

KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2018

Marks Scored:

Level : B.E. /B.Sc.
Year : IV

Course : COMP 484
Semester: I

Exam Roll No.:

Time: 30 mins.

F. M. : 10

Registration No.:

Date **MAR 15 2018**

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Circle the most appropriate answer.

1. Machine learning is
 - a. The autonomous acquisition of knowledge through the use of computer programs
 - b. The selective acquisition of knowledge through the use of computer programs
 - c. The autonomous acquisition of knowledge through the use of manual programs
 - d. The selective acquisition of knowledge through the use of manual programs

2. Factors which affect the performance of learner system does not include
 - a. Representation scheme used
 - b. Training scenario
 - c. Type of feedback
 - d. Good data structures

3. Below are the 8 actual values of target variable in the train file.
[0, 0, 0, 1, 1, 1, 1, 1]
What is the entropy of the target variable?
 - a. $-(5/8 \log(5/8) + 3/8 \log(3/8))$
 - b. $5/8 \log(5/8) + 3/8 \log(3/8)$
 - c. $3/8 \log(5/8) + 5/8 \log(3/8)$
 - d. $5/8 \log(3/8) - 3/8 \log(5/8)$

4. Imagine, you are solving a classification problems with highly imbalanced class. The majority class is observed 99% of times in the training data. Your model has 99% accuracy after taking the predictions on test data. Which of the following is true in such a case?
 - I. Accuracy metric is not a good idea for imbalanced class problems.
 - II. Accuracy metric is a good idea for imbalanced class problems.
 - III. Precision and recall metrics are good for imbalanced class problems.
 - IV. Precision and recall metrics aren't good for imbalanced class problems.

a. I and III b. I and IV c. II and III d. II and IV

5. The k-nearest neighbor algorithm has:
 - a. Low bias and high variance
 - b. High bias and low variance
 - c. High bias and high variance
 - d. Low bias and low variance

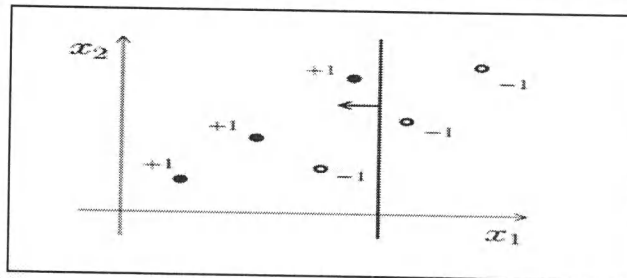
6. Machine Learning is all about:
 - a. Memorizing as many facts as possible
 - b. Inferring new knowledge from the available set of knowledge
 - c. Using inference to make predictions about previously unseen data
 - d. Both "b" and "c"

7. The minimum description length principle favors:
 - a. Simpler hypotheses
 - b. Complex hypotheses
 - c. A mix of simple and complex hypotheses
 - d. None of the above

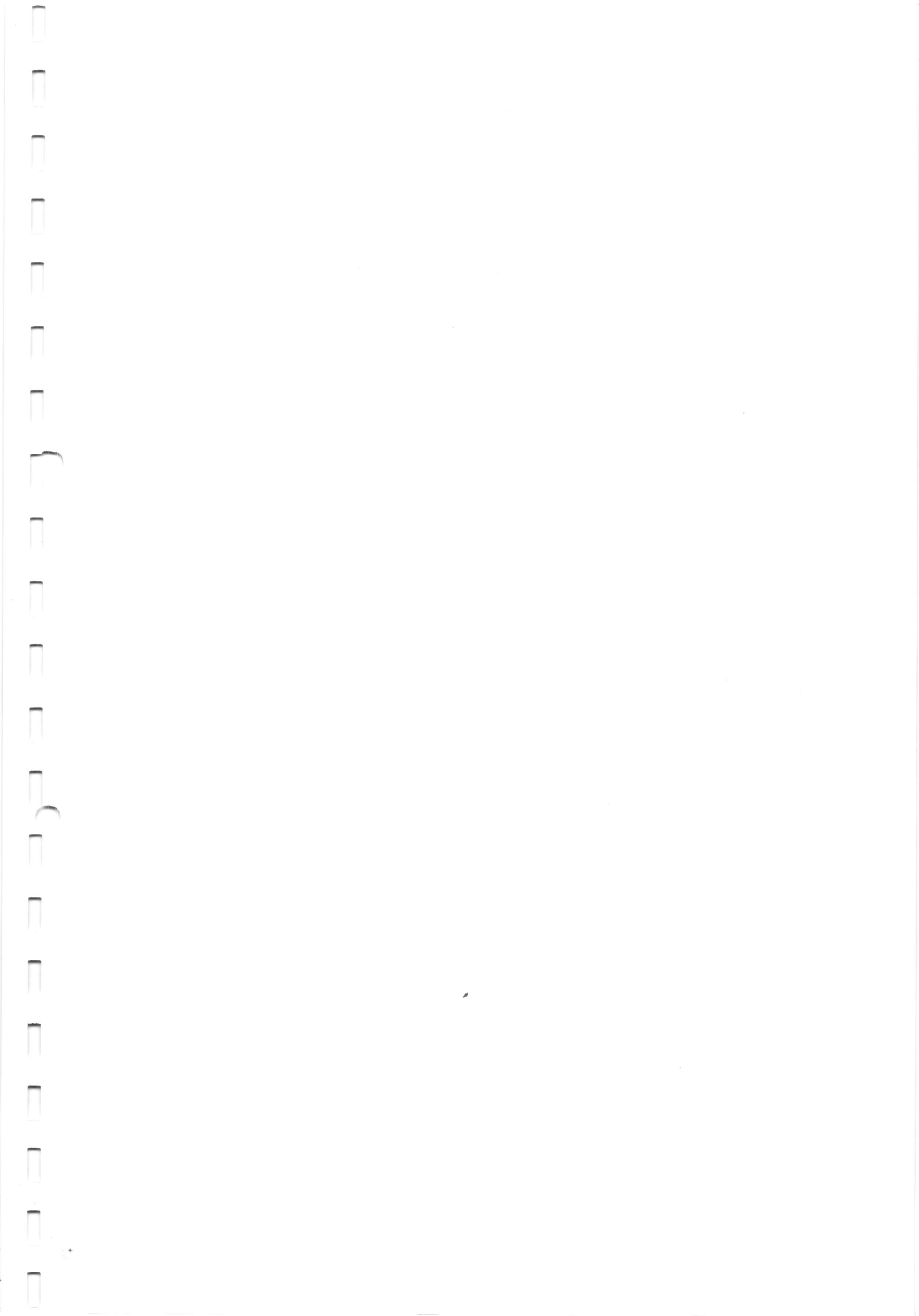
8. 20 emails classified as “spam” and 5 emails classified as “non-spam” contain the word “cheap”. Based on this information, if an incoming email contains the word “spam”, what is the probability of it being “spam”?
- a. 40 % b. 60% c. 80 % d. 30%
9. Given below is the statistics on the download of apps by different people categorized by “gender” and “age”:

Gender	Age	App
Female	15	Pokemon Go
Female	25	Whatsapp
Male	32	Snapchat
Female	40	Whatsapp
Male	12	Pokemon Go
Male	14	Pokemon Go

- Between “Gender” and “Age”, which one seems more decisive for predicting what app will the users download?
- a. Gender b. Age c. Both “a” and “b” d. None of the above
10. How many data points are misclassified in the image below?



- a. 1 b. 2 c. 3 d. 4
11. Consider the scenario. The problem you are trying to solve has a small amount of data. Fortunately, you have a pre-trained neural network that was trained on a similar problem. Which of the following methodologies would you choose to make use of this pre-trained network?
- a. Fine tune the last couple of layers only
b. Re-train the model for the new dataset
c. Freeze all the layers except the last, re-train the last layer
d. Assess on every layer how the model performs and only select a few of them
12. A “Bayesian Network” is most accurately described as:
- a. A special case of neural network that makes use of the Bayes’ Theorem
b. The network variant of Bayes Theorem, assuming independent features
c. A probabilistic model of which Naïve Bayes is a special case
d. A network of probabilistic learning functions, connected by Bayes Rule
13. The k-means algorithm is a:
- a. Supervised learning algorithm
b. Unsupervised learning algorithm
c. Semi-supervised learning algorithm
d. Weakly supervised learning algorithm



KATHMANDU UNIVERSITY
End Semester Examination
August/September, 2018

MAR 15 2018

Level : B.E./B.Sc.
Year : IV
Time : 2 hrs. 30 mins.

Course : COMP 484
Semester: I
F. M. : 40

SECTION "B"

[4 Q. × 5 = 20 marks]

Attempt *ANY FOUR* questions.

1. Suppose the following data characterize the lab result for cancer-suspect people.

$$P(\text{cancer}) = 0.008$$

$$P(\neg \text{cancer}) = 0.992$$

$$h_1 = \text{cancer}, h_2 = \neg \text{cancer}$$

$$P(+|\text{cancer}) = 0.98$$

$$P(-|\text{cancer}) = 0.02$$

$$D = \{+, -\}, P(D|h_1), P(D|h_2)$$

$$P(+|\neg \text{cancer}) = 0.03$$

$$P(-|\neg \text{cancer}) = 0.97$$

Should we diagnose a patient x whose lab result is positive as having cancer? Justify your answer via calculation of h_{MAP} of "cancer" and " \neg cancer". [5]

2. Define the terms "entropy" and "information gain". How are they used to assess the effectiveness of an attribute in classifying the training data? [5]
3. What is the key idea in the CANDIDATE-ELIMINATION algorithm? Define the term "version space". [5]
4. What is a perceptron? Explain how the weights are modified by the perceptron training rule? [5]
5. Briefly explain how instance-based learning methods work. Why are they also sometimes referred to as "lazy" learning methods? [5]

SECTION "C"

[2 Q. × 10 = 20 marks]

Attempt *ANY TWO* questions.

6. Discuss Decision trees as a classification technique. Shed light on the characteristics of problems to which Decision trees are more suitable. [10]
7. State and define Bayes theorem. What is a maximum a posteriori (MAP) hypothesis (h_{MAP})? How is h_{MAP} determined? How do you derive maximum likelihood hypothesis (h_{ML}) from h_{MAP} ? [10]
8. Explain the k-Nearest Neighbor learning algorithm. What are the advantages and disadvantages of the instance-based learning methods? [10]

