

Gender & Age Detection

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Introduction

Objective:

We have two main objectives; firstly, we will classify a person into gender by studying the different features of their face. It is a fundamental and binary classification, male and female. Finally, we would also predict the age of that human being by concentrating on the various features of the face and hair color and other such distinctions.

Metadata:

UTKFace dataset is a large-scale face dataset with long age span (range from 0 to 116 years old). The dataset consists of over 20,000 face images with annotations of age, gender, and ethnicity. The images cover large variation in pose, facial expression, illumination, occlusion, resolution, etc. This dataset could be used on a variety of tasks, e.g., face detection, age estimation, age progression/regression, landmark localization, etc.

Highlights:

- consists of 20k⁺ face images in the wild (only a single face in one photo)
- provides the correspondingly aligned and cropped faces
- provides the corresponding landmarks (68 points)
- images are labeled by age, gender, and ethnicity

Applications and Challenges

-- Age and gender classification techniques can improve a computer's perceptual and interactional capabilities. Various age and gender classification applications, including humancomputer interaction (HCI), can provide users with appropriate and customized services based on gender and age.

-- Age classification can control entry to unwanted content on televisions and the Internet from children. Employment like police, military, and government require age estimation during recruitment and retirement age. Security and surveillance restrict children's access to adult vending machines like (alcohol and cigarette) adulting websites, and movies and monitor fraud detection. It can play a significant role in recognizing lost people and older adults for identification from previous images.

1. Forensic Department in the medical field to gather information about bodies.
2. In the banking sector, detect information about the individual just by the images by age and gender detection.
3. Classify details of the individuals in the ADHAAR database.
4. Criminal Investigation Department to gather information about the suspects by age and gender detection.
5. Surveillance Monitoring.

Models

BASELINE MODEL: CNN

CNN WITH SKIP CONNECTIONS

ALEXNET

RESNET

TRANSFER LEARNING MODELS: VGGNET

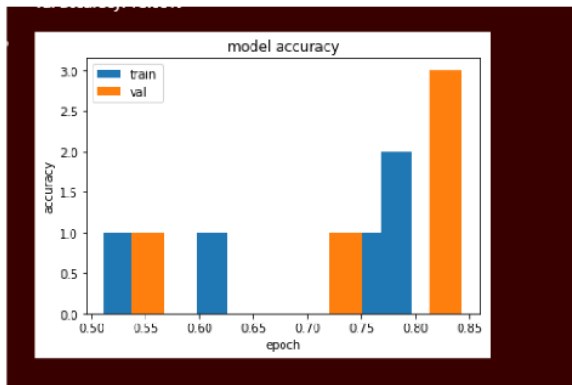
INCEPTIONV3

COMPARISON

NAME OF MODEL	ACCURACY	LOSS
Transfer Learning with VGGNet	77.44%	49.33%
InceptionV3	74.64%	56.15%
AlexNet	61.44%	47.66%
CNN	85.47%	42.81%
CNN with Skip Conections	87.56%	27.22%
ResNet	51.23%	80.99%

Graphs

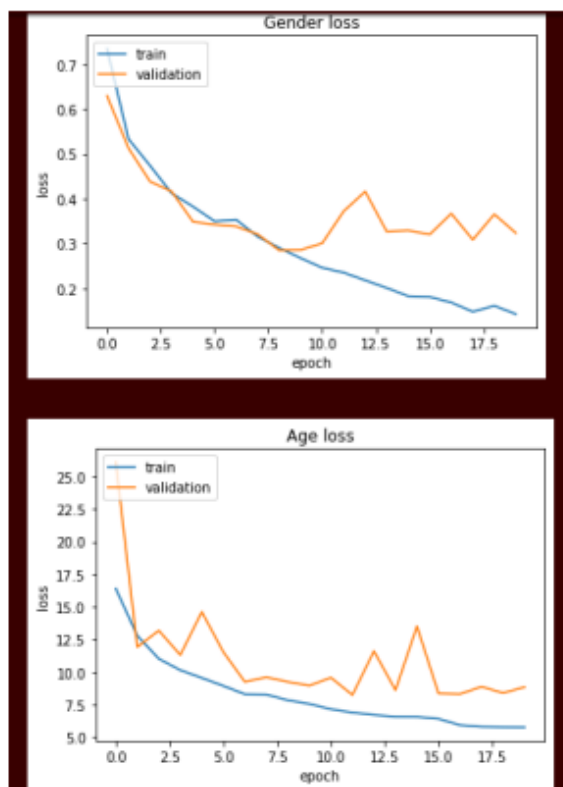
Model 1: CNN



Model Accuracy: 75.09%

Figure 1

Model 2: CNN + Residual NN

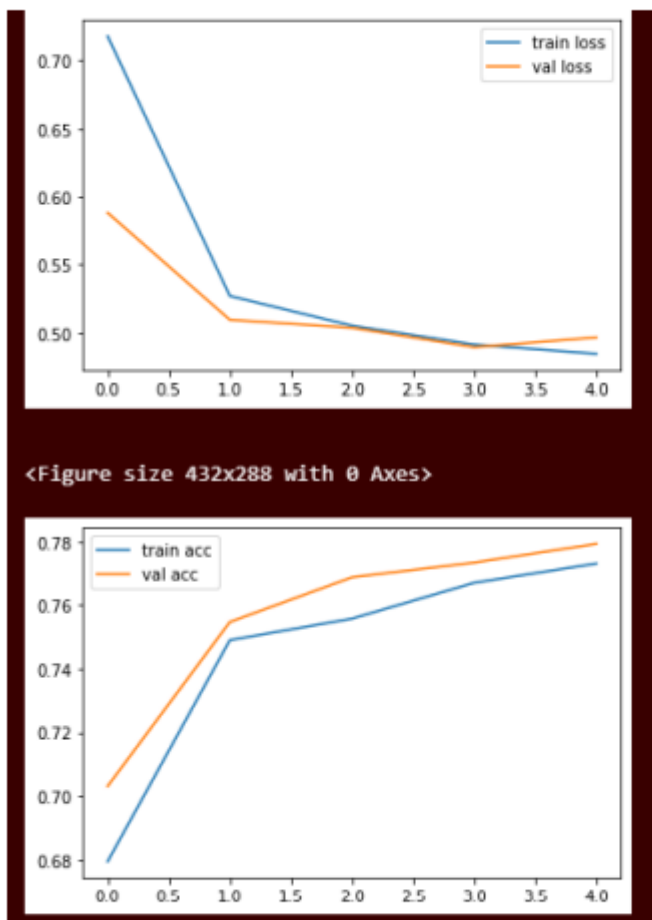


Gender Accuracy: 0.9384 – Age Accuracy: 0.0081

Validation Gender Accuracy: 0.8708 – Validation Age Accuracy: 0.0084

Figure 2

Model 3: Transfer Learning(VGG)



Model Accuracy: 78.36%

Figure 3

Results & Comments

The first thing we observed was the high accuracy achieved on the base model of a CNN. Another thing we see is that the RNN has even higher values than the CNN. The different types of models like GoogleNet, ResNet, and AlexNet do not perform that well. Also, the accuracy of the age predictions is very low because of many unpredictable variables like plastic surgery, makeup, etc.

Hyperparameter Reasoning: Optimizer used is the RMSprop. It basically maintains a moving average of the square of gradients. Dividing this gradient by the root of this average. It helps in increasing our learning rate and our algo could take larger steps in the horizontal direction converging faster.

Hyperparameters: The learning rate used is 10^{-3} . The learning rate other than these gave shallow accuracy values and hence was disregarded. Epochs used vary from 2 to 10—higher ages needed a lot of computational power, which was unavailable. Batch-size is 64 as it was the giving the best accuracy.