

Age and Gender Estimation of Unfiltered Faces – Eran Eiding, Roei Enbar and Tal Hassner

Paper Essence:

- Robust face alignment tool - A Face alignment tool which uses iterative Re-weighted Least Squares (IRLS) approach.
- Dropout SVM – used for training linear support vector machine classifiers.
- Age/Gender Benchmarks of Unfiltered faces – like Gallagher, Adience, PubFig.
- Face representations – Various face representations like anthropometric models, subspace models, higher dimensional manifolds were discussed.
- Adience set – Dataset containing images under challenging real-world conditions.

Work described:

- Laid benchmark and provided a new and extensive dataset for the study of age and gender estimation. A classification designed to make the most from what little information that is available.
- Dropout SVM, Robust facial alignment technique based on uncertainties of facial features.

Why do you feel this work is important in domain of computing or informatics?

Various facial traits like age, gender represent information to a wide range of tasks. Estimating these traits from facial appearances has received less attention than face recognition. I was primarily motivated by the amount of data or information available for the computer vision problems as described above.

What methodology or work was reported?

Detection and alignment - Face is detected using standard Viola and Jones Face detector. Detected faces are then aligned to a single reference coordinate frame using Iterative Re-weighted Least Squares (IRLS) approach.

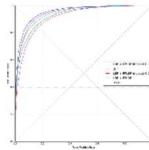
Representation - They chose the local binary patterns (LBP) and the related four patch LBP codes (FPLBP) due to their successful application to face recognition problems as well as their efficient computation and representation requirements. Their system was believed to work on particular image representations and so other face descriptors can be used instead of the ones used here.

Classification – Classification was done using standard linear SVM trained using the feature vector representations listed above. Robust classification was often expressed in terms of a classifier's capabilities to generalize beyond a bounded amount of deviations of the training set. Here the data was limited both in the number of samples available and following strong alignment discussed above and the invariants descriptors they used in natural variation of values for each feature.

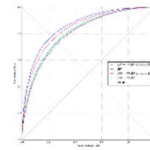
How is it working?

Under Gallagher age benchmark the method was tested with and without alignment of images and the results showed a substantial improvement of the proposed method compared to the previous work and the results were near perfect on this set. Dropout SVM alone provides ~6% performance boost, whereas alignment further improves results by 2.5%. Under Adience age benchmark dropout SVM provides a lesser performance gain, though SVM trained with dropout still provides better results than without. Adience gender test set were performed using training on a Gallagher training set. The results clearly show the difficulty level of proposed data compared to previous collection. In particular no matter what training set is used, testing on the full Adience collection produces lowest scores with the frontal version of Adience benchmark coming in second. An important

observation evident from these results concerns database bias that is how well training examples from one set generalize to test samples in other sets. A few failed gender classification examples demonstrate the difficulty of the classification task defined by the benchmark, due to the myriad of confounding factors which affect facial appearances in images.



Results on Gallagher benchmark



Results on Adience Benchmark

Pros:

- Improved face recognition capabilities.
- Dropout SVM and alignment tool increased the accuracy of results.

Cons:

- Failure in identifying Age/Gender of some results which are easy for human to correctly classify.
- They assumed that age appearances and variations can be modelled using example images, which may not be true.

Future work:

- Considering the uncertainties when performing 3D normalization.
- Adience set is labelled for identity and can be used as a more challenging alternative to the benchmarks used today, when helps in improving face recognition capabilities beyond their present state.

What work are you planning to take up for implementing and demonstrating purpose from the paper?

Face Detection and Alignment – Face is detected using standard Viola and Jones Face detector. Detected faces are then aligned to a single reference coordinate frame using the method proposed in the paper. Face Detection was done using OpenCV routines where 360 degree roll versions are considered of the input image at 5 degree increments. Facial images are handled by this robust facial alignment technique, it explicitly takes into consideration the uncertainty of the facial features and its detection is used to estimate the aligning transformation.

Any other observation from the paper that you wish to provide?

I wanted to discuss more on the Dropout-SVM which was proposed for training linear support vector machine classifiers. It was proposed initially for training deep neural networks and shown there to be extremely powerful means of avoiding over-fitting in these models. Here they proposed using a similar approach when training SVM in an effort to avoid over-fitting due to the scarcity of available data rather than the nature of classification model used. Bringing these together they described a system for age and gender estimation.