Age Estimation From Facial Parts Using Compact Multi Stream Convolutional Neural Network

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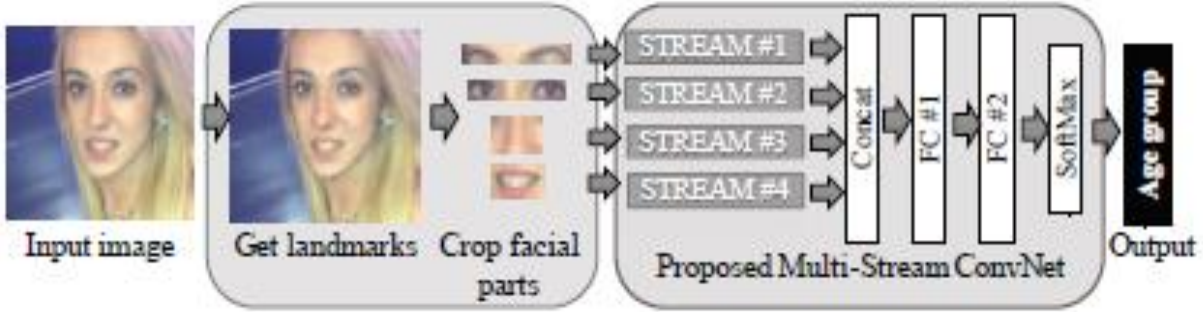
Introduction

- *Age plays a key role in many real-world applications such as preventing purchase of alcohol and tobacco by minors(under 16 yr), soft biometrics, electronic customer relationship and as age synthesis to find lost people.*
- Face age estimation is defined as the possibility of labelling a face image automatically with the exact age or the age group (e.g., young, adult) of the individual face".
- The proposed approach uses deep learning for age estimation, adopts facial parts as input and a compact multi stream CNN as architecture.

Objective

- The main goal of our work is to propose and evaluate a compact multi-stream CNN architecture to explore preprocessed facial parts in order to estimate human age from a single image.



source:-
https://openaccess.thecvf.com/content_ICCVW_2019/papers/CEFRL/Angeloni_Age_Estimation_From_Facial_Parts_Using_Compact_Multi-Stream_Convolutional_Neural_ICCVW_2019_paper.pdf

Procedure

1. A single RGB image is input to the system
2. A face detector is applied followed by a 2D facial landmarks estimator.
3. Based on the landmark coordinates, the facial parts of interest are preprocessed and cropped.
4. Each facial part feeds a specific stream of CNN, whose outputs are concatenated and processed by a sequence of fully connected layers.
5. Finally, a softmax function returns the probabilities of the person belonging to which age group.

Pre-Processing

- Dlib face landmarks (68 landmarks)

  Face contour : 1 - 17 (Blue)

  Eyebrow : 18 - 27 (cyan)

  Nose: 27 - 36(red)

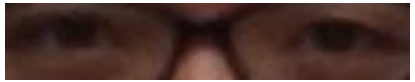
  Eye :36 - 48 (green)

  Mouth :49-68 (yellow)

contd..

- Cropped feature of face using landmarks

Dim: (33, 228,3)



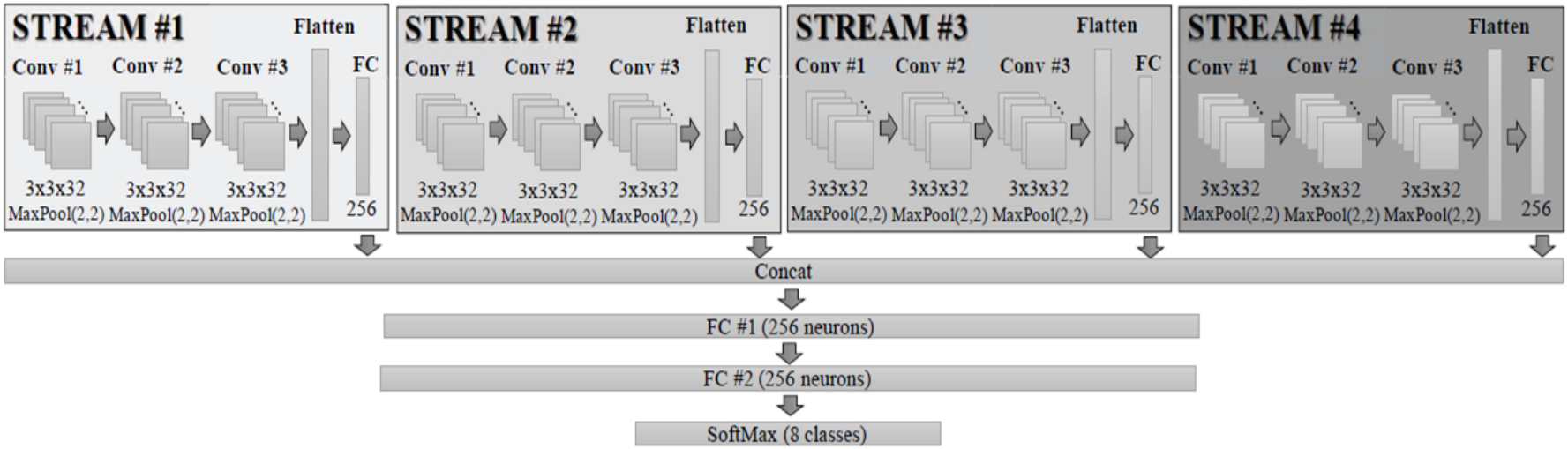
Dim: (38, 202, 3)

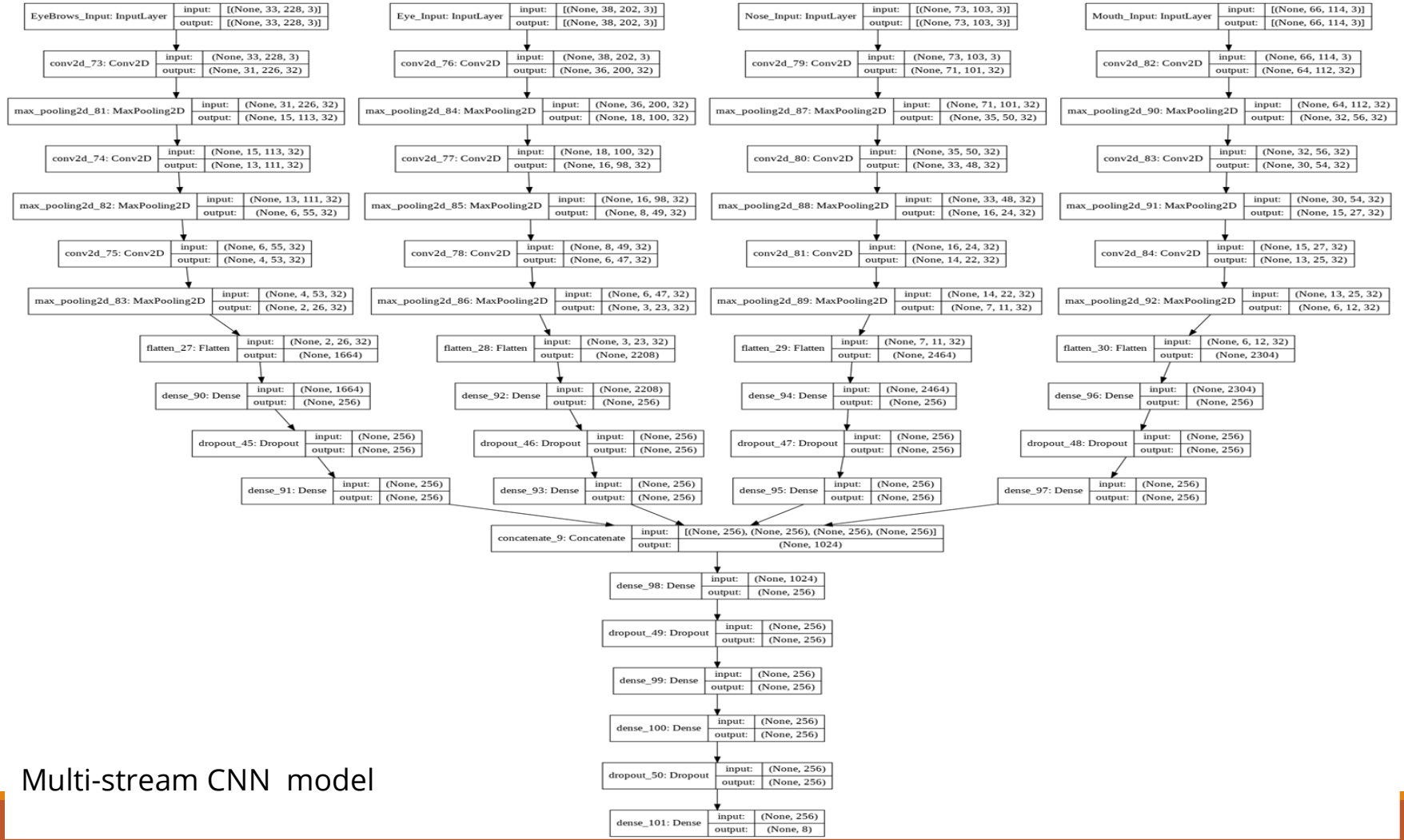
Dim: (73, 103, 3)

Dim: (66, 114, 3)

Proposed Multi stream CNN

- Each facial part is process by an independent CNN stream prior to concatenation with other parts.
- The feature learning occurs before concatenating each facial part.
- Output of each dense layer is used to perform the classification of each stream individually.





Multi-stream CNN model

Implementation

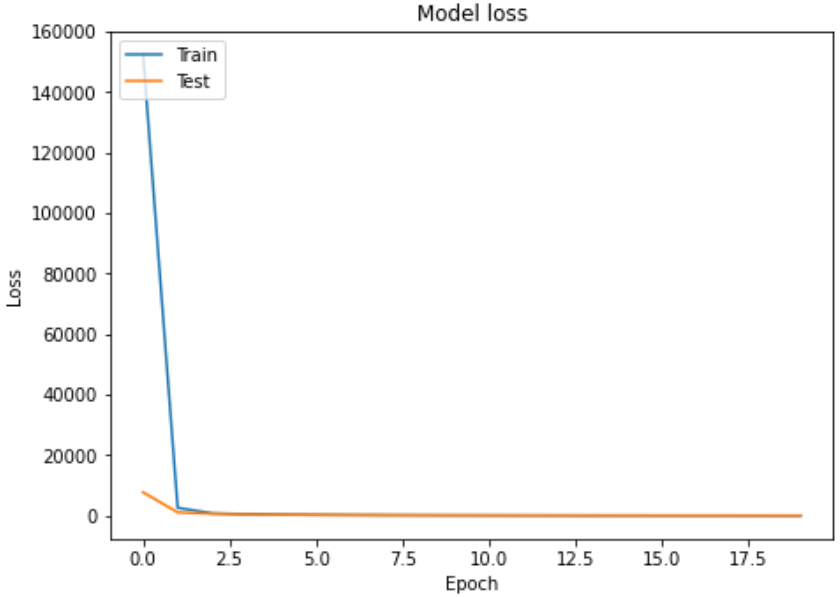
Training :

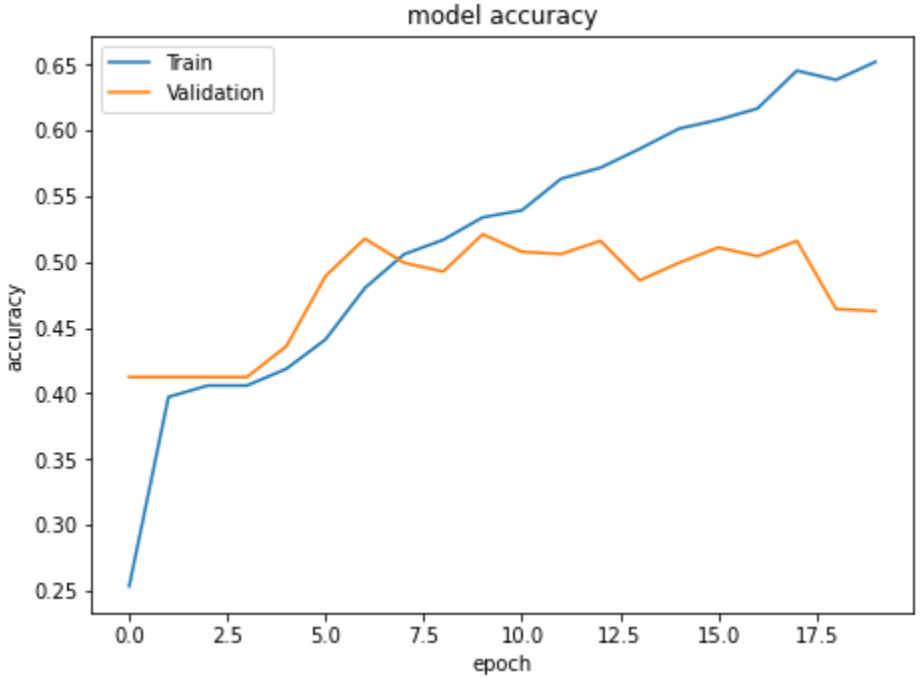
1. The proposed multi-stream CNNs were implemented using Tensorflow and keras libraries.
2. use 20 epochs
3. Batch size to 32
4. Categorical Cross Entropy was chosen as a loss function
5. Adam algorithm was chosen as optimizer with lr = 0.001

Dataset :

1. Adience benchmark dataset,which was basically designed for age and gender classification.
2. Adience data set consists of images uploaded from smartphone devices.
3. Data set includes 26580 images with eight unbalanced age group classes.

Result


Model loss
Train
Test
Loss
Epoch
160000
140000
120000
100000
80000
60000
40000
20000
0
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5


model accuracy
Train
Validation
accuracy
epoch
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5

Reference

- https://openaccess.thecvf.com/content_ICCVW_2019/papers/CEFRL/Angeloni_Age_Estimation_From_Facial_Parts_Using_Compact_Multi-Stream_Convolutional_Neural_ICCVW_2019_paper.pdf
- http://dlib.net/files/data/dlib_face_detection_dataset-2016-09-30.tar.gz

Thank You