PROJECT REPORT

(Project Term July –November 2021)

(Age And Gender Detection)

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Under the Guidance of

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DECLARATION

We hereby declare that the project work entitled ("AGE AND GENDER DETECTION ") is an authentic record of our own work carried out as requirements of Project for the award of B.Tech degree in COMPUTER SCIENCE AND ENGINEERING from Lovely Professional University, Phagwara, under the guidance of (Dr. Sagar Pandey), during August to November 2021. All the information furnished in this project report is based on our own intensive work and is genuine.

Name: Mohammad Musheer Anwar

Registration Number: 11910270

Signature:

CERTIFICATE

This is to certify that the declaration statement made by this group of students is correct to the best of my knowledge and belief. They have completed this Project under my guidance and supervision. The present work is the result of their original investigation, effort and study. No part of the work has ever been submitted for any other degree at any University. The Project is fit for the submission and partial fulfillment of the conditions for the award of B.Tech degree in COMPUTER SCIENCE AND ENGINEERING from Lovely Professional University, Phagwara.

Signature and Name of the Mentor

Designation

School of Computer Science and Engineering,

Lovely Professional University,

Phagwara, Punjab.

Date: 30 March 2022

ACKNOWLEDGEMENT

In the present world of competition there is a race of existence in which those are having will to come forward succeed. Project is like a bridge between theoretical and practical working. With this willing I joined this particular project. First of all, I would like to thanks the supreme power of Almighty God who is obviously the one has always guided me to work on , the one has always guided me to work on the right path of life. Without his grace this project could not become a reality.

Next to him are my parents, whom I am greatly indebted for me brought up with love and encouragement to this stage. I am feeling oblige in taking an opportunity to sincerely thanks my all teachers department of computer Science and Engineering and mentors of Lovely Professional University who guided me towards doing this project of "AGE AND GENDER DETECTION" under as my course helped me to know the different aspects of Machine Learning Application in different purposes.

I am highly obliged in taking the opportunity to thanks the Lovely Professional University which helped me and guided me to learn more about the Machine Learning and its application, and also to different platforms which provide me the path for learning.

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ABSTRACT

To build a gender and age detector that can approximately guess the gender and age of the person (face) in a picture or through webcam.

In this Python Project, I had used Deep Learning to accurately identify the gender and age of a person from a single image of a face. The predicted gender may be one of 'Male' and 'Female', and the predicted age may be one of the following ranges- (0 – 2), (4 – 6), (8 – 12), (15 – 20), (25 – 32), (38 – 43), (48 – 53), (60 – 100) (8 nodes in the final softmax layer). It is very difficult to accurately guess an exact age from a single image because of factors like makeup, lighting, obstructions, and facial expressions. And so, I made this a classification problem instead of making it one of regression.

Age and gender predictions of unfiltered faces classify unconstrained real-world facial images into predefined age and gender. Significant improvements have been made in this research area due to its usefulness in intelligent real-world applications. However, the traditional methods on the unfiltered benchmarks show their incompetency to handle large degrees of variations in those unconstrained images. More recently, Convolutional Neural Networks (CNNs) based methods have been extensively used for the classification task due to their excellent performance in facial analysis. In this work, we propose a novel end-to-end CNN approach, to achieve robust age group and gender classification of unfiltered real-world faces. The two-level CNN architecture includes feature extraction and classification itself. The feature extraction extracts feature corresponding to age and gender, while the classification classifies the face images to the correct age group and gender. Particularly, we address the large variations in the unfiltered real-world faces with a robust image preprocessing algorithm that prepares and processes those faces before being fed into the CNN model. Technically, our network is pretrained on an IMDb-WIKI with noisy labels and then fine-tuned on MORPH-II and finally on the training set of the OIU-Adience (original) dataset. The experimental results, when analyzed for classification accuracy on the same OIU-Adience benchmark, show that our model obtains the state-of-the-art performance in both age group and gender classification. It improves over the best-reported results by 16.6% (exact accuracy) and 3.2% (one-off accuracy) for age group classification and also there is an improvement of 3.0% (exact accuracy) for gender classification.

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Introduction:

What is Computer Vision?

Computer Vision is the field of study that enables computers to see and identify digital images and videos as a human would. The challenges it faces largely follow from the limited understanding of biological vision. Computer Vision involves acquiring, processing, analyzing, and understanding digital images to extract high-dimensional data from the real world in order to generate symbolic or numerical information which can then be used to make decisions. The process often includes practices like object recognition, video tracking, motion estimation, and image restoration.

What is OpenCV?

OpenCV is short for Open Source Computer Vision. Intuitively by the name, it is an open-source Computer Vision and Machine Learning library. This library is capable of processing real-time image and video while also boasting analytical capabilities. It supports the Deep Learning frameworks TensorFlow, Caffe, and PyTorch.

What is a CNN?

A Convolutional Neural Network is a deep neural network (DNN) widely used for the purposes of image recognition and processing and NLP. Also known as a ConvNet, a CNN has input and output layers, and multiple hidden layers, many of which are convolutional. In a way, CNNs are regularized multilayer perceptrons.

The CNN Architecture

The convolutional neural network for this python project has 3 convolutional layers:

- Convolutional layer; 96 nodes, kernel size 7
- Convolutional layer; 256 nodes, kernel size 5
- Convolutional layer; 384 nodes, kernel size 3

It has 2 fully connected layers, each with 512 nodes, and a final output layer of softmax type.

To go about the python project, we'll:

- Detect faces
- Classify into Male/Female
- Classify into one of the 8 age ranges
- Put the results on the image and display it

DataSet

For this python project, we'll use the Adience dataset; the dataset is available in the public domain and you can find it here. This dataset serves as a benchmark for face photos and is inclusive of various real-world imaging conditions like noise, lighting, pose, and appearance.

The images have been collected from Flickr albums and distributed under the Creative Commons (CC) license. It has a total of 26,580 photos of 2,284 subjects in eight age ranges (as mentioned above) and is about 1GB in size. The models we will use have been trained on this dataset.

List of DataSets

- opencv_face_detector.pbtxt
- opencv_face_detector_uint8.pb
- age_deploy.prototxt
- age_net.caffemodel
- gender_deploy.prototxt
- gender_net.caffemodel
- a few pictures to try the project on

Steps to Create the Project

For face detection, we have a .pb file- this is a protobuf file (protocol buffer); it holds the graph definition and the trained weights of the model. We can use this to run the trained model. And while a .pb file holds the protobuf in binary format, one with the .pbtxt extension holds it in text format. These are TensorFlow files. For age and gender, the .prototxt files describe the network configuration and the .caffemodel file defines the internal states of the parameters of the layers.

1. We use the argparse library to create an argument parser so we can get the image argument from the command prompt. We make it parse the argument holding the path to the image to classify gender and age for.

2. For face, age, and gender, initialize protocol buffer and model.

3. Initialize the mean values for the model and the lists of age ranges and genders to classify from.

4. Now, use the readNet() method to load the networks. The first parameter holds trained weights and the second carries network configuration.

5. Let’s capture video stream in case you’d like to classify on a webcam’s stream. Set padding to 20.

6. Now until any key is pressed, we read the stream and store the content into the names hasFrame and frame. If it isn’t a video, it must wait, and so we call up waitKey() from cv2, then break.

7. Let’s make a call to the highlightFace() function with the faceNet and frame parameters, and what this returns, we will store in the names resultImg and faceBoxes. And if we got 0 faceBoxes, it means there was no face to detect.
Here, net is faceNet- this model is the DNN Face Detector and holds only about 2.7MB on disk.

- Create a shallow copy of frame and get its height and width.
- Create a blob from the shallow copy.
- Set the input and make a forward pass to the network.
- faceBoxes is an empty list now. for each value in 0 to 127, define the confidence (between 0 and 1). Wherever we find the confidence greater than the confidence threshold, which is 0.7, we get the x1, y1, x2, and y2 coordinates and append a list of those to faceBoxes.
- Then, we put up rectangles on the image for each such list of coordinates and return two things: the shallow copy and the list of faceBoxes.

8. But if there are indeed faceBoxes, for each of those, we define the face, create a 4-dimensional blob from the image. In doing this, we scale it, resize it, and pass in the mean values.

9. We feed the input and give the network a forward pass to get the confidence of the two class. Whichever is higher, that is the gender of the person in the picture.

10. Then, we do the same thing for age.

11. We'll add the gender and age texts to the resulting image and display it with imshow().

Eample-1 of output:

```
(base) PS C:\Users\Dell> cd D:\Age-Gender-Detection
(base) PS D:\Age-Gender-Detection> python detect.py --image man4.jpg
Gender: Male
Age: 25-32 years
(base) PS D:\Age-Gender-Detection> python detect.py --image man3.jpg
Gender: Male
Age: 25-32 years
(base) PS D:\Age-Gender-Detection> python detect.py --image man2.jpg
Gender: Male
Age: 25-32 years
(base) PS D:\Age-Gender-Detection> python detect.py --image man1.jpg
Gender: Male
Age: 38-43 years
(base) PS D:\Age-Gender-Detection> python detect.py --image photo.jpg
Gender: Male
Age: 25-32 years
(base) PS D:\Age-Gender-Detection>
```

Figure-1

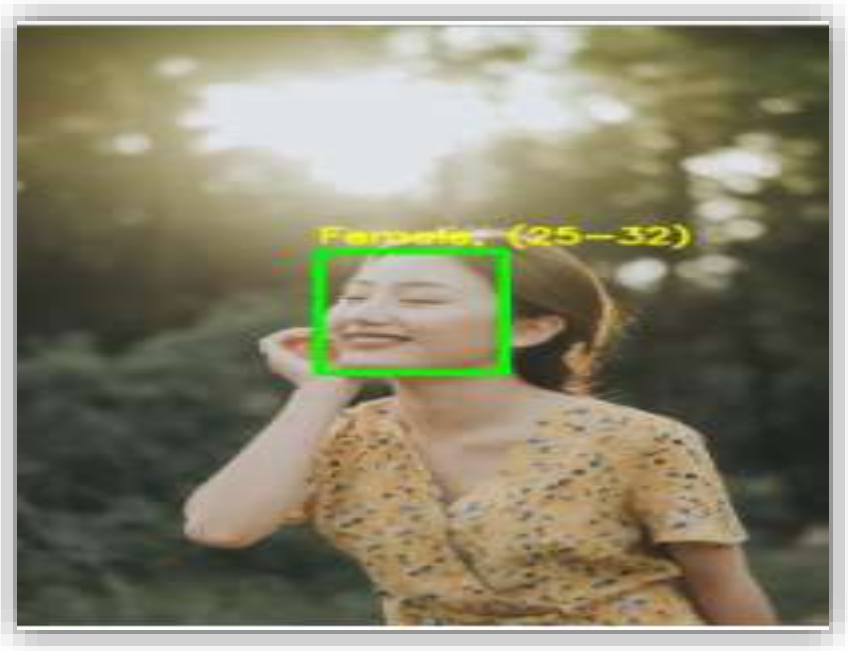

Figure-2

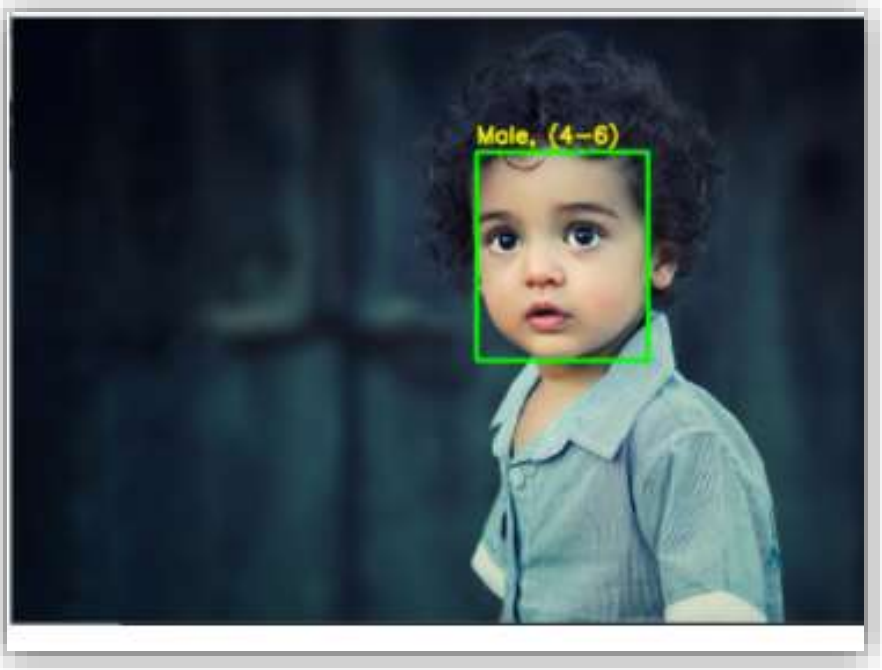

Figure-3

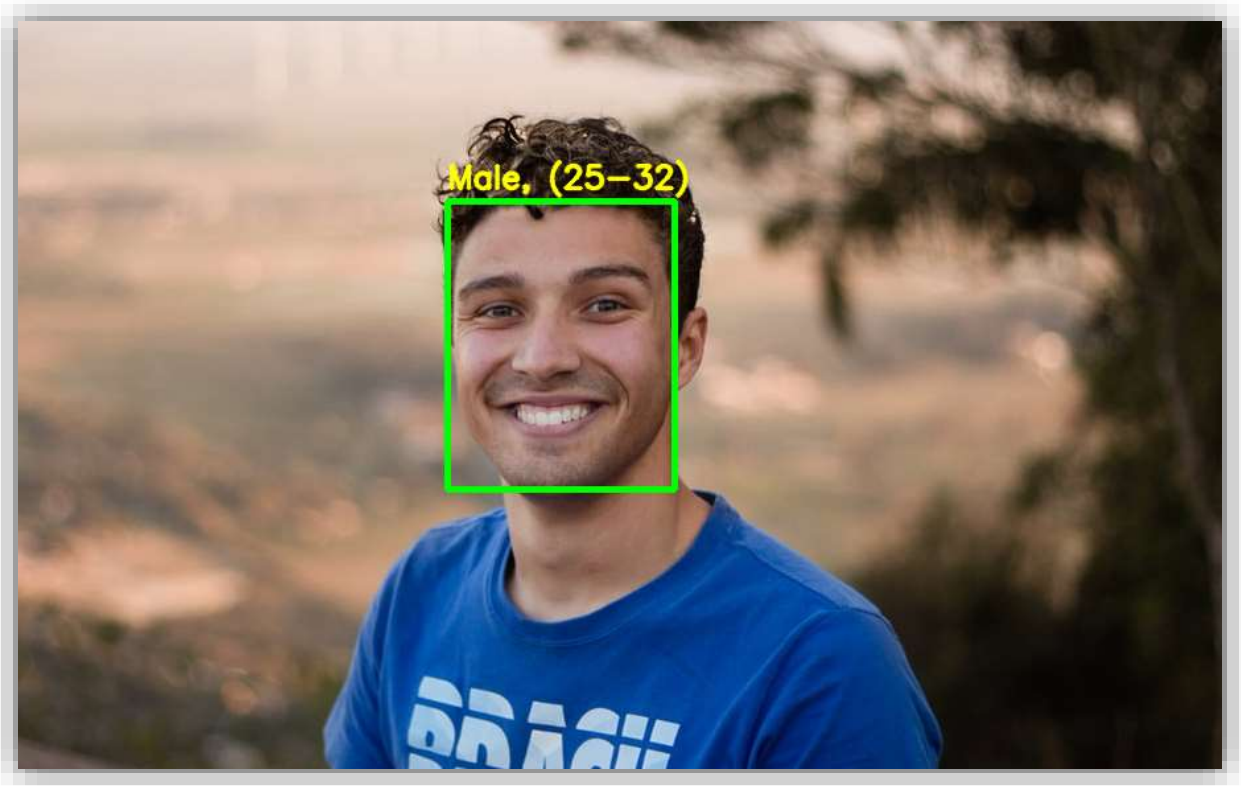

Figure-4

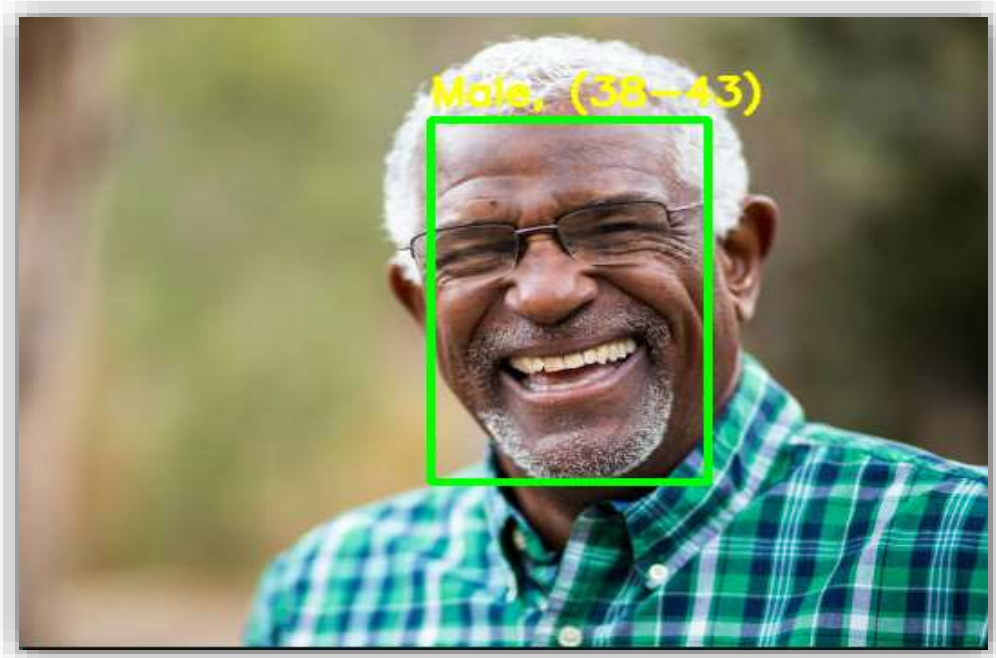

Figure-5

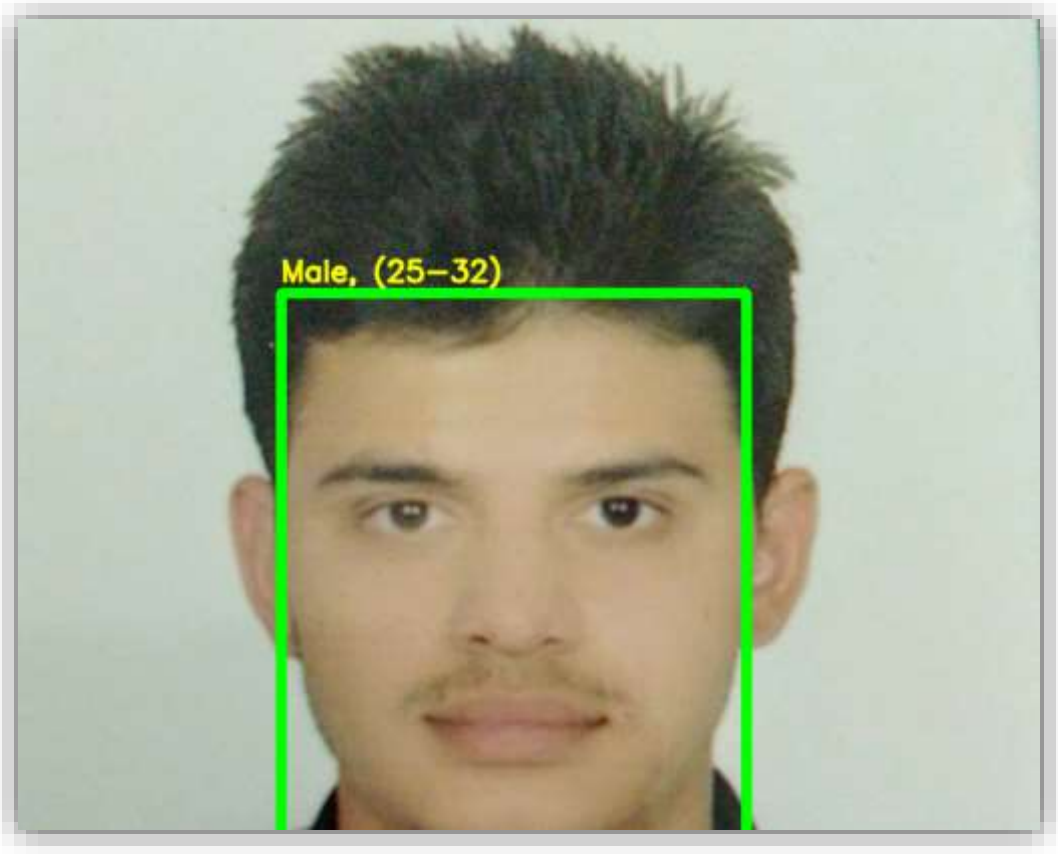

Figure-6

Related Work:

Related Works

In this section, we briefly review the age and gender classification literature and describe both the early methods and those that are most related to our proposed method, focussing on age and gender classification of face images from unconstrained real-world environments. Almost all of the early methods in age and gender classifications were handcrafted, focussing on manually engineering the facial features from the face and mainly provides a study on constrained images that were taken from controlled imaging conditions. To mention a few, in 1999, Kwon and Lobo [29] developed the very first method for age estimation focussing on geometric features of the face that determine the ratios among different dimensions of facial features. These geometric features separate babies from adult successfully but are incapable of distinguishing between young adult and senior adult. Hence, in 2004, Lanitis et al. [30] proposed an Active Appearance Model (AAM) based method that included

both the geometric and texture features, for the estimation task. This method is not suitable for the unconstrained imaging conditions attributed to real-world face images which have different degrees of variations in illumination, expression, poses, and so forth. From 2007, most of the approaches also employed manually designed features for the estimation task: Gabor [14], Spatially Flexible Patches (SFP) [17], Local Binary Patterns (LBP) [31, 32], and Biologically Inspired Features (BIF) [33]. In recent years, classification and regression methods are employed to classify the age and gender of facial images using those features. Classification methods in [12, 34–36] used Support Vector Machine (SVM) based methods for age and gender classification. Linear regression [20, 37], Support Vector Regression (SVR) [38], Canonical Correlation Analysis (CCA) [39], and Partial Least Squares (PLS) [40] are the common regression methods for age and gender predictions. Dileep and Danti [41] also proposed an approach that used feed-forward propagation neural networks and 3-sigma control limits approach to classify people's age into children, middle-aged adults, and old-aged adults. However, all of these methods are only suitable and effective on constrained imaging conditions; they cannot handle the unconstrained nature of the real-world images and, therefore, cannot be relied on to achieve respectable performance on the in-the-wild images which are common in practical applications [12].

More recently, an expanding number of researchers start to use CNN for age and gender classification. It can classify the age and gender of unfiltered face images relying on its good feature extraction technique [23, 26–28, 42–44]. Availability of sufficiently large data for training and high-end computer machines also help in the adoption of the deep CNN methods for the classification task. CNN model can learn compact and discriminative facial features, especially when the volume of training images is sufficiently large, to obtain the relevant information needed for the two classifications. For example, in 2015, Levi et al. [13] proposed a CNN based model, comprising of five layers, three convolutional and two fully connected layers, to predict the age of real-world face images. The model included centre-crop and oversampling method, to handle the small misalignment in unconstrained images. Yi et al. [45], in their paper, applied an end-to-end multitask CNN system that learns a deeper structure and the parameters needed, to solve the age, gender, and ethnicity classification task. In [46], the authors investigated a pretrained deep VGG-Face CNN approach, for automatic age estimation from real-world face images. The CNN based model consists of eleven layers, including eight convolutional and three fully connected layers. The authors in [2] also proposed a novel CNN based method, for age group and gender estimation: Residual Networks of Residual Networks (RoR). The model includes an RoR architecture, which was pretrained on gender and weighted loss layer and then on ImageNet dataset, and finally it was fine-tuned on IMDb-WIKI-101 dataset. Ranjan et al. in [47] presented a model that simultaneously solves a set of face analysis tasks, using a single CNN. The end-to-end solution is a novel multitask learning CNN framework, which shares the parameters from lower layers of CNN among all the tasks for gender recognition, age estimation, etc. In [9], the authors proposed a CNN solution for age estimation, from a single face image. The CNN based solution includes a robust face alignment phase that prepares and preprocesses the face images before being fed to the designed model. The authors also collected large-scale face images, with age and gender label: IMDb-WIKI dataset. In 2018, Liu et al. [48] developed a CNN based model that employed a multiclass focal loss function. The age estimation model was validated on Adience benchmark for performance accuracy, and it achieved a comparable result with state-of-the-art methods. Also in [49], Duan

et al. introduced a hybrid CNN structure for age and gender classification. The model includes a CNN and Extreme Learning Machine (ELM). The CNN extracts the features from the input images while ELM classifies the intermediate results. In [50], the authors proposed a robust estimations solution (CNN2ELM) that also includes a CNN and ELM. The model, an improvement of the work in [49], is three CNN based solutions for age, gender, and race classification from face images. The authors in [51] also proposed a novel method based on "attention long short-term memory (LSTM) network" for age estimation in-the-wild. The method was evaluated on Adience, MORPH-II, FG-NET, LAP15, and LAP16 datasets for performance evaluation. Also in [52], the authors studied an age group-n encoding CNN based model: AGEn. The model explores the relationship between the real age and its adjacent ages, by grouping adjacent ages into the same group.

Unfortunately, some of these methods mentioned above have been verified effectively on constrained imaging conditions; few studied the unconstrained imaging conditions. However, it is still a challenging problem classifying unconstrained faces with large variations in illumination, viewpoint, nonfrontal, etc. There is a need for a suitable and robust model that can improve the state-of-the-art methods for its applicability in intelligent and real-world applications. Here, we address those issues by designing a robust image preprocessing algorithm, pretrain the model on large-scale facial aging benchmarks with noisy age and gender labels, and also regularize the CNN parameters with our novel CNN framework.

Literature:

What Is Machine Learning?

The robot-depicted world of our not-so-distant future relies heavily on our ability to deploy artificial intelligence (AI) successfully. However, transforming machines into thinking devices is not as easy as it may seem. Strong AI can only be achieved with machine learning (ML) to help machines understand as humans do.

Machine learning can be confusing, so it is important that we begin by clearly defining the term:

Machine learning is an application of AI that enables systems to learn and improve from experience without being explicitly programmed. Machine learning focuses on developing computer programs that can access data and use it to learn for themselves.

How Does Machine Learning Work?

Similar to how the human brain gains knowledge and understanding, machine learning relies on input, such as training data or knowledge graphs, to understand entities, domains and the connections between them. With entities defined, deep learning can begin.

The machine learning process begins with observations or data, such as examples, direct experience or instruction. It looks for patterns in data so it can later make inferences based on the examples provided. The primary aim of ML is to allow computers to learn autonomously without human intervention or assistance and adjust actions accordingly.

Why Is Machine Learning Important?

Machine learning as a concept has been around for quite some time. The term “machine learning” was coined by Arthur Samuel, a computer scientist at IBM and a pioneer in AI and computer gaming. Samuel designed a computer program for playing checkers. The more the program played, the more it learned from experience, using algorithms to make predictions.

As a discipline, machine learning explores the analysis and construction of algorithms that can learn from and make predictions on data.

ML has proven valuable because it can solve problems at a speed and scale that cannot be duplicated by the human mind alone. With massive amounts of computational ability behind

a single task or multiple specific tasks, machines can be trained to identify patterns in and relationships between input data and automate routine processes.

- **Data Is Key**: The algorithms that drive machine learning are critical to success. ML algorithms build a mathematical model based on sample data, known as "training data," to make predictions or decisions without being explicitly programmed to do so. This can reveal trends within data that information businesses can use to improve decision making, optimize efficiency and capture actionable data at scale.
- **AI Is the Goal**: ML provides the foundation for AI systems that automate processes and solve data-based business problems autonomously. It enables companies to replace or augment certain human capabilities. Common machine learning applications you may find in the real world include chatbots, self-driving cars and speech recognition.

Machine Learning Is Widely Adopted

Machine learning is not science fiction. It is already widely used by businesses across all sectors to advance innovation and increase process efficiency. In 2021, 41% of companies accelerated their rollout of AI as a result of the pandemic. These newcomers are joining the 31% of companies that already have AI in production or are actively piloting AI technologies.

- **Data security**: Machine learning models can identify data security vulnerabilities before they can turn into breaches. By looking at past experiences, machine learning models can predict future high-risk activities so risk can be proactively mitigated.
- **Finance**: Banks, trading brokerages and fintech firms use machine learning algorithms to automate trading and to provide financial advisory services to investors. Bank of America is using a chatbot, Erica, to automate customer support.
- **Healthcare**: ML is used to analyze massive healthcare data sets to accelerate discovery of treatments and cures, improve patient outcomes, and automate routine processes to prevent human error. For example, IBM's Watson uses data mining to provide physicians data they can use to personalize patient treatment.
- **Fraud detection**: AI is being used in the financial and banking sector to autonomously analyze large numbers of transactions to uncover fraudulent activity in real time. Technology services firm Capgemini claims that fraud detection systems using machine learning and analytics minimize fraud investigation time by 70% and improve detection accuracy by 90%.

- **Retail**: AI researchers and developers are using ML algorithms to develop AI recommendation engines that offer relevant product suggestions based on buyers' past choices, as well as historical, geographic and demographic data.

Training Methods for Machine Learning Differ

Machine learning offers clear benefits for AI technologies. But which machine learning approach is right for your organization? There are many to ML training methods to choose from including:

- supervised learning
- unsupervised learning
- semi-supervised learning

Let's see what each has to offer.

Supervised Learning: More Control, Less Bias

Supervised machine learning algorithms apply what has been learned in the past to new data using labeled examples to predict future events. By analyzing a known training dataset, the learning algorithm produces an inferred function to predict output values. The system can provide targets for any new input after sufficient training. It can also compare its output with the correct, intended output to find errors and modify the model accordingly.

Unsupervised Learning: Speed and Scale

Unsupervised machine learning algorithms are used when the information used to train is neither classified nor labeled. Unsupervised learning studies how systems can infer a function

to describe a hidden structure from unlabeled data. At no point does the system know the correct output with certainty. Instead, it draws inferences from datasets as to what the output should be.

Reinforcement Learning: Rewards Outcomes

Reinforcement machine learning algorithms are a learning method that interacts with its environment by producing actions and discovering errors or rewards. The most relevant characteristics of reinforcement learning are trial and error search and delayed reward. This method allows machines and software agents to automatically determine the ideal behavior within a specific context to maximize its performance. Simple reward feedback — known as the reinforcement signal — is required for the agent to learn which action is best.

Machine Learning Is Not Perfect

It is important to understand what machine learning can and cannot do. As useful as it is in automating the transfer of human intelligence to machines, it is far from a perfect solution to your data-related issues. Consider the following shortcomings before you dive too deep into the ML pool:

- **Machine learning is not based in knowledge.** Contrary to popular belief, machine learning cannot attain human-level intelligence. Machines are driven by data, not human knowledge. As a result, “intelligence” is dictated by the volume of data you have to train it with.
- **Machine learning models are difficult to train.** Eighty-one percent of data scientists admit that training AI with data is more difficult than expected. It takes time and resources to train machines. Massive data sets are needed to create data models, and the process involves manually pre-tagging and categorizing data sets. This resource drain can create latency and bottlenecks in advancing ML initiatives.
- **Machine learning is prone to data issues.** Ninety-six percent of companies have experienced training-related problems with data quality, data labeling and building model confidence. Those training-related problems are a key reason why seventy-eight

percent of ML projects stall prior to deployment. This has created an extraordinarily high threshold for ML success.

- **Machine learning is often biased.** Machine learning systems are known for operating in a black box, meaning you have no visibility into how the machine learns and makes decisions. Thus, if you identify an instance of bias, there is no way to identify what caused it. Your only recourse is to retrain the algorithm with additional data, but that is no guarantee to resolve the issue.

The Future of Machine Learning: Hybrid AI

For all of its shortcomings, machine learning is still critical to the success of AI. This success, however, will be contingent upon another approach to AI that counters its weaknesses, like the "black box" issue that occurs when machines learn unsupervised. That approach is symbolic AI, or a rule-based methodology toward processing data. A symbolic approach uses a knowledge graph, which is an open box, to define concepts and semantic relationships.

Together, ML and symbolic AI form hybrid AI, an approach that helps AI understand language, not just data. With more insight into what was learned and why, this powerful approach is transforming how data is used across the enterprise.

OverView Of the Project

It is easier to identify and predict needs of people based on their gender and age. The task of gender and age detection just from an image is not an easy task even for us humans because it is totally based on looks and sometimes it is not easy to guess it.

Implementation:

Step-1

```
#A Gender and Age Detection program

import cv2
import math
import argparse
import json
```

Screenshot-1

Step-2

```
def highlightFace(net, frame, conf_threshold=0.7):
    frameOpencvDnn=frame.copy()
    frameHeight=frameOpencvDnn.shape[0]
    frameWidth=frameOpencvDnn.shape[1]
    blob=cv2.dnn.blobFromImage(frameOpencvDnn, 1.0, (300, 300), [100, 100, 100], True, False)
```

Screenshot-2

Step-3

```
net.setInput(blob)
detections=net.forward()
faceBoxes=[]
for i in range(detections.shape[2]):
    confidence=detections[0,0,i,2]
    if confidence>conf_threshold:
        x1=int(detections[0,0,i,3]*frameWidth)
        y1=int(detections[0,0,i,4]*frameHeight)
        x2=int(detections[0,0,i,5]*frameWidth)
        y2=int(detections[0,0,i,6]*frameHeight)
        faceBoxes.append([x1,y1,x2,y2])
        cv2.rectangle(frameOpencvDnn, (x1,y1), (x2,y2), (0,255,0), int(round(frameHeight/150)), 8)
return frameOpencvDnn,faceBoxes
```

Screenshot-3

Step-4

```
parser=argparse.ArgumentParser()
parser.add_argument('--image')

args=parser.parse_args()
```

Screenshot-4

Step-5

```
faceProto="opencv_face_detector.pbtxt"
faceModel="opencv_face_detector_uint8.pb"
ageProto="age_deploy.prototxt"
ageModel="age_net.caffemodel"
genderProto="gender_deploy.prototxt"
genderModel="gender_net.caffemodel"
```

Screenshot-5

Step-6

```
MODEL_MEAN_VALUES=(78.4263377603, 87.7689143744, 114.895847746)
ageList=['(0-2)', '(4-6)', '(8-12)', '(15-20)', '(25-32)', '(38-43)', '(48-53)', '(60-100)']
genderList=['Male','Female']
```

Screenshot-6

Step-7

```
faceNet=cv2.dnn.readNet(faceModel,faceProto)
ageNet=cv2.dnn.readNet(ageModel,ageProto)
genderNet=cv2.dnn.readNet(genderModel,genderProto)
```

Screenshot-7

Step-8

```
video=cv2.VideoCapture(args.image if args.image else 0)
padding=10
while cv2.waitKey(1)<0 :
    hasFrame,frame=video.read()
    if not hasFrame:
        cv2.waitKey() or ord(' ')
        break

    resultImg,faceBoxes=highlightFace(faceNet,frame)
    if not faceBoxes:
        print("No face detected")
```

Screenshot-8

Step-9

```
for faceBox in faceBoxes:
        face=frame[max(0,faceBox[1]-padding):
                   min(faceBox[3]+padding,frame.shape[0]-1),max(0,faceBox[0]-padding)
                   :min(faceBox[2]+padding, frame.shape[1]-1)]
```

Screenshot-9

Step-10

```
blob=cv2.dnn.blobFromImage(face, 1.0, (227,227), MODEL_MEAN_VALUES, swapRB=False)
    genderNet.setInput(blob)
    genderPreds=genderNet.forward()
    gender=genderList[genderPreds[0].argmax()]
    print(f'Gender: {gender}')
```

Screenshot-10

Step-11

```
    ageNet.setInput(blob)
    agePreds=ageNet.forward()
    age=ageList[agePreds[0].argmax()]
    print(f'Age: {age[1:-1]} years')
```

Screenshot-11

Step-12

```
    cv2.putText(resultImg, f'{gender}, {age}', (faceBox[0], faceBox[1]-10), cv2.FONT_HERSHEY_SIMPLEX, 0.8, (0,200,200), 2, cv
    cv2.imshow("Detecting age and gender", resultImg)
```

Screenshot-12

Circuit Description:

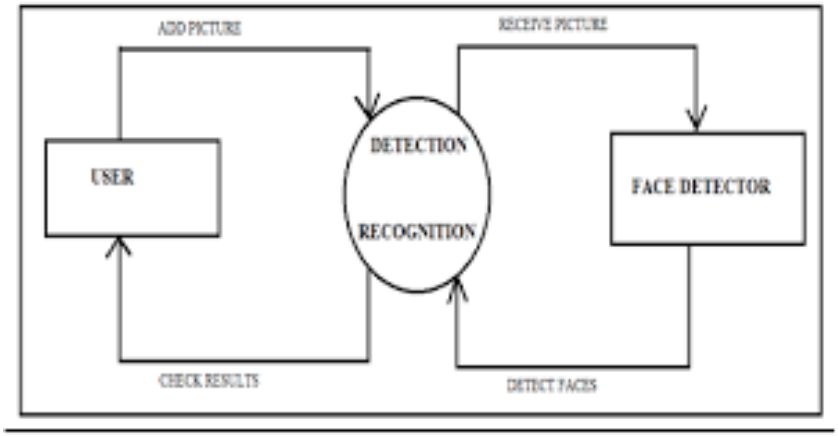

Figure-7

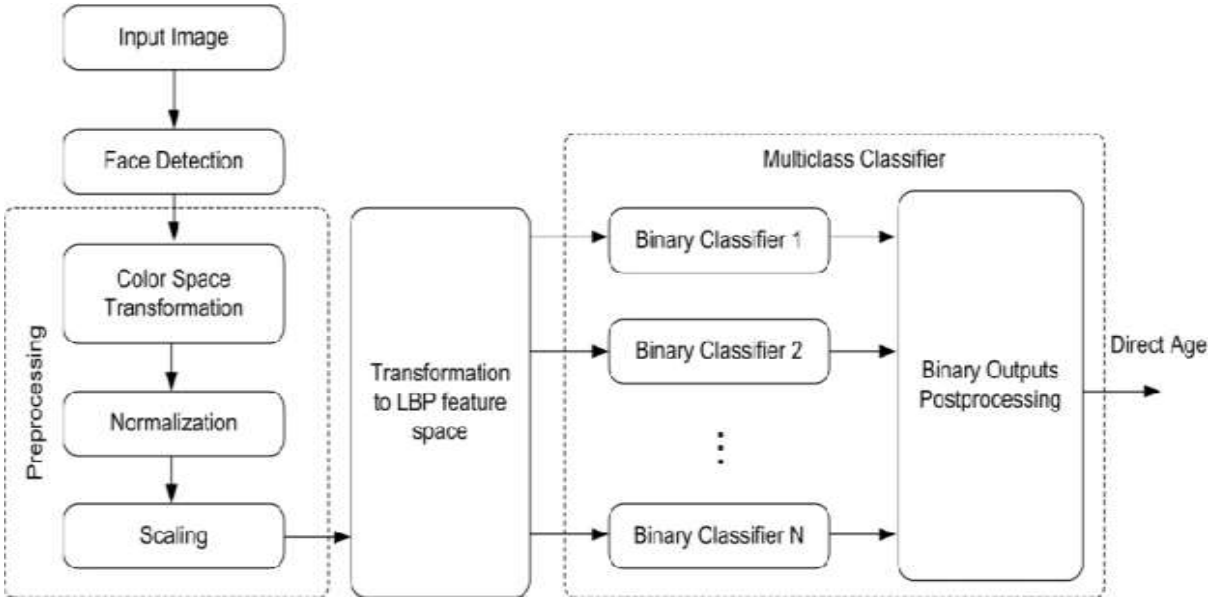

Figure-8

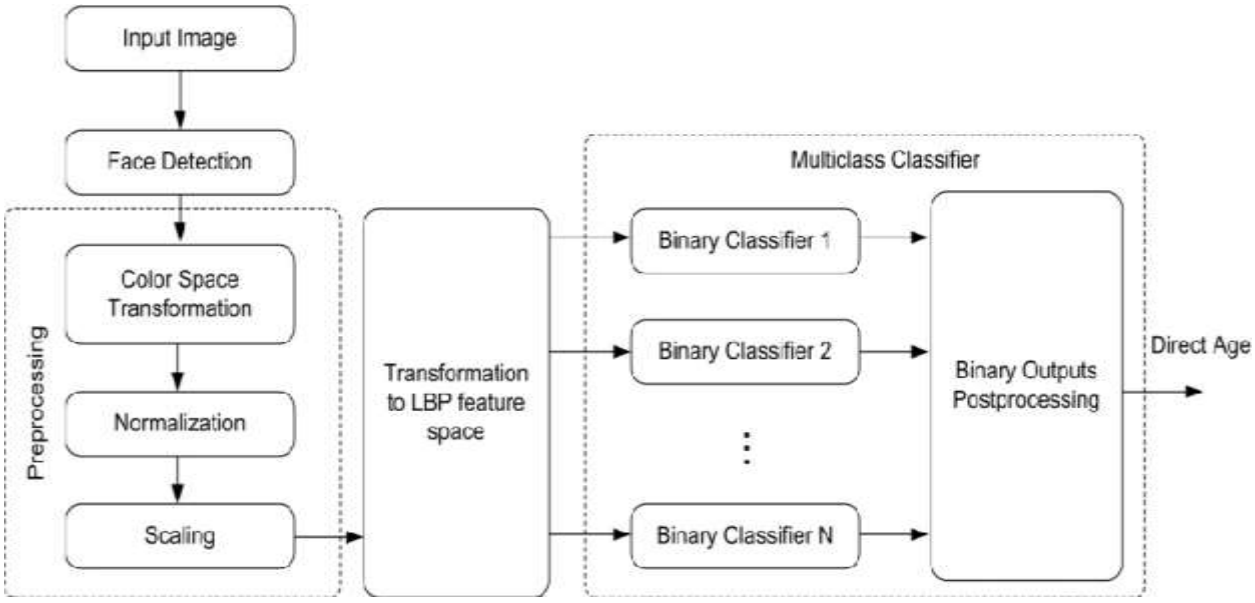

Figure-9

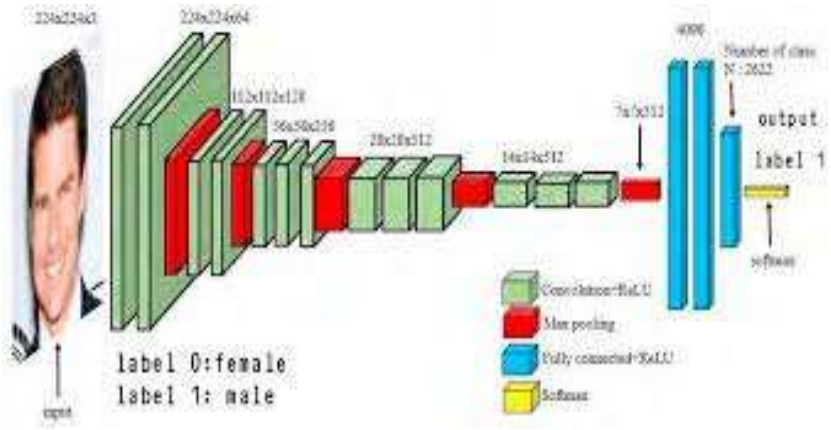

Figure-10

Software Tools:

Opencv:

OpenCV is the huge open-source library for the computer vision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today's systems. By using it, one can process images and videos to identify objects, faces, or even handwriting of a human. When it integrated with various libraries, such as NumPy, python is capable of processing the OpenCV array structure for analysis.

To Identify image pattern and its various features we use vector space and perform mathematical operations on these features.

Figure-11

Python Language:

Python is a general-purpose interpreted, interactive, object-oriented, and high-level programming language. It was created by Guido van Rossum during 1985- 1990. Like Perl, Python source code is also available under the GNU General Public License (GPL).
This tutorial gives enough understanding on Python programming language.

Python is a high-level, interpreted, interactive and object-oriented scripting language. Python is designed to be highly readable. It uses English keywords frequently where as other languages use punctuation, and it has fewer syntactical constructions than other languages.

Python is a MUST for students and working professionals to become a great Software Engineer specially when they are working in Web Development Domain. I will list down some of the key advantages of learning Python:

- **Python is Interpreted** − Python is processed at runtime by the interpreter. You do not need to compile your program before executing it. This is similar to PERL and PHP.
- **Python is Interactive** − You can actually sit at a Python prompt and interact with the interpreter directly to write your programs.
- **Python is Object-Oriented** − Python supports Object-Oriented style or technique of programming that encapsulates code within objects.
- **Python is a Beginner's Language** − Python is a great language for the beginner-level programmers and supports the development of a wide range of applications from simple text processing to WWW browsers to games.

Characteristics of Python

Following are important characteristics of Python Programming −

- It supports functional and structured programming methods as well as OOP.

- It can be used as a scripting language or can be compiled to byte-code for building large applications.
- It provides very high-level dynamic data types and supports dynamic type checking.
- It supports automatic garbage collection.
- It can be easily integrated with C, C++, COM, ActiveX, CORBA, and Java.

Figure-12

Jupiter Notebook:

Notebook documents (or "notebooks", all lower case) are documents produced by the Jupyter Notebook App, which contain both computer code (e.g. python) and rich text elements (paragraph, equations, figures, links, etc…). Notebook documents are both human-readable documents containing the analysis description and the results (figures, tables, etc..) as well as executable documents which can be run to perform data analysis.

Jupyter Notebook App

The Jupyter Notebook App is a server-client application that allows editing and running notebook documents via a web browser. The Jupyter Notebook App can be executed on a local desktop requiring no internet access (as described in this document) or can be installed on a remote server and accessed through the internet.

In addition to displaying/editing/running notebook documents, the Jupyter Notebook App has a "Dashboard" (Notebook Dashboard), a "control panel" showing local files and allowing to open notebook documents or shutting down their kernels..

kernel

A notebook kernel is a "computational engine" that executes the code contained in a Notebook document. The ipython kernel, referenced in this guide, executes python code. Kernels for many other languages exist (official kernels).

When you open a Notebook document, the associated *kernel* is automatically launched. When the notebook is executed (either cell-by-cell or with menu Cell -> Run All),
the kernel performs the computation and produces the results. Depending on the type of computations, the kernel may consume significant CPU and RAM. Note that the RAM is not released until the kernel is shut-down.

See also Close a notebook: kernel shut down.

Notebook Dashboard

The Notebook Dashboard is the component which is shown first when you launch Jupyter Notebook App. The Notebook Dashboard is mainly used to open notebook documents, and to manage the running kernels (visualize and shutdown).

The Notebook Dashboard has other features similar to a file manager, namely navigating folders and renaming/deleting files.

Different Predefined Datasets:

- age_deploy.prototxt
- age_net.caffemodel
- gender_deploy.prototxt
- gender_net.caffemodel
- opencv_face_detector.pbtxt
- opencv_face_detector_uint8.pb

In this project I have used “CAFFE model” for age detection and gender detection. All the file of dataset and deploy model file names are mention above.

Result:

It is easier to identify and predict needs of people based on their gender and age. The task of gender and age detection just from an image is not an easy task even for us humans because it is totally based on looks and sometimes it is not easy to guess it.

Conclusion:

We tackled the classification of age group and gender of unfiltered real-world face images. We posed the task as a multiclass classification problem and, as such, train the model with a classification-based loss function as training targets. Our proposed model is originally pretrained on age and gender labelled large-scale IMDb-WIKI dataset, whose images are obtained directly from the website with some degree of variability and then fine-tuned on MORPH-II, another large-scale facial aging dataset with age and gender annotations. Finally, we use the original dataset (OIU-Adience benchmark of unfiltered faces for age and gender classification) to fine-tune this model. The robust image preprocessing algorithm, handles some of the variability observed in typical unfiltered real-world faces, and this confirms the model applicability for age group and gender classification in-the-wild. Finally, we investigate the classification accuracy on OIU-Adience dataset for age and gender; our proposed method achieves the state-of-the-art performance, in both age group and gender classification, significantly outperforming the existing models. For future works, we will consider a deeper CNN architecture and a more robust image processing algorithm for exact age estimation. Also, the apparent age estimation of human's face will be interesting research to investigate in the future.

It has been observed and realized

It has been observed and realized that the nature, behaviour and social interaction of people is greatly dominated by his/ her gender. Therefore an efficient gender recognition and classification system would play a pivotal role in enhancing the interaction between human and the machine.

Moreover, there are several other applications where gender recognition plays a crucial role which includes biometric authentication, high technology surveillance and security systems, image retrieval, and passive demographical data collections.

Identification of the gender and its classification based on the distinguishable characteristics between male and female facial image can be achieved easily by the human eye. However, machines cannot visualize this difference, hence the same task becomes difficult for the computer to accomplish. Machines need meaningful data to perform gender classification. These data are usually the facial features based on which a computer classifies a facial image into either male or female. Gender Classification is a binary Classification problem.

There exist several algorithms which have been already implemented to generate a solution to the stated problem. This study addresses the issue of gender classification and age detection of the identified gender using Support Vector Machine Classifier. Although the stated methodologies have been implemented on facial image data set and results are obtained with a level of accuracy, yet there are areas which are yet to be cultivated and where further enhancement can be achieved. Thus the future scope of development of the proposed models have been discussed in the following section.

Future Scope:

In the future, the specified methodologies can be further improved by incorporating the below mentioned specifications in the implementation of the proposed mechanisms.

- The Gender Classification and Age Detection algorithms can be implemented with an increased number of facial image data set. This will increase the accuracy level of the output.
- The Proposed Models have been trained and tested on data sets using Linear Kernel. However the similar evaluation can be performed using other kernels of SVM Classifier like ‘rbf kernel’, ‘quadratic kernel’, etc.
- Gender Classification is performed based on the extracted feature’ lip’. The same algorithm is can be implemented on other feature(s) like eyes, nose or combination of more than one feature in human facial image

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