# MNIST Fashion Image Classification

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We have taken a Neural Network based project which classifies the images from the MNIST Fashion dataset and it is implemented using Verilog.We have simulated the complete model in Vivado. We will be reading an image file(28x28) and the output will be the class(group) of fashion image to which it belongs. Here the classes are encoded into 0-9 integers, So final output comprises the number(index) of the group to which the image belongs.

Dataset

We can find MNIST fashion dataset [here](#).

- 0 - T-shirt/top
- 1 - Trouser
- 2 - Pullover
- 3 - Dress
- 4 - Coat
- 5 - Sandal
- 6 - Shirt
- 7 - Sneaker
- 8 - Bag
- 9 - Ankle boot
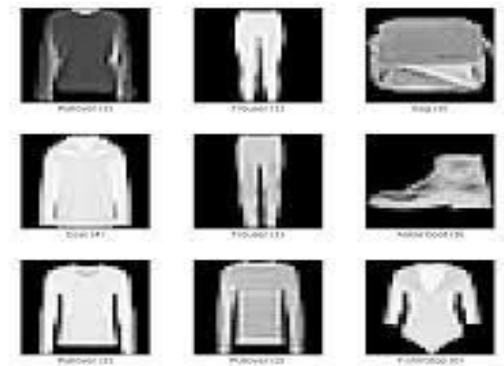
We are using the Multi-Layer Perceptron Model to build the neural network architecture. In this project, first, we have built the neural network in python and trained it using some part of the dataset. We have extracted the information of weights and biases from the trained python model. The architecture of the MLP model is 784x16x10.
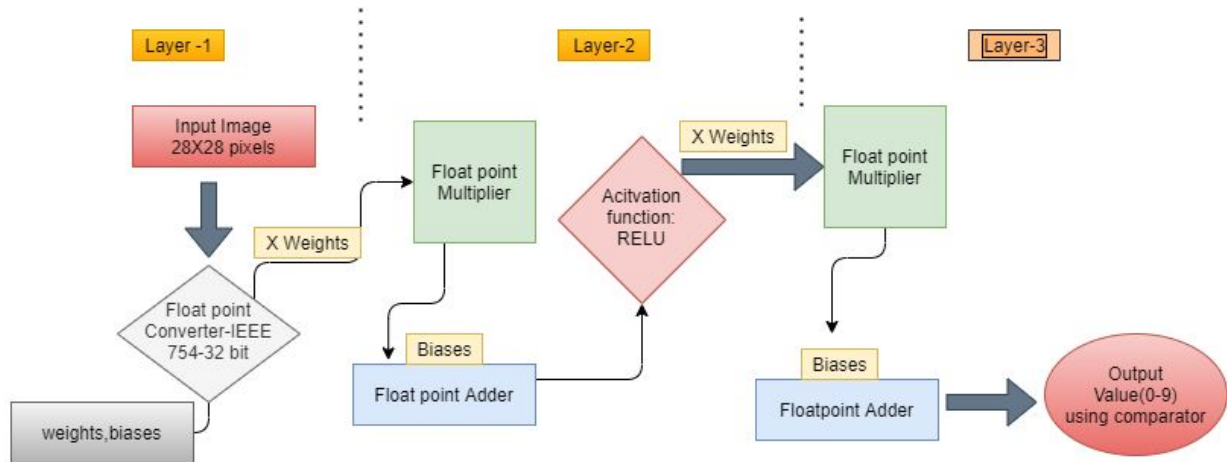
We read the normalized float point values of the image into verilog and then pass them through the implemented neural network. The neural network uses the weights and biases from the trained python model to calculate the values at each neuron. In the output layer the comparator outputs the index of the largest value which represents the predicted label of the input image.

Accuracy

The accuracy of the neural network implemented in python was 86.04%.
We tested the verilog implementation of the MLP model over 32 examples out of which 25 were correct, resulting in an accuracy of 78.125%.

Work Distribution

- → Week 1 :
  - ◆ Python Implementation
  - ◆ Input Image into Vivado
- → Week 2 :
  - ◆ Float Point Converter Implementation
  - ◆ Adder Implementation
  - ◆ Multiplier Implementation
  - ◆ Relu Activation Function implementation
- → Week 3 and 4:
  - Integrating all modules, implementing and testing the final model