

CITS5508 Machine Learning Sample Exam paper

Semester One 2021

Tip for studying for the exam:

- Study the lecture notes. Also read the textbook – focus on the sections that are covered in the lectures.
 - Try the exercises at the end of each chapter in the textbook. Answers to these exercises can be found in Appendix A of the textbook.
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This sample exam paper has 6 questions.

This actual exam paper will have 10 questions, each of which contains two separate (unrelated) parts. Each part is worth 5 marks.

You should attempt ALL questions.

TOTAL: 100 MARKS

Your answers should be written on the question paper in the spaces provided under each question.

Calculators are not permitted.

On average, you should try to spend ~ 12 minutes for each question. As we have a small number of students doing the online exam this year, no diagram drawing will be required in all the exam questions.

- (a) Explain what *feature scaling* is. Give an example for scaling features. Give an example of what could go wrong if feature scaling is not carried out. (5 marks)
 - (b) What is the difference between Supervised Learning and Unsupervised Learning? Give an example for each. (5 marks)
- (a) Suppose that you have an N -class classification problem. What would be a suitable output function for your algorithm if $N = 2$? What would this function be if $N > 2$? Briefly explain your answers. (5 marks)
 - (b) Explain what the OvO “one versus one” strategy is and what it is used for. (5 marks)
- (a) Briefly explain what *kernel trick* (that is commonly used in SVM) is. (5 marks)
 - (b) Explain the difference between *bagging* and *pasting*. Under what classification and regression algorithms are they commonly used and why are these algorithms/methods so popular? (5 marks)
- (a) Describe what a *random forest classifier* and *extra-trees* are. (5 marks)

- (b) Briefly explain what *manifold* and *manifold learning* mean. (5 marks)
- 5. (a) What is *explained variance ratio*? How do you use it? (5 marks)
- (b) What is a *multi-layer perceptron* (MLP)? Design a simple MLP (no need to draw a diagram) and describe the number of connection weights in your MLP that require training. (5 marks)
- 6. (a) What is a *pooling* layer? In what network would you find pooling layers? What are the parameters that define a pooling layer? (5 marks)
- (b) What is a *stacked autoencoder*? What is meant by “tying the weights” in a stacked autoencoder? (5 marks)