

# COMP3608 MCQ

April 2020

1. Consider the following matrices

$$I = \begin{bmatrix} 1 & 0 & 1 \\ 3 & 2 & -1 \\ -1 & 1 & 1 \end{bmatrix}$$

$$F = \begin{bmatrix} -1 & 1 \\ 2 & 3 \end{bmatrix}$$

Suppose that we apply the convolution of  $F$  on  $I$  with a dilation of 0, a padding of 0, and a stride of 1. What is the size of the output? (3 marks)

- (a)  $3 \times 3$
- (b)  $2 \times 2$
- (c)  $3 \times 2$

2. Consider the following matrix

$$I = \begin{bmatrix} 1 & 0 & 1 \\ 3 & 2 & -1 \\ -1 & 1 & 1 \end{bmatrix}$$

Suppose that we apply a  $2 \times 2$  max-pool to  $I$ . Which of the following is the result (3 marks):

- (a)

$$\begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$$

- (b)

$$\begin{bmatrix} 3 & 2 & 1 \\ 3 & 2 & 1 \end{bmatrix}$$

- (c)

$$\begin{bmatrix} 3 & 2 \\ 3 & 2 \end{bmatrix}$$

3. Suppose that you need are given CT scans of a patient's lungs. The patient can either have cancer or not have cancer. If the patient has cancer, their cancer severity is scored as being either stage I, stage II, stage III, or stage IV. You are to build a machine learning algorithm to help physicians make their medical diagnosis. What type of machine learning problem are you trying to solve? (4 marks)
- (a) Regression
  - (b) Classification
  - (c) Clustering
  - (d) Particle Swarm Optimisation
4. Suppose that the regularisation coefficient for the regularisation term in a machine learning model is set to a very high number. Which of the following is true (Choose all that apply) (4 marks):
- (a) The model is more likely to overfit
  - (b) The model is more likely to underfit
  - (c) The model's parameters would tend to infinity
  - (d) The model's parameters would tend to 0
5. From a geometric perspective, why is the error squared in linear regression (choose all that apply) (4 marks):
- (a) To make the error positive
  - (b) To penalise further deviations more strongly
  - (c) To prevent calculation errors
  - (d) To bring the geometric perspective in alignment with the probability perspective
6. Suppose that you are designing a feed-forward neural network to perform binary classification. Which of the following activation functions are valid activation functions for use in the output layer. Choose all that apply (6 marks)
- (a) Rectified Linear Unit
  - (b) Identity Function
  - (c)  $\tanh$
  - (d) Logistic Sigmoid
  - (e) Softmax
  - (f) Softplus

7. Suppose that you are given data on a set of users' movie preferences and you would like to discover sub-groups in the data. What machine learning paradigm does this fall under (3 marks):
- (a) Supervised Learning
  - (b) Reinforcement Learning
  - (c) Unsupervised Learning
8. Suppose that you want to use machine learning to build an agent that can intelligently navigate a room to sanitize said room. What machine learning paradigm does this fall under (3 marks):
- (a) Supervised Learning
  - (b) Reinforcement Learning
  - (c) Unsupervised Learning
9. Which of the following are disadvantages of neural networks. Choose all that apply (6 marks).
- (a) Neural networks are computationally expensive
  - (b) Neural networks are difficult to interpret
  - (c) Neural networks require large quantities of training data
  - (d) Neural networks are mathematically unfounded
  - (e) Neural networks are difficult to implement
  - (f) Neural networks are crude approximations of our brains
10. Suppose that you are trying to predict the Miles Per Gallon of a car given its characteristics encoded as a feature vector. Which metric would use to evaluate a machine learning model trained a dataset of such feature vectors. Choose all that apply. (5 marks)
- (a) MAPE
  - (b) MSE
  - (c) MAE
  - (d)  $F_1$
  - (e) Accuracy

11. Suppose that you are given the following data, and would like to predict  $y$  from  $x$ . (3 marks)

$x$	$y$
[0, 0]	0
[0, 1]	1
[1, 0]	1
[1, 1]	0

Which machine learning model would you use for this problem (Hint: Plot the points):

- (a) Logistic Regression
- (b) Neural Networks
- (c) Linear Regression