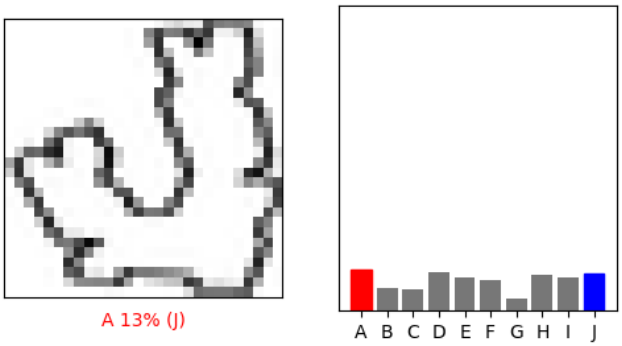
CPSC 501- Assignment 2 Part 2: MNIST Logistic Regression on a replacement for MNIST dataset

Partial Model:

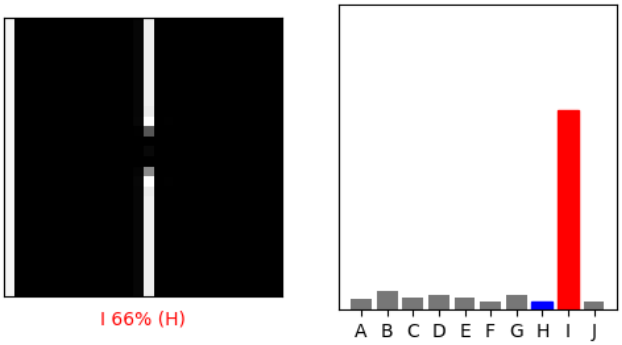
- I chose three layer model like in part 1. I added an extra layer of 'tf.keras.layers.Dense(128, activation='relu').' I chose the activation function as ReLu because it worked very well from part 1. I changed last layer's activation function to 'Softmax' like I did in part 1 of the assignment. Also, I changed optimizer to 'Adam' and loss function to 'sparse_categorical_crossentropy'. Lastly, I changed epochs from 1 to 5. Increasing epochs in this model did not increase accuracy of the model so I kept it at 5. This partial model gave me a train accuracy of 90.3% and test accuracy of 93.3%.

Three Images and their original Partial model label:

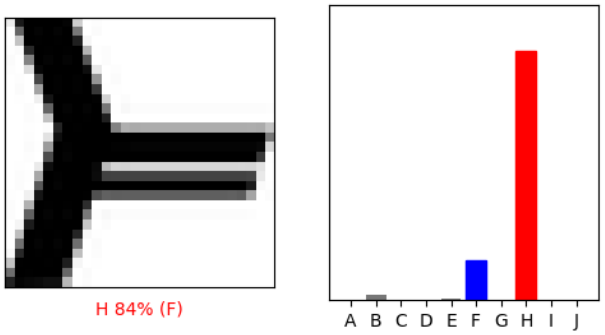
- The partial model was unable to correctly classify the above following of an 'J', where it predicted it was a 'A' with 13% confidence.



- The partial model was unable to correctly classify the following image of a 'H', where it predicted it was an 'I' with 66% confidence.



- The partial model was unable to correctly classify the following image of a 'F', where it predicted it was a 'H' with 84% confidence.

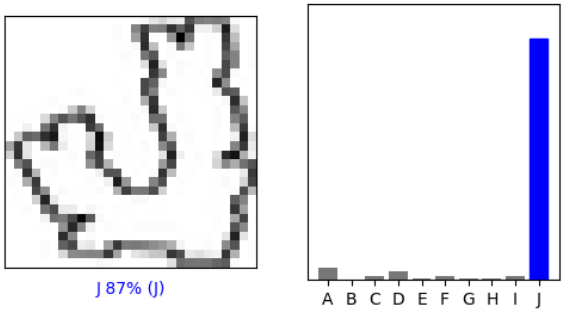


Changes to the model and improvement:

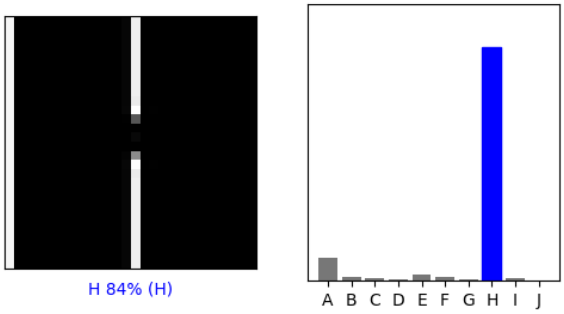
- I added Reshape layer that reshapes inputs into the given shape.
- I added 2D Convolution Layer, this layer creates a convolution kernel that is convolved with layers input which helps produce a tensor of outputs
- I added MaxPooling2D layer which downsamples the input along its spatial dimensions by taking the maximum value over an input window for each channel of the input.
- I added Dropout layer which randomly sets input units to 0 with a frequency of rate at each step during training time, which helps prevent overfitting.
- All these layers added helped the model to achieve higher prediction accuracy of 95.4% on test data.

Three Images and their Complete model label:

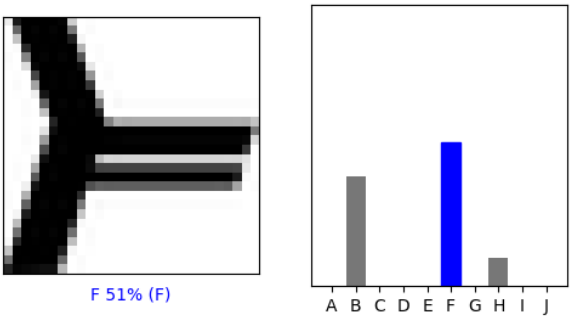
- The complete model was able to correctly classify the following image of a ‘J’ with 87% confidence.



- The complete model was able to correctly classify the following image of a ‘H’ with 84% confidence.



- The complete model was able to correctly classify the following image of a ‘F’ with 51% confidence.



Accuracy:

Train accuracy: 99.3%
Test Accuracy: 95.3%