bias *b*? **(4 marks)**

10. Suggest values for the weights and the bias of a perceptron to learn the following boolean function **(4 marks)**:

x1	x2	y
0	0	1
1	0	0
0	1	0
1	1	0

11. Suggest the parameters for a perceptron with a single hidden layer that can learn the following function (**6 marks**):

x1	x2	Y
0	0	0
1	0	1
0	1	1
1	1	0

12. Starting from initial weight values (0,0,0) and using the training data from the following boolean function:

X1	X2	Y
0	0	0
1	0	1
0	1	1
1	1	1

, fill in <u>all</u> the rows with the steps of a perceptron training algorithm (**6 marks**):

	X1	X2	X3	Label	prediction	Error	new W1	new W2	new W3
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									

13. Starting from zero initial weights and using the training data from the following function:

Class	X1	X2	X3	X4
0	1	0	0	1
1	0	1	0	1
2	0	0	1	1

, fill in all the rows with the steps of a multi-class perceptron training algorithm (**6 marks**):

	X1	X2	X3	X4	label	prediction	Updated W[][]											
							W01	W02	W03	W04	W11	W12	W13	W14	W21	W22	W23	W24
1																		
2																		
3																		
4																		
5																		
6																		

END OF PAPER

(Dr D. Roussinov)