Image Analysis and Pattern Recognition EE-451

Final project:

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Summary

1) Segmentation:
    a) Preprocessing
    b) handle exceptions
    c) Isolate players and dealer
    d) Get suit and digit
2) Feature extraction and classification
3) Prediction

Part1: Segmentation

image preprocessing:

1) Adjust gamma (so that green colors are better represented)
2) Apply a green filter ⇒ grayscale image (depending whether the pixel is green or not)
3) Apply dilation (with chosen number of iterations) on the grayscale image
4) Find the contours of the image
5) Apply a hull on the contours
6) Sort the contours depending on the length and keep the 5 first ones (dealer badge + 4 cards)

Part1: Segmentation

handle exceptions:

- Define metric to know whether the contours were well found or not:

$$ratio = \frac{area\ of\ contour}{area\ of\ the\ enclosed\ circle}$$

- ratio for the dealer badge ~ 0.9
- ratio for cards ~ 0.6

if conditions not satisfied, applied different preprocessings

- Dealer: contour with biggest ratio

Part1: Segmentation

Isolate players and dealer:

- compute the center of each contour
- get each player using the coordinates of the cards
- Dealer: player whose closest to badge
- Reorganize contours and centers with respect to player number (player 1 first, player 2 second, etc.)

Part1: Segmentation

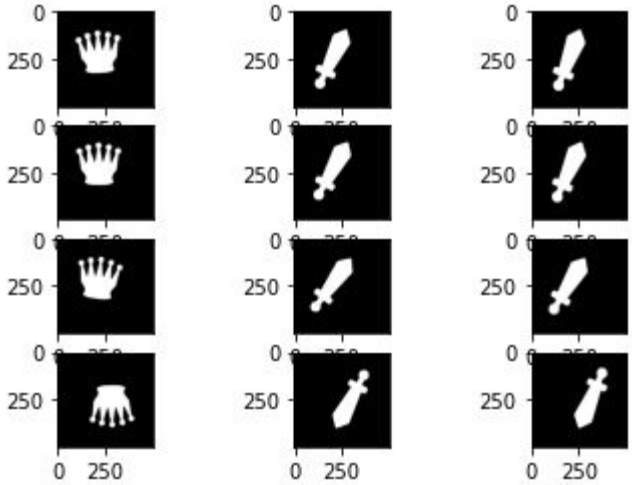
get suits and digits:

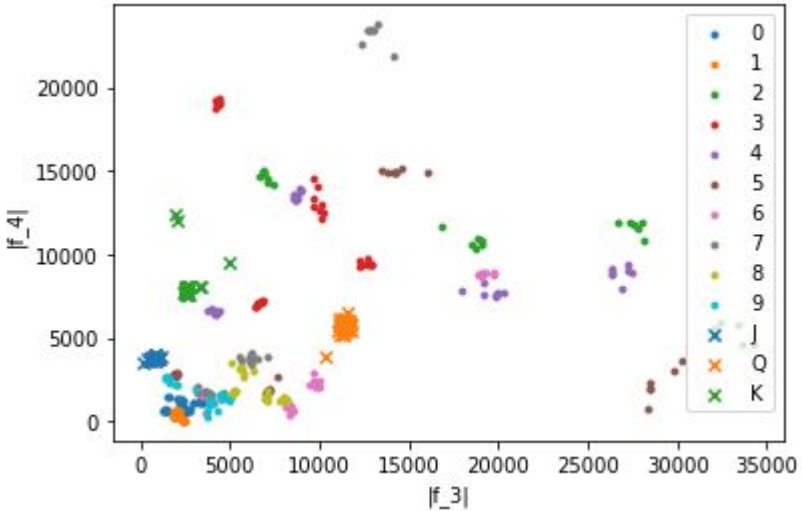
- We have the contours list of one card
- suits: where the ratio of contours is the closest and when contours are far one from another
- digit: contours in the rectangle bounded by the digits in the opposite extremities

Part 2: feature extraction and classification

Digits and Figures

First approach: data augmentation of the figures set, to combine with the MNIST dataset, and Neural Network





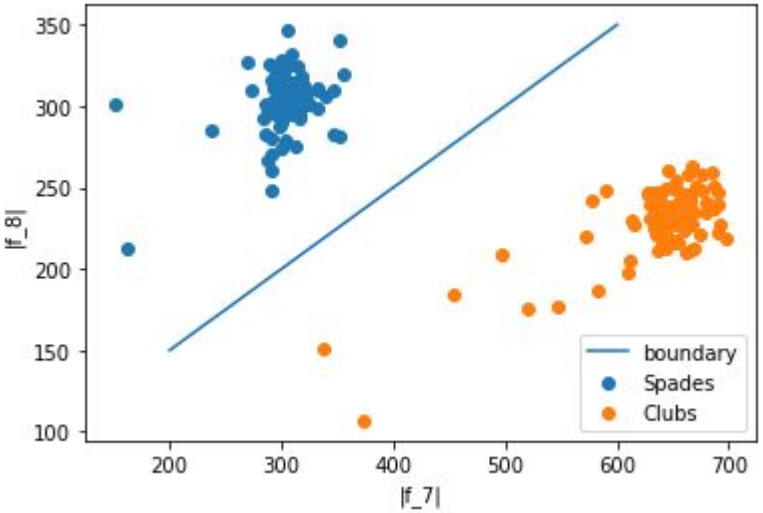
Second approach: Fourier descriptors for the figures (and Gaussian model) plus Neural Network for the digits (trained on MNIST)

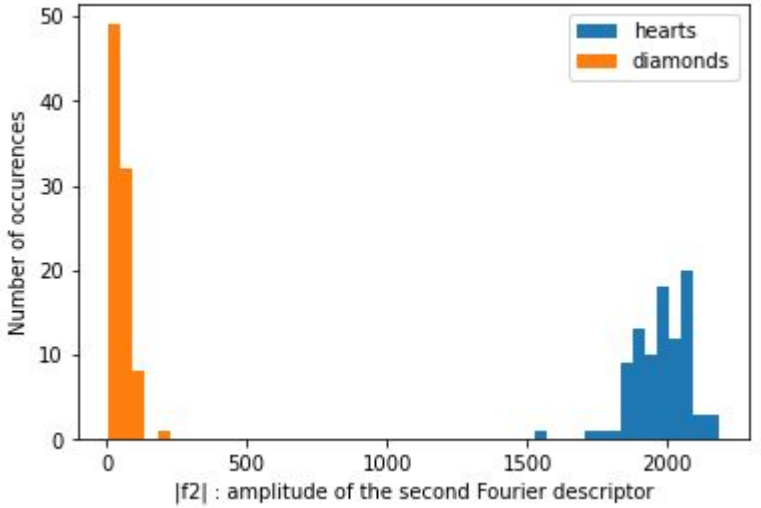
MNIST's preprocessing is mimicked:

"The original black and white (bilevel) images from NIST were size normalized to fit in a 20x20 pixel box while preserving their aspect ratio. The resulting images contain gray levels as a result of the anti-aliasing technique used by the normalization algorithm. The images were centered in a 28x28 image by computing the center of mass of the pixels, and translating the image so as to position this point at the center of the 28x28 field."

Suits

First approach: color detection and Fourier descriptors





Second and final approach: data augmentation and Neural Network