Artificial Intelligence and Machine Learning (6CS012)

Time: 3 hrs **F.M: 100**

P.M: 40

All questions are compulsory

SET - 01

Multiple Choice Questions (1 * 10 = 10 Marks)

1. A game can be formally defined as a kind of search problem with the following
    a. Initial State
    b. Successor Function
    c. Terminal Test
    d. All the mentioned
2. Backpropagation is defined by
    a. The transmission of error back through the network to allow weights to be adjusted so that the network can learn
    b. The transmission of error back through the network to adjust the weights
    c. Another name was given to the curvy function in the perceptron
    d. All of above
3. Which of the following is not the promise of the artificial neural network?
    a. It can handle noise
    b. It can survive the failure of some nodes
    c. It can explain results
    d. It has inherent parallelism
4. Which of the following is the application of Neural Network?
    a. Risk Management
    b. Data Validation
    c. Both of above
    d. None of them
5. PROLOG is an AI programming language that solves problems with a form of symbolic logic known as predicate calculus. It was developed in 1972 at the University of Marseilles by a team of specialists. Can

you name the person who headed this team?

a. John McCarthy
b. Niklaus Wirth
c. Seymour Papert
d. Alian Colmerauer

6. What is cybernetics?
    a. Study of communication between two humans
    b. Study of communication between human and machine
    c. Study of Boolean Values
    d. None of them
7. A program that allows the computer to simulate conversation with a human being
    a. Speech Application Program Interface
    b. Speech Recognition
    c. Chatterbot
    d. Alexa
8. To invoke the LISP system, you must try
    a. AI
    b. LISP
    c. CL (Common Lisp)
    d. Lisp and CL
9. In 1985, the famous chess player David Levy beat a world champion chess program in four straight games by using orthodox moves that confused the program. What was the name of the chess program?
    a. Kaissa
    b. CRAY BLITZ
    c. Golf
    d. PARI
10. An AI techniques that allow the computer to understand associations and relationships between objects and event is called:
    a. Cognitive Science
    b. Relative Symbolism
    c. Heuristic Processing
    d. None of above

Short Questions (4*15 = 60 Marks)

1. For the curve y = 6x - x^2 find the slopes at the point (x_1, y_1), (0, 0) and (1, 5). At what point on the curve is the tangent parallel to the x-axis?
2. What is the output of the network for the input (1,2), i.e. the left input neuron having the value 1 and the right one having the value 2? Do you have to do all the network computations once again in order to answer this question? Explain why you do or do not have to do this.
3. Please describe the main differences between the human brain and today's computers (such as your desktop PC) in terms of information processing.
4. After working on the project we realized that the dimensionality of data is enhanced by one-hot encoding. But, label encoding does not. How? (**Explain with a suitable example**)
5. Find Derivative
    a. Sigmoid Function
    b. Tanh Function
6. Calculate the correlation coefficient between the two variables

X	25	19	28	30	18	24
Y	58	52	65	70	51	62

7. Draw the graph of the following equations
    a. y = $\frac{1}{x}$
    b. $x^2 + y^2 = 9$
    c. y = |-2x|
    d. x = -3|siny|
8. Explain machine learning for 5-year-old children.
9. Why "accuracy" is a misleading metric in machine learning? Explain with a suitable example.
10. You are given a data set. From the long list of machine learning algorithms, how do you determine which one algorithm to use?
11. If you are having 4GB RAM in your machine and you want to train your model on a 10GB data set. How would you go about this problem? Have you ever faced this kind of problem in your machine learning/data science experience so far?
12. A data set on cancer detection is given to you. You've developed a model for classification and achieved 96 percent accuracy. Why shouldn't you be happy with the success of your model? What would you do about that?
13. When is Ridge regression favorable over Lasso regression?

14. The easy part is to perform a binary classification tree algorithm. Do you know how a tree split happens i.e. how does the tree determine which variable to break at the root node and the succeeding nodes?
15. What is the bias-variance trade-off?

Very Long Questions (10*3 = 30 Marks)

1. We will use the dataset below to learn a decision tree that predicts if the people pass the machine learning (Yes or No), based on their previous GPA (High, Medium, or Low) and whether or not they studied.

GPA	Studied	Passed
L	F	F
L	T	T
M	F	F
M	T	T
H	F	T
H	T	T

For this problem, you can write your answers using log_2,but it may be helpful to note that $log_2 3 \approx 1.6$.

   a. What is the entropy H(Passed)?
   b. What is the entropy H(Passed | GPA)?
   c. What is the entropy H(Passed | Studied)?
   d. Draw the full decision tree that would be learned for this dataset. You do not need to show any calculations.

2. Compute the Tylor series of function g(x) = sin(πx) centered at a = 1.
3. Find the eigenvectors, eigenvalues, eigenspace associated with eigenvalues, and eigen direction.

$$A = \begin{bmatrix} -2 & -4 & 2 \\ -2 & 1 & 2 \\ 4 & 2 & 5 \end{bmatrix}$$

Good Luck!

STEPHEN HAWKING ONCE SAID, "The thing about smart people is that they seem like crazy people to dumb people."