



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN SOFTWARE ENGINEERING

SCT 405: ADVANCED ARTIFICIAL INTELLIGENCE

DATE: Tuesday 10th April, 2012

TIME: 8.00 a.m. – 10.00 a.m.

Instructions: Answer question 1 and any other two questions

Question 1

a) Distinguish between the following terms in the context of machine learning and artificial intelligence. Use appropriate examples to illustrate.

- i) Regression and classification
- ii) Unsupervised learning and reinforcement learning

(12 Marks)

b) Define the following terms in the context of artificial intelligence.

- i) False positive
- ii) Feature vector
- iii) Activation function

(6 Marks)

c) Explain the concept of overfitting in the context of decision tree learning.

(4 Marks)

d) Also known as 'knowledge discovery in databases (KDD)', data mining has been defined as the extraction of non-trivial, previously unknown and potentially useful information in large data sets. With the aid of suitable illustrative examples, describe four kinds of 'discoveries' (i.e. the classical problem types) that a data mining practitioner may seek to make during analysis of a large data set.

(8 Marks)

[30 Marks]

Question 2

The table below shows a table of security situation in which it is either necessary to call the police or not.

Situation	Sounds	Alarm	Time of Day	Call Police
S1	Silence	Yes	Day	No
S2	Shouts	No	Day	No
S3	Tapping	No	Night	No
S4	Shouts	Yes	Night	Yes
S5	Silence	Yes	Night	Yes
S6	Tapping	No	Night	No
S7	Shouts	Yes	Night	Yes
S8	Silence	No	Night	No
S9	Tapping	No	Day	No

- a) Explain briefly how you would go about drawing a decision tree based on this table

(8 Marks)

- b) Using the ID3 algorithm derive a decision tree

(12 Marks)

[20 Marks]

Question 3

Artificial neural networks, as an artificial intelligence technique are inspired by the structure of the biological brain.

- a) Draw a well labeled schematic diagram of an artificial neural network **(6 Marks)**

- b) Briefly describe the back propagation algorithm of neural network learning. **(6 Marks)**

- c) Describe four characteristics of problem domains that are appropriate for neural network learning. **(8 Marks)**

[20 Marks]

Question 4

Apart from data mining, artificial intelligence techniques and algorithms, and notably those in machine learning have found many other every day applications. Discuss four of the following machine learning applications, clearly highlighting learning aspects of each and the challenges associated with each application.

- i) Natural Language Processing
- ii) Image analysis
- iii) Speech recognition
- iv) Computer vision
- v) Security applications
- vi) Robotics applications

[20 Marks]

Question 5

For the process of data mining to yield useful results, deliberate efforts must be made to increase the probability of that happening during all stages of the process:

- a) Briefly describe a formal data mining methodology, by highlighting its key stages the activities in each stage and how they can contribute to greater probability of 'success'.

(12 Marks)

- b) Identify and briefly describe four major challenges usually encountered by the data mining practitioner as he practices his trade.

(8 Marks)

[20 Marks]