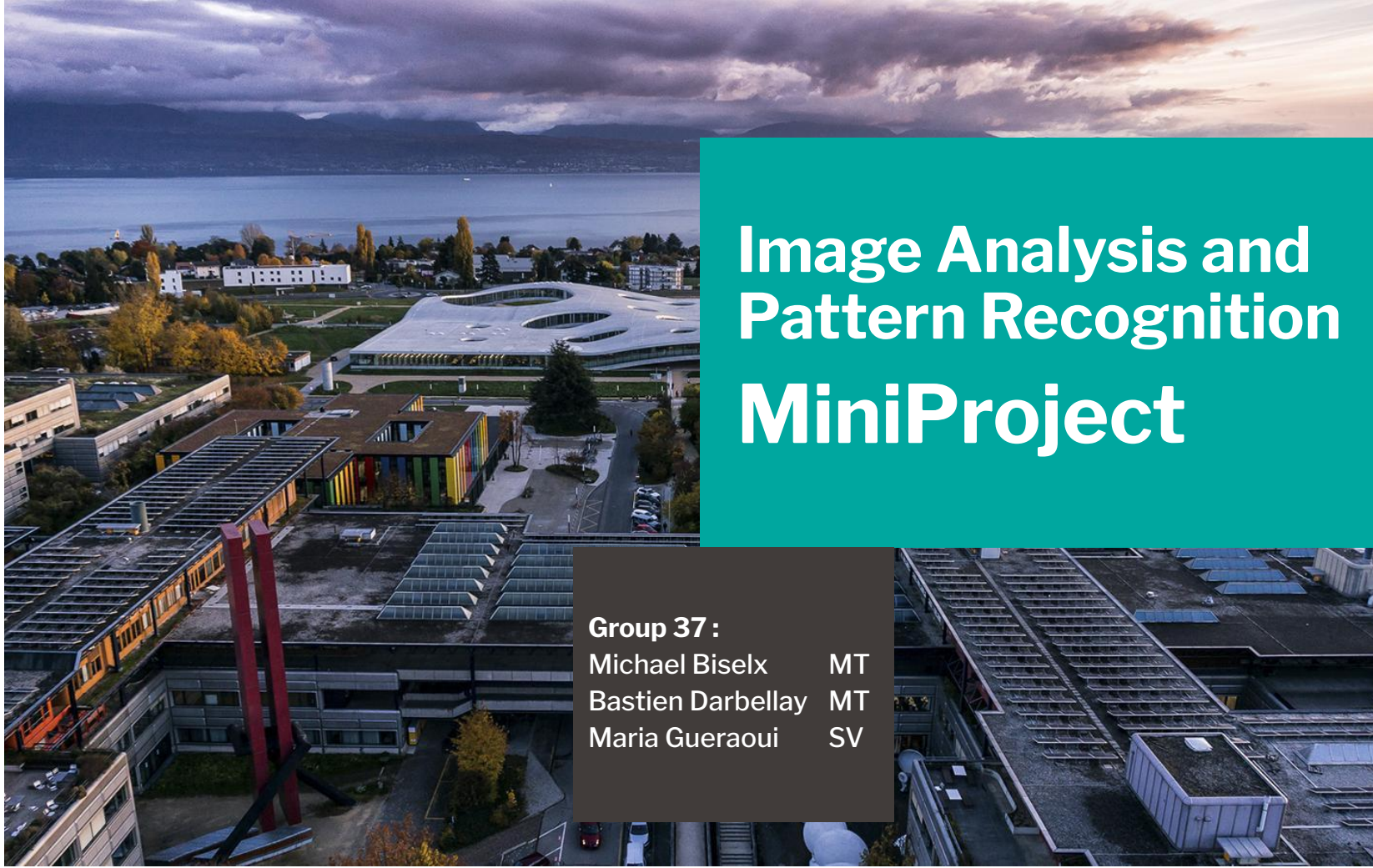

Image Analysis and Pattern Recognition

MiniProject

Group 37 :

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Bastien Darbellay MT
Maria Gueraoui SV

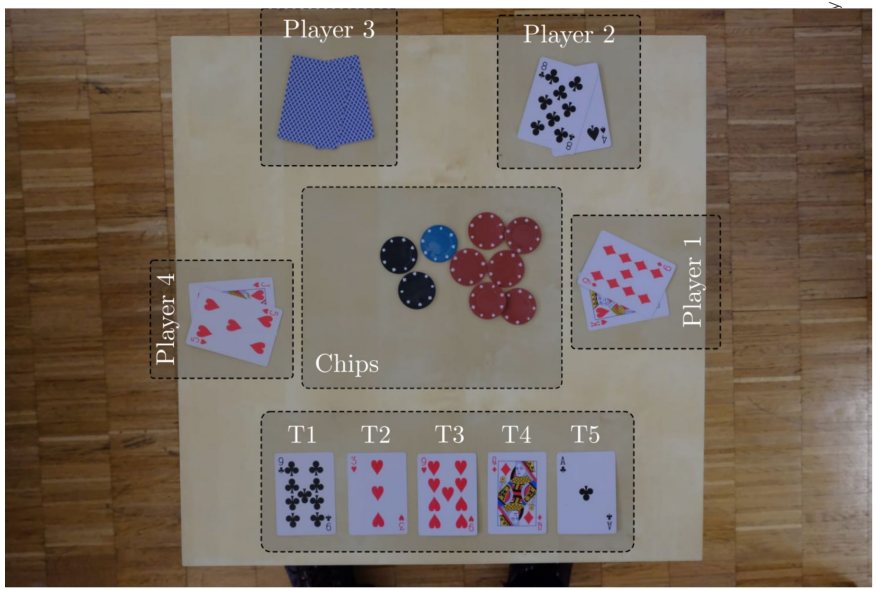
IAPR : Project

Outline

- Introduction
- Workflow
- Methods
- Code Structure
- Results
- Limitations
- Conclusion

Introduction

- We were asked to help an anonymous card player named Bartick Pruel improve his poker skills.
- To do so, we implemented a program that detects the different hands and parameters of a poker table image.
- More specifically it detects the colors and number of chips, the table cards and the different players cards.
- This will hopefully help M. Pruel understand in what kind of situation he can find himself while playing poker.



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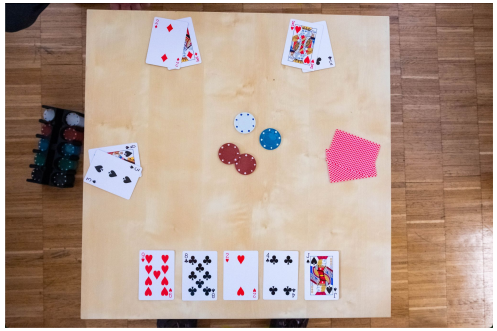
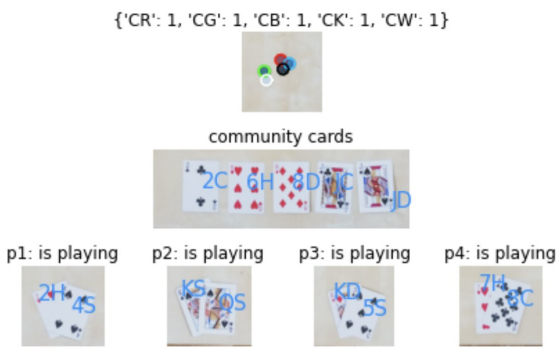
Workflow

- Preprocessing
  - Table Registration
  - Color/Lighting Correction
  - Segmentation
- Chip Counting
- Card Recognition
  - Fold detection
  - Symbol extraction
  - Card Estimation





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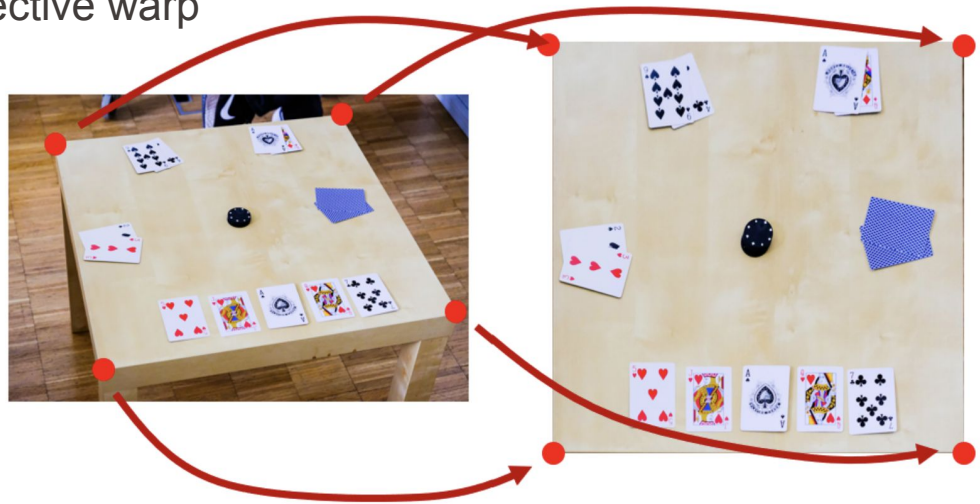
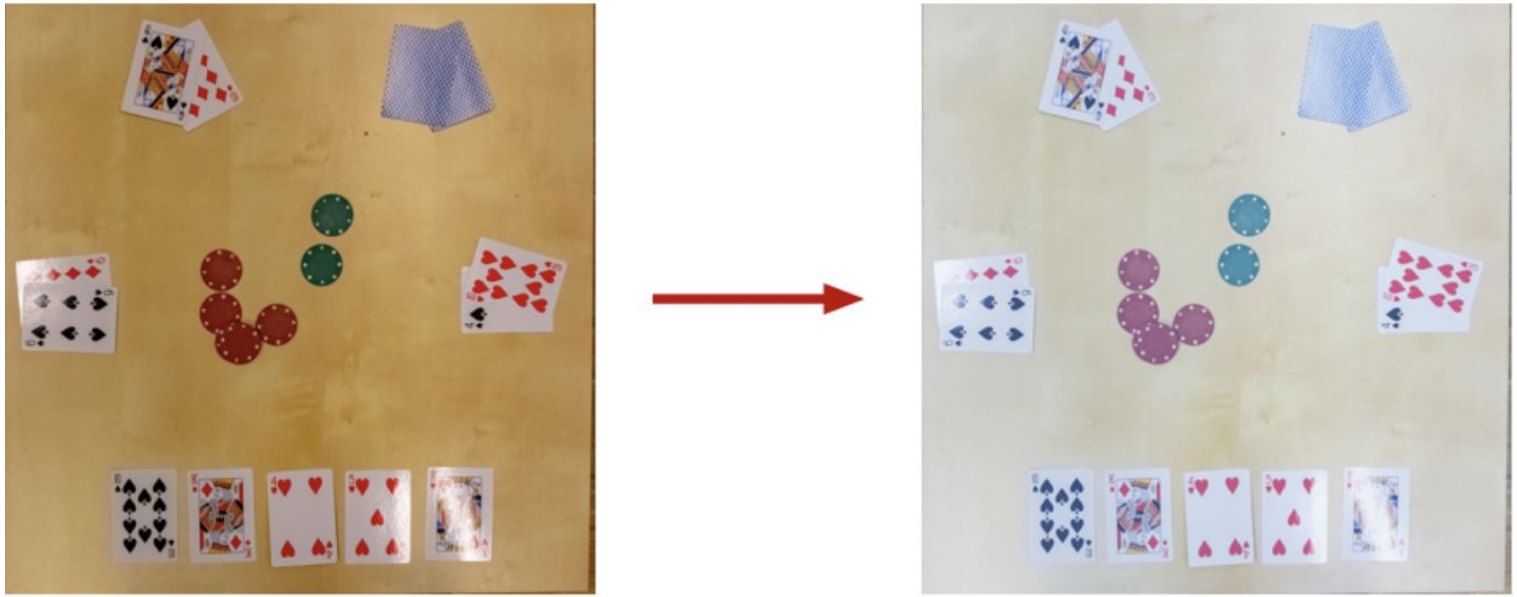
Preprocessing, Table Registration

- Detect edges and corners
  - Downsampling & Grayscale
  - Edge detection (Sobel) & Hough Line transform
- Geometric transformation to place corners at corners of images
  - perspective warp



Preprocessing, Color/Lighting Correction

- Remove variance due to lighting correction
  - mean value = 0.7
  - sigmoid squeezing to preserve bright/dark features



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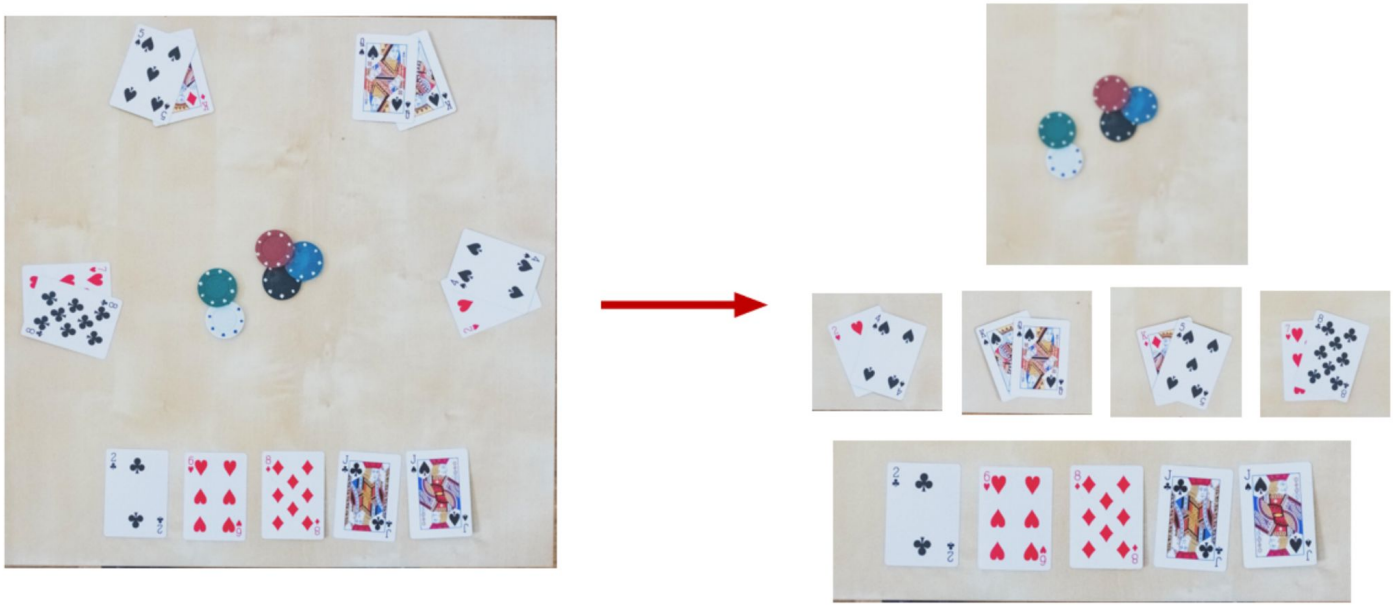
Preprocessing, Segmentation

- From project specifications : chips / player cards / table cards
- From now each regions has different treatments



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Preprocessing, Example

starting point (2000, 3000, 3)

corner detection & warp

registered table (2000, 2000, 3)

lighting correction

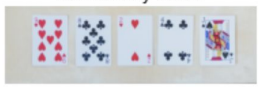
equalized table (2000, 2000, 3)

segmentation

segmented image

chips

community cards



p1

p2

p3

p4

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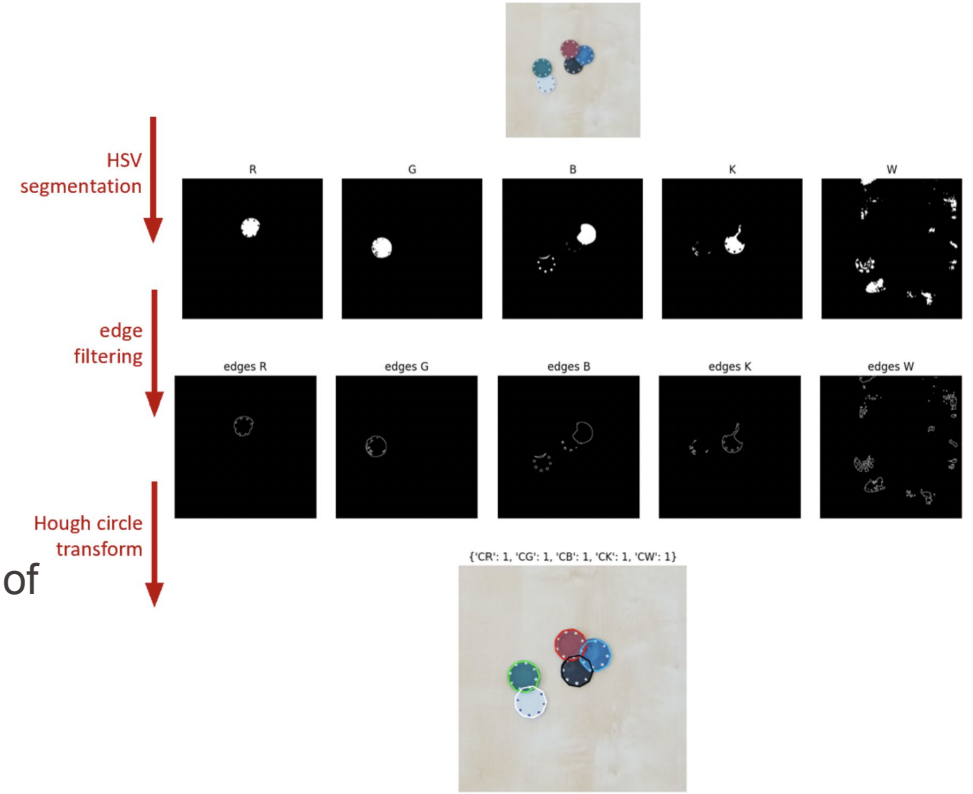
Chips Counting

- HSV segmentation
  - HSV thresholds to extract specific regions
- Edge filtering
- Hough circle transform
  - Extraction of contours of the right dimension
  - Can recognize partial circles of the right size as chips



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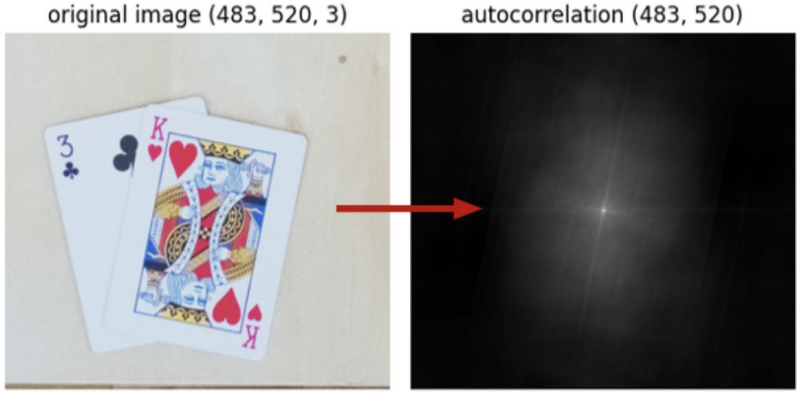
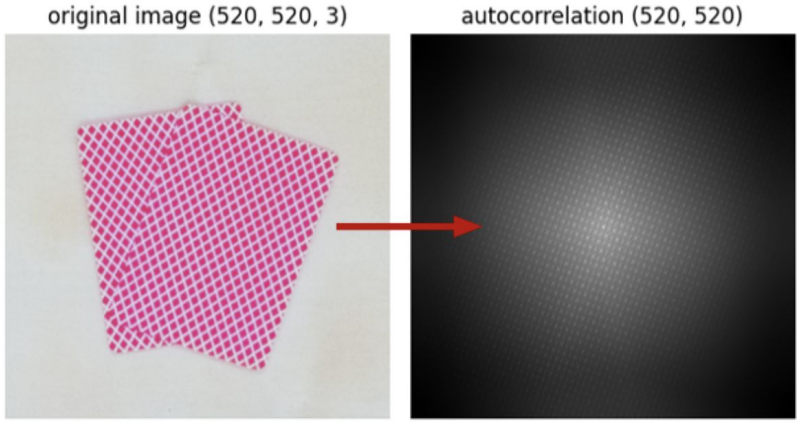
Card Recognition, Fold Detection

- Has the player folder or not?
  - The diamond pattern on the back of the cards has a high repetition -> can be detected via autocorrelation





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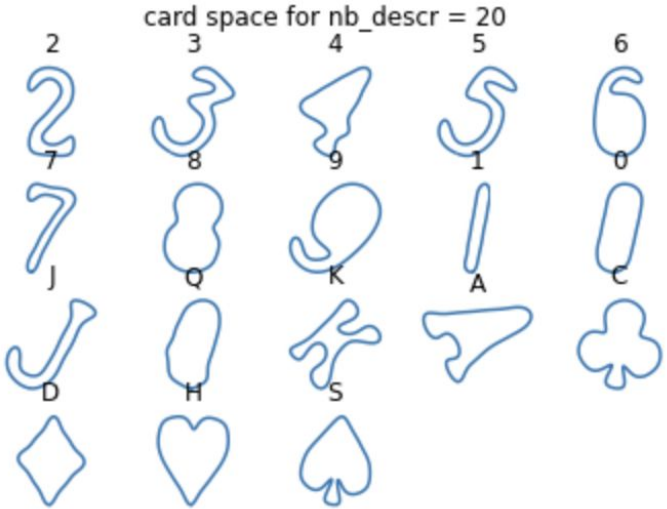
Card Recognition, Symbol Extraction

- Set of “ideal” descriptors for each symbol
  - there is no variance on the symbols themselves, as all card symbols come from a standard set.
- Contour extractions from the players or table cards
- Comparison with these “ideal” descriptors
  - because there is no variance, we can simplify the classification problem

    -> find closest match
  - If no match, the contours are considered as noise



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Card Recognition, Card Estimation

- Cards recognition from their symbol patterns
  - If a value and suit symbol are close, this is considered to be a possible card detection
- Fully visible cards :
  - two similar card symbols (value + suit) are within a certain distance (diagonal of card)
- Covered cards :
  - taken from remaining card symbols based on their “likelyhood” (closeness in the card descriptor space)

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Code structure

Two modules :

- “preprocessing.py”:
  - methods for image preprocessing & segmentation
  - methods for chips counting
- “evaluate_cards.py”:
  - card symbols detection in an image
  - symbol pattern recognition

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Results

Training set

- Runtime
- Scores
  - score as high as 97% (game 09)
  - score as low as 38% (game 04, blurry image)
  - score between 75% to 90% for other images

Test set

- Scores
  - ?

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Limitations

- Chips Counting
  - Difficult to separate white chips from bright background
- Symbol Extraction
  - Difficult to find a method robust to small angle rotations, impossible to find difference between “6” and “9”, the value is assigned “randomly”.
- Heavy algorithm
  - Takes some time (5-10 seconds) to run a single image, due to preprocessing step
  - Segments evaluation also take time due to cards evaluation (2-5 seconds)

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