Hand-written Optical Character Recognition

Roland David Oswald & Bridget Mansour

Objective

Our goal is to create an algorithm that converts handwritten text to typed text. This may be useful for students who would like to have their handwritten class notes typed out just by simply taking a picture & running it through our program. Going forward, this could help users identify printable text from previously illegible handwriting.

Related Work

Many handwritten OCR methods have been proposed for text identification.
- This has been attempted using **neural networks** as well as with using gradient features, which both play an integral part in any recognition system.
- **Matlab's neural network toolbox** has been used for recognition purposes by projecting handwritten characters on different sized grids. **Hidden layers, including their sizes, and epochs** have been considered as crucial parameters in neural network training.
- **Character extraction and edge detection** algorithms have been used to classify characters for neural network training purposes.
- **Geometry-based feature recognition** techniques have also been explored.

These methods have been extensively researched and have been proven significant for the field of computer vision.

Reference: Hand Written Character Recognition Using Neural Networks, Chiranjeevi Adi
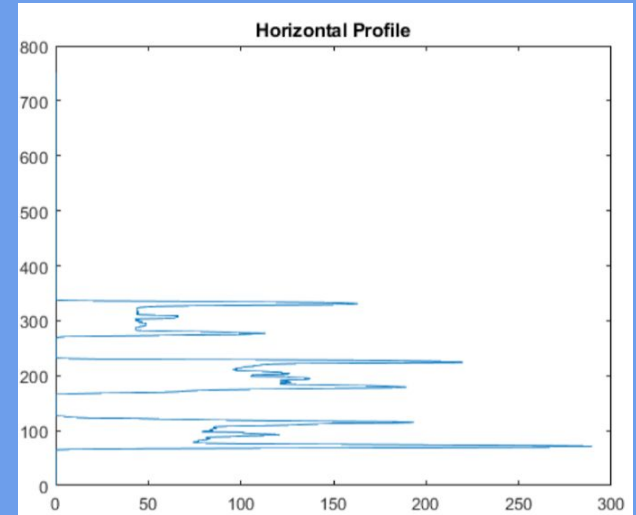
Technical Approach
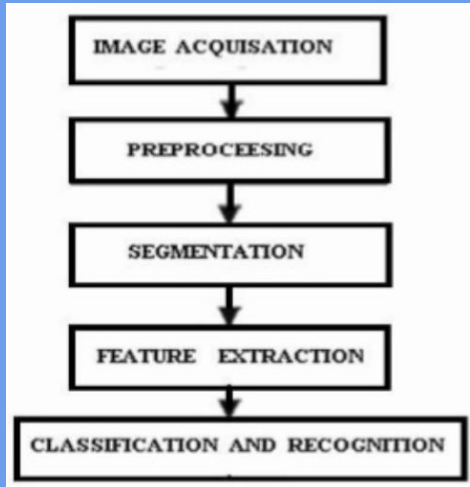
Pre-processing:
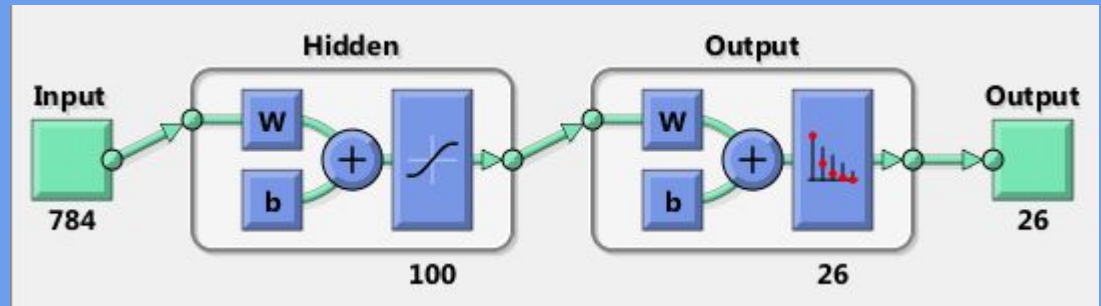
- Resize image
- RGB > grayscale > binary

Segmentation:

- Horizontal projection
  - For multiple lines/cropping
- Dilation
- Connected components
  - Bounding Box

Technical Approach

Classification & Recognition:

- Prior to this step, the segmented images of each letter were resized to 28 x 28 and flattened to 784 x 1 (same size as images used for training our NN)
- Using Matlab's Neural Network training toolbox, we trained our network using a dataset found on nist.gov
- We classified our input images based off of the function generated by Matlab's neural network, in which a similarity-comparison percentage was returned for each class (A-Z)
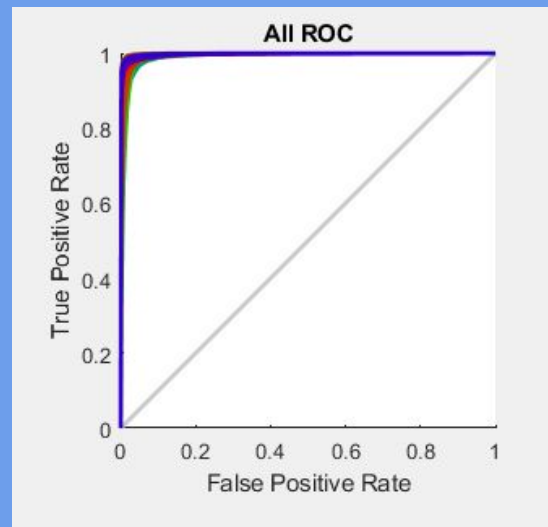- We had our algorithm output the class letter that contained the max percentage.
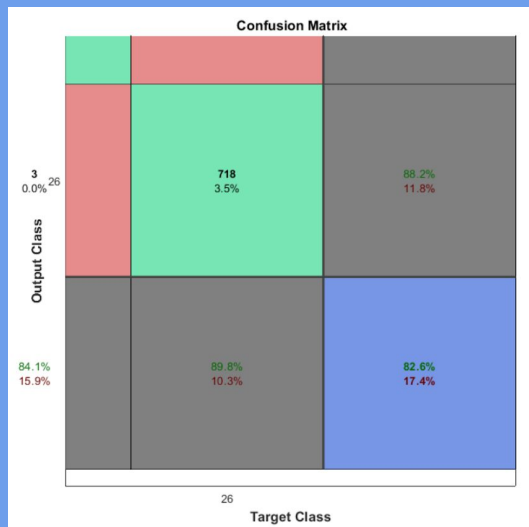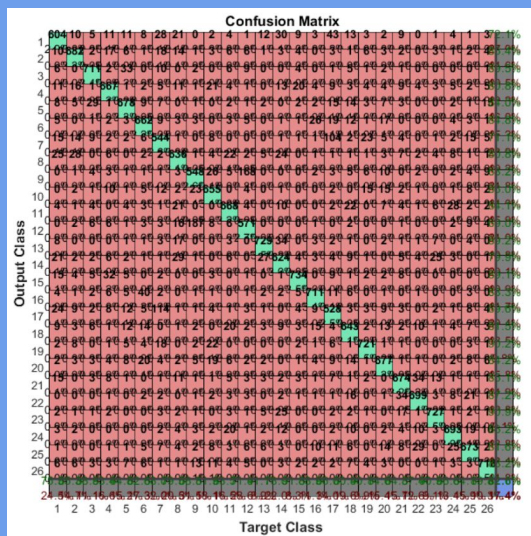
Results

Data Set used: NIST Special Database 19
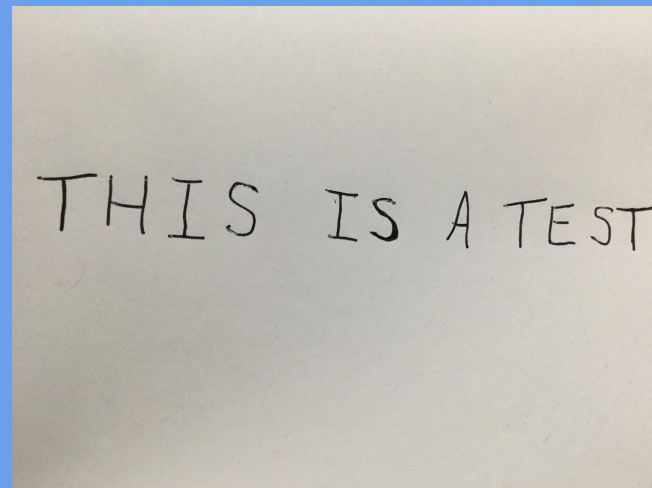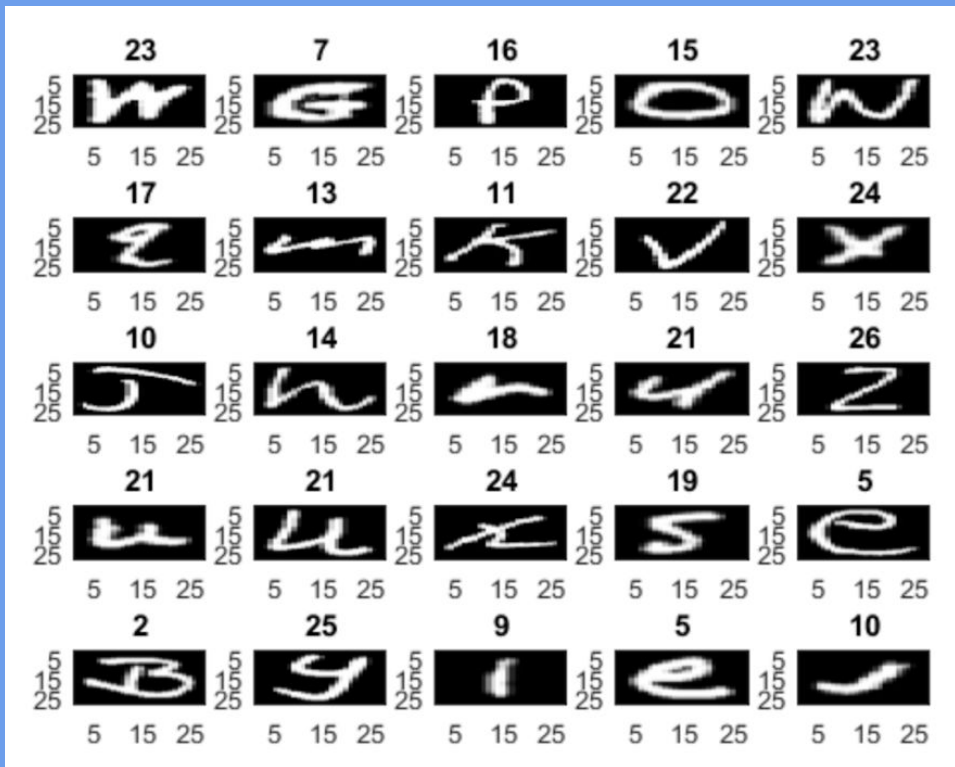

```
Sent =

        'THIS IS A TEST'
```

Results

Conclusion

- Hand-written text can be to decipher, even with the use of extensive neural networks.
- Segmentation proved to be the most challenging aspect of our project.
- Though difficult, we were able to obtain results with roughly an 83% accuracy.

Future Work

- Given more time, we would like to be able to account for lowercase text and digits, which would require a larger dataset.
- Going forward, cursive handwritings in which letters are not separate would be accounted for.
- Finally, punctuation and symbols would be necessary in order to fully convert an image into text.