WORKSHEET ANSWERS-5

DEEP LEARNING

Q1 to Q8 are MCQs with only one correct answer. Choose the correct option.

1. Which of the following can approximate any function universally (i.e. universal approximators)?

**Ans. B) Neural Networks**

2. In which of the following domains we cannot use neural networks?

**Ans.** **D) None of the above**

3. Rearrange the following steps of a gradient descent algorithm in correct order of their occurrence? i. Initialize random weight and bias ii. Repeat the process until you find the best weights of network iii. Change weights and biases for each neuron to reduce the error iv. Calculate error distances between the actual and the predicted value v. Pass an input through the network and get values from output layer Choose the correct option:

Ans. **C) i – v – iv – iii – ii**

4. What is the full form of RNN?

**Ans. A) Recurrent Neural Network**

5. What is plasticity in neural networks?

**Ans. A)** **input pattern keeps on changing**

6. What is stability plasticity dilemma?

**Ans. C) dynamic inputs & categorization can’t be handled**

7. Read the following statements: Statement 1: It is possible to train a network well by initializing all the weights as 0 Statement 2: It is possible to train a network well by initializing biases as 0 Which of the statements given above is true, Choose the correct option?

**Ans. B) Statement 2 is true while statement 1 is false**

8. Which of the following architecture has feedback connections?

**Ans. A) Recurrent Neural network**

Q9 and Q10 are MCQs with one or more correct answers. Choose all the correct options.

9. In training a neural network, you notice that the loss does not decrease in the few starting epochs. The reason behind it could be

**Ans.** **A) Learning Rate is low, C) Regularisation parameter is low, D) Stuck at local minima**

10. Which of the following function(s) can be used to impart non – linearity in a neural network?

**Ans.** **B) Rectified Linear Unit**, **D) Sigmoid Function**

11. What is Deep Learning?

**Ans. Deep learning** is a subset of **machine learning** in artificial intelligence that has networks capable of **learning** unsupervised from data that is unstructured or unlabelled. Also known as **deep** neural **learning** or **deep neural network**.

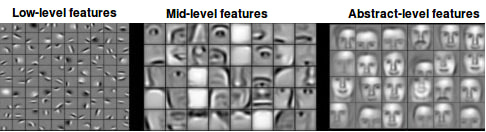
12. What is reinforcement learning?

**Ans.** Reinforcement learning is an area of Machine Learning. It is about taking suitable action to maximize reward in a particular situation. It is employed by various software and machines to find the best possible behavior or path it should take in a specific situation. Reinforcement learning differs from the supervised learning in a way that in supervised learning the training data has the answer key with it so the model is trained with the correct answer itself whereas in reinforcement learning, there is no answer but the reinforcement agent decides what to do to perform the given task. In the absence of a training dataset, it is bound to learn from its experience.

13. What Are the Differences Between Machine Learning and Deep Learning?

**Ans. Comparison between Deep Learning & Machine Learning!**

* **Functioning**: Deep learning is a subset of machine learning that takes data as an input and makes intuitive and intelligent decisions using an artificial neural network stacked layer-wise. On the other hand, machine learning being a super-set of deep learning takes data as an input, parses that data, tries to make sense of it (decisions) based on what it has learned while being trained.
* **Feature Extractor**: Deep learning is considered to be a suitable method for extracting meaningful features from the raw data. It does not depend on hand-crafted features like local binary patterns, a histogram of gradients, etc., and most importantly it performs a hierarchical feature extraction. It learns features layer-wise which means that in initial layers it learns low-level features and as it moves up the hierarchy it starts to learn a more abstract representation of the data (as shown in the figure below). On the other hand, machine learning is not a good method for extracting meaningful features from the data. It relies on hand-crafted features as an input to perform well.



Layer-wise features learned by deep learning network

Here features mean pixel values, shape, textures, position, color and orientation. The performance of most of the traditional machine learning algorithm depends on how accurately the features are identified and extracted. Using traditional feature extractors does not solve the significant problem since even a slight variation in the data changes the features extracted from a conventional feature extractor like local binary pattern (LBP), a histogram of oriented gradients (HOG), etc. Whereas, a deep learning network tries to learn all of these features through a combination of layers at different levels and finally combines them to form a bigger picture as an abstract representation.

**Data Dependency:**Machine learning algorithms often work well even if the dataset is small, but deep learning is *Data Hungry* the more data you have, the better it is likely to perform. It is often said that with more data the network depth (number of layers) also increase hence more computation.

**Computation Power**: As you learned that deep learning networks are data dependent, they need more than what a CPU can offer. For the deep learning network training, you need a graphical processing unit (GPU) which have thousands of cores compared to a CPU that has very minimal cores. The computation power not only depends on the amount data but also on how deep (large) is your network, as you increase the amount of data or the number of layers, you need more and more computation power. On the other hand, a traditional machine learning algorithm can be implemented on a CPU with fairly decent specifications.

**Training and Inference Time:**The training time of a deep learning network can range from anywhere between a few hours to months. Yes, you read it right! The training can often last for months. If you have a vast number of data, training a network a more significant data usually takes time. Moreover, as you increase the number of layers in your network, the number of parameters known as weights will increase, hence, resulting in slow training. Not only training but very deep neural networks can also take a lot of inference time since the input test data will pass through all the layers in your network, a lot of multiplication will take place which will consume a considerable amount of time. Whereas traditional machine learning algorithms often train very fast ranging from few minutes to a couple of hours, but during the test time, some algorithms can also take quite a bit of time.

**Problem-solving technique**: To solve a problem using machine learning, you have to divide the problem into different parts. Let's say you want to do object recognition, for that you first traverse through the complete image and find if there is an object at each location and where exactly it is present. "Then, from all the candidate objects, you apply a machine learning algorithm let's say support vector machine (SVM) with local binary patterns (LBP) as feature extractor to recognize relevant objects. On the other hand, in deep learning, you give the network both the bounding box coordinates & all the object's corresponding labels, and network learns to localize and classify on its own.

**Industry Ready**: Machine learning algorithms are often easy to Decode how they worked. They are interpretable regarding what parameters it chose and why it chose those parameters, but on the other hand, deep learning algorithms are nothing but a black box. Even if the deep learning algorithms can surpass humans in performance, they are still not reliable when it comes to deploying them in the industry. Machine learning algorithms like linear regression, decision trees, random forest, etc., are widely used in industries like one of its use case is in bank sector for stock predictions.

**Output**: The output of a traditional machine learning is usually a numerical value like a score or a classification. Whereas, the output of a deep learning method can be a score, an element, text, speech, etc.

14.What is a perceptron?

**Ans.** A perceptron is a neural network unit (an artificial neuron) that does certain computations to detect features or business intelligence in the input data.Perceptron was introduced by Frank Rosenblatt in 1957. He proposed a Perceptron learning rule based on the original MCP neuron.

A Perceptron is an algorithm for supervised learning of binary classifiers. This algorithm enables neurons to learn and processes elements in the training set one at a time.

There are two types of Perceptrons: Single layer and Multilayer.

Single layer Perceptrons can learn only linearly separable patterns.

Multilayer Perceptrons or feedforward neural networks with two or more layers have the greater processing power.

The Perceptron algorithm learns the weights for the input signals in order to draw a linear decision boundary.

This enables you to distinguish between the two linearly separable classes +1 and -1.

15. What’s the difference between AI and ML?

Ans. **The key difference between AI and ML are:**

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| ARTIFICIAL INTELLIGENCE | MACHINE LEARNING |
| AI stands for Artificial intelligence, where intelligence is defined acquisition of knowledge intelligence is defined as a ability to acquire and apply knowledge. | ML stands for Machine Learning which is defined as the acquisition of knowledge or skill |
| The aim is to increase chance of success and not accuracy. | The aim is to increase accuracy, but it does not care about success |
| It work as a computer program that does smart work | It is a simple concept machine takes data and learn from data. |
| The goal is to simulate natural intelligence to solve complex problem | The goal is to learn from data on certain task to maximize the performance of machine on this task. |
| AI is decision making. | ML allows system to learn new things from data. |
| It leads to develop a system to mimic human to respond behave in a circumstances. | It involves in creating self learning algorithms. |
| AI will go for finding the optimal solution. | ML will go for only solution for that whether it is optimal or not. |
| AI leads to intelligence or wisdom. | ML leads to knowledge. |