Handwritten Digit Recognition

Project Proposal

Course Code: CSTE 4104
Course Title: AI Lab

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Problem statement:

The goal of this project is to create a model that will be able to recognize and determine the handwritten digits from its image by using the concepts of Convolution Neural Network. Though the goal is to create a model which can recognize the digits, it can be extended to letters and an individual's handwriting. The major goal of the proposed system is understanding Convolutional Neural Network, and applying it to the handwritten recognition system

Dataset:

MNIST database of handwritten digits is used as dataset. It consists of a training set of 60,000 examples, and a test set of 10,000 examples. The digits have been size-normalized and centered in a fixed-size image of 28*28 pixels (784 pixels)1 .

Related Work:

Being a well-studied classification problem, multiple machine learning techniques such as regression, KNN, SVM and Neural Networks have been investigated to recognize digits with maximum accuracy. As per existing study, KNN and SVM classifiers could pose scalability difficulties, and could also be a comparatively unreliable classifier2 . To build strong neural network for this project, reading more research papers will help me in gaining additional knowledge.

The Classifier:

We hope to use CNN based classifier to accomplish the task. It is comprised of one or more convolutional layers and then followed by one or more fully connected layers in a standard multilayer neural network.
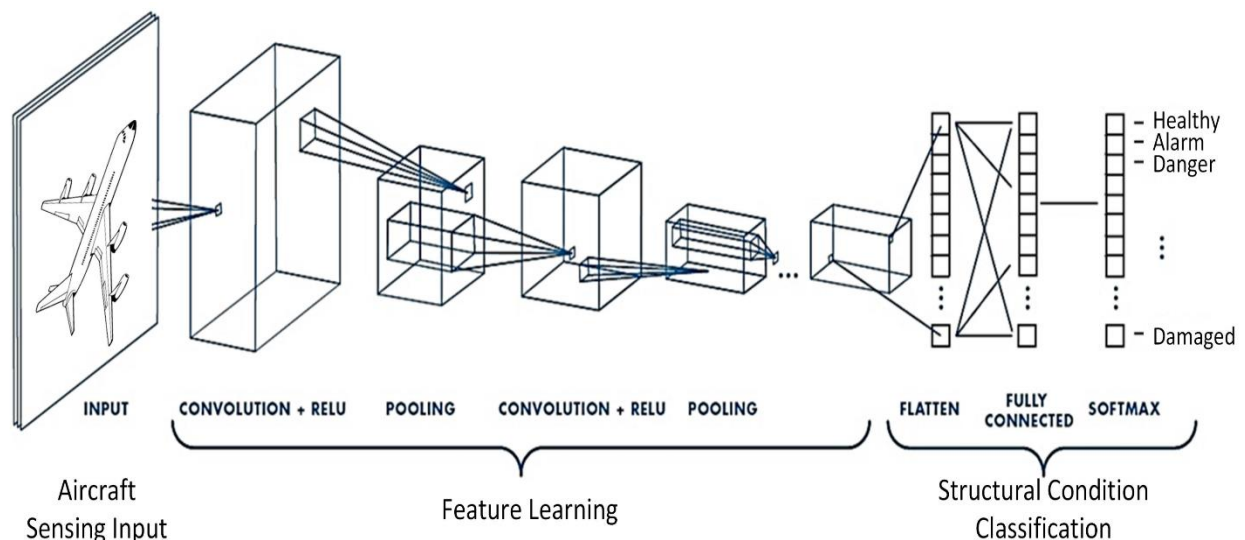
- ✓ **Convolution + ReLU:** Convolution layer serves as neural networks filter. This layer also provides feature mapping, learning the parameters of such maps and how the patterns are detected. Here the activation function is ReLU(Rectified Linear Unit) which provides the linearity of the model.

- ✓ **Pooling:** We will do specific type of pooling max pooling where the kernel extracts the maximum value of the area it convolves.

✓ *Flattening:* In this layer we use the data pooled from previous layer and convert into a 1-dimensional array for inputting it to the next layer.

✓ *Full Connection:* Here, previous layer inputs are connected together.

✓ *Softmax:* Used as the activation function for multi-class classification problem where class membership is required on more than two class levels.

Setting the system with libraries:

Before we actually build the model we need right libraries and frameworks to be installed. We are going to use Google Colab to create an environment where we can run our model. Google Colab is simple to use and it uses google server to run the models and we can access free GPU and TPU for faster process. Important libraries we will use are-

➢ Tensorflow: Python library that supports many classification and regression algorithms for deep learning and neural network

➢ Numpy: Python library that can provide n-dimensional arrays.

➢ Matplotlib: Visualization library that can use for 2D plot of arrays.

➢ Keras: Open source python library for developing deep neural network models.

➢ Seaborn: Plotting library that offers simple interface, simple defaults for plots needed for machine learning.

Steps to develop the model:

o Import the libraries and load the dataset.

o Preprocess the data

o Create the model

o Train the model

o Evaluate the model

o Predict the digit for input values.

Conclusion:

• We are hoping to increase the model's accuracy up to 98-99% and keep the model light weighted.

• Our future work can be included as combining both Bangla digits and English digits dataset so that we can get a better model and predict both category digits with ease.