



# Data Engineering – Background Removal

Explainable Machine Learning - Deep Learning Life Cycle

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Research Question

Data Engineering Process

Future Considerations

## Research Question

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

# Data Engineering Process

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Several Problems have to be solved in the preprocessing stage

- data selection:
  - cgi,
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  - self generated data



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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

Searching the WWW we found some interesting libraries:

- YOLO-Hand-Detection: find hand position in an image <sup>1</sup>
  - + works on real life images, open source
  - not included in Python Package Index

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<sup>1</sup><https://github.com/cansik/yolo-hand-detection>

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- YOLO-Hand-Detection: find hand position in an image <sup>1</sup>
  - + works on real life images, open source
  - not included in Python Package Index
- rembg: model that automatically removes image background <sup>2</sup>
  - + comes as library in Python Package Index
  - not works in all cases, has some strange edge cases

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Searching the WWW we found some interesting libraries:

- MediaPipe Hands: generates a 3d hand model from a 2d image<sup>3</sup> [1]
  - + works quite well and comes as library in Python Package Index
  - developed by google

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<sup>3</sup><https://google.github.io/mediapipe/solutions/hands.html>

Parameters for Image Processing:

- desired dimensions of preprocessed image
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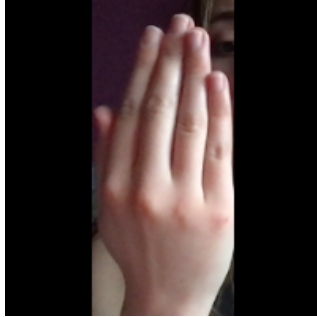
Preprocessing steps:

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



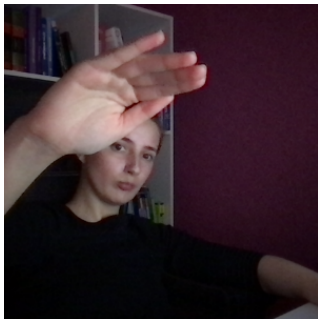
**Figure 2:** cropped



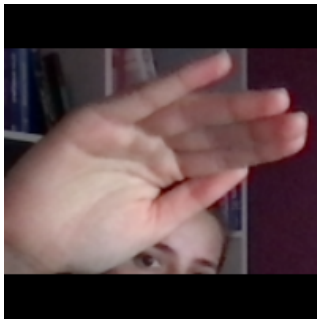
**Figure 3:** background removal



## Preprocessing Examples – a not so good one



**Figure 4:** original



**Figure 5:** cropped



**Figure 6:** background removal


## Future Considerations

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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
- do we want to train with MediaPipes 3d hand model
- what is the exact setting in which we want to use our deep learning model

**Thank you!**

-  F. Zhang, V. Bazarevsky, A. Vakunov, A. Tkachenka, G. Sung, C.-L. Chang, and M. Grundmann, “Mediapipe hands: On-device real-time hand tracking,” 2020.