**1: Age andd Gender Classification using Convolutional Neutral Networks by Gil Levi and Tal Hasser**

Age and gender classification became a major interest for computer vision scientists. The significant advances in today’s social media and the explosion of data make such task a necessity. The previous work in this are did provide a solution. However, its low precision did not match the current demand especially for commercial products. This paper tries to provide a solution to such a problem with a contemporary method using convolutional neural network. This method proves its proficiency outperforming the existing state-of-the-are methods available in its time. The method is evaluated against the well known Adiene benchmark for age and gender estimation and show a dramatic increase in the results.

Past approaches use the so-called face descriptor methods which heavily rely on face dimensions and ratios between face’s landmarks. These methods do not fit into current applications as the images to classify needs to be taken with special constraints. The paper tries to correlate the recent advances in the face recognition field with the age and gender recognition using identical methodology, CNNs.

The network structure is as follows:

* 96 filters in the first convolutional layer followed by (ReLu) and max pooling layers.
* 256 filters in the second convolutional layer followed by (ReLu) and max pooling layers.
* 384 filters in the last convolutional layer followed by (ReLu) and max pooling layers as well.
* Two fully connected layers.
* A third fully connected layer maps to the final classes for age or gender.

The experiment is implemented using the Caffe open source framework. Training was performed on an Amazon GPU machine. The training time was about 4 hours.

Results are summarized in the table below.

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**2: Convolutional Neural Networks for Age and Gender Classification**

This paper summarizes a work on gender and age classification. It builds over the work of the previous paper. The main motivation for this paper are:

* To investigate the claim that deeper network architecture, reducing the number of parameters or modifying the level of the dropout would not provide better precision. These modification results in a decrease in the system precision (or at best, stay the same).
* To train the age classifier on separated genders, men and women. This results in an improve in the results. The summary is in the table below.

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**Our ideas for the project:**

After reading these two papers and a useful discussion with our supervisors. There are some ideas we can apply to the project.

* We can replicate the work done by these papers trying to use hierarchal learning instead. The idea of the hierarchal learning is that we will classify age for three larger classes and then narrow our classification for inner age classes. This may give better results as the classifier produces better results when the number of classifiers is reduced.
* We can replicate the work done on these papers as well but transferring images to another color domain such as CMYK. Such domains have better color representations and the chance to improve the results is promising.

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| Study | Length  (pages) | Authers | Dataset description | Methodology | Results | Comments |
| Convolutional Neural networks for age and gender classification | 7 | Ari Ekmekji | * Adience face dataset, for testing and training. * 26.580 photos of 2.284 unique subjects collected from ***Flicker***. * Images used are front facing. Total of 20,000. * Images are originally of size 768x768, preprocessed to 256x256. | 1. Network Architecture:   The network architecture is relatively shallow to prevent over-fitting the data.   1. Training and Testing:   Dataset is divided into 6 subject exclusive folds, each of these folds is, then, divided into male and female each is further divided into 8 age groups.   1. The classification is done by separating the tasks of classifying men’s age and women’s age. 2. The approach used is to first classify data on gender and then classify on age for each gender separately. This shows better results. | Age:  0-2: 0.27  4-6: 0.76  8-13: 0.76  15-20: 0.92  25-32: 0.78  38-43: 0.87  48-53: 0.79  60+: 0.76  all: 0.79  Gender:  exact: 54.5  1-off: 84.1 | The work of this paper is based on the work of the next paper in this table. |

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| Age and gender classificatoin using convolution neural networks | 9 | Gil Levi  Tal Hassner | * Adience face dataset, for testing and training. * 26.580 photos of 2.284 unique subjects collected from Flicker. | 1. Network Architecture:   The network architecture is relatively shallow to prevent over-fitting the data.   1. Training and Testing:   Dataset is divided into 5 subject exclusive folds. | Gender:  0.859  Age:  exact: 50.7  1-off: 84.7 | This method outperforms all previous methods to its date, 2015. |