HANDWRITTEN LETTER RECOGNITION

Work done by:

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Subject: Tópicos de Aprendizagem Automática

INTRODUCTION

Handwritten Letter Recognition is a deep learning classification problem that consists in recognizing handwritten capital letters, lowercase letters and numbers from images.

Deep learning algorithms in general have a high potential into the future since they can help sparing people's time and work.

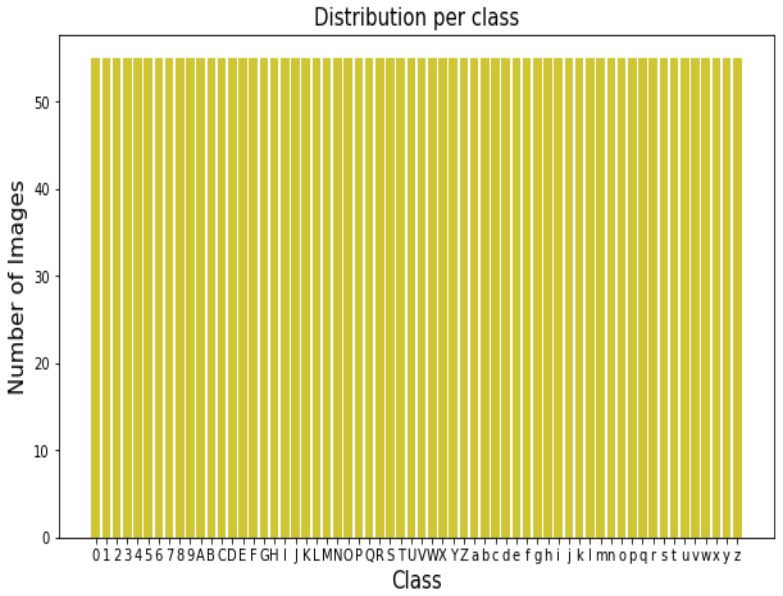
This subject raised interest in us due to the fact it can help in a lot real life situations such as filling forms to banks, ensurances , etc.

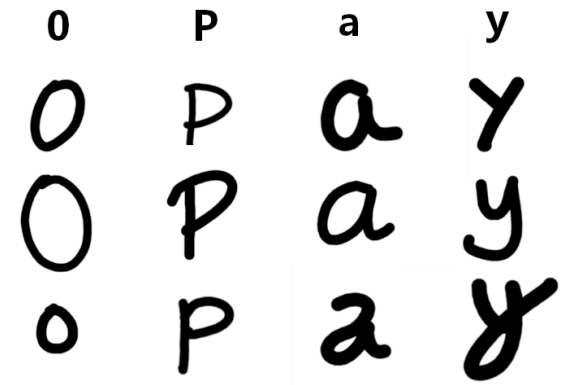
ANALYZING DATA SET

Data set with over 3000 images

Each class with homogeneous number of images

Major obstacle is calligraphy variations

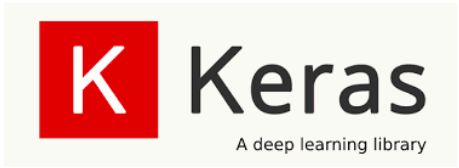




PRE-PROCESSING DATA

- Transformation from RGB(1) to grayscale(2)
- Cropping white space(3)
- Resizing(4)
- Normalizing

MODEL DESCRIPTION



Modelo 1:

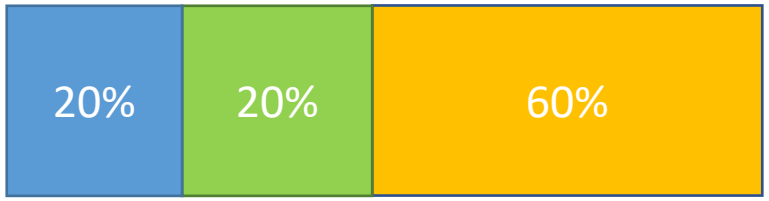
- Convolutional
- MaxPooling
- Convolutional
- MaxPooling
- Convolutional
- MaxPooling
- Flatten
- Dense
- Dense

Modelo 2:

- Convolutional
- Convolutional
- MaxPooling
- Dropout
- Dropout
- Flatten
- Dense
- Dense
- Dense

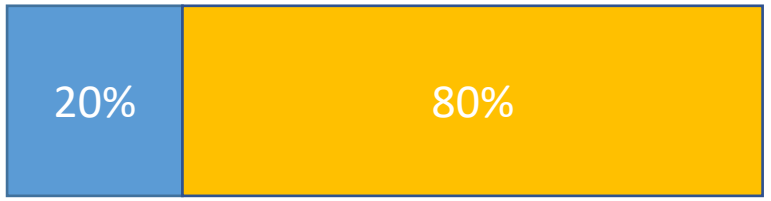
MODEL TRAINING

Traditional Data split:

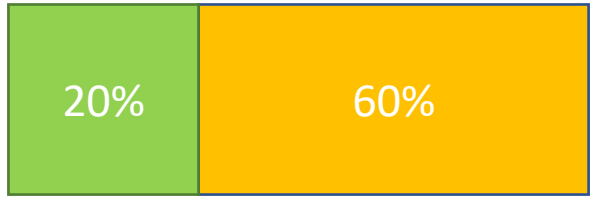


- Test set
- Validation set
- Train set

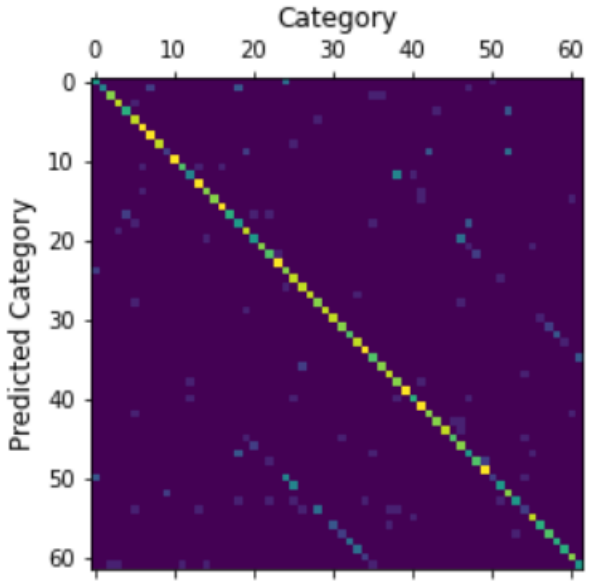
K-fold Cross Validation Data split:

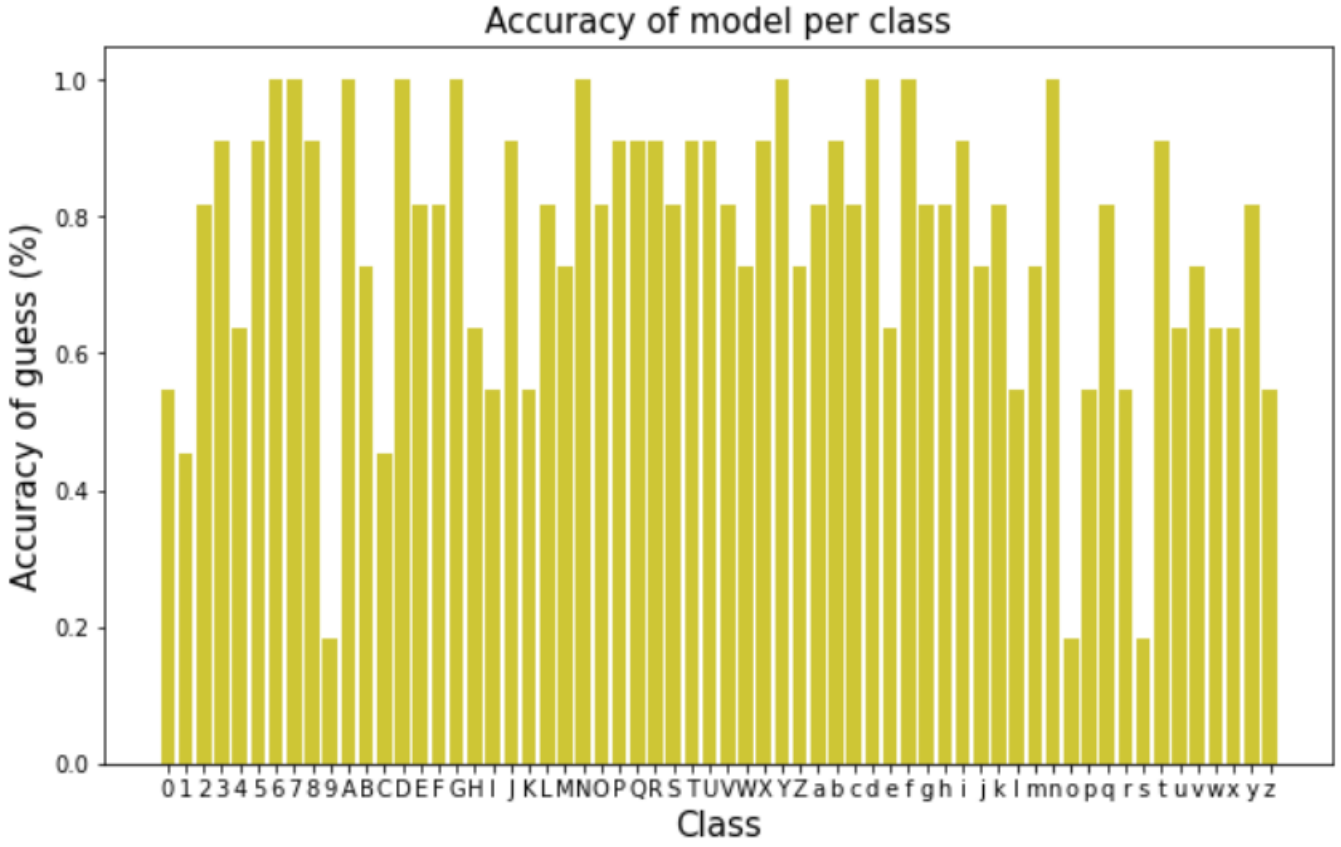


Cross Validation:

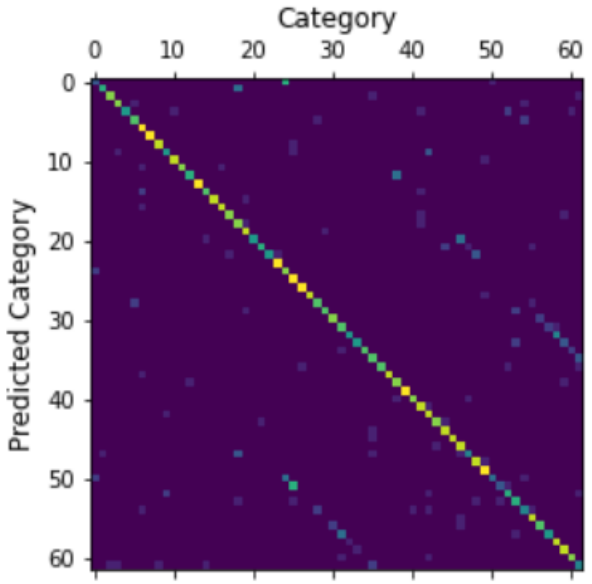


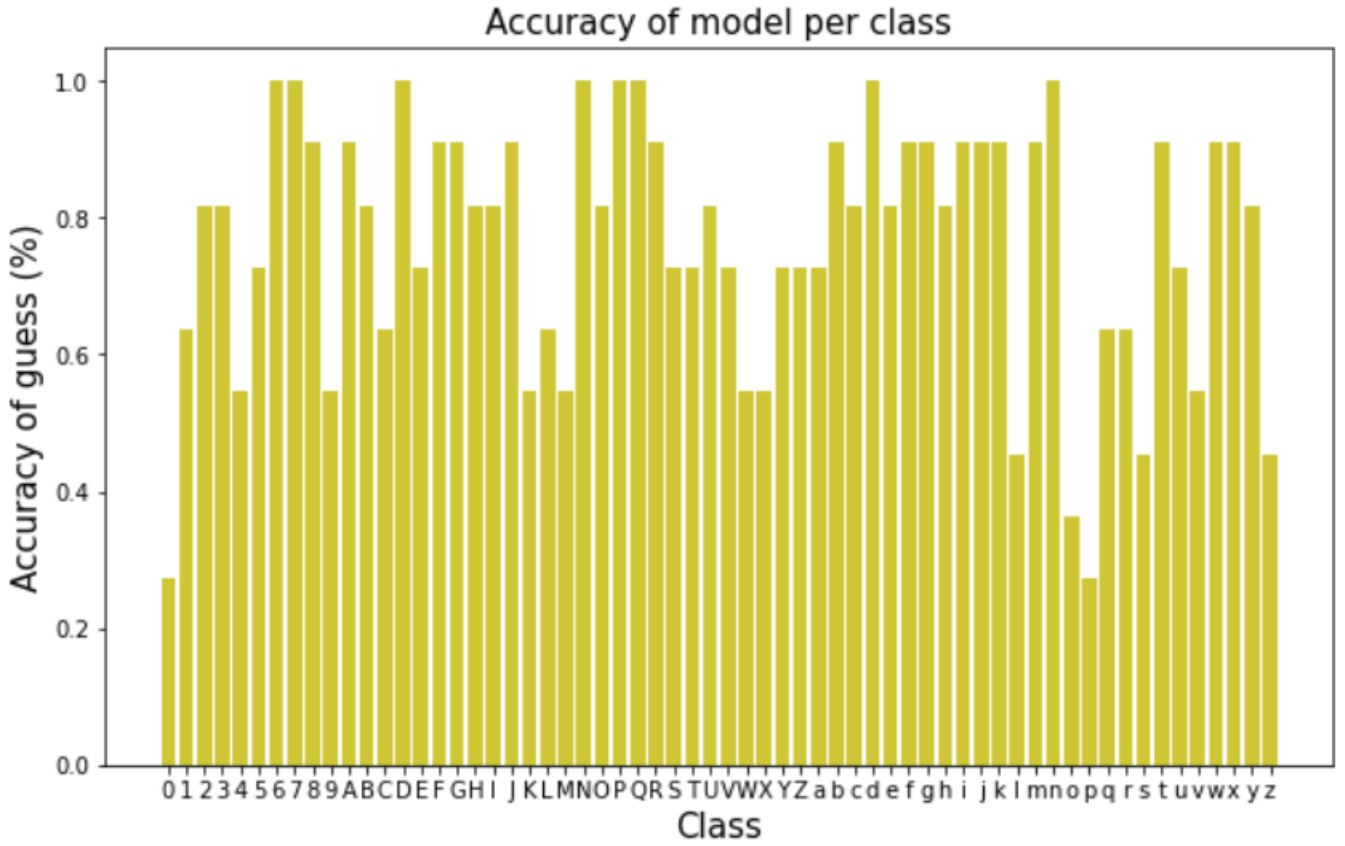
RESULTS (MODEL 1)





RESULTS (MODEL 2)



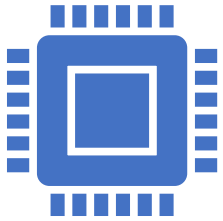


MODEL COMPARISON

	Model 1	Model 2
Train Accuracy	0.9479	0.9124
CV Accuracy	0.7815	0.7797
Test Accuracy	0.7654	0.7639
Train Loss	0.1544	0.2390
CV Loss	0.8673	0.8269
Test Loss	0.9538	0.9569

HYPERPARAMETER SELECTION

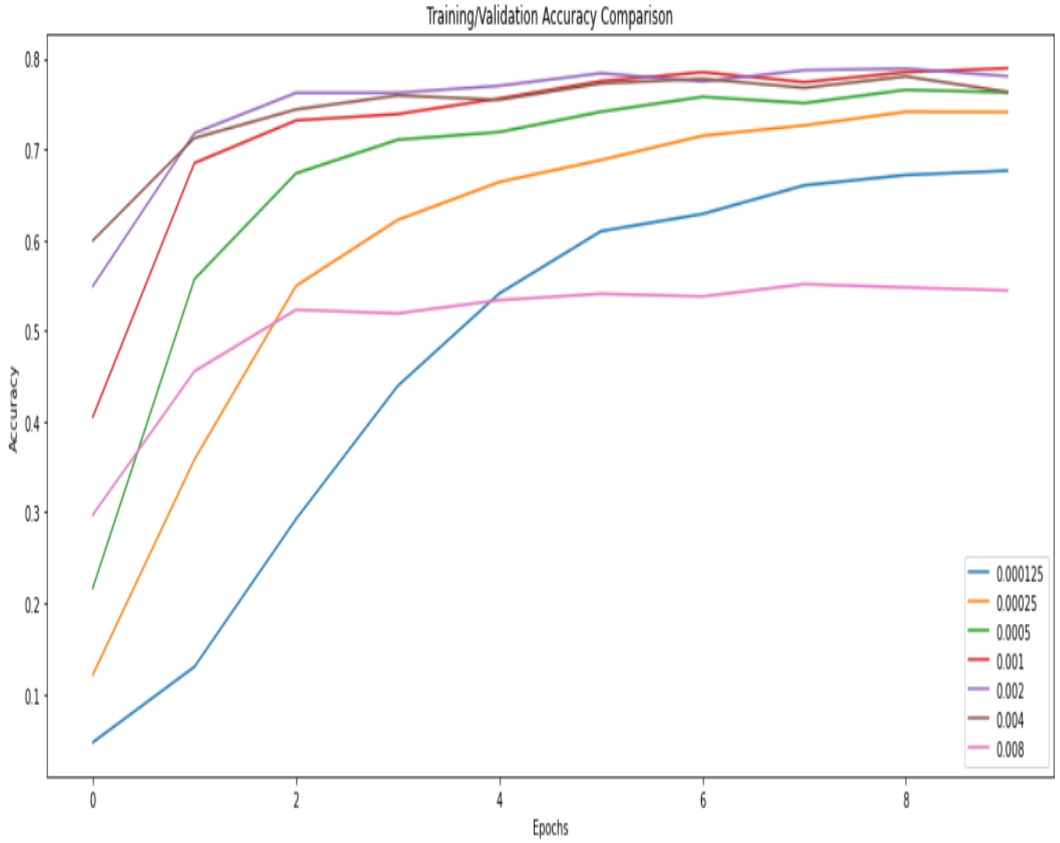
Learning rate

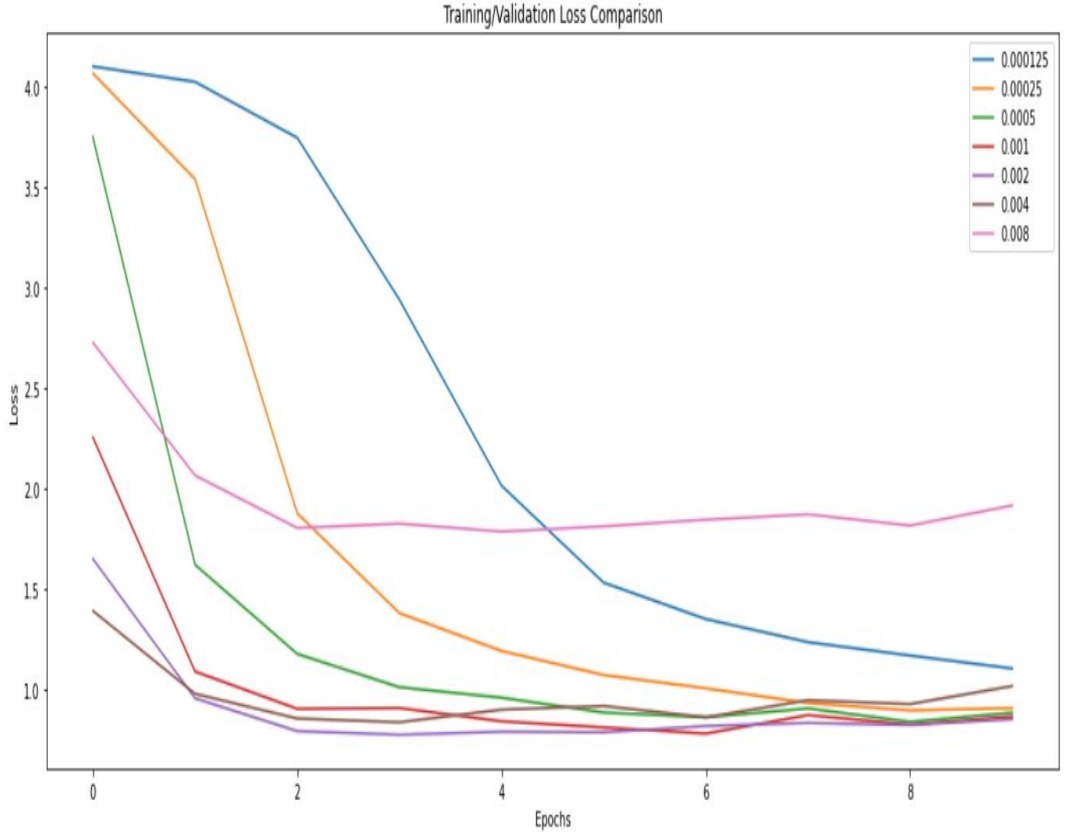


Kernel size

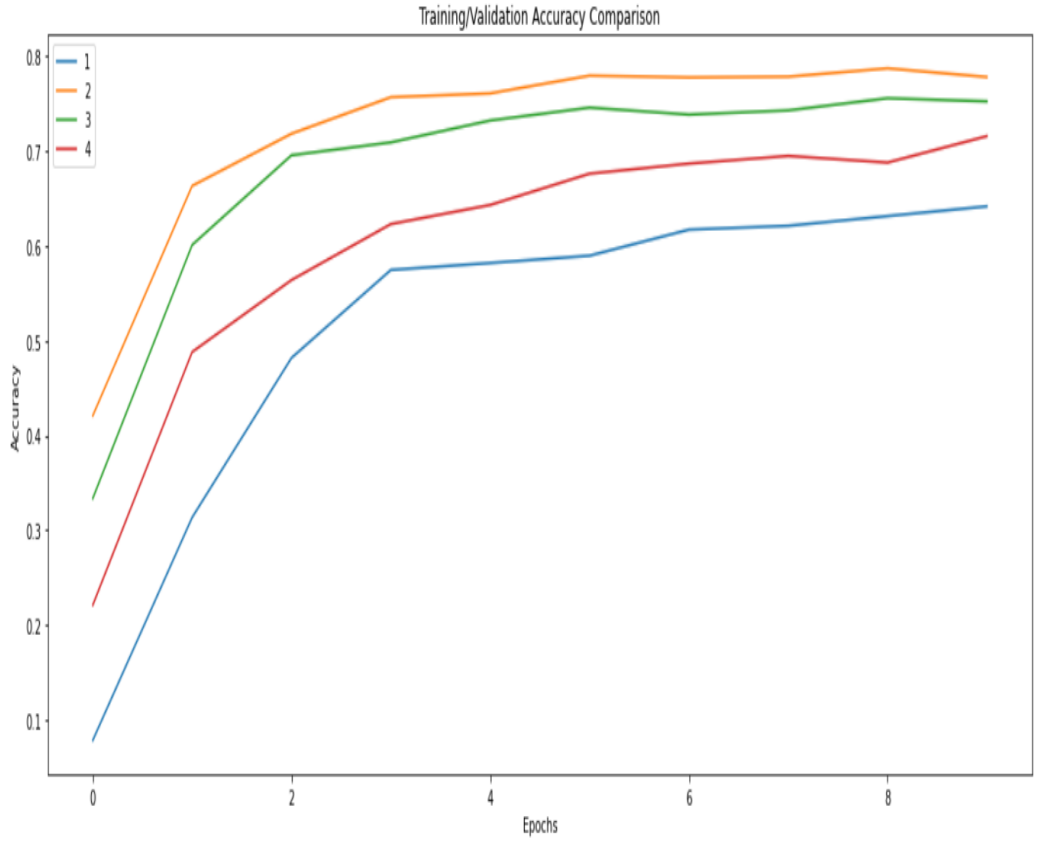
Dropout rate

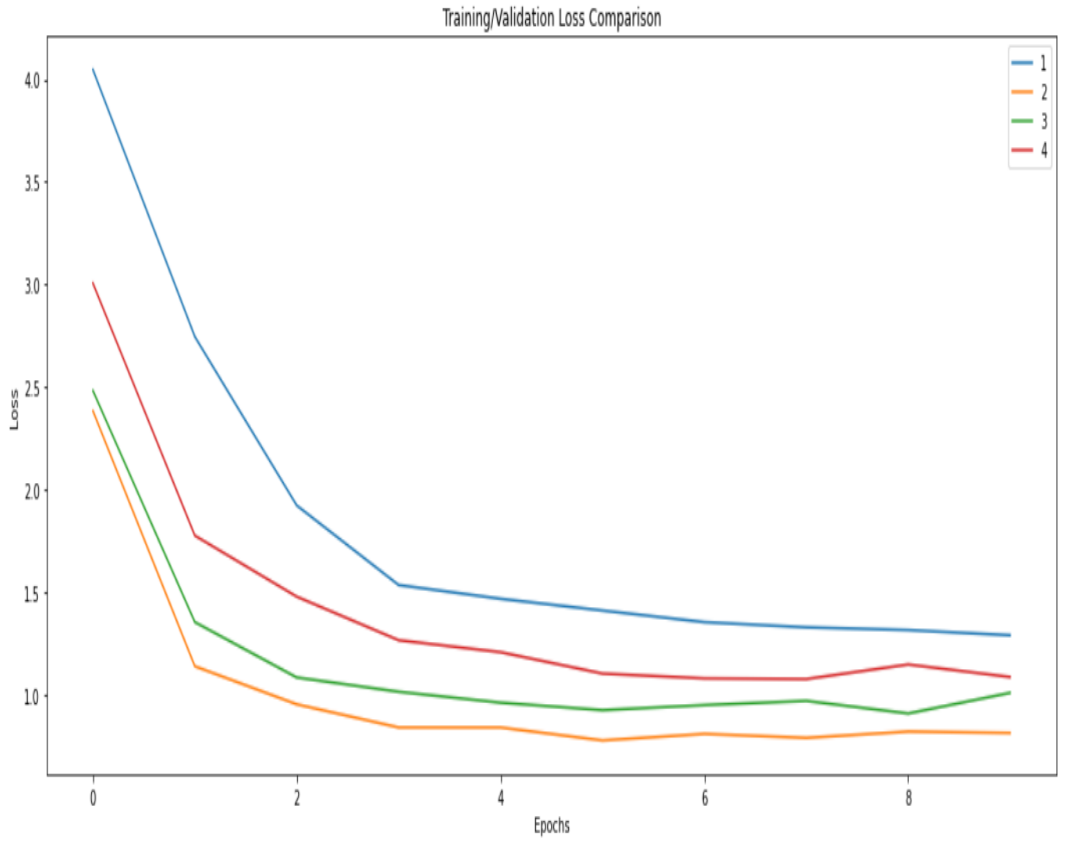
LEARNING RATE



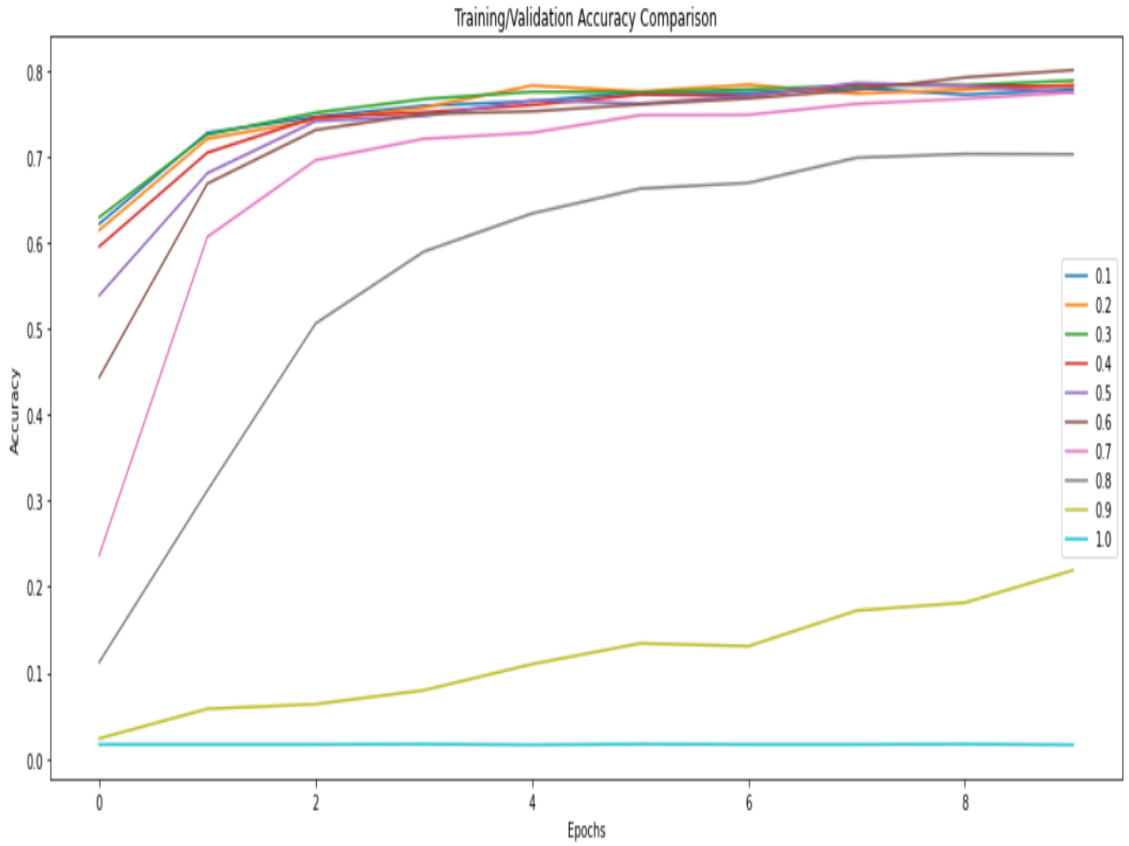


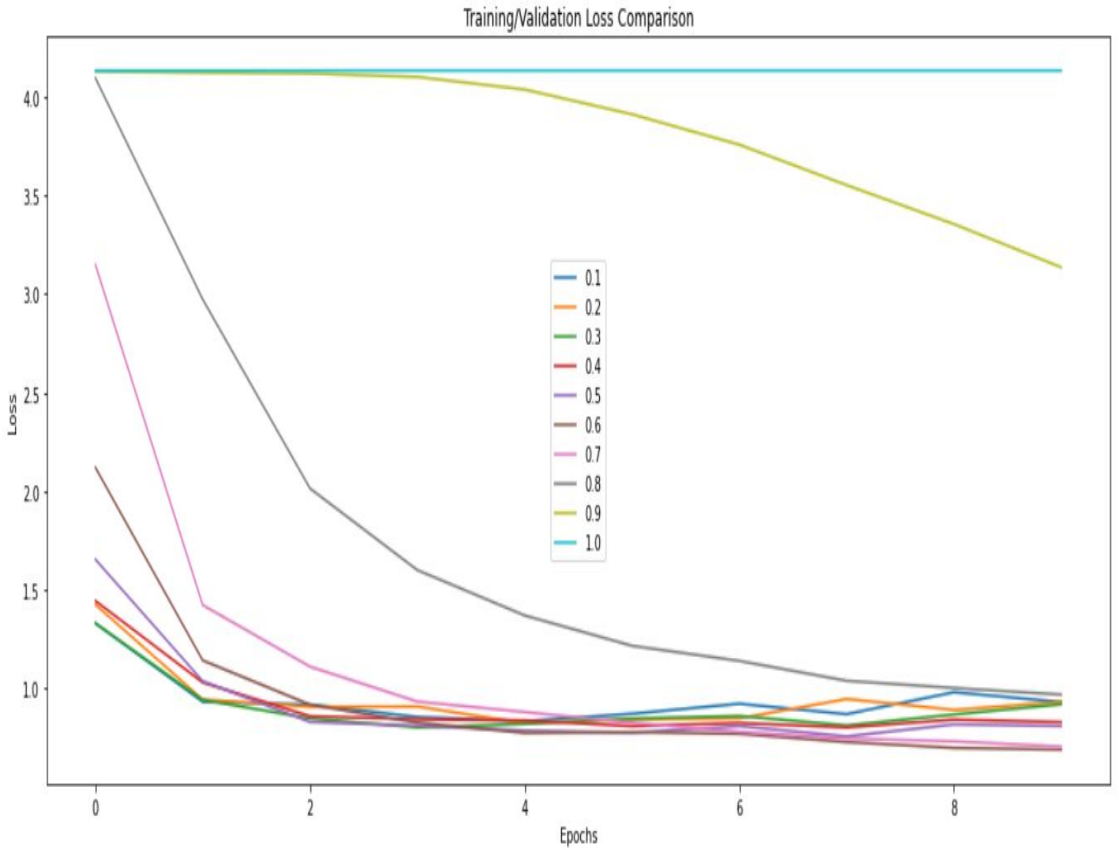
KERNEL SIZE


Training/Validation Accuracy Comparison
Accuracy
Epochs
1
2
3
4


Training/Validation Loss Comparison
Loss
Epochs
1
2
3
4

DROPOUT RATE





PREVIOUS WORK

Our dataset was only published 2 months ago and, as such, there is not much work about it.

Compared to the accuracy we saw on kaggle, we increased the accuracy of the first model.

We are unable to know if we managed to improve the second model because its values were tested in a much bigger dataset.

CONCLUSION

- We implemented 2 models that allowed us to recognize with some accuracy handwritten letters and numbers.
- Just like in real life, our dataset also included incomprehensible or dubious letters.
- We faced a lack of computing power to test some parameters.

QUESTIONS