Type: Open (Online)   **Time: 30 mins**   **Max Marks: 24**   **Date: 12.09.2020**
All parts of the same question should be answered together.

BITS Id No:

Name:

Code of Honor: I hereby agree to the fact that I will not give or receive any aid during the examination. This includes, but is not limited to, viewing the answering of others, sharing answers with others, and making unauthorized use of internet while taking the exam. If I violate any of these in any manner, I am ready to receive the consequences of punishment awarded for using unfair means in examination.

1. If End-to-End learning can be thought of as a model which gets the raw data as input and outputs directly the desired outcome, with no intermediate tasks or feature engineering. Then do you agree with the statement that 'Deep Learning is End-to-End learning'. Support your answer with appropriate reasoning.   [2 Marks]

Sol: Yes, since extracting useful features, abstract features from raw input data and other feature engineering activities are expected to be taken care by the deep learning techniques.

2. Will the feature engineering activities (like feature selection, normalization or standardization of feature) always guarantee the best possible transformed features and hence help in building optimal learning models? Support your answer by putting up valid arguments.   [3 Marks]

Sol: No, most of these feature engineering techniques are heuristics based techniques and hence may not guarantee the best possible transformed features and thus the resulting learning models may not be optimal.

3. State at least two main reasons for resurgence of Neural Networks (in the name of Deep Learning).
                                                                                     [2 Marks]
Sol: Increased computational power, Increase in data set sizes.

4. Suppose you are asked to develop learning model for a binary classification problem with 20 features / attributes. You are given 1000 training examples in which 30 example which are repetitive (i.e., 970 distinct examples). Find the maximum number of decision regions carved by 1-NN classifier (1-Nearest Neighbor classifier algorithm). Give appropriate reasoning for your answer.   [3 Marks]

Sol: 970, the number of decision regions are the number of distinct data points.

5. For the above problem (problem 4), on the basic feature space (i.e., without applying any transformation function on basic features or kernels) find the number of decision regions carved by SVM. Give appropriate reasoning for your answer.   [3 Marks]

Sol: Two, the number of decision regions by SVM are upper and lower regions of the separating hyper plane.

6. "The issue with local constancy assumption is that the number of regions that will be discovered by the learning algorithm is relatively smaller as compared to the truly existing decision regions of the problem." Do you agree with this statement? Provide appropriate reasoning in support of your answer. [3 Marks]

Sol: Yes, ideally the number of decision regions depends on the problem but should not be on the number of training data points.

7. It is known that Mr.Akash may not like playing tennis always. His liking playing tennis is very much dependent on four Boolean features/attributes – Outlook, Humidity, Wind and Temperature. These binary features assumes values as follows:
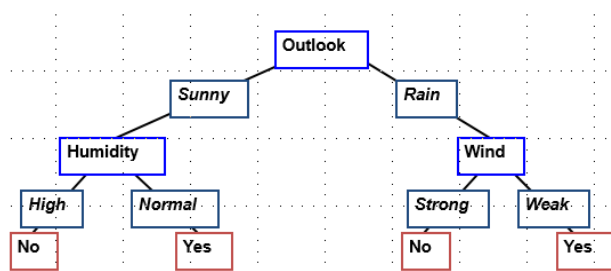Outlook – Sunny & Rain
Humidity - High & Normal
Wind – Strong & Weak
Temperature – Hot & Mild
You are provided with 100 training examples and by making use of one of the famous algorithms you have built the following decision tree.

Find the number of decision regions of the below mentioned decision tree?   [3 Marks]

Sol: Four decision regions.

8. Give an example of an application which require us to disentangle the factors of variation. [3 Marks]

Sol: Speaker's accent in speech recognition

9. Do you agree with the following statement "One of the main goals of deep learning is to understand how the brain works on an algorithmic level"? Support your answer response with valid argument.
                                                                                        [2 Marks]
Sol: No, the branch of science that deals with the understanding of how the brain works on an algorithmic level is computational neuro science.