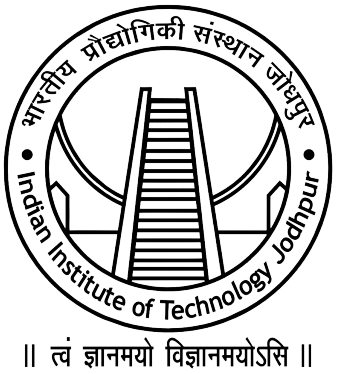
Indian Institute of Technology, Jodhpur, India

Department of Computer Science and Engineering

Advanced Biometrics CSL7430

Assignment 2



Tejas Gaikwad

(MT19AI021)

Contents

1 Question 1

Use LFWa Database and perform multitask learning for attribute prediction

1.1 Image to image enhancement

I have tried to perform multitask learning for attribution prediction on LFWa (Labeled Faces in the Wild aligned.

1.1.1 Model Block Diagram

Model comprises of a main base model followed by connected dense layer models

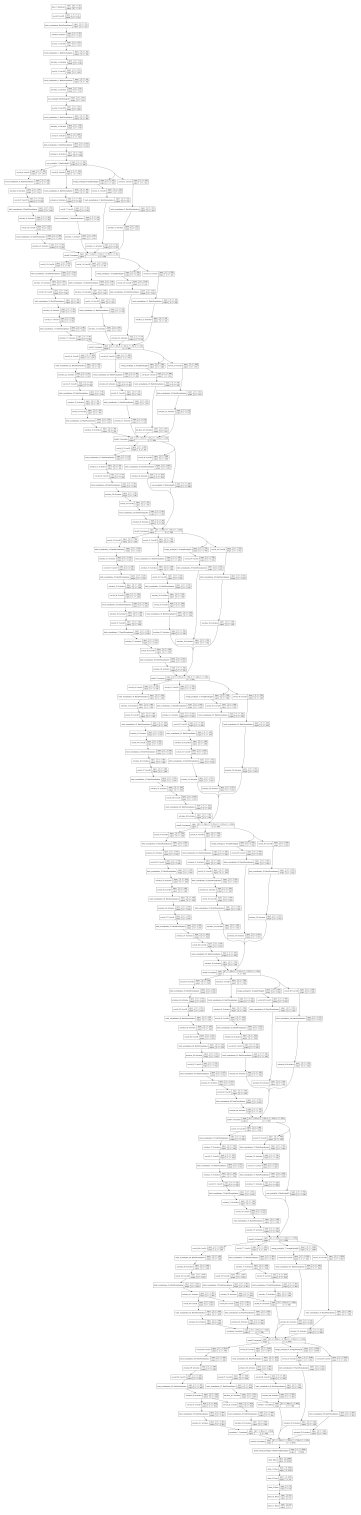


Figure 1: *Model Block Diagram for Task : EYEGLASSES Prediction*

1.1.2 Training Loss and Accuracy

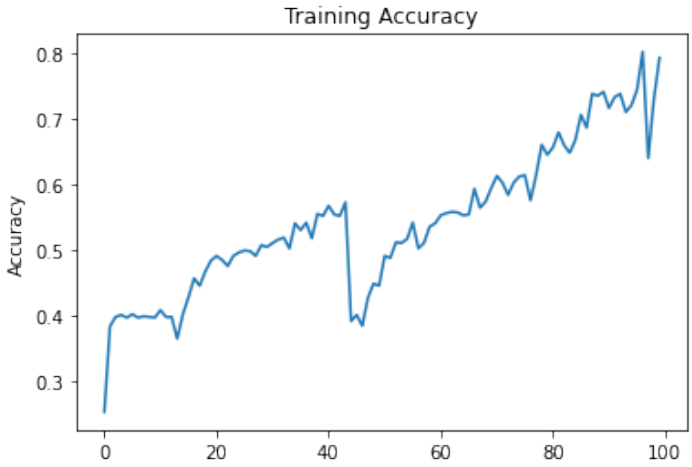


Figure 2: *Eyeglasses Model Training accuracy*

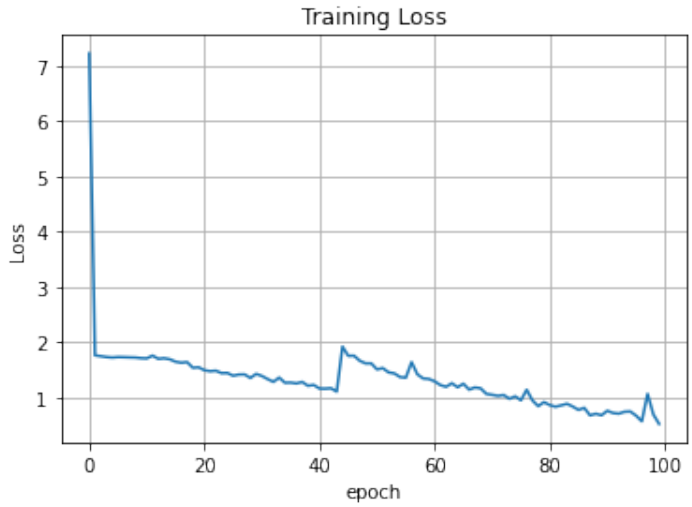


Figure 3: *Eyeglasses Model Training Loss*

1.1.3 Results

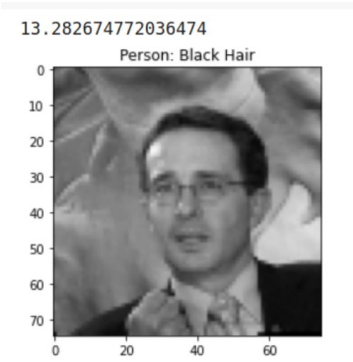


Figure 4: *Attribute: Male Prediction with Confidence*

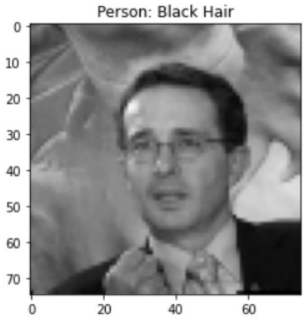


Figure 5: *Attribute: Black Hair Prediction with Confidence*

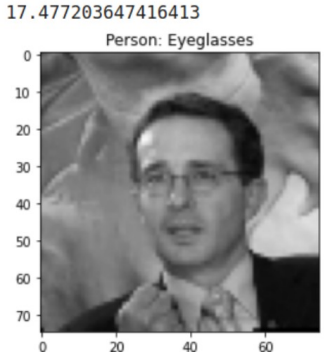


Figure 6: *Attribute: Eyeglass Prediction with Confidence*

2 Question 2

Use LFW database and following the protocol, perform face recognition with your choice of DL algorithm

2.1 System Design

Refer the block diagram and model summary for detailed information of the implementation.

2.1.1 Model

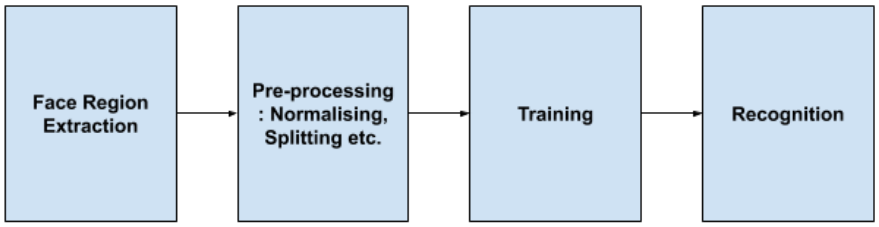


Figure 7: *Basic Block Diagram*

```
Model: "functional_3"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
input_2 (InputLayer)         [(None, 32, 32, 3)]       0
_________________________________________________________________
block1_conv1 (Conv2D)        (None, 32, 32, 64)        1792
_________________________________________________________________
block1_conv2 (Conv2D)        (None, 32, 32, 64)        36928
_________________________________________________________________
block1_pool (MaxPooling2D)   (None, 16, 16, 64)        0
_________________________________________________________________
block2_conv1 (Conv2D)        (None, 16, 16, 128)       73856
_________________________________________________________________
block2_conv2 (Conv2D)        (None, 16, 16, 128)       147584
_________________________________________________________________
block2_pool (MaxPooling2D)   (None, 8, 8, 128)         0
_________________________________________________________________
block3_conv1 (Conv2D)        (None, 8, 8, 256)         295168
_________________________________________________________________
block3_conv2 (Conv2D)        (None, 8, 8, 256)         590080
_________________________________________________________________
block3_conv3 (Conv2D)        (None, 8, 8, 256)         590080
_________________________________________________________________
block3_pool (MaxPooling2D)   (None, 4, 4, 256)         0
_________________________________________________________________
block4_conv1 (Conv2D)        (None, 4, 4, 512)         1180160
_________________________________________________________________
block4_conv2 (Conv2D)        (None, 4, 4, 512)         2359808
_________________________________________________________________
block4_conv3 (Conv2D)        (None, 4, 4, 512)         2359808
_________________________________________________________________
block4_pool (MaxPooling2D)   (None, 2, 2, 512)         0
_________________________________________________________________
block5_conv1 (Conv2D)        (None, 2, 2, 512)         2359808
_________________________________________________________________
block5_conv2 (Conv2D)        (None, 2, 2, 512)         2359808
_________________________________________________________________
block5_conv3 (Conv2D)        (None, 2, 2, 512)         2359808
_________________________________________________________________
block5_pool (MaxPooling2D)   (None, 1, 1, 512)         0
_________________________________________________________________
global_average_pooling2d_1 ( (None, 512)               0
_________________________________________________________________
dense_2 (Dense)              (None, 512)               262656
_________________________________________________________________
dense_3 (Dense)              (None, 7)                 3591
=================================================================
Total params: 14,980,935
Trainable params: 14,980,935
Non-trainable params: 0
_________________________________________________________________
None
```

Figure 8: *Model Summary*

2.1.2 Results

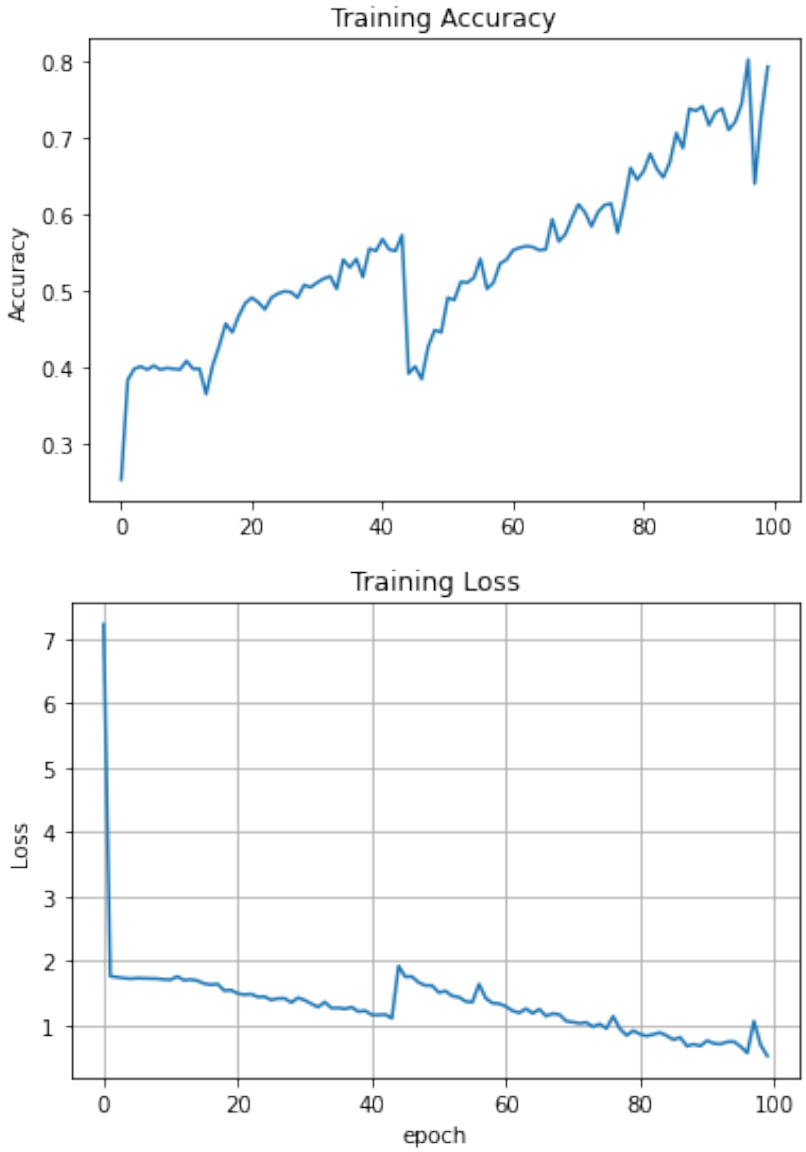


Figure 9: *Training : Accuracy and Loss*

	precision	recall	f1-score	support
Ariel Sharon	0.40	0.31	0.35	13
Colin Powell	0.49	0.57	0.53	60
Donald Rumsfeld	0.65	0.41	0.50	27
George W Bush	0.70	0.73	0.72	146
Gerhard Schroeder	0.33	0.32	0.33	25
Hugo Chavez	0.55	0.40	0.46	15
Tony Blair	0.26	0.28	0.27	36
accuracy			0.56	322
macro avg	0.48	0.43	0.45	322
weighted avg	0.56	0.56	0.56	322

Figure 10: *Final Results*

3 Question 3

Using IIITD Iris database (2,250 real iris images from https://drive.google.com/open?id=1HQSjTBOfvw
WqUG55XwYsvyAb8 - for password, please contact Mahapara/Puspita) , implement
iris recognition of your choice

3.1 System Design

Refer the block diagram and model summary for detailed information of the implementation.

3.1.1 Model

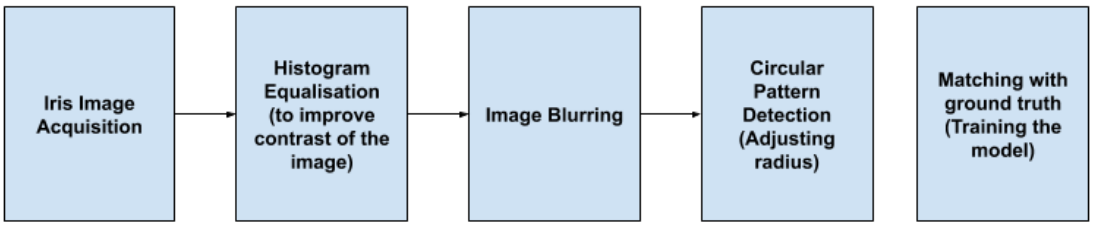


Figure 11: *Basic Block Diagram for IRIS Recognition*

3.1.2 Results

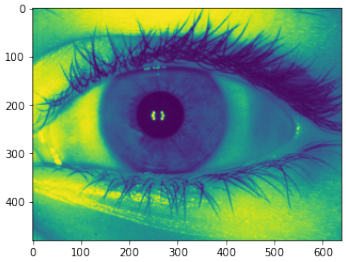


Figure 12: *Histogram equalisation of the image*

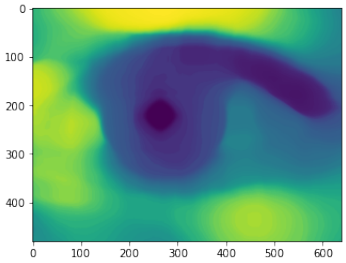


Figure 13: *Blurring of the Image*

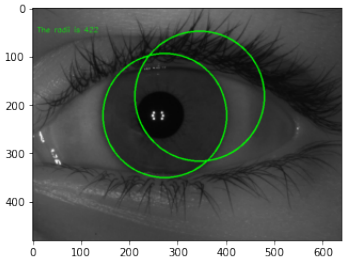


Figure 14: *Dense Layer based AE Model Summary*

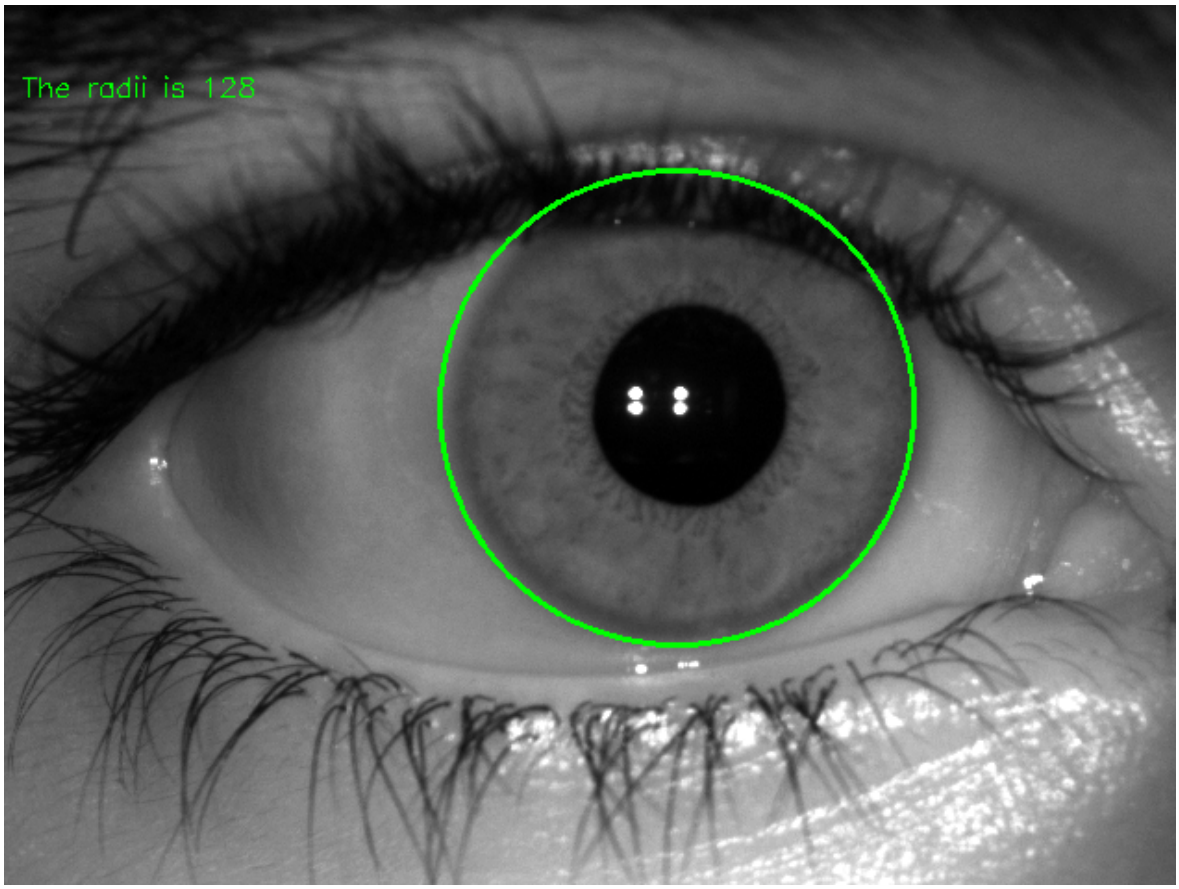


Figure 15: *Best Result*

4 Question 4

Using Multimodal database of your choice, implement fusion algorithm (either at image leve, feature level or score level) of your choice

4.1 System Design

Refer the block diagram and model summary for detailed information of the implementation.

4.1.1 Model

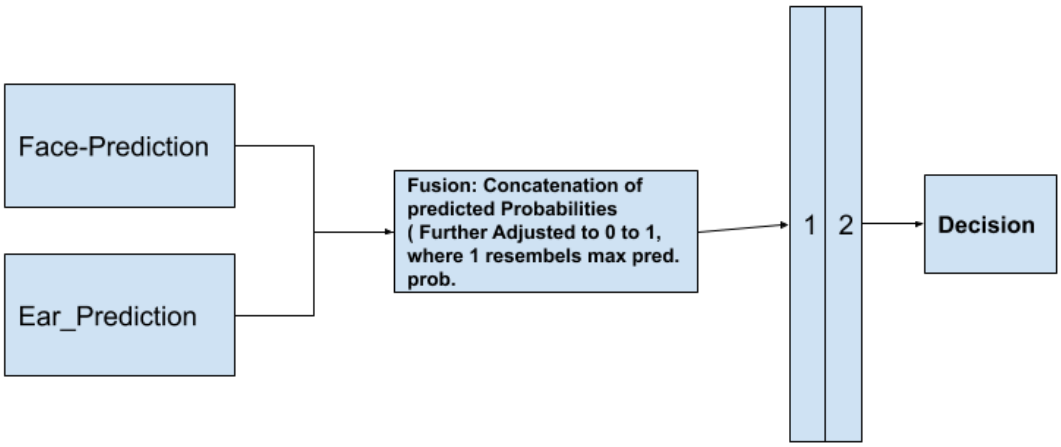


Figure 16: *Basic Block Diagram for Fusion of Face and Ear Bio-metrics*

4.1.2 Results

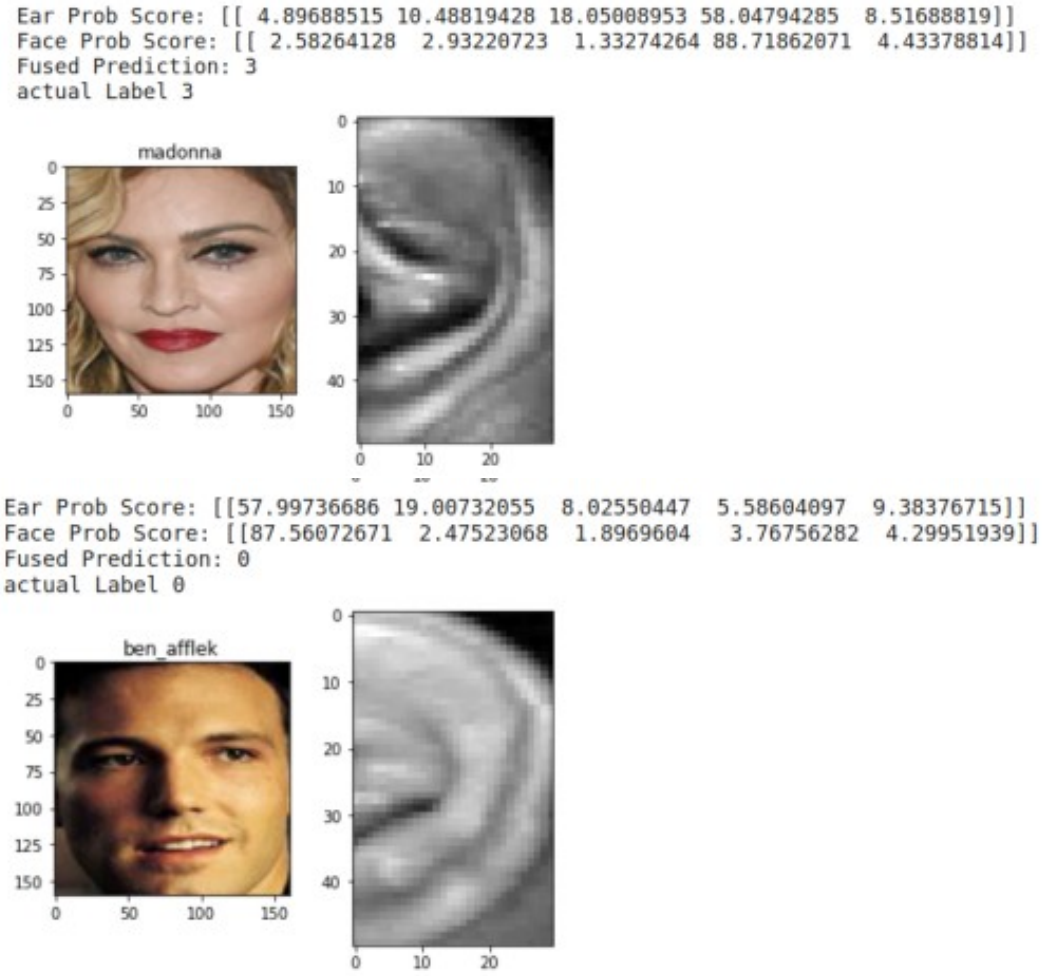


Figure 17: *Prediction after Fusion*