

Assignment No.

- Title - Classification using Deep neural network (With example) - use the OCR letter recognition dataset
- Objective -
The objective of this assignment is to build a deep neural network model for multiclass classification using the OCR letter recognition data set.
- Problem Statement -
The OCR letter recognition dataset contains 20,000 samples of handwritten letters, each of which is labeled with corresponding letter of the alphabet.
- The task is to build a deep neural network model that can accurately classify the letters into their corresponding classes.

- Software and Hardware Requirement :-

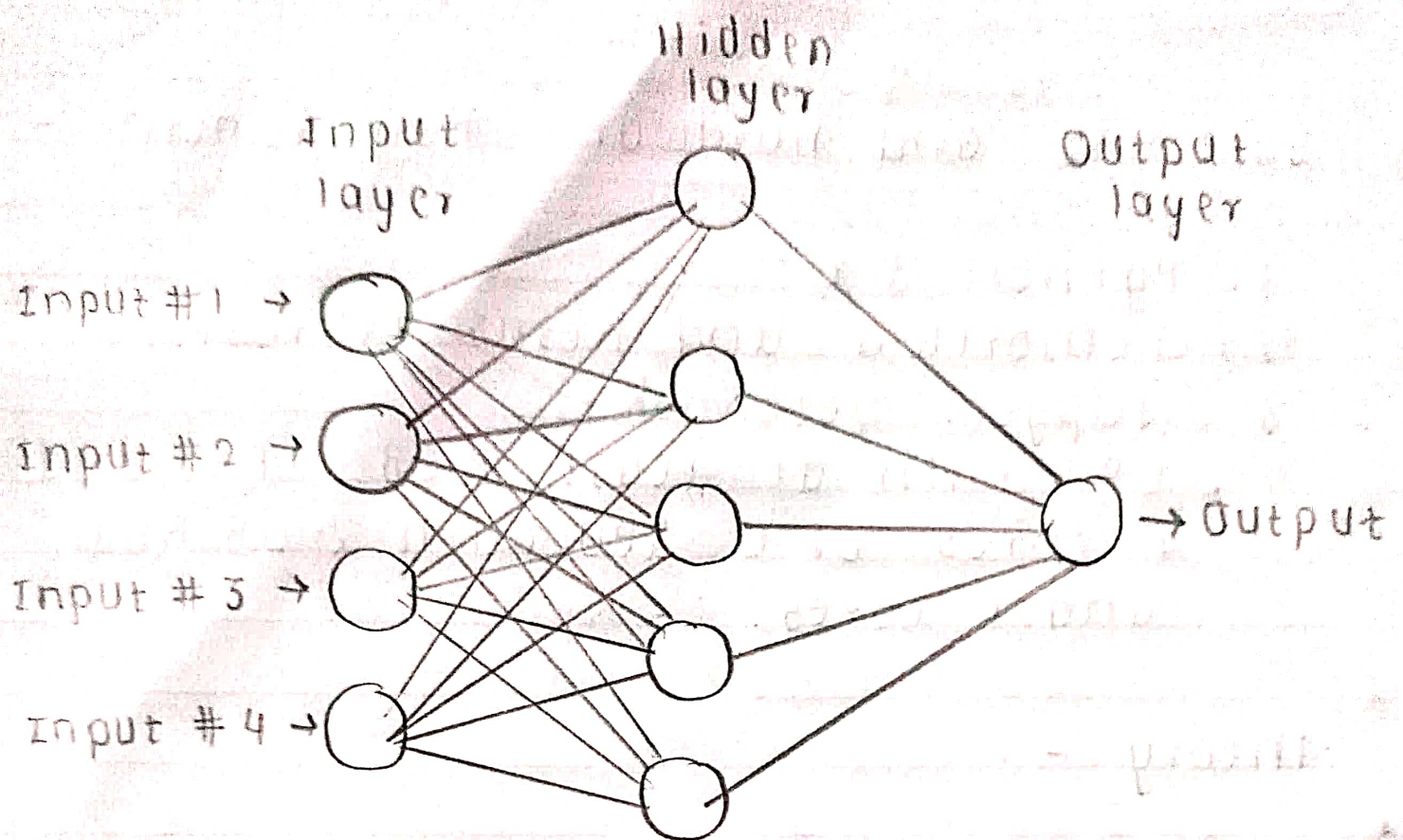
1. Python 3.x
2. Tensorflow and Keras libraries
3. Jupyter Notebook
4. CPU with at least 8 GB RAM and 4 cores or a GPU with 2 GB RAM and 8 cores.

- Theory -

In this assignment, we will be building a deep neural network model for multiclass classification. The model will consist of several layers of neurons, each of which will perform a nonlinear transformation of the input data. We will be using the tensorflow and Keras libraries in Python to build the model.

The OCR letter recognition dataset will be preprocessed to convert the input data into a suitable format for deep learning.

The dataset will be split into training and testing sets, and the model will be trained using the



training set. The performance of the model will be evaluated using the testing set.

Classification is a subcategory of supervised learning where the goal is to predict the categorical class labels (discrete, unordered values, group membership) of new instances based on past observations.

There are perhaps four main types of classification tasks -

- ① Binary classification
- ② Multi-class classification
- ③ Multi-Label classification
- ④ Imbalanced classification

Multi class classification and Binary classification is one of the most common and frequently tackled problems in the machine learning domain. In its simplest form the user tries to classify an entity into one of the two possible categories. For example, the Keras library, that comes along with the TensorFlow library, will be emplo-

employed to generate the Deep Learning model.

We will be using a fully connected neural network architecture, also known as a feedforward neural network. The network will consist of an input layer, one or more hidden layers, and an output layer. Each neuron in the hidden layers will use a nonlinear activation function, such as the rectified linear unit (ReLU), to transform the input data.

The output layer will use a Softmax activation function to convert the output values into probabilities.

The performance of the model will be evaluated using metrics such as accuracy, precision, recall, and F1 score. We will also use confusion matrices to visualize the performance of the model in classifying each other.

We have learned about the different layers and activation functions used in the model, as well as the metrics used to evaluate its performance.



- Deep Learning -

Deep learning is a subset of machine learning that includes a family of methods most commonly built on the principle of neural networks inspired by the functioning of a human brain. The "deep" in "deep learning" refers to the multiple number of layers that are used to perform separate tasks, which corresponds to the structured nature of neural networks.

In OCR, the lower layers of a neural network may similarly identify the edges of letters but its the work of the higher layers to make sense of the words. But we'll get there ; let's take one step at a time.

Artificial neural networks (ANNs, also referred to simply as neural networks, or NNs) are the most common foundation for deep learning.



By the end of this assignment, you will have a solid understanding of how to build deep neural networks for multiclass classification tasks.

- Conclusion-

In this assignment, we have explored the process of building a deep neural network model for multiclass classification using the OCR letter recognition dataset.