Experiment 8: Train the Neural Network on a given datatset

<u>**Theory:**</u>

1. **Neural Network**

An artificial neural network (ANN) learning algorithm, usually called "neural network" (NN), is a learning algorithm that is vaguely inspired by biological neural networks. Computations are structured in terms of an interconnected group of artificial neurons, processing information using a connectionist approach to computation. Modern neural networks are non-linear statistical data modeling tools. They are usually used to model complex relationships between inputs and outputs, to find patterns in data, or to capture the statistical structure in an unknown joint probability distribution between observed variables.

2. **CNN**

Convolutional neural networks are distinguished from other neural networks by their superior performance with image, speech, or audio signal inputs. They have three main types of layers, which are:

a) Convolutional layer
b) Pooling layer
c) Fully-connected (FC) layer

The convolutional layer is the first layer of a convolutional network. While convolutional layers can be followed by additional convolutional layers or pooling layers, the fully-connected layer is the final layer. With each layer, the CNN increases in its complexity, identifying greater portions of the image. Earlier layers focus on simple features, such as colors and edges. As the image data progresses through the layers of the CNN, it starts to recognize larger elements or shapes of the object until it finally identifies the intended object.

3. **Keras**

Keras is the recommended library for deep learning in Python. Keras runs on top of open source machine libraries like TensorFlow, Theano or Cognitive Toolkit (CNTK). Keras is based on minimal structure that provides a clean and easy way to create deep learning models based on TensorFlow or Theano. Well, Keras is an optimal choice for deep learning applications.

4. **Tensorflow**

TensorFlow is the most famous symbolic math library used for creating neural networks and deep learning models. TensorFlow is very flexible and the primary benefit is distributed computing. Its flexible architecture allows for the easy deployment of computation across a variety of platforms (CPUs, GPUs, TPUs), and from desktops to clusters of servers to mobile and edge devices.

<u>**About Dataset:**</u>

(Describe MNIST dataset)

Conclusion: In this way, we trained the convolutional neural network to recognize the hand-written digit using the Keras and Tensorflow libraries.