Machine Learning Research Project

Aristotelis, Daris, Max & Paulo

Outline

- Topic & Research Question
  - Why?
- Methodology
  - Preprocessing
  - Machine Learning
- Results
- Discussion

Topic & Research Question

- Current progress

Topic

- Supervised Learning
    - Classification
    - Neural Networks & other ML models
- Handwriting Recognition
    - Letters → Words

Research Question

Which machine and deep learning model is the best at recognizing handwriting?

Why?

- Document Digitization
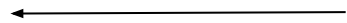
- Forensic Analysis
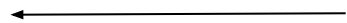
- Data Entry Automation

Methodology

Preprocessing

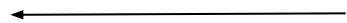- Database
  - 200,000 pairs of words/digitized names

LÉNA ←———————————— Ideal

CLOTAIRE... ←———————————— Unusable

NOM: GORTCHAKOFF ←———————————— Noise

Preprocessing

- Getting usable data (perfectly cut letters)

NOM

B A L T H A 2 A R

NOM
3.0
84LTHA2AR
0.333333333333333

Fuzzy Distance
+
OCR

B A L T H A 2 A R
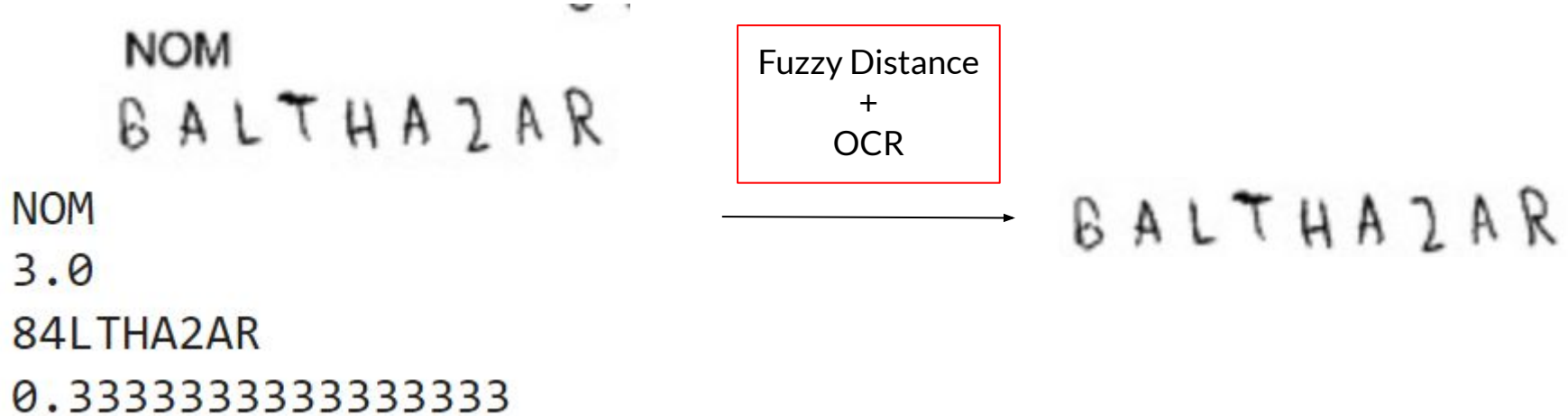
Preprocessing

OpenCV
findContours()
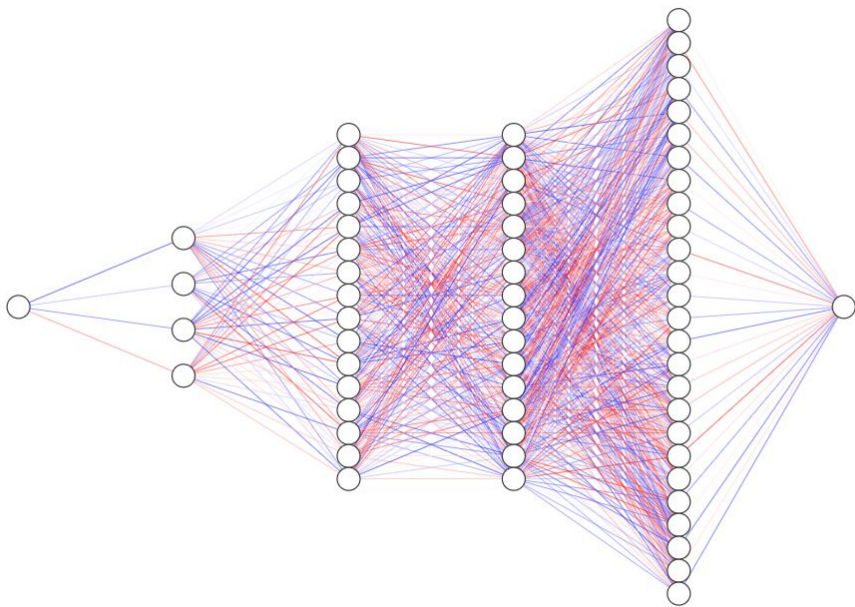
Contour Area: 54.5
Contour Area: 80.0
Contour Area: 80.0

Preprocessing

Label: A
$\longrightarrow$
[1,0,0,0,...,0,0]

One-hot encoding

Machine Learning
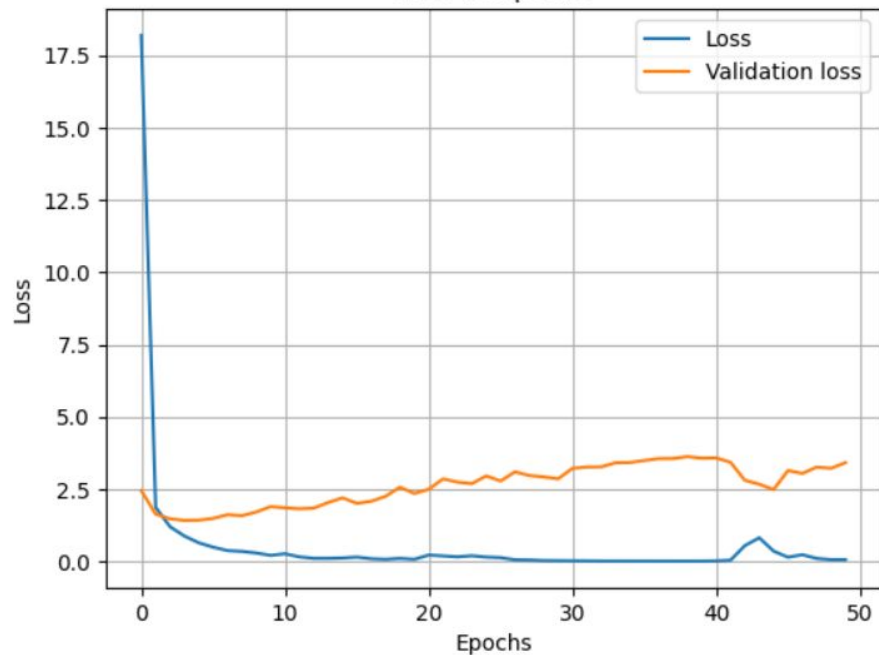

- 16 convolutional neurons
- Flatten
- 64 dense neurons
- 64 dense neurons
- 27 neurons (for each letter & "-")
- Output (argmax)

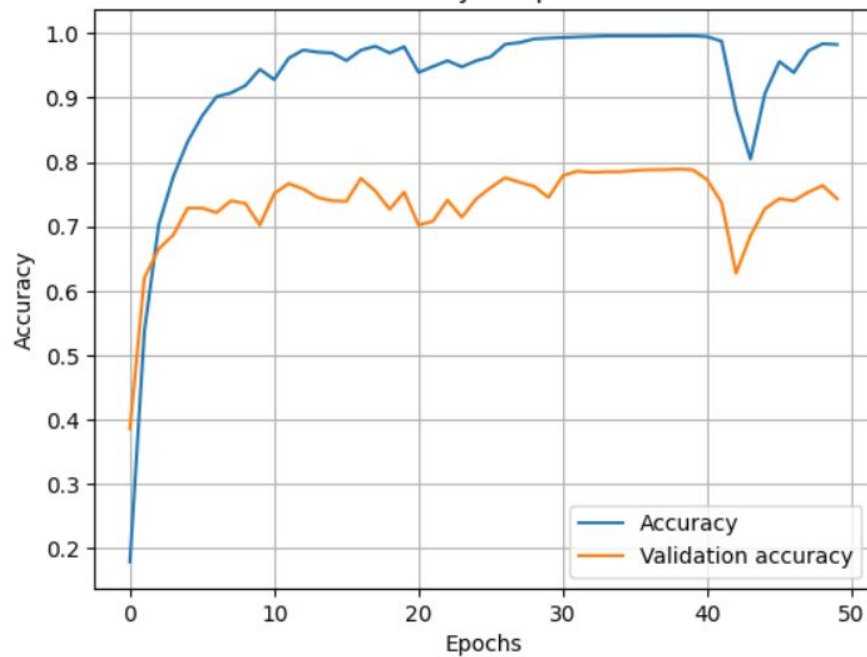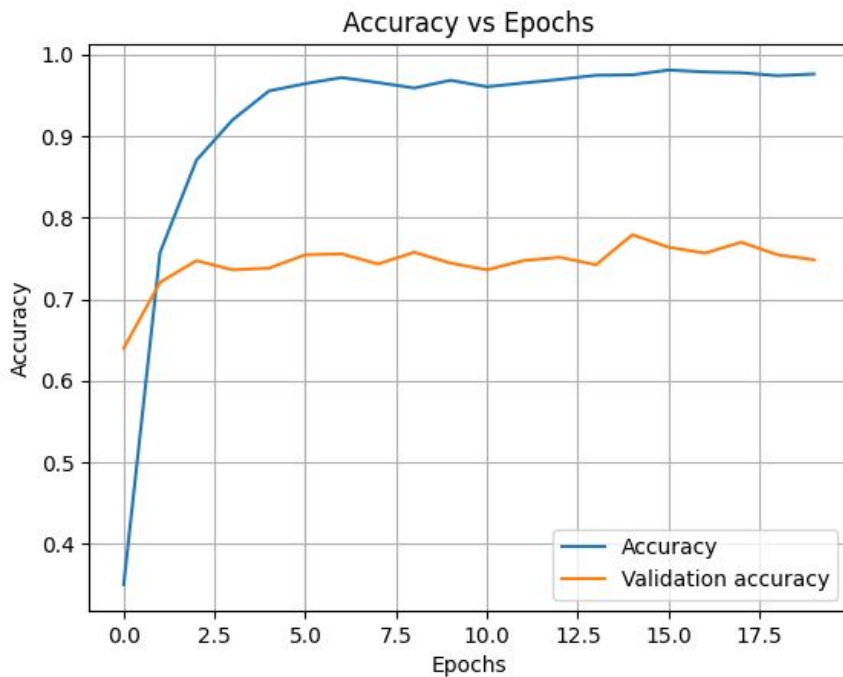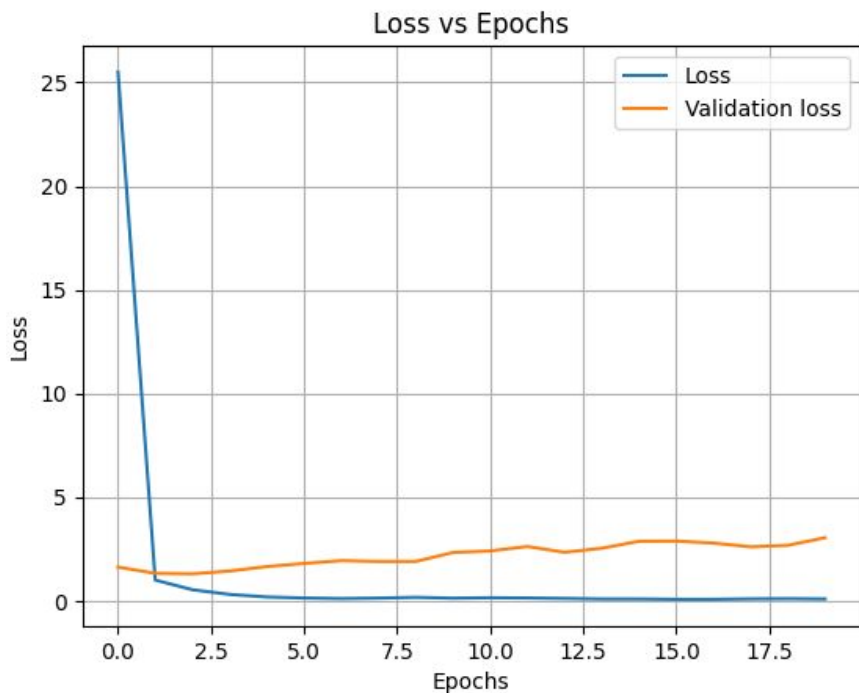Input Layer ∈ ℝ¹   Hidden Layer ∈ ℝ⁴   Hidden Layer ∈ ℝ¹⁶   Hidden Layer ∈ ℝ¹⁶   Hidden Layer ∈ ℝ²⁶   Output Layer ∈ ℝ¹

Results & Discussion

Results
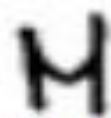
Results: Removing one Dense layer

Results

Predicted: R
Actual: A

Predicted: R
Actual: A

Predicted: Y
Actual: M

Predicted: A
Actual: S

Discussion

- High accuracy
- Computation time
- Homogeneous data set
    - Preprocessing
- Further research
    - Expand inputs
    - Data entry automation, digitalization