Regular Track: Assignment #2

Image Based Biometry 2021/22
Faculty of Computer and Information Science
University of Ljubljana

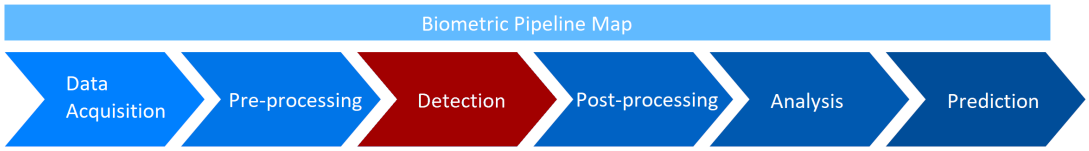
Detection/Segmentation

Biometric pipeline coarsely consists of: data acquisition, pre-processing, detection, feature acquisition and decision making as visualized in Figure 1. For this assignment you are going to tackle the first three steps, with the emphasis on detection/segmentation step using either the dataset provided with this assignment or your own dataset.

Realize, that it is likely you do not have all the knowledge needed to complete this assignment well, just yet – additional materials are going to be provided and feel free to ask for advice. Also, be aware that most approaches you are going to try are not going to be successful – do not let this frustrate you.

Download the base Python evaluation code available from Eučilnica.

Figure 1. Biometric recognition pipeline.



I. Task Overview

1) Data:
   - Use the attached AWE-W dataset where ear locations are marked with corresponding bounding boxes (if you decide to do detection) and masks (if you decide to do segmentation),
   - OR feel free to use any other dataset, such as http://shuoyang1213.me/WIDERFACE/, http://vis-www.cs.umass.edu/fddb/index.html etc.,
   - OR prepare/modify a dataset appropriate for detection/segmentation (prepare it properly: read annotations, reformat them if needed, etc.).
2) Preprocessing:
   - Try different image preprocessing approaches and observe if they improve performance, such as histogram equalization, brightness correction, edge enhancement, etc.
   - Do the necessary image processing needed for your detector/segmentor – in the case of CNNs this often includes image resize into a fixed form and subtraction of the average pixel value.
3) Detector/Segmentor: compare multiple detectors/segmentors. Try searching through https://github.com and https://paperswithcode.com/. Beware that for training you need a GPU, if you do not have one, try using https://colab.research.google.com/
   - You can evaluate multiple existing approaches, e.g.: compare an already trained VJ and already trained CNN detectors. However, in this case face dataset is recommended, since existing ear detectors/segmentors are not that common.
   - You can prepare your own detector/segmentor, e.g. you train multiple CNNs on the attached data and report the results.
   - You can modify existing detectors and compare performance. The difficulty varies here significantly, e.g., you can simply evaluate existing VJ with different parameters (lower amount of points), or you can modify existing CNN architecture and train it (highest points).

- You can do an ablation study with some existing approaches, by observing how different aspects affect performance – change in resolution, occlusions, brightness etc.

4) Evaluation:
   - Use the separate training (with evaluation) set during development, and the testing set for the final results (report results on the test set).
   - Select the appropriate measures – in the supplied code intersection over union is provided, other measures you would maybe like to report you need to prepare yourself.
5) Meeting:
   - Prepare for the meeting by collecting the final results you deem important (comparison plots, numbers) and brief description of everything you have done.
   - Visit any lab session time-slot during the submission week, either online or physically.

II. Grading

The maximum amount of points you can get is 100. The grading will be the following:

1) Preprocessing: up to 10 pts (more, if you focus your work on this and develop your own and show the improvement).
2) Detection/segmentation: up to 70 pts – depends on the quality of your approach and the amount of work invested, e.g. evaluation of the already trained VJ by changing parameters will get you roughly between 10 to 20, however, you can combine VJ with ablation study for more points. Development of your own CNN architecture and comparison to other state-of-the-art approaches 70 pts.
3) Evaluation: up to 10 pts (preparation of plots, additional measures etc.).
4) Additional: up to 10pts – reserved for things like outstanding performance, preparation of datasets, etc.

The grading will follow the rules above. However, notice that there could be some deviation based on the estimated amount of work you invested.

After the meeting feel free to improve your grade through the rebuttal.

If you have any questions or issues do not hesitate to contact Žiga (ziga.emersic@fri.uni-lj.si) or visit lab sessions.