Answers	Coding Efficiency	Viva	Timely Completion	Total	Dated Sign of Subject Teacher
5	5	5	5	20	

Start Date :..... Date of Completion:.....

Group B Deep Learning

Assignment No: 3A

Title of the Assignment:

Use any dataset of plant disease and design a plant disease detection system using CNN.

Objective of the Assignment:

Students should be able to identify the diseased plant using Plant Village Dataset.

Prerequisite:

1. Basic of programming language

2. Concept of Classification

3. Concept of Deep Neural Network

Contents for Theory:

1. What is Classification?

2. What is CNN?

3. How Deep Neural Network Work on Classification?

4. Code Explanation with Output?

What is Classification?

Classification is a type of supervised learning in machine learning that involves categorizing data into predefined classes or categories based on a set of features or characteristics. It is used to predict the class of new, unseen data based on the patterns learned from the labeled training data. In classification, a model is trained on a labeled dataset, where each data point has a known class label. The model learns to associate the input features with the corresponding class labels and can then be used to classify new, unseen data. For example, we can use classification to identify whether an email is spam or not based on its content and metadata, to predict whether a patient has a disease based on their medical records and symptoms, or to classify images into different categories based on their visual features. Classification algorithms can vary in complexity, ranging from simple models such as decision trees and k-nearest neighbors to more complex models such as support vector machines and neural networks. The choice of algorithm depends on the nature of the data, the size of the dataset, and the desired level of accuracy and interpretability.

What us CNN ?

Convolutional Neural Networks (CNNs) are commonly used for image classification tasks, and they are designed to automatically learn and extract features from input images. Let's consider an example of using a CNN to classify images of handwritten digits. SNJB's Late Sau. K.B. Jain College Of Engineering In a typical CNN architecture for image classification, there are several layers, including convolutional layers, pooling layers, and fully connected layers. Here's a diagram of a simple CNN architecture for the digit classification task: The input to the network is an image of size 28x28 pixels, and the output is a probability distribution over the 10 possible digits (0 to 9). The convolutional layers in the CNN apply filters to the input image, looking for specific patterns and features. Each filter produces a feature map that highlights areas of the image that match the filter. The filters are learned during training, so the network can automatically learn which features are most relevant for the classification task. The pooling layers in the CNN down sample the feature maps, reducing the spatial dimensions of the data. This helps to reduce the number of parameters in the network, while also making the features more robust to small variations in the input image. The fully connected layers in the CNN take the flattened output from the last pooling layer and perform a classification task by outputting a probability distribution over the 10 possible digits. During training, the network learns the optimal values of the filters and parameters by minimizing a loss function. This is typically done using stochastic gradient descent or a similar optimization algorithm. Once trained, the network can be used to classify new images by passing them through the network and computing the output probability distribution. Overall, CNNs are powerful tools for image recognition tasks and have been used successfully in many applications, including object detection, face

recognition, and medical image analysis. CNNs have a wide range of applications in various fields, some of which are: Image classification: CNNs are commonly used for image classification tasks, such as identifying objects in images and recognizing faces. Object detection: CNNs can be used for object detection in images and videos, which involves identifying the location of objects in an image and drawing bounding boxes around them. Semantic segmentation: CNNs can be used for semantic segmentation, which involves partitioning an image into segments and assigning each segment a semantic label (e.g., "road", "sky", "building"). Natural language processing: CNNs can be used for natural language processing tasks, such as sentiment analysis and text classification. Medical imaging: CNNs are used in medical imaging for tasks such as diagnosing diseases from X-rays and identifying tumors from MRI scans. Autonomous vehicles: CNNs are used in autonomous vehicles for tasks such as object detection and lane detection. SNJB's Late Sau. K.B. Jain College Of Engineering Video analysis: CNNs can be used for tasks such as video classification, action recognition, and video captioning. Overall, CNNs are a powerful tool for a wide range of applications, and they have been used successfully in many areas of research and industry. How Deep Neural Network Work on Classification using CNN Deep neural networks using CNNs work on classification tasks by learning to automatically extract features from input images and using those features to make predictions. Here's how it works: Input layer: The input layer of the network takes in the image data as input. Convolutional layers: The convolutional layers apply filters to the input images to extract relevant features. Each filter produces a feature map that highlights areas of the image that match the filter. Activation functions: An activation function is applied to the output of each convolutional layer to introduce non-linearity into the network. Pooling layers: The pooling layers down sample the feature maps to reduce the spatial dimensions of the data. Dropout layer: Dropout is used to prevent overfitting by randomly dropping out a percentage of the neurons in the network during training. Fully connected layers: The fully connected layers take the flattened output from the last pooling layer and perform a classification task by outputting a probability distribution over the possible classes. Softmax activation function: The softmax activation function is applied to the output of the last fully connected layer to produce a probability distribution over the possible classes. Loss function: A loss function is used to compute the difference between the predicted probabilities and the actual labels. Optimization: An optimization algorithm, such as stochastic gradient descent, is used to minimize the loss function by adjusting the values of the network parameters. Training: The network is trained on a large dataset of labeled images, adjusting the values of the parameters to minimize the loss function. Prediction: Once trained, the network can be used to classify new images by passing them through the network and computing the output probability distribution.

Conclusion-

In this way we can classify plant disease using CNN.

Assignment Question 3.

1. What do you mean by Convolutional Neural Network?
2. Why do we prefer Convolutional Neural networks (CNN) over Artificial Neural networks (ANN) for image data as input?
3. Explain the different layers in CNN?
4. Explain the significance of the RELU Activation function in Convolution Neural Network?
5. Why do we use a Pooling Layer in a CNN?
6. What is the size of the feature map for a given input size image, Filter Size, Stride, and Padding mount?
7. Explain the terms “Valid Padding” and “Same Padding” in CNN?
8. What are the different types of Pooling? Explain their characteristics?
9. Does the size of the feature map always reduce upon applying the filters? Explain why or why not?
10. What is the role of the Fully Connected (FC) Layer in CNN?
11. Briefly explain the two major steps of CNN i.e, Feature Learning and Classification?
12. What are the problems associated with the Convolution operation and how can one resolve them?