Hiragana Recognition with CNN

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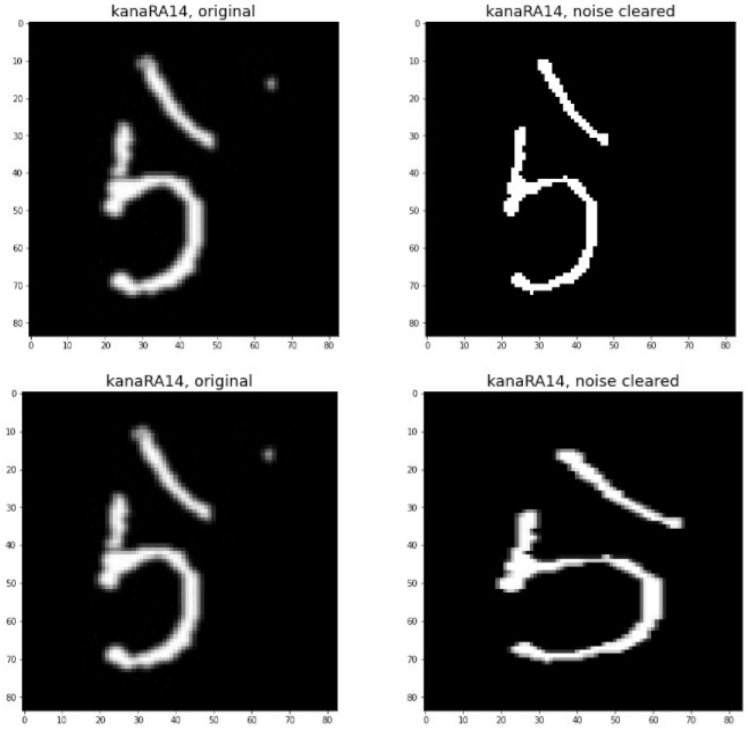
Dataset

- 1405 handwritten Hiragana images
  - 1000 images produced by Matheus Inoue.
  - 405 images produced by Wishyut.
  - 52 Hiragana characters, each character corresponding to 20-29 images.
- Extract labels from filenames
  - Each filename contains the romanji corresponding to each Hiragana, e.g. “kanaA0.jpg” indicates “a” (あ).
  - Regex is used to extract the file name.

- Training data and testing data
  - Data is split into 1124 training data and 281 testing data.

Image Preprocessing

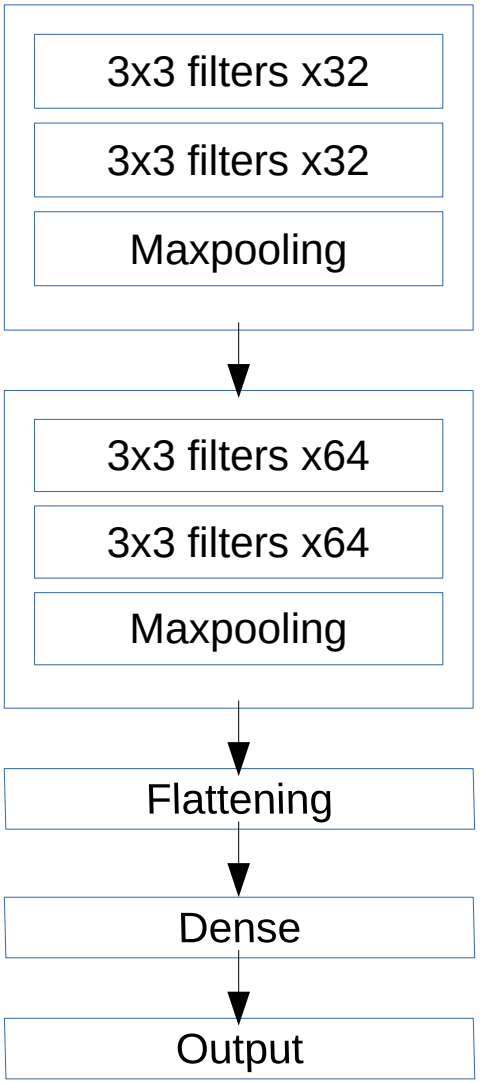
- Noise removal
  - Morphology techniques and thresholds are applied to input images using openCV.
- Reshape images
  - Each image is reshaped into 64x64 pixels and put inside a 84x84 frame.



- Augmentation
  - Small rotations and shears are applied to training images.

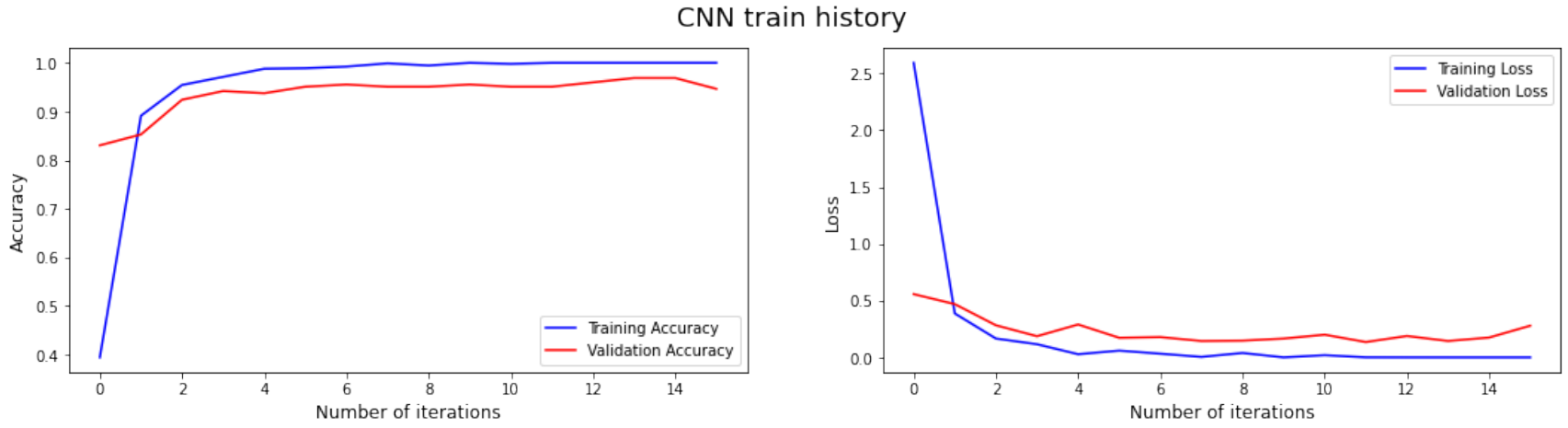
CNN Model

- The CNN structure
  - Two convolution blocks
    - Each block contains 2 convolution layers and 1 maxpooling layer
  - One flattening layer
  - One dense layer with 256 neurons
  - Output layer with 52 neurons
    - Corresponds to 52 characters



CNN Model

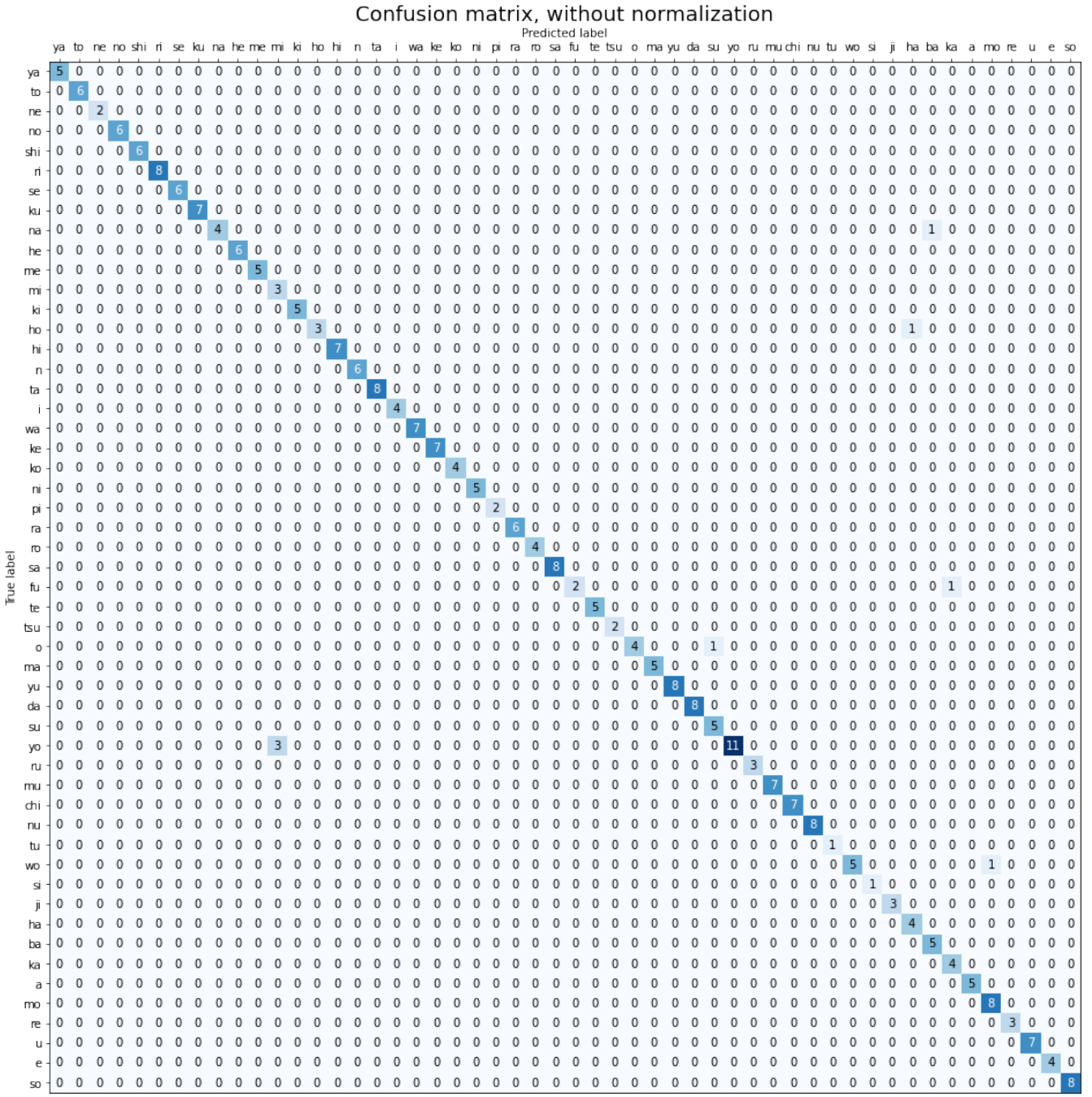
- Training details
  - Use RMSprop as optimizer
  - 16 iterations with early stopping criterion
- Training history
  - Run through 16 iterations
  - Final validation loss: 0.2790



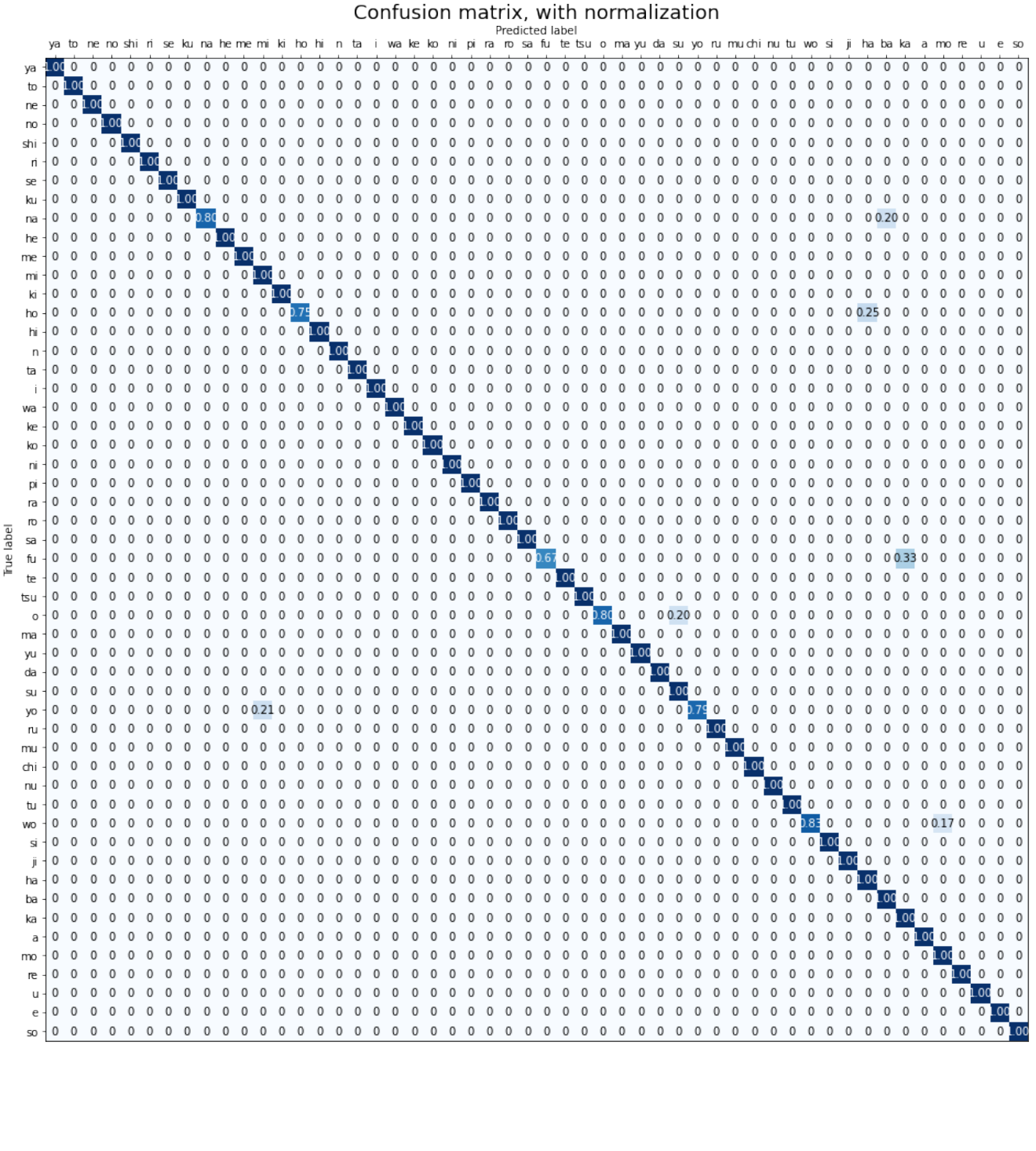
Testing results

- 281 testing data from the original dataset
  - **97%** accuracy
- 92 images of my handwritten Hiragana
  - **83%** accuracy
  - These images are not from the original dataset; in other words, they may have different features.
- Conclusion
  - More diverse handwriting styles, alongside increased data quantity, can lead to a better model with higher accuracy.

Confusion matrix
of the total
281 testing data



Normalized confusion matrix of the total 281 testing data



Conclusion

- More diverse handwriting styles, alongside increased data quantity, can lead to a better model with higher accuracy.
- Future work
  - Extend the model to recognize entire sentences instead of characters
  - Train a model to translate sentences