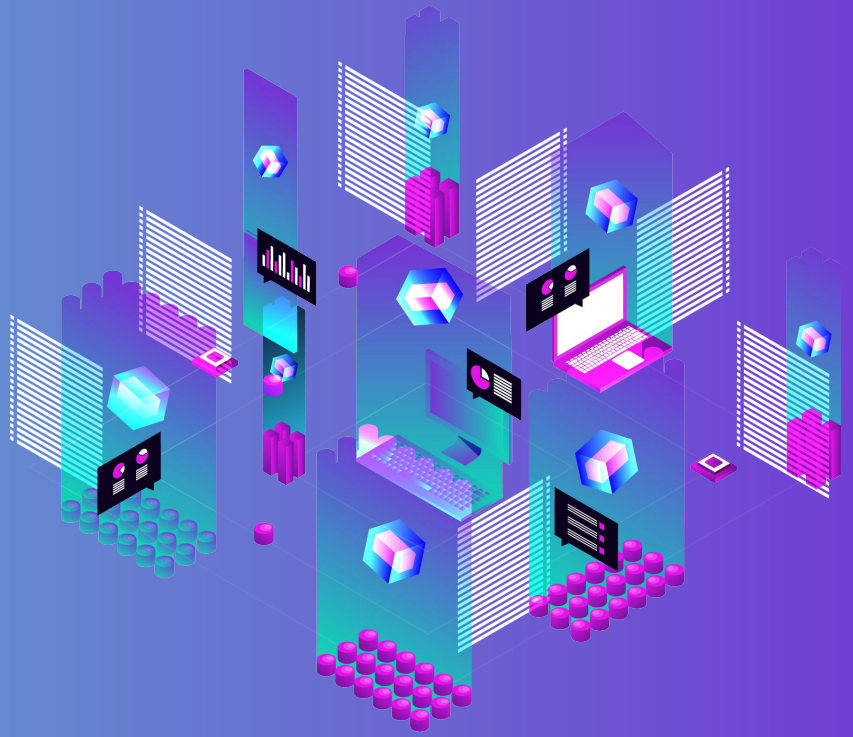
RECONHECIMENTO DE DÍGITOS



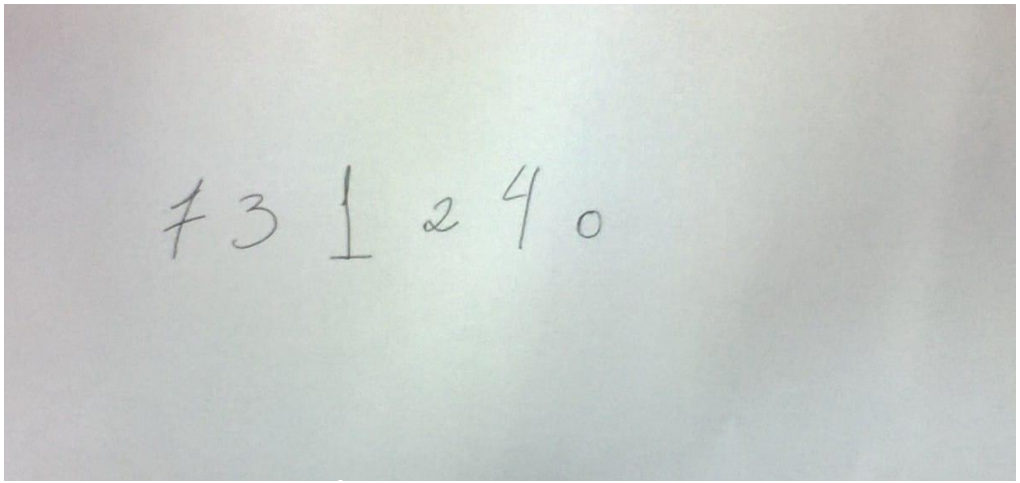
Grupo CiDAMO - UFPR

cidamo.github.io

AUTORES

Egmara Antunes
João Fassina
Renan Domingues

OBJETIVO



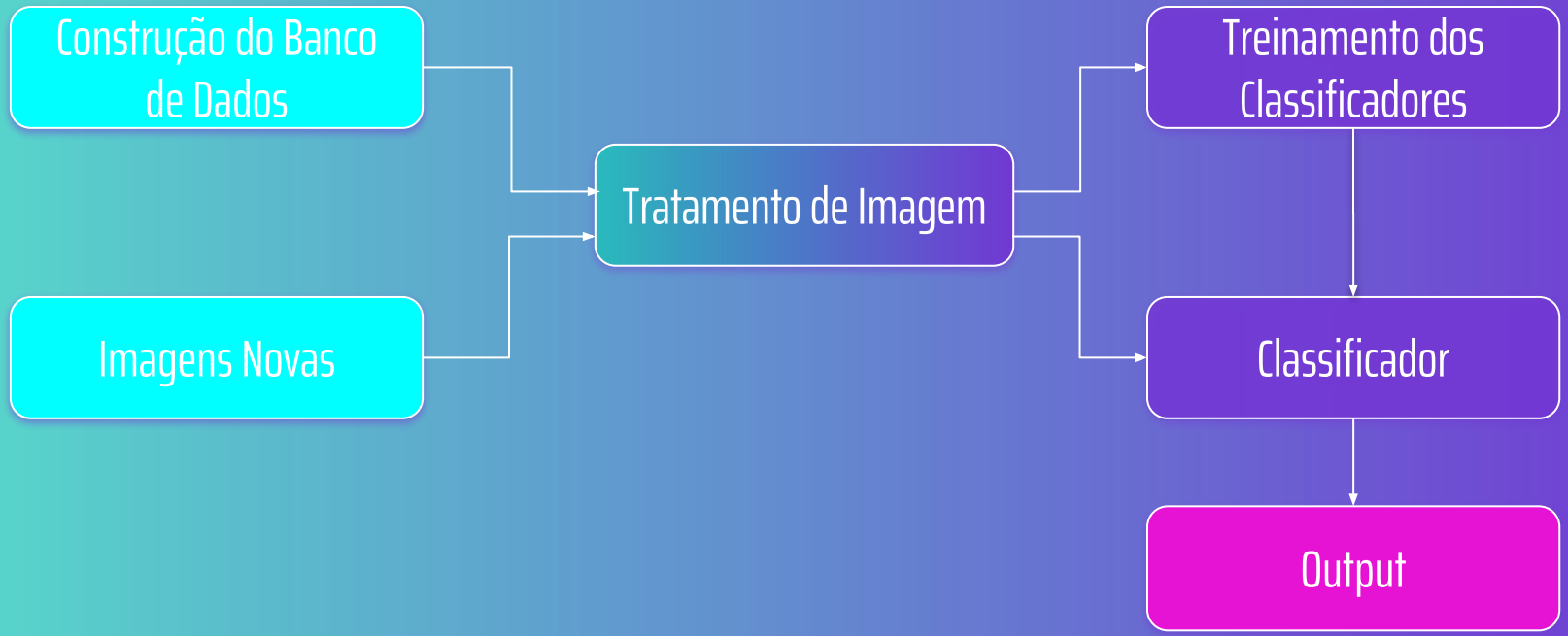
INPUT

→

[7, 3, 1, 2, 4, 0]

OUTPUT

ETAPAS


Construção do Banco de Dados
Imagens Novas
Tratamento de Imagem
Treinamento dos Classificadores
Classificador
Output

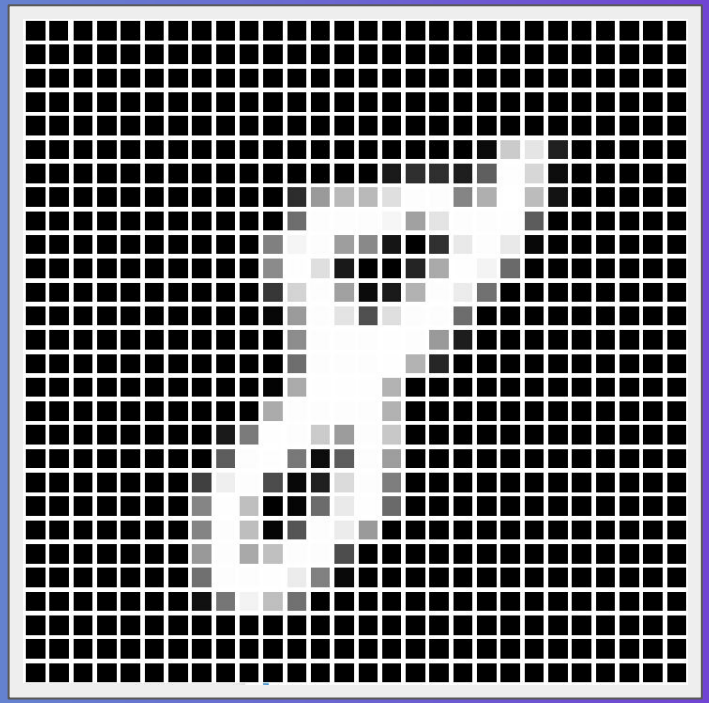
CONSTRUÇÃO DO BANCO DE DADOS

70000
AMOSTRAS

7000
DE CADA DÍGITO

IMAGENS
28X28

BANCO DE DADOS DO MNIST



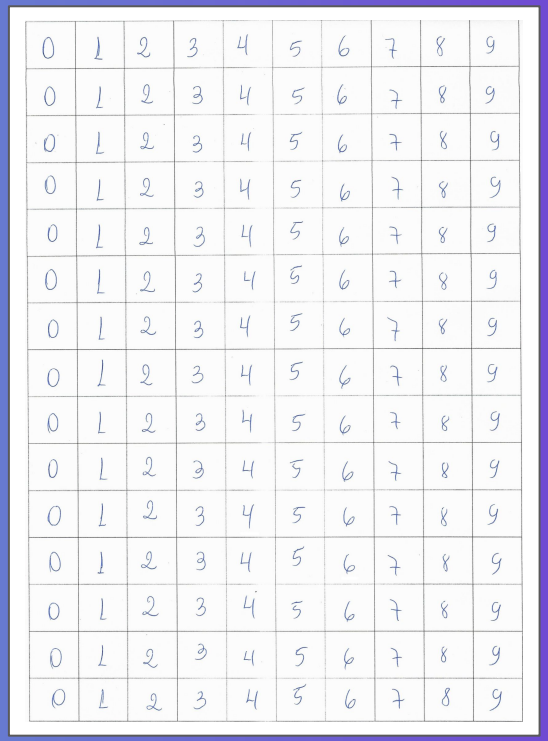
CONSTRUÇÃO DO BANCO DE DADOS

225
DE CADA DÍGITO

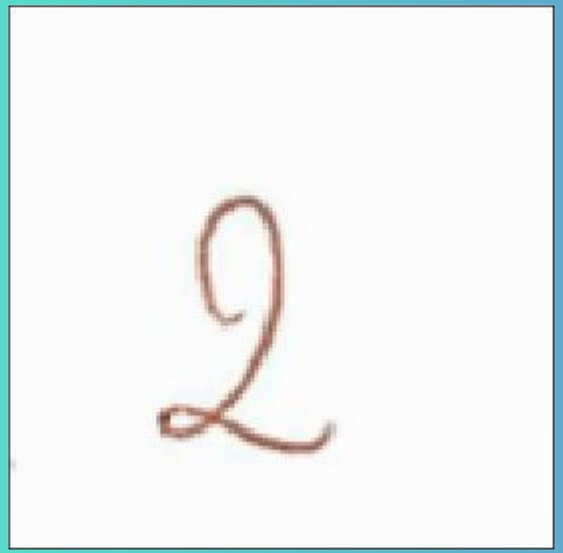
2250
AMOSTRAS

IMAGENS
28X28

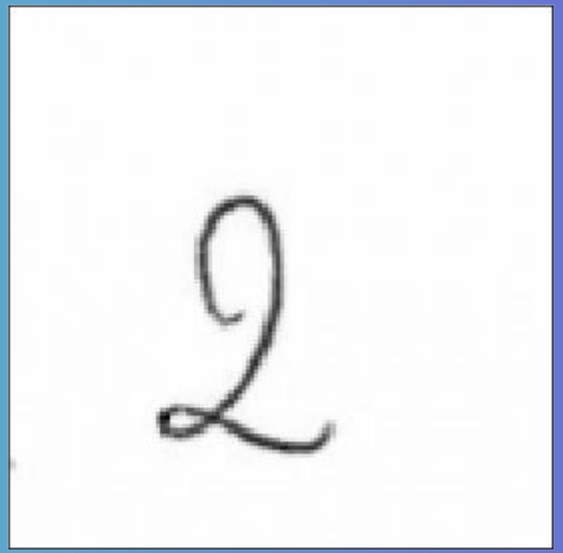
BANCO DE DADOS DESENVOLVIDO



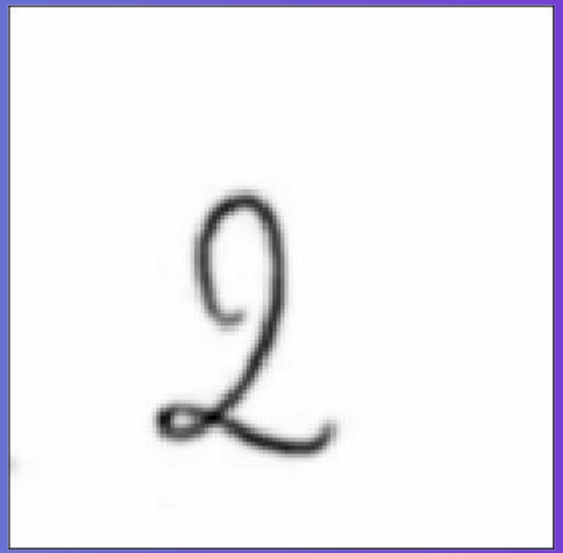
TRATAMENTO DE IMAGEM



Original

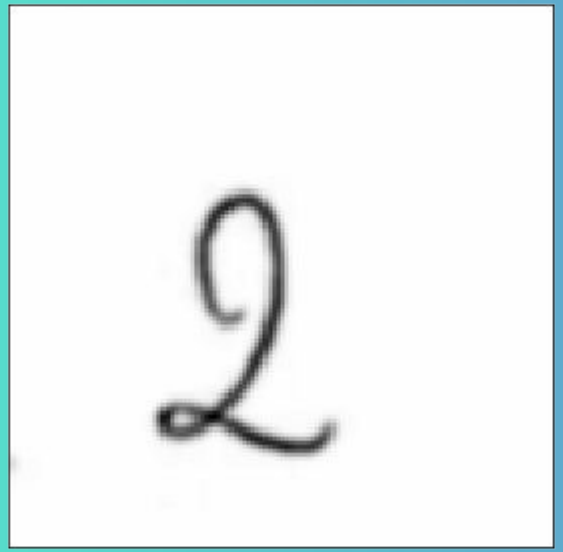


Cinza

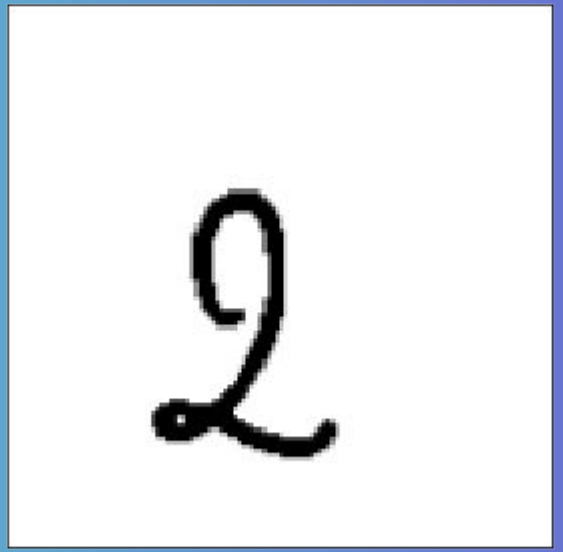


Borrada

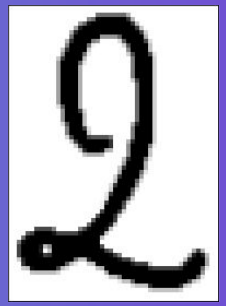
TRATAMENTO DE IMAGEM



Borrada

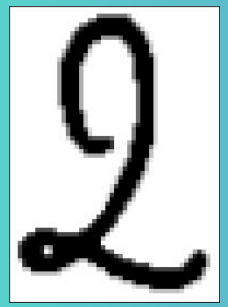


Threshold

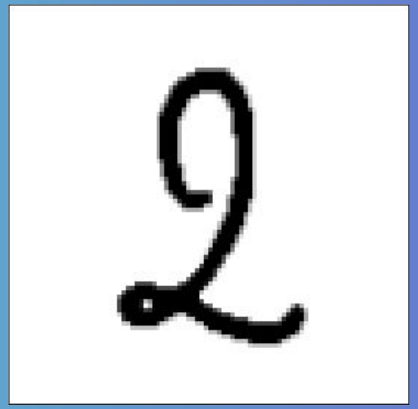


Cortada

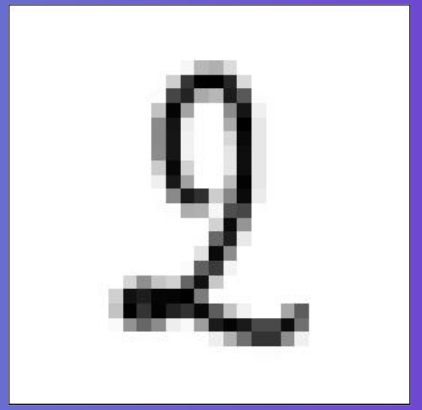
TRATAMENTO DE IMAGEM



Cortada



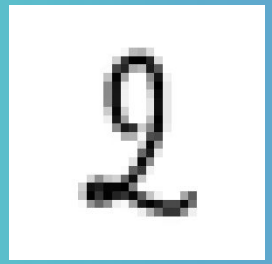
Centralizada



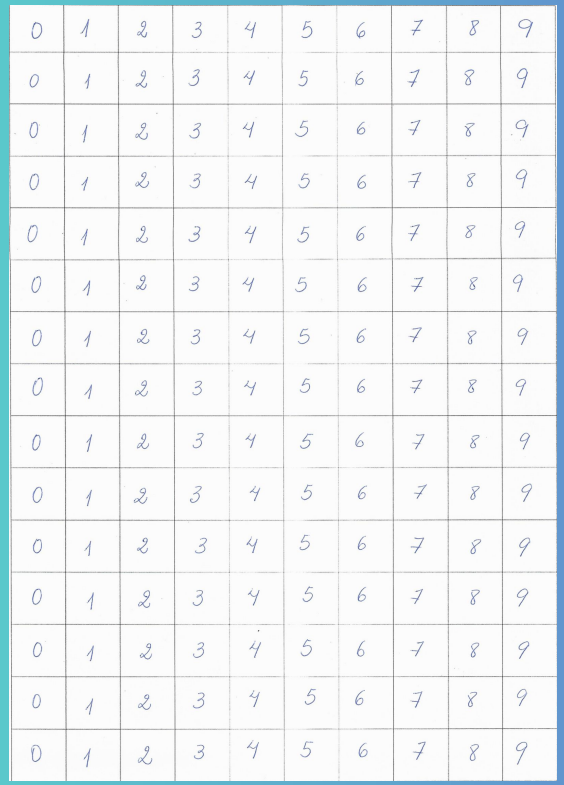
28x28

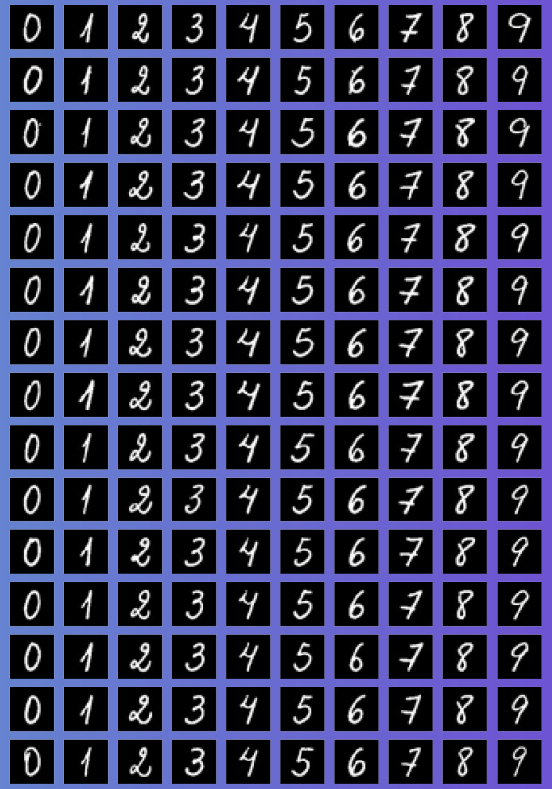
NORMALIZAÇÃO DA IMAGEM

$$\begin{bmatrix} 255 & 255 & 0 & 255 & 255 \\ 255 & 255 & 0 & 255 & 255 \\ 255 & 255 & 0 & 255 & 255 \\ 255 & 255 & 0 & 255 & 255 \\ 255 & 255 & 0 & 255 & 255 \end{bmatrix} \rightarrow \begin{bmatrix} 0 & 0 & 255 & 0 & 0 \\ 0 & 0 & 255 & 0 & 0 \\ 0 & 0 & 255 & 0 & 0 \\ 0 & 0 & 255 & 0 & 0 \\ 0 & 0 & 255 & 0 & 0 \end{bmatrix} \rightarrow \begin{bmatrix} 0 \\ 0 \\ 0 \\ \vdots \\ 255 \\ 255 \\ \vdots \\ 0 \end{bmatrix} \rightarrow \begin{bmatrix} 0 \\ 0 \\ 0 \\ \vdots \\ 1 \\ 1 \\ \vdots \\ 0 \end{bmatrix}$$



BANCO DE DADOS



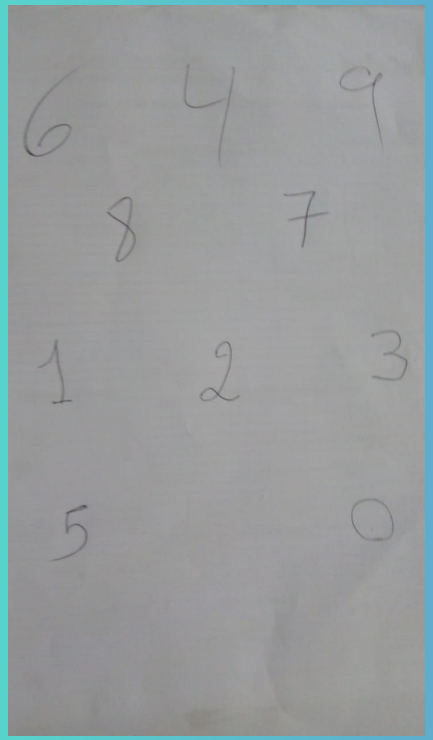


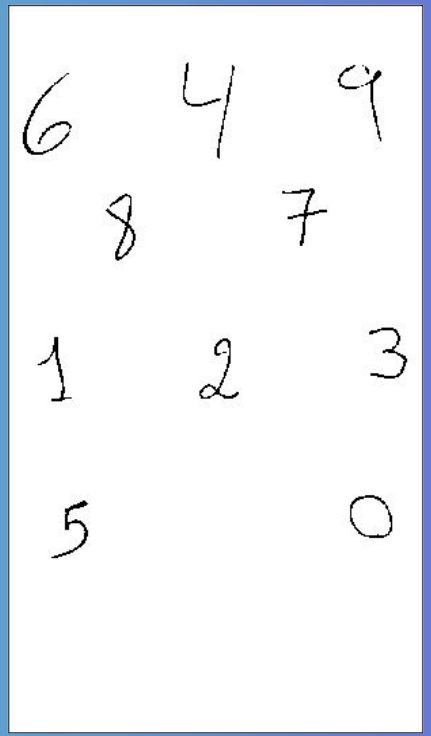
BANCO DE DADOS

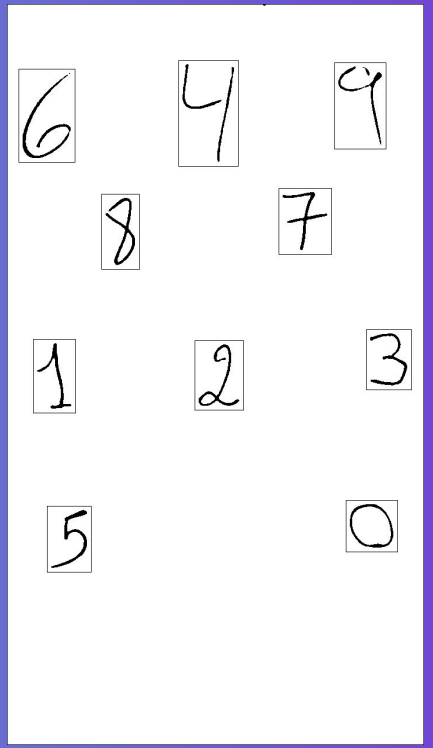
- Nosso

- MNIST

TRATAMENTO DE TESTES







CLASSIFICADORES

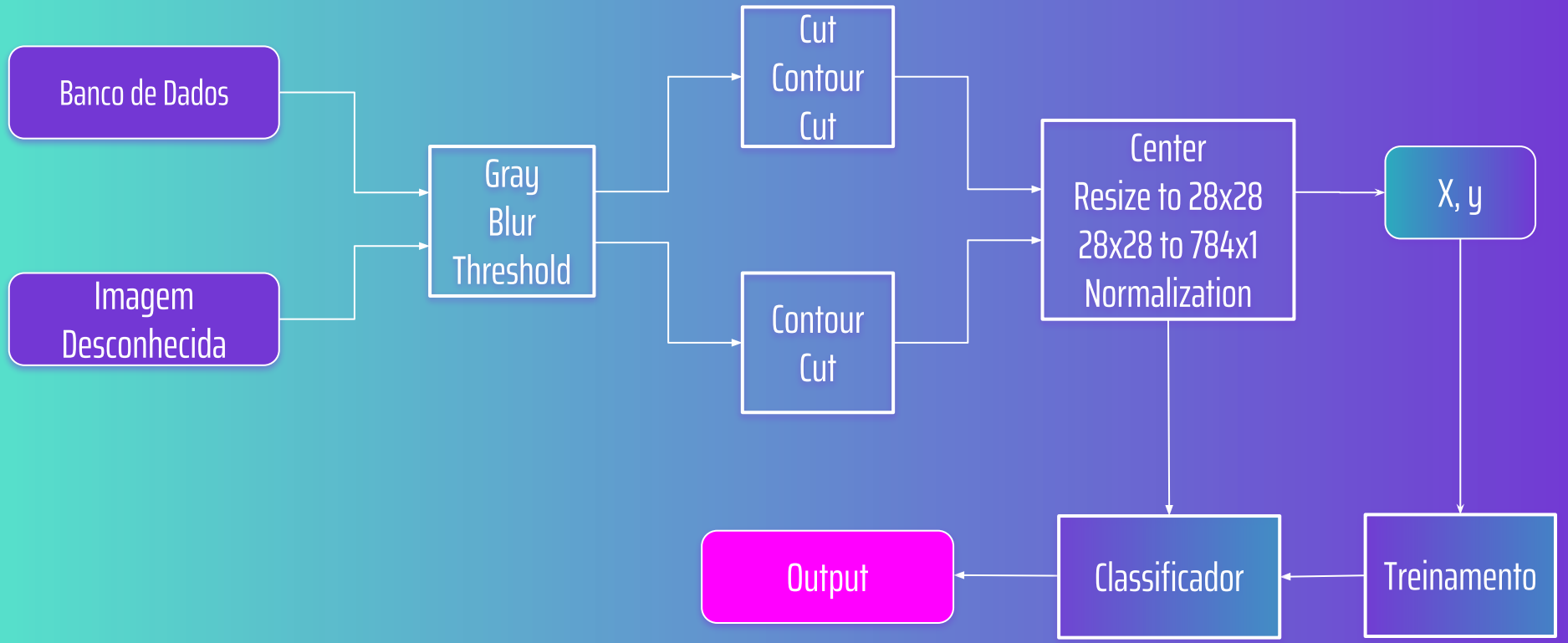
- Treinamento supervisionado com banco de dados próprio e usando classificadores das bibliotecas Scikit-Learn e Keras
  - Rede Neural
  - Floresta
  - SVC
  - Rede Neural Convolucional (Keras)

CLASSIFICADORES

- Alguns parâmetros foram otimizados usando k-fold cross validation
- Para detalhes sobre as implementações verificar o repositório

https://github.com/Egmara/Machine-Learning-Projeto-UFPR-Reconhecimento-de-algarismos

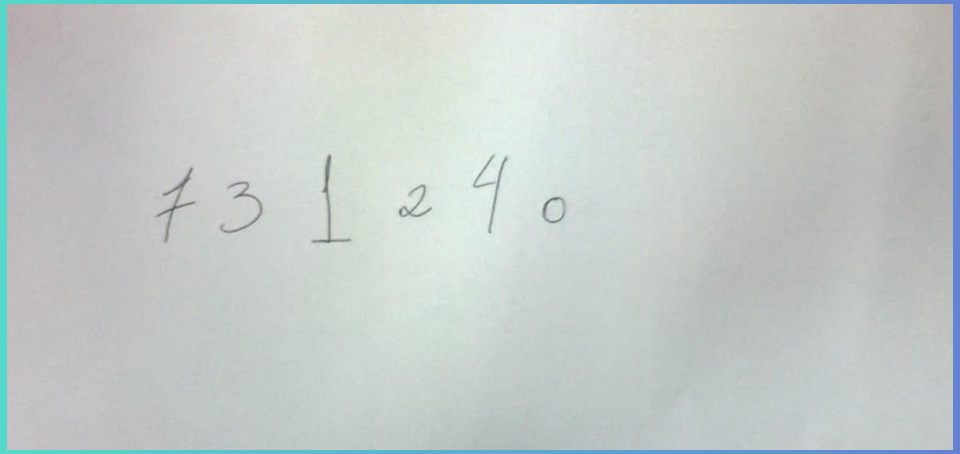
FLUXOGRAMA GERAL DO PROJETO

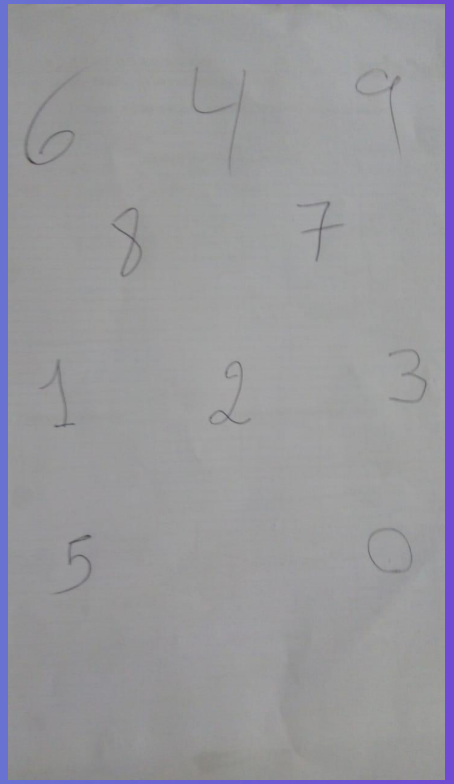


TESTES

- O objetivo é classificar dígitos em imagens diferentes do banco de dados
- Os testes foram realizados com fotos de folhas contendo dígitos de tamanho e posição arbitrários
- Além disso, os testes foram escritos apenas por pessoas que não contribuíram com o banco de dados

EXEMPLOS DE TESTES





RESULTADOS

Classificador	Acertos	Acurácia
RandomForest	36/51	70.6%
MLP	42/51	82.4%
SVC	41/51	80.4%
CNN	49/51	96.1%

LINKS ÚTEIS

github.com/Egmara/Machine-Learning-Projeto-UFPR-Reconhecimento-de-algarismos

cidamo.github.io/projetos/reconhecimento-de-digitos/