Data Engineering – Background Removal

Explainable Machine Learning - Deep Learning Life Cycle

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Our main Data Engineering Problems:

- Combining different datasets
- Different hand positions in different datasets
- Hands in different contexts in each dataset

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- $\Longrightarrow$ reducing complexity of datasets is key

Research Question: **Does removing the background during the image preprocessing phase benefit the image classification task at hand?**

Data Engeneering Process

Problem Description

Several Problems have to be solved in the preprocessing stage

- data selection:
  - cgi,
  - real-hands or
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- data selection:
  - cgi,
  - real-hands or
  - self generated data
- standardize/normalize hand positions from different datasets
- all images have to be processed by only ONE preprocessor

Existing libraries

Searching the WWW we found some interesting libraries:

- YOLO-Hand-Detection: find hand position in an image [1]
  - \+ works on real life images, open source
  - \- not included in Python Package Index

[1] https://github.com/cansik/yolo-hand-detection
[2] https://pypi.org/project/rembg/
[3] https://google.github.io/mediapipe/solutions/hands.html

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- MediaPipe Hands: generates a 3d hand model from a 2d image [3]
  - \+ works quite well and comes as library in Python Package Index
  - \- developed by google

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Our Preprocessor

Parameters for Image Processing:

- desired dimensions of preprocessed image
- crop image, based on the hand position within the image
- remove background

Preprocessing steps:

1. read image using cv2
2. crop image based on bounding-box found with MediaPipe
3. remove left over background using rembg library
4. resize image and add padding if necessary

Preprocessing Examples – a good one

Figure 1: original

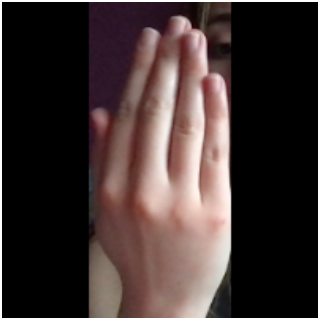

Figure 2: cropped

Figure 3: background removal

Preprocessing Examples – a not so good one

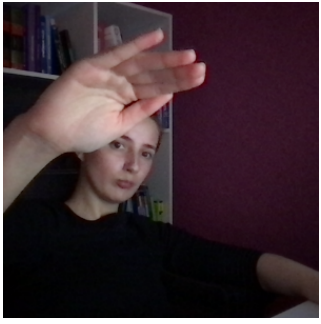

Figure 4: original

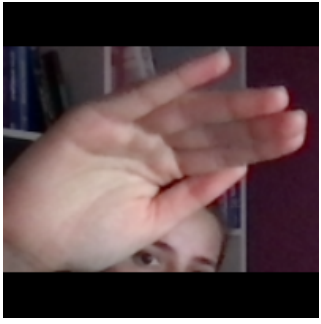

Figure 5: cropped

Figure 6: background removal

Future Considerations

Discussion

Things we will have to consider for the future project

- is there a better library than rembg
- how much data do we want use
- do we want to train on color or greyscale images
- what is the exact setting in which we want to use our deep learning model

Thank you!

References i