**ASSIGNMENT**

**UNIT III & IV & V**

**MCA III Semester**

**Introduction to AI & Machine Learning**

**Subject Code :-** **MCA197A**

**Part-A**

1. **[CO3]** What is the application of machine learning methods to a large database called?

A) Big data computing B) Internet of things

C) Data mining D) accuracy

1. **[CO4]** Which of the following are common classes of problems in machine learning?  
    a)Regression b) Classification c) Clustering d) All of above
2. **[CO3]** Which of the following is a good test dataset characteristic?

a) is representative of the dataset as a whole

b) large enough to yield meaningful results

c) All of above d) None of above

1. **[CO4]** Full form of PAC is \_\_\_\_\_\_\_\_\_\_\_\_\_
2. Probably Approx Cost
3. Probably Approximate Correct
4. Probability Approx Communication
5. Probably Approximate Computation
6. **[CO3]** A \_\_\_\_\_\_\_\_ problem is when the output variable is a category

A) clustering B) reinforcement learning C) semi supervised D) classification

1. **[CO4]** \_\_\_\_\_\_is Computationally complex.

A) Unsupervised learning B) reinforcement learning C) semi supervised D) classification

1. **[CO4]** What does dimensionality reduction reduce?

a) collinearity b)stochastic c) entropy d)performance

1. **[CO3]** FIND-S Algorithm starts from the most specific hypothesis and generalize it by considering only
2. Negative b) Positive c)Negative or Positive d)None of the above
3. **[CO4**]The Candidate-Elimination Algorithm represents the .
4. Solution Space b) Version Space c) Elimination Space d)All of the above
5. **[CO3**] What is Machine learning?  
   a) The autonomous acquisition of knowledge through the use of computer programs  
   b) The autonomous acquisition of knowledge through the use of manual programs  
   c) The selective acquisition of knowledge through the use of computer programs  
   d) The selective acquisition of knowledge through the use of manual programs
6. **[CO4]** Bayes rule can be used for:-

a) Solving queries b) Increasing complexity c) Answering probabilistic query d) Decreasing complexity

1. **[CO3]** Different learning methods does not include?  
    a) Memorization b) Analogy c) Deduction d) Introduction
2. **[CO3]** Identify the kind of learning algorithm for “facial identities for facial expressions”.
3. Prediction b) Recognition patterns c) Recognizing anomalies d) Generating patterns
4. **[CO3]** What is the application of machine learning methods to a large database called?
5. Big data computing b)Internet of things c)Data mining d)Artificial intelligence
6. **[CO3]** Among the following options identify the one which is false regarding regression.
7. It is used for the prediction
8. It is used for  interpretation
9. It relates inputs to outputs
10. It discovers casual relationships
11. **[CO3]** Choose the most widely used mattress and tools to assess the classification models.
12. The area under the ROC curve
13. Confusion matrix
14. Cost-sensitive accuracy
15. All of the above
16. **[CO4]** What does K stand for in K mean algorithm?
17. Number of clusters
18. Number of data
19. Number of attributes
20. Number of iterations
21. **[CO4]** Among the following option identify the one which is used to create the most common graph types.
22. plot
23. quickplot
24. qplot
25. All of the above
26. **[CO4**] \_\_\_\_lies between Supervised and Unsupervised techniques.

A) clustering  
B) association  
C) semi supervised  
D) reinforcement

1. **[CO4]** Targetted marketing, Recommended Systems, and Customer Segmentation are applications in which of the following
2. Supervised Learning: Classification

b) Unsupervised Learning: Clustering

c) Unsupervised Learning: Regression

1. Reinforcement Learning
2. **[CO5**]provides way and means of weighing up the desirability of goals and the likelihood of achieving
3. Utility theory
4. Decision theory
5. Bayesian networks
6. Probability theory

**22. [CO5]** Bayes rule can be used for:-

1. Solving queries
2. Increasing complexity
3. Answering probabilistic query
4. Decreasing complexity

**23. [CO5]** The Expectation-Maximization Algorithm has been used to identify conserved domains in unaligned proteins only. State True or False. a) True b) False

**24. [CO5]** PAC stand for

1. Probably Approximate Correct
2. Probably Approx Correct
3. Probably Approximate Computation
4. Probably Approx Computation

**25. [CO5]** What are the area CLT comprised of?

1. Sample Complexity
2. Computational Complexity
3. Mistake Bound
4. All of these

**26. [CO5]** What is/are the problem solving methods for RL?

1. Dynamic programming
2. Monte Carlo Methods
3. Temporal-difference learning
4. All of these

**27. [CO5]** Tree/Rule based classification algorithms generate which rule to perform the classification.

a) if-then b) then c) do

**28. [CO5]** What is not a RNN in machine learning?

a) One output to many inputs

b) Many inputs to a single output

c) RNNs for nonsequential input

d) Many inputs to many outputs

**29. [CO5]** Which of the following option is true about k-NN algorithm?

a) It can be used for classification

b) It can be used for regression

c) It can be used in both classification and regression Answer

**30. [CO5]** \_\_\_\_\_\_\_\_ problem is when the output variable is a category

A) clustering  
 B) reinforcement learning  
 C) semi supervised  
 D) classification

**Part-B**

1. **[CO3]** Explain types of data set used to develop learning system?
2. **[CO3]** Describe the difference between regression and classification**?**
3. **[CO3]** Explain best fit line?
4. **[CO3]** Explain Binary Classifier?
5. **[CO3]** Explain Underfitting?
6. **[CO4]** Explain Overfitting?
7. **[CO4]** Explain SVM?
8. **[CO4]** Explain Bagging?
9. **[CO4]** Explain Boosting?
10. **[CO4]** Explain Cost Function?

Cost function **measures the performance of a machine learning model for a data set**. Cost function quantifies the error between predicted and expected values and presents that error in the form of a single real number. Depending on the problem, cost function can be formed in many different ways.

1. **[CO5]** Explain Deep Learning?

Deep learning is **a subset of machine learning, which is essentially a neural network with three or more layers**. These neural networks attempt to simulate the behavior of the human brain—albeit far from matching its ability—allowing it to “learn” from large amounts of data.

1. **[CO5]** Explain ANN?

An **Artificial Neural Network** in the field of **Artificial intelligence** where it attempts to mimic the network of neurons makes up a human brain so that computers will have an option to understand things and make decisions in a human-like manner. The artificial neural network is designed by programming computers to behave simply like interconnected brain cells.

1. **[CO5]** Explain KNN?

K-Nearest Neighbour is one of the simplest Machine Learning algorithms based on Supervised Learning technique. K-NN algorithm assumes the similarity between the new case/data and available cases and put the new case into the category that is most similar to the available categories. K-NN algorithm stores all the available data and classifies a new data point based on the similarity. This means when new data appears then it can be easily classified into a well suite category by using K- NN algorithm. K-NN algorithm can be used for Regression as well as for Classification but mostly it is used for the Classification problems.

1. **[CO5]** Explain RNN?

**Recurrent Neural Network(RNN)** is a type of [Neural Network](https://www.geeksforgeeks.org/tag/neural-network/) where the **output from the previous step are fed as input to the current step**. In traditional neural networks, all the inputs and outputs are independent of each other, but in cases like when it is required to predict the next word of a sentence, the previous words are required and hence there is a need to remember the previous words. Thus RNN came into existence, which solved this issue with the help of a Hidden Layer. The main and most important feature of RNN is **Hidden state**, which remembers some information about a sequence.

1. **[CO5]** Explain the significance of neural networks?

Neural networks can help computers make intelligent decisions with limited human assistance. This is because they can learn and model the relationships between input and output data that are nonlinear and complex.

**Part-C**

1. **[CO3]** Explain the difference between logistic and linear regression in details?
2. **[CO3]** Explain Data Frame? How data Frames are different from numpy 2D array?
3. **[CO3]** Explain implicit and explicit indexing?
4. **[CO3]** Explain random data generation in Numpy ?
5. **[CO3]** Differentiate Scalar and Vector data sets in details?
6. **[CO4]** Explain the difference between boosting and bagging in details?
7. **[CO4]** Write a python program to draw a line with suitable x axis, y axis and the title?
8. **[CO4]** Write a python program to plot two or more lines and set the line markers?
9. **[CO4]** Explain the typrs of machine learning with suitable examples?
10. **[CO4]** Explain k-means nearest neighbour algorithm?
11. **[CO5]** Explain PCA algorithm?

Principal Component Analysis is an unsupervised learning algorithm that is used for the dimensionality reduction in [machine learning](https://www.javatpoint.com/machine-learning). It is a statistical process that converts the observations of correlated features into a set of linearly uncorrelated features with the help of orthogonal transformation. These new transformed features are called the **Principal Components**. It is one of the popular tools that is used for exploratory data analysis and predictive modeling. It is a technique to draw strong patterns from the given dataset by reducing the variances.

PCA generally tries to find the lower-dimensional surface to project the high-dimensional data.

PCA works by considering the variance of each attribute because the high attribute shows the good split between the classes, and hence it reduces the dimensionality. Some real-world applications of PCA are **image processing, movie recommendation system, optimizing the power allocation in various communication channels.** It is a feature extraction technique, so it contains the important variables and drops the least important variable.

The PCA algorithm is based on some mathematical concepts such as:

* Variance and Covariance
* Eigenvalues and Eigen factors

1. **[CO5]** Explain Backpropagation algorithm?

**The algorithm is used to effectively train a neural network through a method called chain rule.** In simple terms, after each forward pass through a network, backpropagation performs a backward pass while adjusting the model’s parameters (weights and biases).

The 4-layer neural network consists of 4 neurons for the **input layer**, 4 neurons for the **hidden layers** and 1 neuron for the **output layer**.

1. **[CO5]** Explain Convolutional neural networks?

A convolutional neural network (CNN or convnet) is a subset of [machine learning](https://www.techtarget.com/searchenterpriseai/definition/machine-learning-ML). It is one of the various types of artificial [neural networks](https://www.techtarget.com/searchenterpriseai/definition/neural-network) which are used for different applications and data types. A CNN is a kind of network architecture for [deep learning](https://www.techtarget.com/searchenterpriseai/definition/deep-learning-deep-neural-network) algorithms and is specifically used for [image recognition](https://www.techtarget.com/searchenterpriseai/definition/image-recognition) and tasks that involve the processing of [pixel](https://www.techtarget.com/whatis/definition/pixel) data.

There are other types of neural networks in deep learning, but for identifying and recognizing objects, CNNs are the network architecture of choice. This makes them highly suitable for computer vision ([CV](https://www.techtarget.com/searchenterpriseai/definition/machine-vision-computer-vision)) tasks and for applications where object recognition is vital, such as [self-driving cars](https://www.techtarget.com/searchenterpriseai/definition/driverless-car) and [facial recognition](https://www.techtarget.com/searchenterpriseai/definition/facial-recognition).

1. **[CO5]** Explain Dimensionality Reduction?

Dimensionality reduction is the process of reducing the number of random variables under consideration, by obtaining a set of principal variables. It can be divided into feature selection and feature extraction.

An intuitive example of dimensionality reduction can be discussed through a simple e-mail classification problem, where we need to classify whether the e-mail is spam or not. This can involve a large number of features, such as whether or not the e-mail has a generic title, the content of the e-mail, whether the e-mail uses a template, etc. However, some of these features may overlap.

Dimensionality reduction is advantageous to AI developers or data professionals working with massive datasets, performing data visualization and analyzing complex data. It **aids in the process of data compression, allowing the data to take up less storage space as well as reduces computation times**.

1. **[CO5]** Explain Feedforward neural networks?

A Feed Forward [Neural Network](https://deepai.org/machine-learning-glossary-and-terms/neural-network) is an artificial neural network in which the connections between nodes does not form a cycle. The opposite of a feed forward neural network is a [recurrent neural network](https://deepai.org/machine-learning-glossary-and-terms/recurrent-neural-network), in which certain pathways are cycled. The feed forward model is the simplest form of neural network as information is only processed in one direction. While the data may pass through multiple hidden nodes, it always moves in one direction and never backwards. A Feed Forward Neural Network is commonly seen in its simplest form as a single layer [perceptron](https://deepai.org/machine-learning-glossary-and-terms/perceptron). In this model, a series of inputs enter the layer and are multiplied by the weights. Each value is then added together to get a sum of the weighted input values. If the sum of the values is above a specific threshold, usually set at zero, the value produced is often 1, whereas if the sum falls below the threshold, the output value is -1. The single layer perceptron is an important model of feed forward neural networks and is often used in classification tasks.

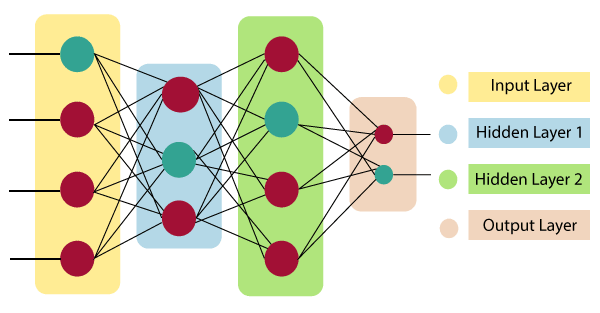
**Part-D**

* 1. **[CO3]** Write down the suitable python code with help of numpy library of these following operations:-

1. Array Broadcasting
2. Array Slicing
3. Concatenating nd array
4. Array Type Casting
5. Creating Boolean Array
6. **[CO3]** Describe matplotlib library with suitable python code?
7. **[CO4]** Describe Decision Tree Classification Algorithm in details?
8. **[CO4]** Describe Random Forest Algorithm with suitable example?
9. **[CO5]** Describe artificial neural network architecture with suitable diagram?

The term "Artificial neural network" refers to a biologically inspired sub-field of artificial intelligence modeled after the brain. An Artificial neural network is usually a computational network based on biological neural networks that construct the structure of the human brain. Similar to a human brain has neurons interconnected to each other, artificial neural networks also have neurons that are linked to each other in various layers of the networks. These neurons are known as nodes.

Artificial neural network tutorial covers all the aspects related to the artificial neural network. In this tutorial, we will discuss ANNs, Adaptive resonance theory, Kohonen self-organizing map, Building blocks, unsupervised learning, Genetic algorithm, etc.



**Input Layer:**

As the name suggests, it accepts inputs in several different formats provided by the programmer.

**Hidden Layer:**

The hidden layer presents in-between input and output layers. It performs all the calculations to find hidden features and patterns.

**Output Layer:**

The input goes through a series of transformations using the hidden layer, which finally results in output that is conveyed using this layer.

The artificial neural network takes input and computes the weighted sum of the inputs and includes a bias. This computation is represented in the form of a transfer function.

What is Artificial Neural Network

1. **[CO5]** Describe all features of tensor flow tool in details?

## **Features of Tensorflow**

Below, we are discussing some important TensorFlow Features:

### **a. Responsive Construct**

With TensorFlow we can easily visualize each and every part of the graph which is not an option while using Numpy or SciKit.

### **b. Flexible**

One of the very important Tensorflow Features is that it is flexible in its operability, meaning it has modularity and the parts of it which you want to make standalone, it offers you that option.

### **c. Easily Trainable**

It is easily trainable on CPU as well as GPU for distributed computing.

### **d. Parallel Neural Network Training**

TensorFlow offers pipelining in the sense that you can train multiple neural networks and multiple **GPUs** which makes the models very efficient on large-scale systems.

### **e. Large Community**

Needless to say, if it has been developed by Google, there already is a large team of software engineers who work on stability improvements continuously.

### **f. Open Source**

* The best thing about this machine learning library is that it is open source so anyone can use it as long as they have internet connectivity.
* So, people manipulate the library in ways unimaginable and come up with an amazing variety of useful products, it has become another DIY community which has a huge forum for people getting started with it and for those who find it hard to use it or to get help with their work.

### **g. Feature Columns**

* Tensorflow has feature columns that could be thought of as intermediaries between raw data and estimators, therefore, bridging input data with your model.

The figure above describes how the feature column is implemented.

### **h. Availability of Statistical Distributions**

* The library provides distribution functions including Bernoulli, Beta, Chi2, Uniform, Gamma, which are important especially while considering probabilistic approaches such as Bayesian models.

### **i. Layered Components**

* TensorFlow includes functions like tf.contrib.layers that produce layered operations of weights and biases and also provide batch normalization, convolution layer, dropout layer, etc.
* So tf.contrib.layers.optimizers has optimizers such as Adagrad, SGD, Momentum which are often used to solve optimization problems for numerical analysis, it provides initializers with tf.contrib.layers.initializers used to maintain the gradient scale.

This type of TensorFlow Features makes it what it is today.

### **j. Visualizer (with TensorBoard)**

* With TensorBoard you can inspect a totally different representation of a model and make the changed necessary while debugging it.

### **k. Event Logger (with TensorBoard)**

* So, just like UNIX, where you use tail –f <log\_file > to monitor the output of tasks at the cmd and do quick checks, logging events in Tensorflow allows doing the same by logging events and summaries from the graph and the output over time with TensorBoard.