



MACHAKOS UNIVERSITY

University Examinations for 2021/2022

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FOURTH YEAR SECOND SEMESTER EXAMINATIONS FOR

BACHELOR OF SCIENCE (MATHEMATICS AND COMPUTER SCIENCE)

BACHELOR OF SCIENCE (COMPUTER SCIENCE)

SCO 411: NEURAL NETWORKS

DATE: 15/12/2021

TIME: 2.00-4.00 PM

INSTRUCTIONS: Answer Question ONE and other TWO Questions

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) State any five reasons for studying ANN. (5 marks)
- b) You are designing a deep learning system to detect driver fatigue in cars. It is crucial that your model detects fatigue, to prevent any accidents. Which of the following is the most appropriate evaluation metric: Accuracy, Precision, Recall, Loss, Value. Explain your choice. (5 marks)
- c) Draw a well labelled diagram of a neural network model showing all the components (8 marks)
- d) Using relevant example, describe reinforcement method of learning algorithm. (7 marks)
- e) Suppose that a credit card company decided to deploy a new system for assessing credit worthiness of its customers. The new system is using a feed-forward neural network with a supervised learning algorithm. Explain what the bank should have before the system can be used. (5 marks)

QUESTION TWO (20 MARKS)

- a) Using relevant diagrams, explain recurrent network structure (6 marks)
- b) Fill in one of 'increases', 'decreases' or 'no change' in each of the cells after performing the operation indicated (6 marks)

Operation	Bias	Variance
Regularizing the weights		
Increasing the size of the layers (more hidden units per layer)		
Getting more training data (from the same distribution as before)		

- c) Define ANN (3 marks)
- d) Describe the competitive process of the Self-Organising Map algorithm. (5 marks)

QUESTION THREE (20 MARKS)

- a) Explain the following
- one way in which using tanh instead of logistic activations makes optimization easier. (2 marks)
 - the difficulties with the logistic activation function of saturated units. (2 marks)
 - whether switching to tanh fixes the problem (ii) above. (2 marks)
- b) Explain how splitting a dataset into train, dev and test sets help identify overfitting (4 marks)
- c) A student would like to model the probability of the weather being rainy. Describe how the student would perform this task using FisPro (10 marks)

QUESTION FOUR (20 MARKS)

- a) Explain the following learning rules
- Delta (3 marks)
 - Percetron (2 marks)
 - Hebbs (3 marks)
- b) Deep networks typically require a lot of data to train from scratch, but can be “fine tuned” for another task quickly. Explain this in terms of the features computed in the layers. (6 marks)
- c) Demonstrate using relevant examples, how the following can be used in the artificial brain (6 marks)
- ADD
 - EX-OR
 - NOT

QUESTION FIVE (20 MARKS)

- a) Briefly contrast the backward updates for a ReLU layer using (i) normal backpropagation, (ii) guided backpropagation and (iii) deconvolution (6 marks)
- b) A student would like to decide whether to attend a wedding party or not. The decision variables are weather condition, availability of transport, and completion of assignment. Explain how the decision would be made using artificial Neural Network. (8 marks)
- c) State three differences supervised and unsupervised ML methods (6 marks)