IAPR FINAL PROJECT

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OUTLINE

- Image segmentation:
  - Detecting Cards
  - Detecting Ranks
  - Detecting Suits.
- Finding the dealer
- Rank classification
- Suits classification
- Results

Image segmentation

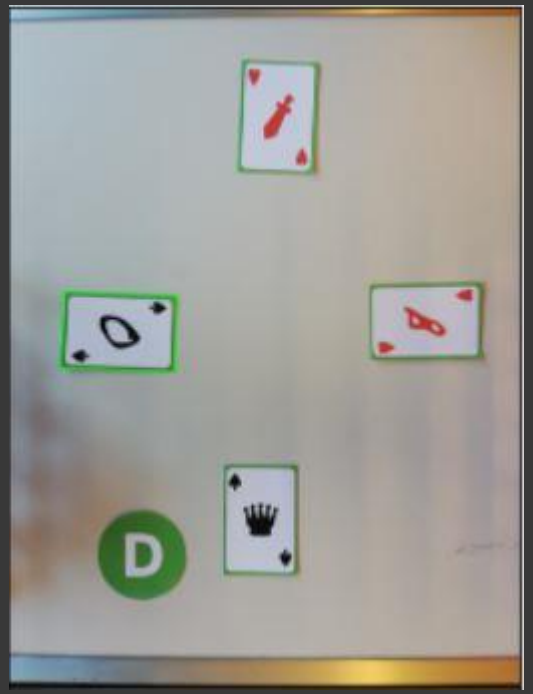
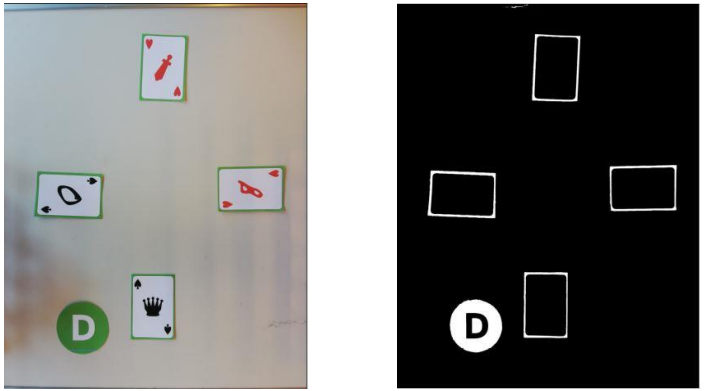


Image Segmentation

- Convert images to HSV and threshold to detect green colors
- Use morphological operation (closing with kernel size 12*12)



Detected mask example

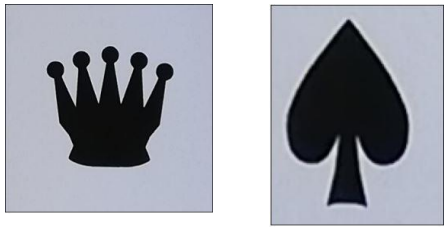
Image segmentation

- Find contours of the mask
- Find the smallest rectangle that contains the contour

Detected card example

Image segmentation

- Sort players based on the center of the cards
- Rotate the cards based on their position (Player1, Player2, ..)
- a 380*380 box to detect ranks
- a 140*100 box to detect suits

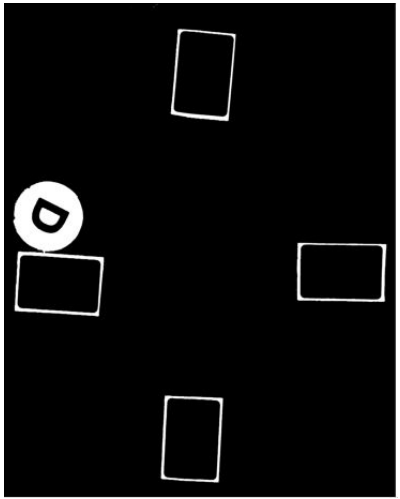


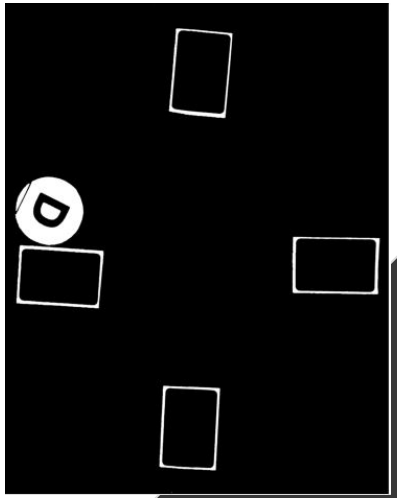
Detected rank and suit example

- Find dealer based on distance from the card

Image Segmentation

- Handling the cases that dealer card is near the player card:
- Opening with kernel size 4*4



Suit classification

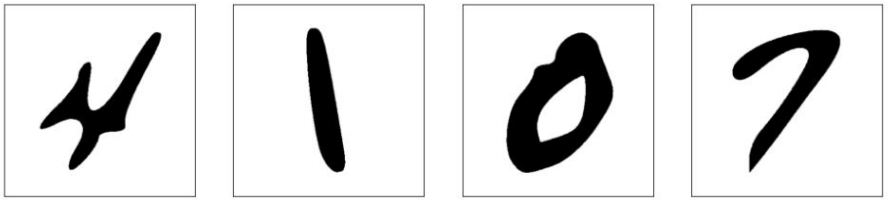
01 Dataset

02 Model

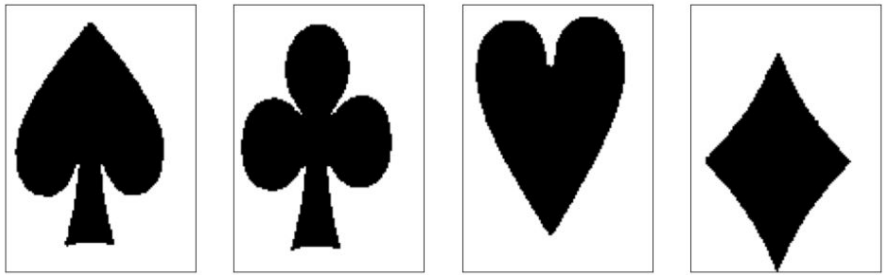
03 Accuracy

Suit Classification

- For both suits and ranks we threshold our images and reduce them to single channel



Example of ranks after threshold

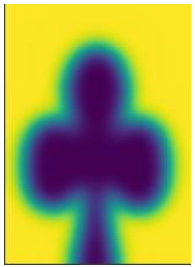


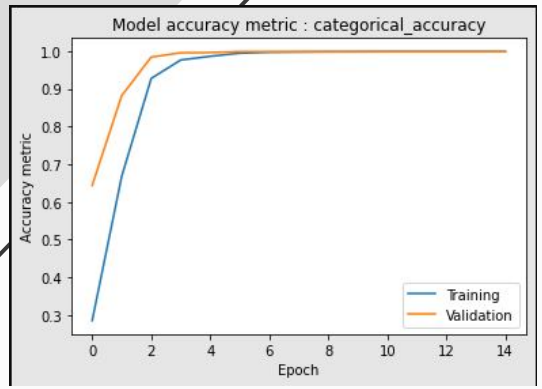
Example of suits after threshold

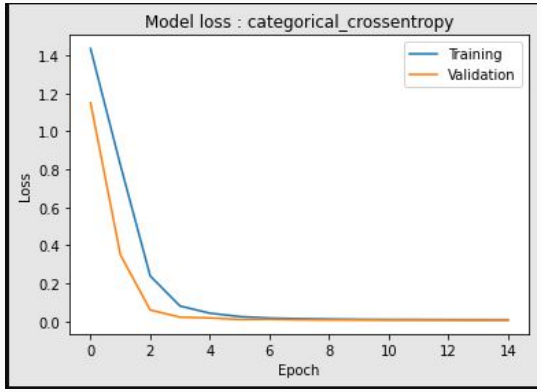
Suit Classification

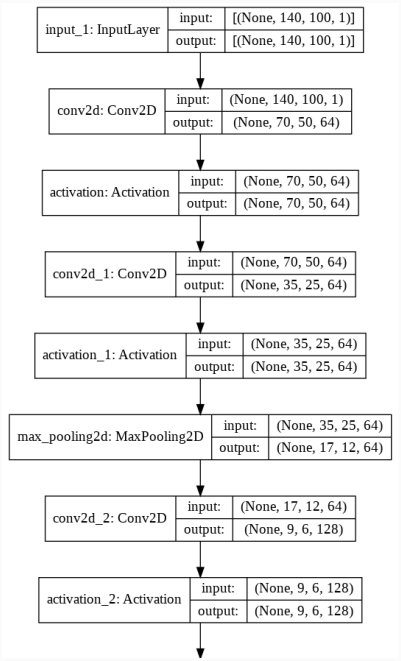
- Dataset :
  - Augmented manually labeled suits from training set
- Data augmentation:
  - Shifting images 15 pixels to left, right, up, down
  - Rotating images by -10 to 10 degree
  - Random gaussian blur with kernel 1 to 5
  - Original dataset length 728 --> Final lenght 8008

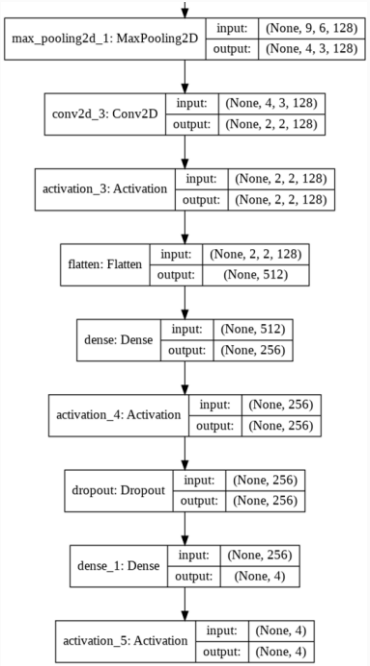












NETWORK STRUCTURE

Validation Categorical Accuracy = 0.9971

Rank classification

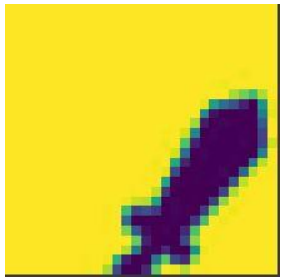
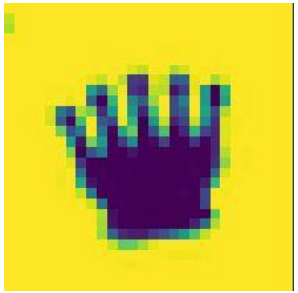
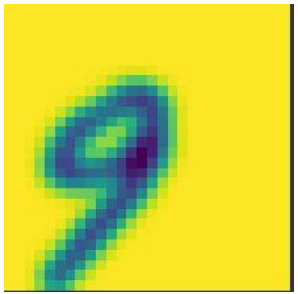
01 Dataset

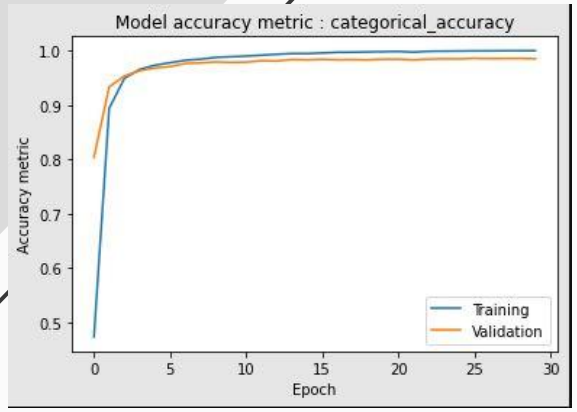
02 Model

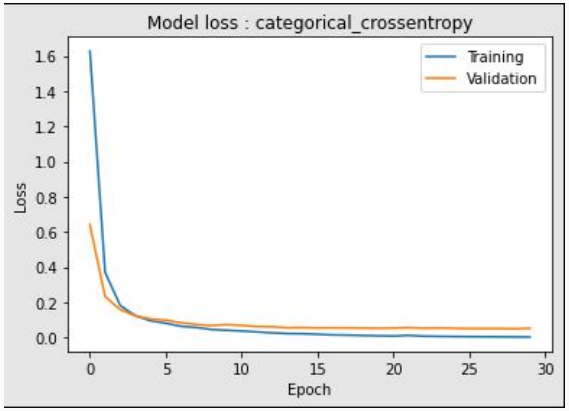
03 Accuracy

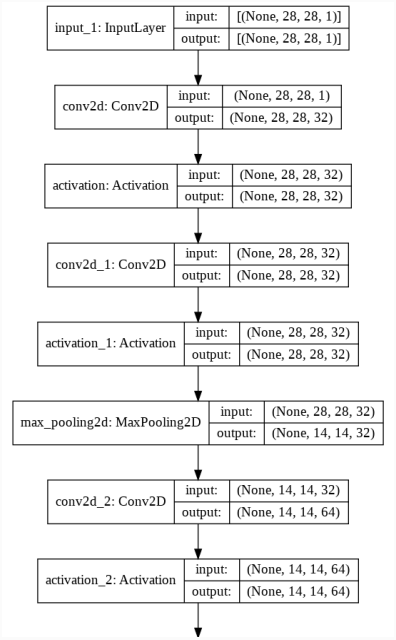
RANK CLASSIFICATION

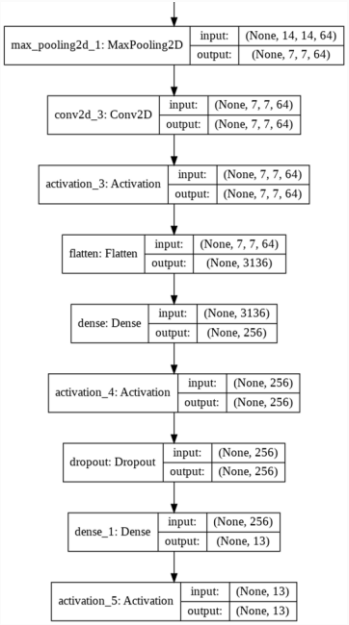
- Dataset :
  - Augmented MNIST
  - Augmented manually labeled JQK ranks from training set
- Data augmentation:
  - Shifting images 5 pixels to left, right, up, down
  - Rotating images by -10 to 10 degree
  - Random gaussian blur with kernel 1 to 3
  - Original dataset length (JQK) 84 --> Final length 36000 (without MNIST)







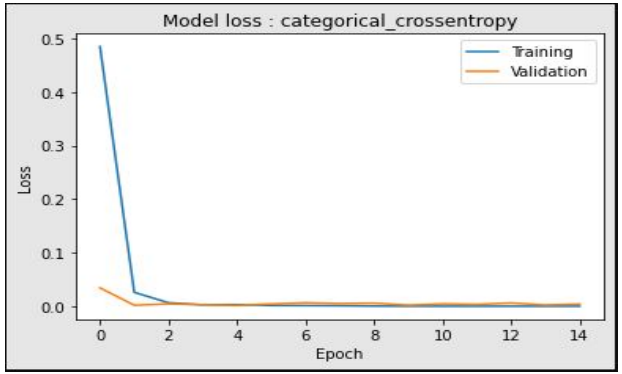


NETWORK STRUCTURE

Validation Categorical Accuracy = 0.9996

Jack Classification

- Upright Jacks were mislabeled as 1's in rare cases
- Flipped Jacks were mislabeled as 8's in a moderate amount of cases
- Two additional networks trained to differentiate between both cases
- Same structure as rank classifier but with output 2
- All predictions with value 1, 8 or 10 (J) are double-checked with the corresponding network



Validation Categorical Accuracy = 0.9994

Evaluation

Image Segmentation

All the cards, ranks and suits are segmented correctly

Suit and rank Classification

All the suits and ranks are classified correctly

Dealer

Dealer is detected correctly in all the cases

Scores

- Game scores in both standard and advance modes are counted correctly
- There is an anomaly in game 4 round 11 with two 6 heart cards