IAPR 2024 - Project

Coin Detection Challenge

Lecturers
Jean-Philippe Thiran
Behzad Bozorgtabar

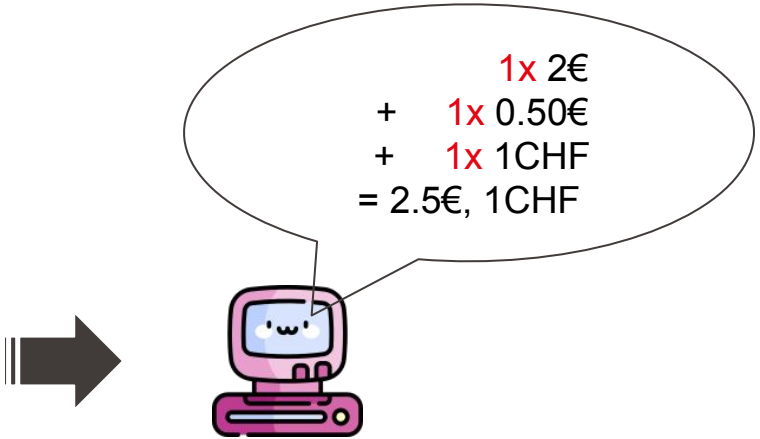
TAs
Christian Abbet
Alexandre Abbey
Tomar Devavrat
Davide Nanni
Thomas Stegmüller
Ekin Taskin
Guillaume Vray

EPFL - 26th April 2024

Introduction

Goal

- Build an automatic system that counts the total value of Euros and Swiss Francs on an image.



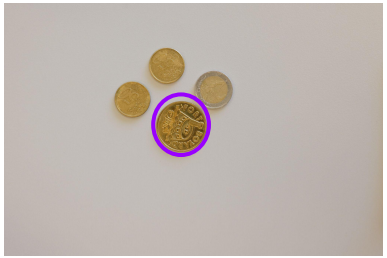
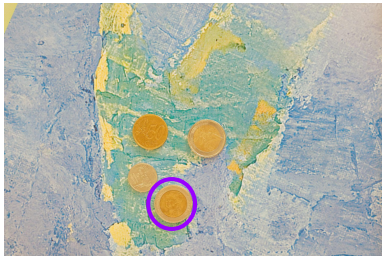
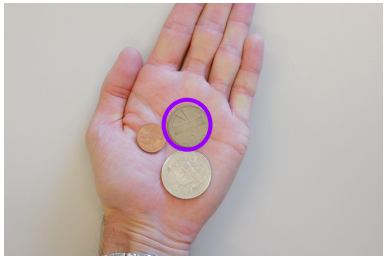
Data

Six Settings

2x Currency Settings

- € or CHF or € + CHF
- € + OODs or CHF + OODs or € + CHF + OODs

3x Backgrounds

Neutral	Noisy	Hand
		
		

Data

Things that we know

- **Setup**
  - Camera at the same distance -> Ratios are preserved.
  - **Two splits** acquired the same day:
    - Train: 81 images
    - Test: 162 images
- **Coins**
  - CHF: Head or tail.
  - EUR: Tail only.
- **OOD**
  - **Training**: “Outliers”, at least one OOD.
  - **Training/Test**: At most 2 OOD per image.

Data
Reference

- Two reference images provided (optional).

Data

Weak Supervision

- Train labels show the number of each coin type within an image.

L1010281.png

id	5CHF	2CHF	1CHF	0.5CHF	0.2CHF	0.1CHF	0.05CHF	2EUR	1EUR	0.5EUR	0.2EUR	0.1EUR	0.05EUR	0.02EUR	0.01EUR	OOD
L1010281	0	0	0	0	2	3	1	0	0	0	0	0	2	0	0	0
L1010298	0	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0

Data

Splits

Folder ID	Background	OOD	# Train	# Test
1	Neutral	No	16	-
2	Noisy	No	15	-
3	Hand	No	10	-
4	Neutral	Yes	17	-
5	Noisy	Yes	16	-
6	Hand	Yes	7	-
-	All	All	81	162

Kaggle Challenge

Ranking Score

- Evaluation is solely based on your model's ability to count the number of each coin type in the image.
  - We do not base the evaluation on the total value of € and CHF your model would output as a simple error would lead to 0 point.

- Let $y \in \mathbb{N}_0^{N \times C}$ be a set of N observations over C classes and $\hat{y} \in \mathbb{N}_0^{N \times C}$ be a set of N predictions over C classes. Then the ranking score is the image-wise average F1-score computed as follows:

$$F1 = \frac{1}{N} \sum_{i=1}^{N} \frac{2\mathrm{TP}_i}{2\mathrm{TP}_i + \mathrm{FPN}_i}$$

where $\mathrm{FPN}_i = \sum_{j=1}^{C} |y_{i,j} - \hat{y}_{i,j}|$, $\mathrm{TP}_i = \sum_{j=1}^{C} min(y_{i,j}, \hat{y}_{i,j})$

Kaggle Challenge
Ranking

- **Submission**
  - A *sample_submission.csv* file is provided.

id	5CHF	2CHF	1CHF	0.5CHF	0.2CHF	0.1CHF	0.05CHF	2EUR	1EUR	0.5EUR	0.2EUR	0.1EUR	0.05EUR	0.02EUR	0.01EUR	QOD
L0000000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
L0000001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

- **Leaderboards**
  - Public leaderboard
    - Score computed on 30% of the test data.
    - Shown until the end of the project.
    - **Non-graded.**
  - Private leaderboard
    - Score computed on 70% of the test data.
    - Shown at the end of the project.
    - **Graded.**

Kaggle

Rules

- **What you need to know**
  - Link: https://www.kaggle.com/t/4664de3191e6465f8deee8181460c48a
  - **YOU MUST CREATE AN ACCOUNT WITH YOUR EPFL EMAIL!!!**
  - Starts on **26th April, 11:30 am.**
  - Ends on **29th May, 11:55 pm.**
  - Teams of 3.
  - Max. 5 submissions per day per team.

- **What is forbidden**
  - **Copy the code from another team.**
  - **Augment your training set with the provided test images**.
    - The test images should only be used for testing!
  - **Use any external dataset.**
  - **Use any ML or deep learning models pretrained on external dataset.**
    - Only models pre-trained on ILSVRC2012 (aka ImageNet-1K) of maximum 400MB are authorized.

Grading

Final Submission and Presentation

- **Final Submission**
  - Deadline: **29th May, 11:59 pm.**
  - What you need to submit:
    - A **jupyter notebook** containing a step-by-step explanation of your implementation. Ensure that the notebook can generate your final Kaggle submission when rerun.
    - A **requirements.txt** files listing all python packages you used.
    - Any additional files we need to rerun your notebook.
    - **Submission is limited to 500MB!!!**

- **Final Presentation**
  - Date: **31st May (8:15 am - TBA)**
  - 15 minutes per group:
    - 7 (sharp) minutes slide presentation.
    - 8 minutes questions.
  - Important:
    - The TAs will review your code on **30th May** to understand what you have done and prepare the questions accordingly.
    - Be prepared for detailed questions!

Grading

100 points

- **Project Report (60 points)**
  - Segmentation (20 points)
  - Feature extraction (20 points)
  - Classification (20 points)

- **Performance of your model (20 points)**
  - Beat *Pattern Matching* baseline (10 points)
  - Beat *ML* baseline (10 points)

- **Final Presentation (20 points)**
  - Quality of the presentation (10 points)
  - Quality of the answers to the questions (10 points)

- **Kaggle Ranking** (10 BONUS points on the project):
  - 1st=10pts | 2nd=7pts | 3rd=5pts | 4th=4pts | 5th=3pts | 6th=2pts | 7th=1pt

Grading

Cheater?

- **Submission disqualified from Kaggle**
- **-50 points penalty:**
  - **-20 points for model performance**
  - **-30 points for project report**

- **IF YOU HAVE ANY DOUBT TRESPASSING THE RULES, ASK US!!!!**

Questions ?

How to Proceed

Ideas

1. Localisation
2. Feature extraction
3. Classification

How to Proceed

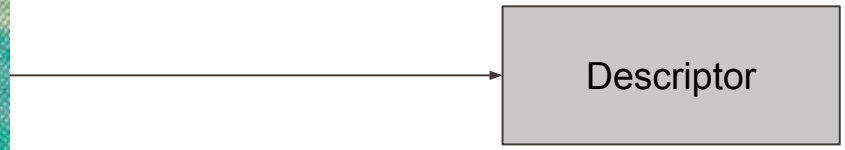
Ideas

1. Localisation

How to Proceed

Ideas

2. Feature extraction

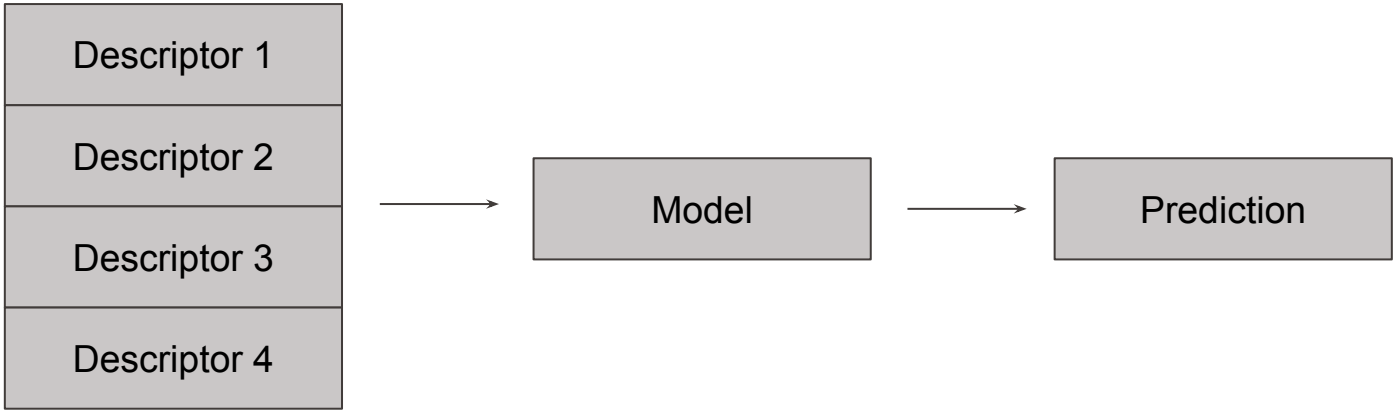


Fourrier, histogram, pretrained, .

How to Proceed

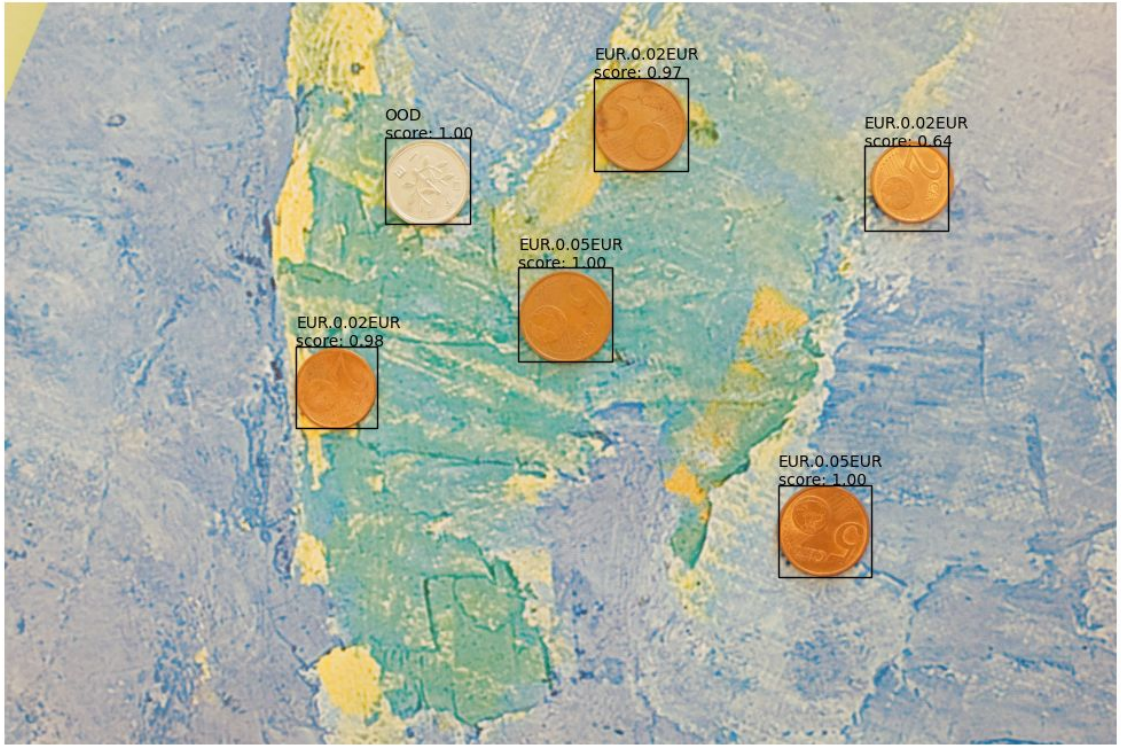
Ideas

3. Classification



How to Proceed

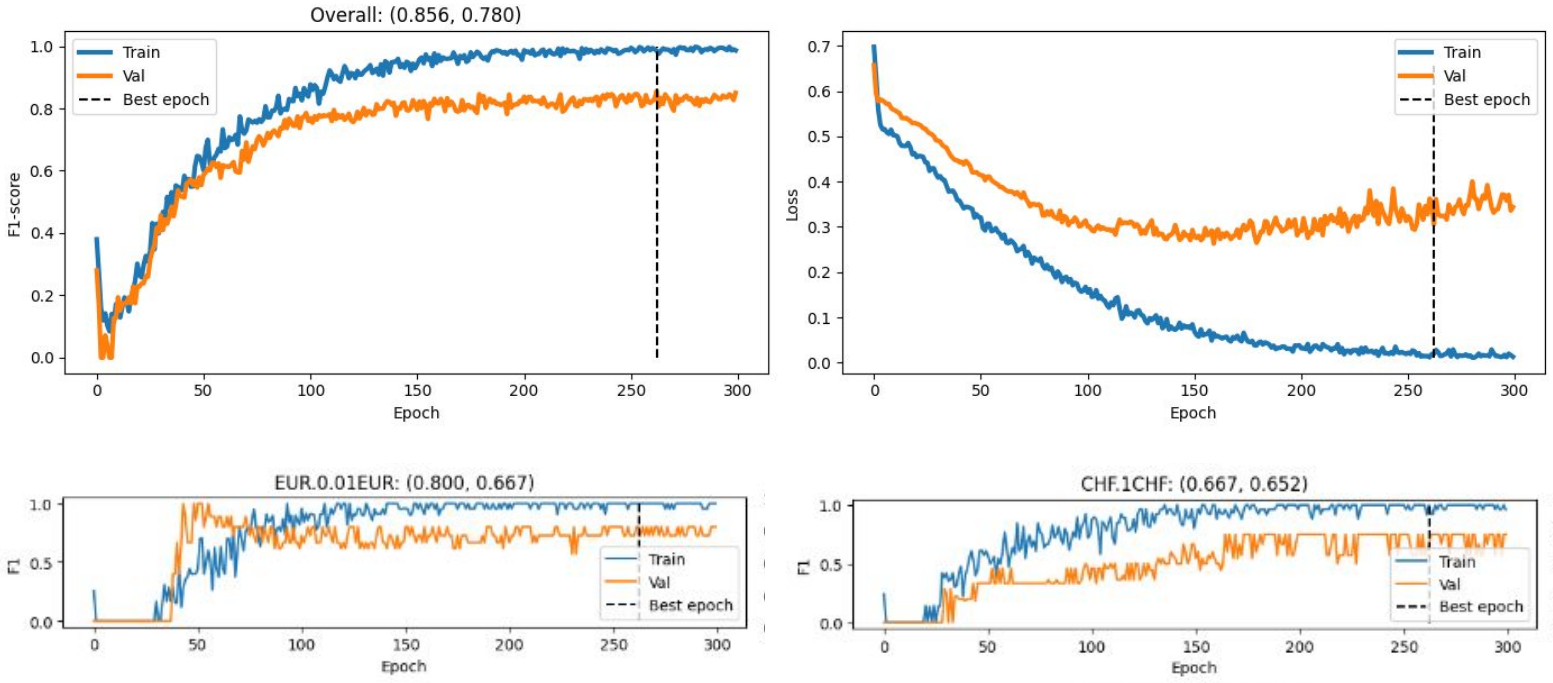
Ideas - End



How to Proceed

Ideas - Extra

MONITOR !



How to Proceed

Kaggle

- Baselines

#	Team	Members	Score
	Baseline ML		0.7947
	Baseline Pattern Matching		0.3620
	Random Guess		0.2540

- Private competition, invitation link on Moodle (mail list)
- Public vs Private

Questions ?