**Paper-1**

**Title**:-**Classification using deep learning neural networks for brain tumors**

**Methodology**:-

The methodology for classification of brain tumor using DNN includes following four main steps.

**step-1 Brain MRIs Dataset acquisition**

According to WHO(world Health Organisation)more than 120 types of brain tumors can be there which can be differ in origin, location, size, characteristics of tumor tissues. In this paper three types of malignant brain tumour types are considered :

1. Glioblastoma

2. Sarcoma

3. Metastatic bronchogenic carcinoma

**step-2 Image segmentation using Fuzzy C-means**

Image segmentation is used to separate different normal brain tissue from brain tumor tissue. Fuzzy C-means is used to segment the brain MRI into 5 sections.

**step-3 Feature extraction using DWT (discrete wavelet transform) and reduction using PCA (Principle component**

**analysis)**

After segmentation features of the segmented tumor is extracted using discrete wavelet transform (DWT). Methodology utilizes a 3-levels decomposition of Haar wavelet to extract 32\*32 i.e 1024 features for each brain MRI. But this number is not so big compared as to the number of feature maps resulted by the convolution filters of Convolutional Neural Network. Thus the principal components analysis (PCA) is used to approximate the original extracted features with lower dimensional feature vectors.

**Step-4** **Classification using DNN**

After the feature extraction, classification is performed on resulted feature vector.

7 fold cross validation technique is used for classification to build and train the DNN of 7 hidden layer structure.

**Disadvantages**:-

1.Require more hardware specification and take more time for processing for large size images like(256\*256)

2.Require separate method for segmenation and feature extraction.

**Paper-2**

**Title:-Methods for interpreting and understanding deep neural networks**

In this paper we have studied the problem of interpreting a deep neural network model and explaining its predictions.

Machine learning techniques are used in applications such as classification, speech recognition, natural language processor. So interpretability has become more important in applications such as medicine of self driving car. As in such applications reliance of the model on the correct feature must be guaranteed.

**1. Interpreting Deep Neural Network model:-**

We studied problem of interpreting concept learned by deep neural network. A deep neural network is an artificial neural network with multiple layers between the input and output layers. The DNN finds correct manipulation to convert the input into output for linear as well as for non-linear relationship. DNN(Deep neural network) is a collection of neurons. These neurons receive the neuron activations as input from the previous layers. The neural network forms a complex nonlinear mapping from input to output.

* 1. Activation Maximization

Activation maximization is as technique that maximizes the activation of hidden units after giving the desired output class. It is a type of analysis framework which searches for an input pattern that produces a maximum model response for a specific output.

**2.Layer-wise relevance propagation (LRP)**

LRP(Layer-wise propagation) is a backward propagation technique. In LRP technique is based on conservation principle. In neural network each neuron receives a share of output network that is the signal from output layer and redistributes it to previous layers in equal amount until input neurons are reached.

**3.Evaluating explanation quality**

Following are some strategies for evaluating the quality of explaination

4.1. Transfer with a simple task

4.2. Explanation continuity

4.3 Explanation selectivity

**4.Applications**

1)Model validation

2)Analysis of scientific data

**Paper-3**

**Title:-Visualizing Higher-Layer Feature of a Deep Network**

Only model definitions and the quantitative analyses is not enough, there is also need for qualitative comparisons of the solutions learned by various DNN architectures. In this paper we have studied good qualitative interpretations of high level features represented by such models.

**1.Models**

In this paper we have studied two models. The first model is a Deep Belief Net (DBN).This model is obtained by training and stacking three layers as Restricted Boltzmann Machines in a greedy manner. The second model is Stacked Denoising Auto-Encoder (SDAE) by Vincent et al.

**2.Maximizing the activation**

We find the input patterns of bounded norm which maximize the activation of a given hidden unit. As the activation function of a unit in the first layer is a linear function of the input. We can find this for a given unit, the input sample(s) (from either the training or the test set) that give rise to the highest activation of the unit. In this we have studied Sampling from a unit of a Deep Belief Network.

**3. Sampling a Unit**

The activation maximization method produces features and it decides which examples would “fit” these features; the sampling method produces examples and it lets us decide which features these examples have in common.

**Limitations**

one cannot find a simple representation of a higher layer unit as we scale the datasets to larger and larger images i.e DNN cannot process larger size images efficiently.