CSE666 Programming Assignment 1

Due: March 12th 2023 11:59:59PM

Given an image from President Biden's State of the Union address:

1. **(10 points) Annotation:** Mark bounding boxes for each face in the image and save them using any tool.
2. **(10 points) Face detection:** Detect faces present in the image, label each region of interest (RoI) containing a face with a bounding box, and return the number of faces present in the image, i.e. the number of detected bounding boxes. Evaluate face detection models – (deterministic models and/or pretrained networks) against bounding boxes from step 1.
3. **(10 points) Sentiment/Expression analysis**: For each identified RoI, analyze the expression to return metrics like anger/disgust/sadness, etc. Evaluate the performance of your model.
4. **(10 points) Gender:** Classify each detected face by gender. Evaluate the performance of your model against gender information from the dataset.

   Use information from the following resources to evaluate your results:
   https://cawpdata.rutgers.edu/women-elected-officials/position?current=1&position%5b%5d=US+Senator

   https://cawp.rutgers.edu/facts/levels-office/congress/women-us-congress-2023

   For the purpose of this exercise, assume all congresspeople not listed in the above resources as male.

5. **(10 points) Face pose estimation:** For each identified RoI, estimate face pose to determine whether the attendee is looking straight or to a side. Evaluate the performance of your model.

6. **(10 points) Feature extraction:** Extract features for each face detected using pretrained models and store the generated embeddings for matching.
7. **(25 points) Face recognition:** Given a dataset containing images and names of lawmakers, identify each RoI and return a label with the Senator/Congressperson's name. (Note that not all attendees present will be included in the dataset since not all attendees are lawmakers. For such cases your solution must return the label = "Unknown"). Evaluate the performance of your matcher.
8. **(15 points) Report:** Write a report documenting - for each of the aforementioned tasks - the approach taken, results, and any references consulted.

The image is copyrighted by NY Times and can't be used for any external publication of submissions to external APIs. You may not use external API calls that require the image to be uploaded. Only local models are allowed.

Dataset:

The dataset.zip file contains a TSV (tab separated values) file that maps image filenames to names of congresspeople and the img/ directory contains the images referenced by filenames.

You are also provided count_images.jpg which is the image to be subjected to the tasks outlined above.

Submission format:

Your submission must be a zip file uploaded to UBLearns, named in the format *<person_number>_<UBITname>_assignment01.zip*

The zip file must contain the source code for the implementation and the report in PDF format. Comment code to help reproduce your results where necessary. Your submission will be verified to see if your results match your report and will also be checked for plagiarism. Include any instructions, if necessary, to run your code in a README.MD Markdown file.

Sample submission directory structure:

```
00000000_johndoe_assignment01.zip
├── 00000000_johndoe_assignment01.pdf
├── count_faces.jpg
├── data/
│   ├── congress.tsv
│   └── img/
├── README.MD
├── results/
│   ├── bounding_boxes.json
│   └── embeddings.npz
└── src/
    ├── data.py
    ├── main.py
    ├── model.py
    ├── model_weights/
    │   ├── classifier.hdf5
    │   └── detector.pth
```

└── util.py