Handwritten Signatures Classification
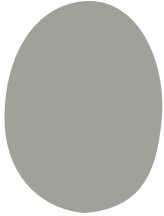
DETI – Universidade de Aveiro
Fundamentos de Aprendizagem Automática - Pétia Georgieva

Daniel Correia nº 90480

17/05/2021

Handwritten Signatures Dataset

1. Dataset – 300 signatures
   a. 30 people
   b. 5 genuine and 5 forged signatures per person
2. Training data – 240 signatures
   a. 4 genuine and 4 forged signatures per person
3. Test data – 60 signatures
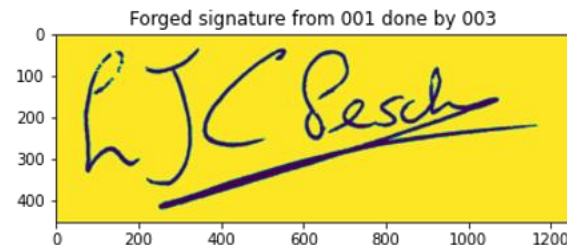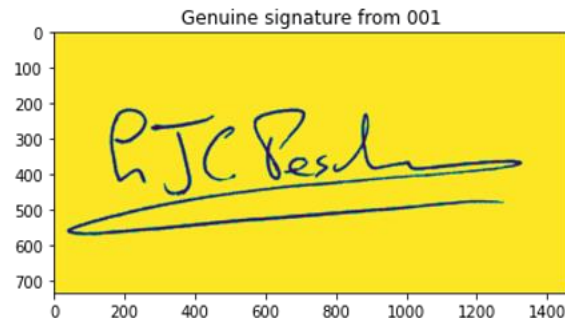   a. 1 genuine and 1 forged signatures per person

20% **80%**

Test data   Training data

Genuine signature from 001

Forged signature from 001 done by 003
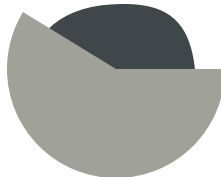
Handwritten Signatures Dataset Pre-processing

01 **BGR to RGB**

Transform the original data in BGR format to RGB format

02 **Resizing**

The images had different sizes. All resized to 224px, 224px, 3 channels

03 **Features**

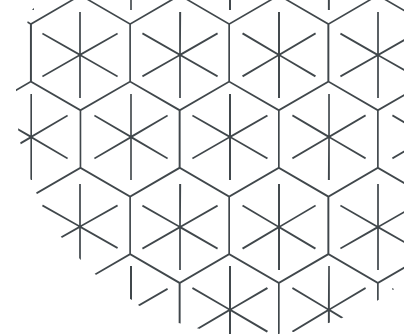Transform the (224, 224, 3) pictures to (150528)
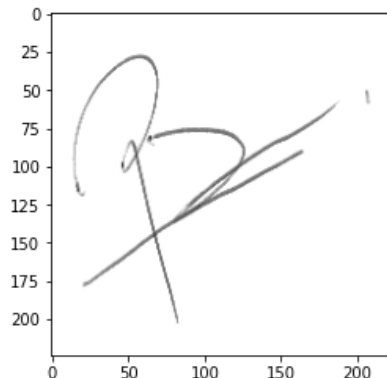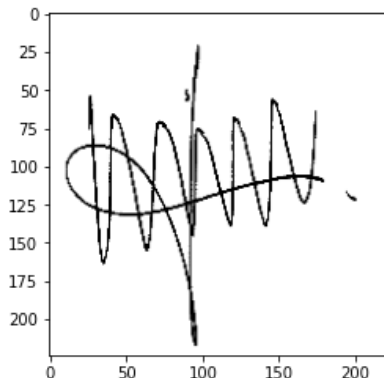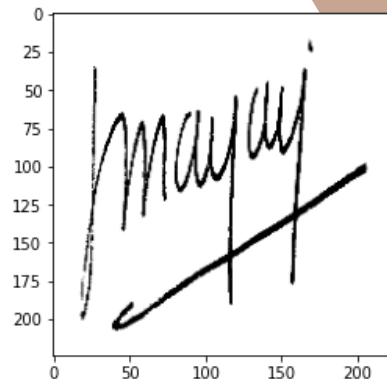
Logistic Regression

- Regularization: L2 norm regularization
- Solver Algorithm: Limited-memory BFGS
- Optimal hyper-parameter C: 0.01

- Accuracy: 81.66%
- Recall: 81.66%

Accuracy	0.8166
Precision	0.8170
Recall	0.8166
F1 Score	0.8166

Tabela I

ACCURACY, PRECISION, RECALL E F1 SCORE DE LOGISTIC REGRESSION

Support Vector Machine

- Kernels tested:
    1. Linear
    2. Radial basis function
    3. Sigmoid
    4. Poly
- Found optimal hyper-parameters for C, gamma

Kernel	C	gamma	sigma
Linear SVM	0.01	100	0.01
RBF SVM	0.01	100	0.01
sigmoid SVM	1	100	0.01
poly SVM	0.01	100	0.01

Tabela II

ACCURACY, PRECISION, RECALL E F1 SCORE DE SVM

- Best accuracy: 80.13%
- Best recall: 80%

| Kernel	Accuracy	Precision	Recall	F1 Score
Linear SVM	0.8	0.8013	0.8	0.7998
RBF SVM	0.5	0.25	0.5	0.3333
sigmoid SVM	0.5667	0.5679	0.5667	0.5647
poly SVM	0.6667	0.6697	0.6667	0.6652

Tabela III

MELHORES HÍPER-PARÂMETROS C E GAMMA PARA CADA KERNEL

Neural Network

- Pre-trained neural network utilized: Inception-V3
- Loss function: Categorical Crossentropy
- Optimizer: Adagrad
- Brush Size: 2
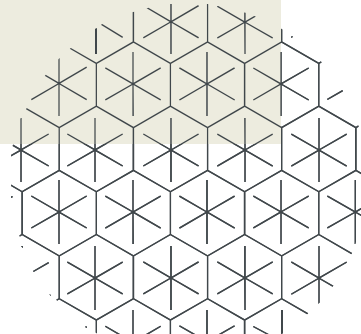- Epochs: 20

- Accuracy: 65%
- Loss: 65%
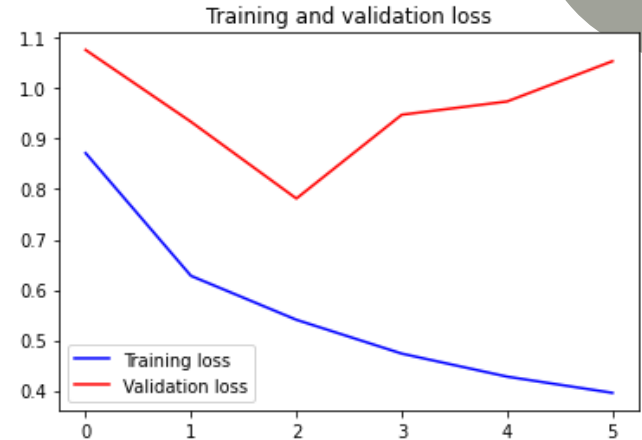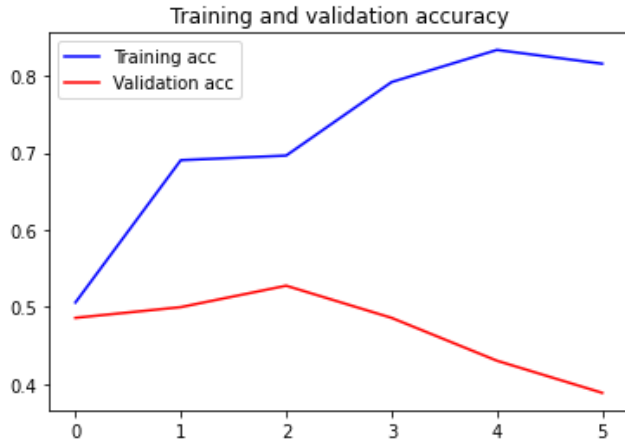
Conclusions

The best results were achieved with Logistic Regression Model

Improvements
- More Data
- Convolutional Neural Network

Thanks

universidade
de aveiro