Image analysis and pattern recognition

Project :
Playing card game

- **Groupe 19**

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Image pre-processing:

Threshold on the image to get a binary image where we can extract the contours of the cards :

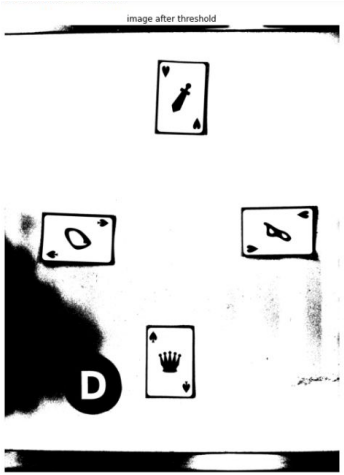


image 1 of game 1 after threshold

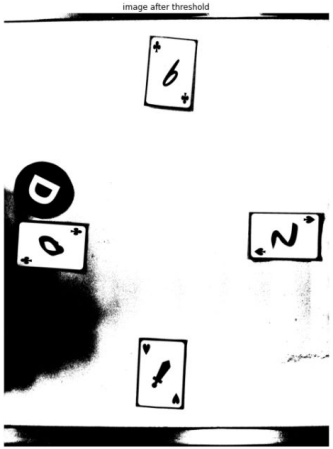


image 1 of game 5 after threshold

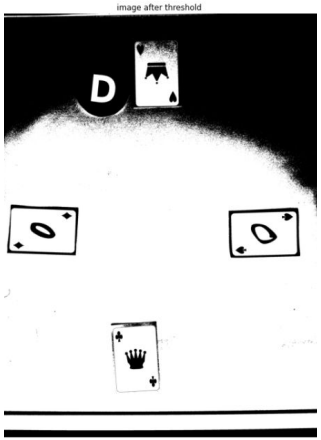


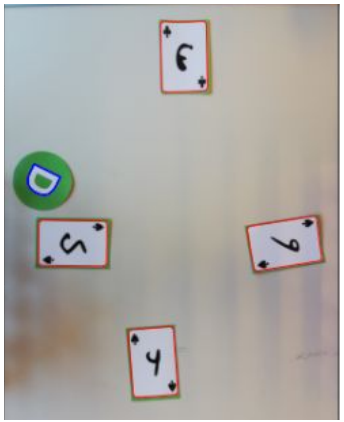
image 1 of game 7 after threshold

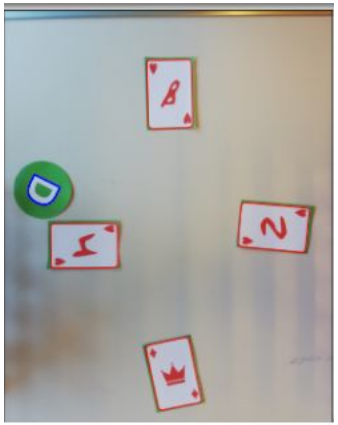
Find the contours

Compute the contours on the image

check the 20 largest contours to see if they are similar to the one expected for a card :

- ➔ Check if similar geometry (width and height)
- ➔ Check if close to the expected position



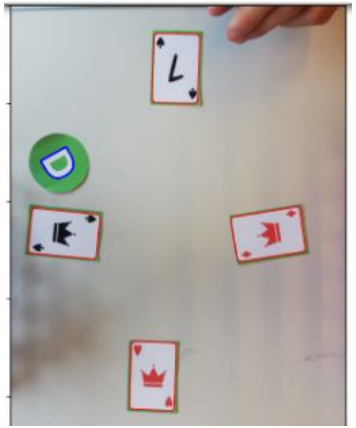


Find the dealer :

Compute the contours on the image

check the 20 largest contours to extract the contour corresponding to the letter “ D ” :

- ➔ Check if similar perimeter (length of the contours)
- ➔ Check if similar area (number of pixel inside the contours)

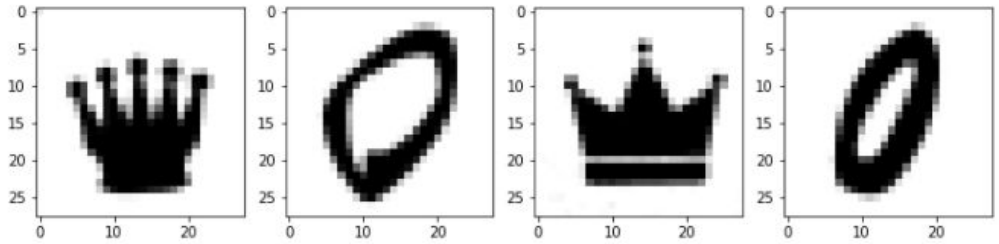


Find the symbols and the numbers :

- ➔ Using the min and max values of the contours in x and y : we extract the images of the 4 cards
- ➔ We rotate the images so that they are all oriented in the same side
- ➔ compute the contours on the cards
- ➔ find the contours corresponding to the two symbols based on it's geometry (width and height) and position on the cards
- ➔ Use fourier descriptors and the mean value in Red in the area inside the contours to find the symbol (A2/A1 and A5/A1)

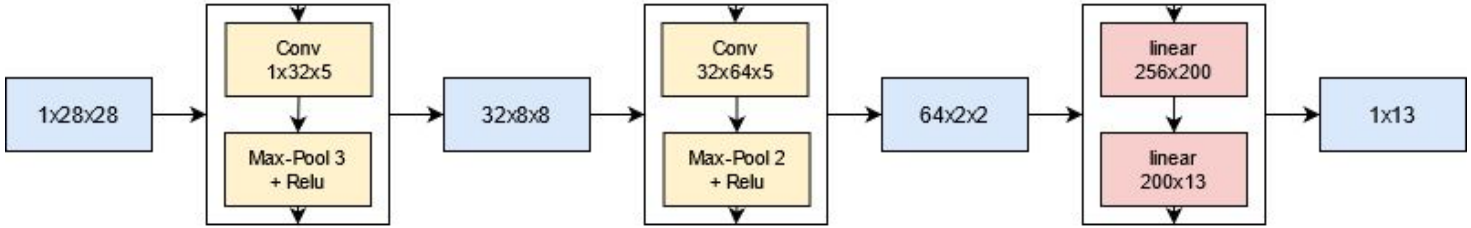
Find the symbols and the numbers :

- ➔ Compute the contour of the number at the middle of the cards
- ➔ Calculate the mean value in x and y of this contours
- ➔ Extract from the image a square of size (340,340) centered at x_mean, y_mean
- ➔ Resize this image to an image of size (28,28) that will be given to our model for the prediction



Find the numbers :

➔ Creating a Convolutionnal Neural Network



➔ Extract all the jacks queens and kings and add them to the MNIST data set

➔ Training the Network on the dataset.

Find the numbers :

Finally finding the numbers extracted from the card.

- ➔ Overall performance: 347/364 = 95.3%
- ➔ main errors made on number 9.

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Global accuracy: 95.3%

Errors: 17/364
Truth-Result
Game: 1, round: 02, card: 3   |   9-4
Game: 1, round: 08, card: 3   |   9-7
Game: 1, round: 10, card: 4   |   9-1
Game: 3, round: 04, card: 2   |   9-7
Game: 3, round: 05, card: 3   |   9-4
Game: 4, round: 02, card: 3   |   9-4
Game: 4, round: 03, card: 3   |   9-7
Game: 4, round: 07, card: 2   |   9-8
Game: 4, round: 08, card: 2   |   2-1
Game: 4, round: 08, card: 3   |   0-1
Game: 4, round: 09, card: 2   |   5-2
Game: 5, round: 01, card: 3   |   9-4
Game: 6, round: 01, card: 2   |   5-2
Game: 6, round: 06, card: 1   |   9-4
Game: 6, round: 13, card: 2   |   9-7
Game: 7, round: 02, card: 1   |   9-7
Game: 7, round: 12, card: 2   |   9-4
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Compute points:

Standard rules

➔ Find maximums of each rounds.

Advanced rules

➔ Find suits different from the dealer
➔ replace them with -1
➔ compute points with our standard rule function