

CS 417

NEURAL NETWORK PROJECT

Instructors

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ARABIC HANDWRITTEN DIGIT RECOGNITION USING CNN

Recognizes handwritten Arabic digits (0-9)
Uses Convolutional Neural Networks (CNN)

GOAL / OBJECTIVE

GOAL

Accurately recognize handwritten Arabic digits (0–9) from images.

OBJECTIVES

BUILD A CNN MODEL FOR FEATURE EXTRACTION AND CLASSIFICATION
HANDLE VARIATIONS IN HANDWRITING AND NOISE IN IMAGES

EVALUATE THE MODEL WITH ACCURACY, LOSS, AND CONFUSION MATRIX

ENABLE PREDICTION ON UNSEEN DIGIT IMAGES.

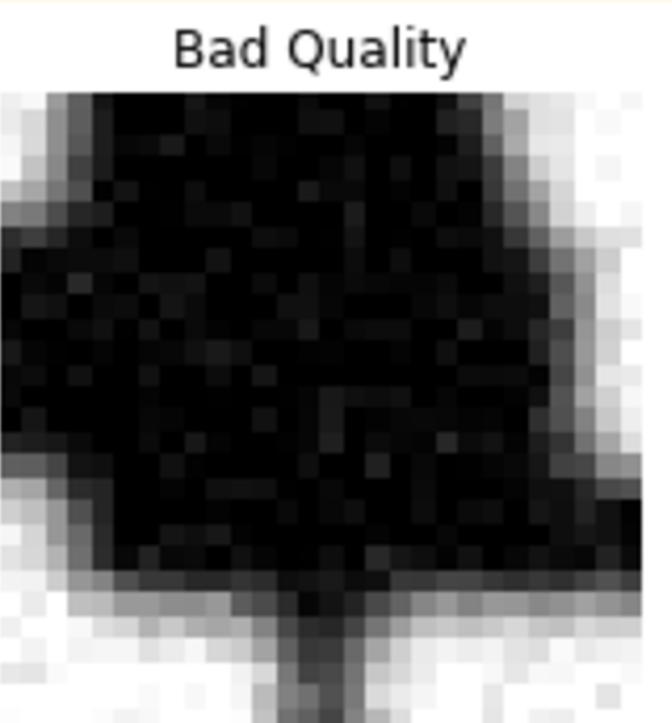
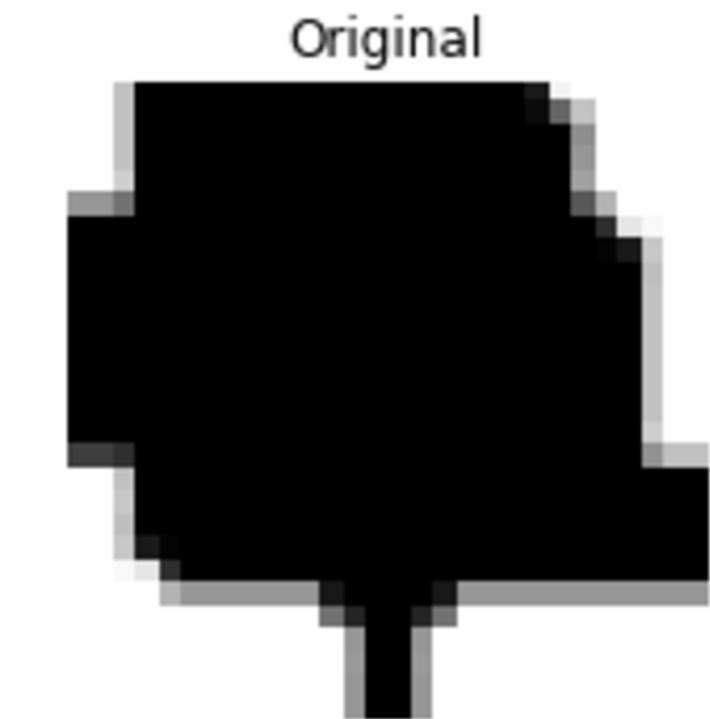
DATASET & PREPROCESSING

DATASET:

- Arabic handwritten digits (0-9)
- Written by multiple individuals (AHCD / MADBase / custom)

PREPROCESSING STEPS:

- RESIZE & NORMALIZE IMAGES
- SPLIT DATASET (TRAIN/TEST)
- ADD NOISE FOR ROBUSTNESS



DATASET & PREPROCESSING

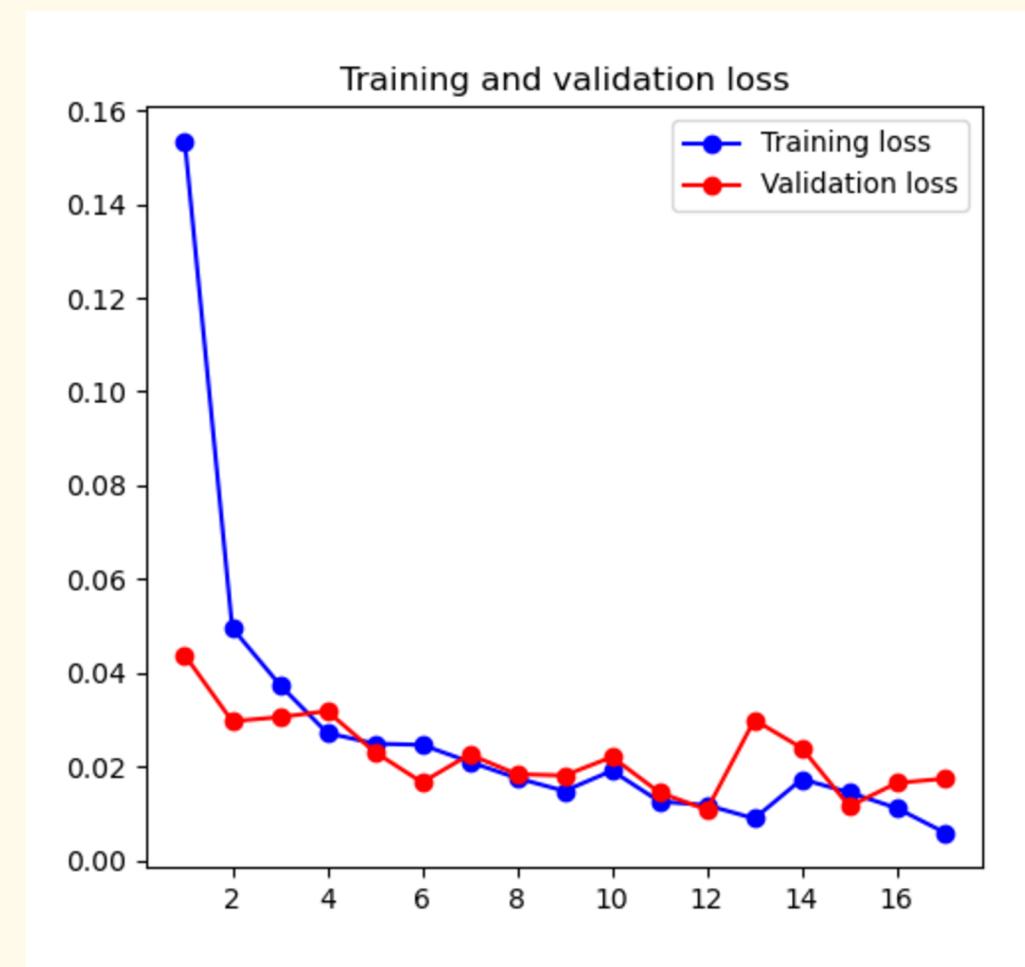
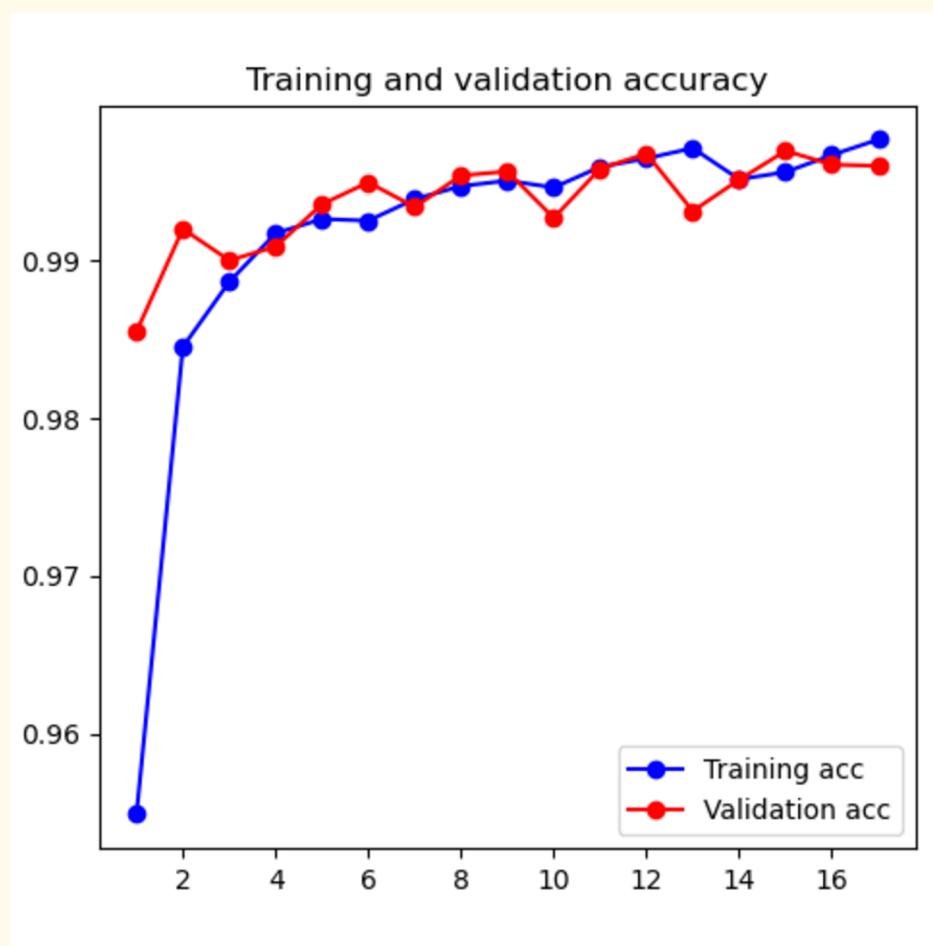


CNN ARCHITECTURE

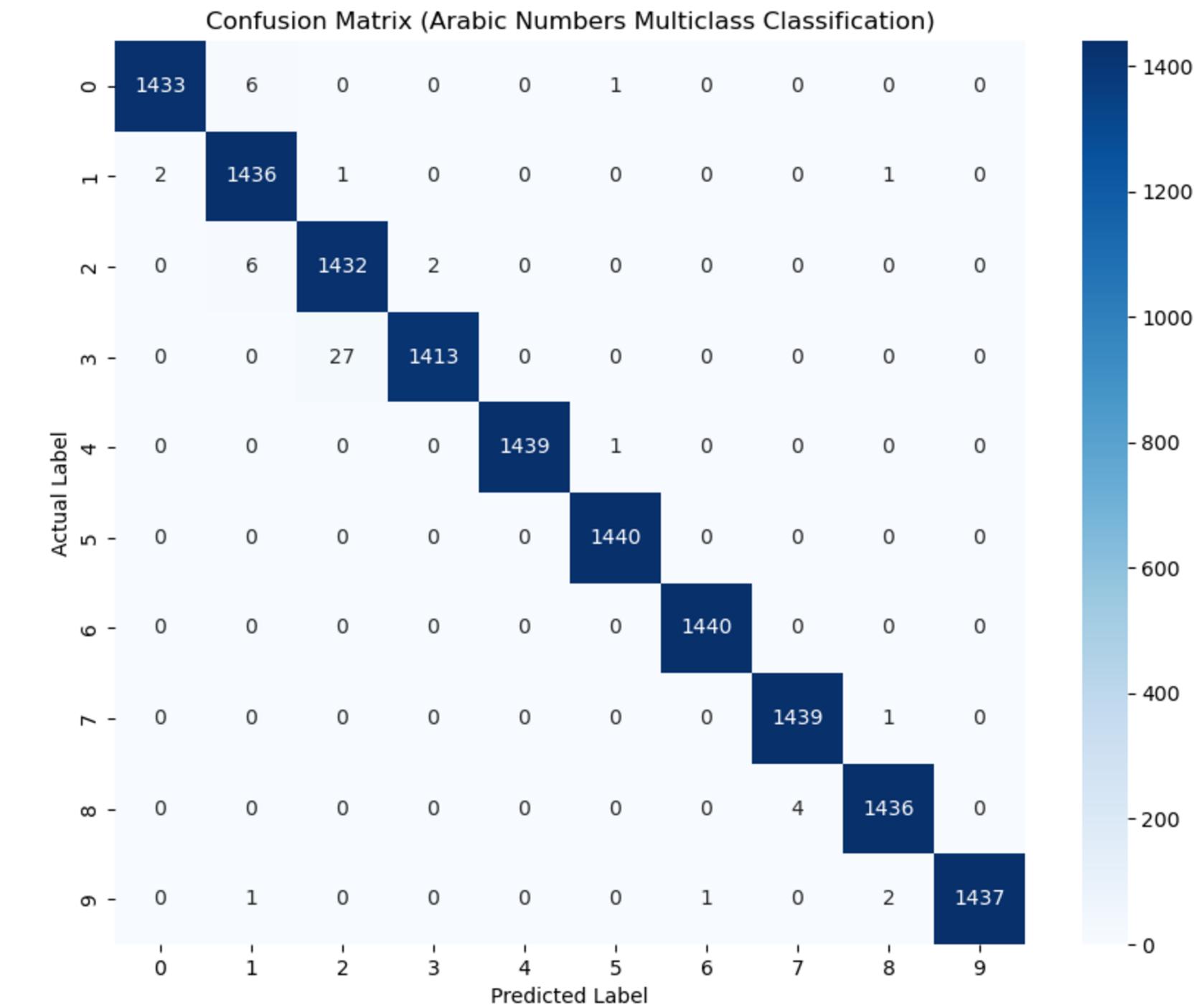
- 3 CONVOLUTIONAL LAYERS: 32 → 64 → 128 FILTERS, RELU
- BATCH NORMALIZATION → STABILIZES TRAINING
- MAXPOOLING → REDUCES IMAGE SIZE
- FLATTEN → CONVERTS 2D FEATURE MAPS TO 1D
- DENSE → 256 NEURONS, RELU
- DROPOUT 40% → PREVENTS OVERFITTING
- OUTPUT DENSE → 10 NEURONS, SOFTMAX → PREDICTS DIGIT (0–9)
- OPTIMIZER: ADAM | LOSS: SPARSE CATEGORICAL CROSSENTROPY | METRIC: ACCURACY

TRAINING & EVALUATION

- TRAINING: `TRAIN.PY` → LOADS DATA, BUILDS CNN, TRAINS MODEL, SAVES WEIGHTS
- EVALUATION: `EVALUATE.PY` → ACCURACY & LOSS METRICS
- LEARNING CURVE: SHOWS CONVERGENCE & POTENTIAL OVERFITTING



RESULTS & INFERENCE



TECHNOLOGIES & CONTRIBUTIONS

TECHNOLOGIES

- PYTHON
- TENSORFLOW/KERAS
- NUMPY
- OPENCV/PIL
- MATPLOTLIB



MEET OUR TEAM

**Ebram Wael
Malak Sobhy
Abanoub Refaat
Fady Mouner
Youssef Emad**

THANK
YOU