FACE DETECTION
PROJECT 3

CSE-573: Computer Vision and Image Processing

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1 Viola-Jones Algorithm:

Viola-Jones algorithm is used for face detection in images and is very successful in this domain. This algorithm consists of 4 steps.

- Haar Feature selection
- Integral Image
- Boosting
- Cascading

1.1 Haar Feature Selection

This step is used for extracting features which are similar to a face from image. A rectangular Haar-like feature is calculated as the difference of the sum of pixels of areas inside the rectangle, which can be at any position and scale within the original image. This modified feature set is called 2-rectangle feature. Viola and Jones also defined 3-rectangle features and 4-rectangle features.

1.2 Integral Image

Integral image is an image calculated by cumulative addition of intensities on subsequent pixels in both horizontal and vertical axis. It gets the sum of intensities in pixels up to that point.

1.3 Boosting

Boosting turns individual weak learners into an ensemble learner. All the learners have similar weight in the beginning. Then, the weight of the learners who misclassify is improved and hence better accuracy is achieved.

1.4 Cascading

These are classifiers on different stages where if an image passes through one classifier, it is classified by another classifier but if any image is rejected by any classifier it is outright rejected.

Code

Code for this project consists of 3 python files. A model is trained through the trainer on face images and negative images which gets the classifiers and does the boosting on extracted features. This trainer finally classifies an image as a face or not. This trained model is then tested on test images and results are stored in a json file.

Result

Analysis

This code does not perform as well as it should have probably due to training limitations.

References

Following resources were considered while developing the algorithm

https://www.youtube.com/watch?v=OgY-7W_ksdQ
https://www.cs.cmu.edu/~efros/courses/LBMV07/Papers/viola-cvpr-01.pdf
https://medium.com/datadriveninvestor/understanding-and-implementing-the-viola-jones-image-classification-algorithm-85621f7fe20b
https://www.cs.ubc.ca/~lowe/425/slides/13-ViolaJones.pdf