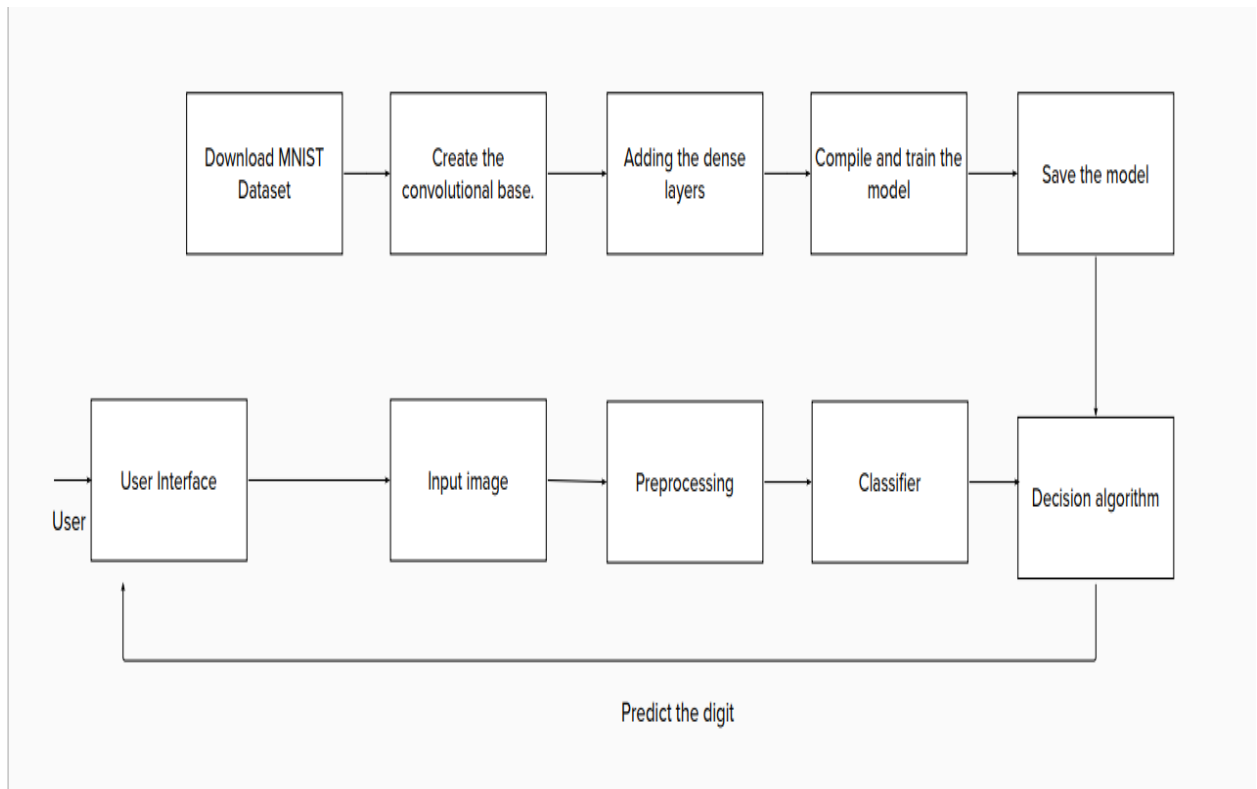


# TECHNOLOGY ARCHITECTURE

## A NOVEL METHOD FOR HANDWRITTEN DIGIT RECOGNITION SYSTEM



### Technology Architecture

#### MNIST Dataset

The MNIST database (Modified National Institute of Standards and Technology database) is a large database of handwritten digits that is commonly used for training various image processing systems. The database is also widely used for training and testing in the field of machine learning. The MNIST database contains 60,000 training images and 10,000 testing images.

#### Create the Convolutional Base

A convolutional neural network (CNN, or ConvNet) is a class of artificial neural network (ANN), most commonly applied to analyze visual imagery. CNNs are also known as Shift Invariant or Space Invariant Artificial Neural Networks (SIANN), based on the shared-

weight architecture of the convolution kernels or filters that slide along input features and provide translation- equivariant responses known as feature maps. Counter-intuitively, most convolutional neural networks are not invariant to translation, due to the down sampling operation they apply to the input. They have applications in image and video recognition, recommender systems, image classification

## **Adding a dense layer**

Dense layer is used to classify image based on output from convolutional layers. Each layer in Neural Network contains neurons, which compute weighted average of its input and this weighted average is passed through a non-linear function called as an “activation function”.

## **Compile and train the model**

Compile defines the loss function, the optimizer and the metrics. That’s all. It has nothing to do with the weights and you can compile a model as many times as you want without causing any problem to pretrained weights. You need a compiled model to train (because training uses the loss function and the optimizer).

Training a model simply means learning (determining) good values for all the weights and bias from labeled examples. In supervised learning, a machine learning algorithm builds a model by examining and attempting to find a model that minimizes loss; this process is called empirical risk minimization.

## **Save the model**

A saved model contains a complete TensorFlow program, including trained parameters (i.e, tf. Variable s) and computation. It does not require the original model building code to run, which makes it useful for sharing or deploying with TFlite , TensorFlow Serving , or TensorFlow Hub.

## **User interface**

The user interface (UI) is the point of human-computer interaction and communication in a device. This can include display screen, keyboard, a mouse and the appearance of a desktop. It is also the way through which a user interacts with an application or a website.

## **Input image**

We can upload a handwritten digit as an image into the website. The model will show the predicted result.

## **Preprocessing**

Preprocessing refers to all the transformations on the raw data before it is fed to the machine learning or deep learning algorithm. For instance, training a convolutional neural network on raw images will probably lead to bad classification performances.

## **Classifier**

Image classifiers rely on Convolutional Neural Networks (CNNs) to process an image. CNNs are a special form of neural network with a specific architecture of layers. The four types of CNN layers are the convolutional layer, ReLU layer, pooling layer, and fully connected layer.

## **Predicted result**

The model will predict the handwritten digits present in an image and the predicted output is displayed in a user interface.