IMAGE PROCESSING BASED GENDER CLASSIFICATION AND FACE IDENTIFICATION USING SVM

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project/internship titled **"Image processing based gender classification and face identification using SVM"**, submitted by **Manas Sharma**, ID No: **191-15-12269** to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 5 December, 2021.
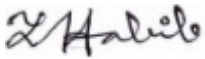
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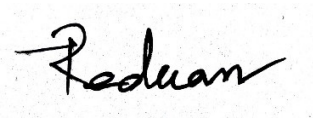Daffodil International University

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I hereby declare that, this report has been done by me under the supervision of **Dewan Mamun Raza, Sr Lecturer, Department of CSE** Daffodil International University. I also declare that neither this report nor any part of this report has been submitted elsewhere for award of any degree or diploma.

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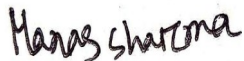**Co-Supervised by:**

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Dewan Mamun Raza, Sr Lecturer, Department of CSE, Daffodil International University, Dhaka, deserves my deep gratitude and gratitude. To complete this project, my supervisor has extensive knowledge and a deep interest in the fields of **"Machine Learning, Image Processing, and Computer Vision."** His never-ending tolerance, intellectual direction, persistent encouragement, constant and energetic supervision, constructive criticism, good counsel, and reading many substandard drafts and revising them at every stage made this projetc possible.

I'd like to offer my heartfelt gratitude to **Dr. Touhid Bhuiyan, Professor and Head, Department of CSE,** as well as the other faculty members and staff of Daffodil International University's CSE department, for their assistance in completing my Project. Finally, i must express my deep gratitude for my parents' continuous understanding and encouragement

ABSTRACT

Face Identification and Gender Classification using Image Processing and SVM is the association and streamlining of face identification model. The primary goal of this project is to bring together and optimize an automatic face detection and recognition system. Human identification refers to the classification of gender, which can improve the accuracy of identification. As a result, accurate gender classification algorithms may improve application accuracy while also reducing complexity. However, several obstacles exist for particular purposes, such as rotation as well as gray scale variations, which could also limit the application's accuracy. The main overall goal of this study is to study how to use Open CV to interpret the values in image, pattern, and array processing in addition to developing pipe-lining and SVM models. The essential target of building this module is to grasp the characteristics in picture, model, and bunch planning with Open-CV for amazing taking care of appearances for building pipe-lining, SVM models.

KEYWORDS— GENDER CLASSIFICATION, FACIAL IMAGES, OPENCV, IMAGE PROCESSING, MACHINE LEARNING, SUPPORT VECTOR MACHINE.

TABLE OF CONTENTS

CONTENTS	PAGE NO

LIST OF FIGURES

LIST OF TABLES

CHAPTER-01

INTRODUCTION

1.1 Introduction

Face recognizable method of human proof is a significant trademark in detectable AI and image processing frameworks to distinguish wanted objective. A human face carry differentiate and distinct data comprising age, gender, nationality, and so on Face data is relevant much of the time like human-Computer cooperation, picture recovery, Bio-metrics validation, Monitoring drivers, human-robot interaction, and sporting competitiveness senses investigation, video summing up, and picture/video ordering.[24]

Fundamentally we are building an image handling model which is face acknowledgment and it additionally attempt to identify the facial components and group the Gender- male or female. The cycle is beginning by social occasion the information. As the information is accumulated we will mastermind the profoundly unstructured information in an organized structure after that we are learning picture strategies utilizing Open-CV and get numerical idea driving the picture. For picture examination we require procedures for per-processing our information, Extract Features from picture, eigen images utilizing PCA(Principal Component Analysis) and Single Value Decomposition. With the eigen images we can figure out how to test our Machine Learning model, and the model prior to sending it.[26]

The principle objective of this work is the joining together and smoothing out of a programmed face location application and acknowledgment framework for video ordering applications. Human distinguishing proof means the order of gender orientation which can build the ID precision. In this way, exact gender orientation arrangement calculations might expand the exactness of the applications and can lessen its intricacy. In any case, in certain applications, a few difficulties are there like revolution, dim scale varieties that might lessen the exactness of the application. The primary objective of building this module is to comprehend the qualities in picture, example, and cluster

preparing with Open-CV for powerful handling faces for building pipe-lining, SVM models.

1.2 Motivation

The hypothesis of gender identity is a more powerful predictor for any particular outcome. What cannot be tested without data on gender identity. Gender identification is needed to find how many male/female is in a specific place or to find a specific person. A security section can utilize gender data information for perception and control zone. For occurrence, female assembly is arranged for gathering and errand is to allow. Using Gender classification model we can identify whether is there is any intruder.

One more use of Gender Classification order is in business region. A Digital bulletin machine is one of the best guide to show advertisements. Contingent on the gender identified at bulletin, bulletin machine pick the promotion and show on level board cards. Thus, I am exceptionally invigorated for a framework advancement that perceives the face and tracks an individual's Gender.

1.3 Rationale of Study

Biggest thought-provoking and difficult task was to design a model that can identify human face and then predict the gender of the input face. There are lots of uses of gender detection. mostly in security purpose. But there are some cases where it is use for unessential and misuses of its distinguishing characteristics. Evaluating this factors was quite hard. Lots of data was needed to analyzing this task. Nevertheless, to induce the course of action implies to distinguish the Gender Discovery we are working in this venture. To have a better than average precision rate and better execution my venture has to be compelled to go through different calculations estimations and a bunch of considerable information.

1.4 Research Questions

I) How can a gender be identified using Face Recognition and Support Vector Machine ?

Some research have done on recognize gender utilizing voice, discourse, body movement. Some are talked about with face image processing. Identify gender using human Face is not a new sector. This region for research in the realm of robotic, artificial intelligence quite promising. This paper have a significant result for the security industry just as for individuals. Utilizing this technique anybody can get the best advantages from it.

1.5 Expected Outcome

Currently in my research I'm working on people of all ages. For that i need huge amount of unprocessed data. After Gathering all data i have to clean and process the data for apply in my work. After processing the data I've to identify human front face using image recognition techniques. To get a good result i use haar cascade classifier and other machine learning algorithm to find a best result and a good accuracy rate from my project. My main goal is to build a model what is bridge between human and machine learning by detecting gender. By Completing this project we will get,

I) Face Detection

II) Gender classification

III) Predict Gender from image and video

1.6 Report Layout

Chapter 1: Introduction

This Section I have examined about the presentation, inspiration of my work, destinations furthermore, expected result and exploration method and the report design.

Chapter 2: Background

I've examined the foundation conditions of my work. I moreover do writing survey, comparative thinks about, scope of the issue and troubles of the model.

Chapter 3: Research Methodology

This part is about strategy focus to build proposed model. This portion has the strategies and steps of the proposed demonstrate.

Chapter 4:Experimental Results ans Discussion

In this chapter, I will show how the system works. We will test data and analyze the output. Than we compare the accuracy with other related model.

Section 5:Impact on Society, Environment and Sustainability

This section I will discuss of the proposed model, how it will impact on society and discussed about alongside the performance analysis and a summary, what are the pros and cons of this model.

Part 6: Conclusions and Future Scope

This area contains the conclusion portion and the considerations of suggestion of encouraging ponder on this subject.

CHAPTER-02

BACKGROUND

2.1 Introduction

Numerous research papers that are identified with Gender Classification for various sorts of information bases have been over viewed to recognize various methodologies use for various Gender order issues. Moreover, the special gathering examinations that are depicted in term paper have been seen to induce considerations on how the classification is treated. Generally, gender is the identifications the character of the human in general public he or she lives in. So exceptionally important to identify the gender might assist the individual with utilizing the brilliant all the more viably. Along these lines, in our venture we have gathered a few information to dissect personality am focusing on the utilization of the model as indicated by the utilization in the security areas.

2.2 Literature Review

In "Gender Classification Using Machine Learning with Multi-Feature Method"[1] has proposed a Gender recognition algorithm utilizing stand-up to pictures. For prepossessing, Brightness of a picture Ensuring Energetic Fluffy Histogram Equalization utilized. In this paper, Scale Invariant Fourier Alter (Channel) was utilized for highlight extraction, and Bolster Vector Machine (SVM) was associated for classification. Execution comes approximately were compared on live pictures, FEI got low comes about.

From "Facial Trait Acknowledgment by Repetitive Learning With Visual Fixation" [2] talks to facial property acknowledgment by repetitive learning with visual fixation. Confront highlights were computed with CNN and enhancement of highlights was encoded with a dreary arrange. The visual fixation was by and large district between eyes or on the eyes and expanded to nose and lips. Fixation was extended to facial quality utilizing recordings as well. Proposed framework gotten acknowledgment rate of 89.8 utilizing ADIENCE dataset and 91.36 utilizing MULTI-PIE dataset.

Paper [3] appears the best procedure to distinguish the gender by utilizing go up against pictures. Here data contains people in standard walking development and two calculations deal with confronting pictures removed from recordings. Viola-Jones calculation connected on the input pictures to recognize go up against and after that confront arrangement calculation utilized for per-processing. Amid confront acknowledgment, the combination of trainable and space particular highlights was utilized. The COSFIRE and the SURF-based strategy.

The proposed strategy from [4] evacuates irrelevant include and associated to refine classification accuracy. Melding a channel and a wrapper assessed relationship among highlights and chosen clusters molded utilizing shared information for classification. SVM classifier is utilized to classify the gender of the person. Proposed technique attempted utilizing nine datasets gave more precision as compared to CNN classifier.

Particular approaches for recognizing the gender of the individual are based on diverse highlights. The paper[5] presented the same iris code for gender prediction and affirmation. The paper shows a plot to select key highlights utilizing depiction based on shared information techniques like mRMR as well as CMIM. Exactness gotten from cleared out iris code was 85.33% and right iris code was 84.33%. The technique is unachievable in the case of a person wearing glasses.

In[12] Ignat and Coman (2015) Gabor channels were utilized as component extractor and support vector machine (SVM) and closest neighbor as classifiers. Gender orientation acknowledgment dependent on shading data was presented in Lin and Zhao (2011). They arrived at 92% exactness rate.

In[13] assumed that intertwining choices dependent on highlights from various scale goals could further develop the gender acknowledgment rate.For this explanation, he joined plain force, shape, and surface elements at various scales. He tried their methodology on a bunch of University of 2 of 17 DAGHER AND AZAR North Dakota pictures proposed for an exact examination of various calculations. The outcomes demonstrated that the data accumulated at various scales is a higher priority than separating various elements on a solitary scale.

Lian and Lu [15] isolated surface information from the facial pictures utilizing LBP, in spite of the fact that Deniz, Bueno, Salido, and De la Torre [22] connected Histograms of Oriented Gradients (Hogs) to partitioned appearance highlights. Each course of action strategy was performed by utilizing SVMs, which had been illustrated to be predominant to standard classifiers. These methodologies have appeared superior execution on gender introduction gathering beneath different hindrances, pose, and light conditions.

2.3 Comparative Analysis and Summery

Studying the research papers of the connected field gives a decent assumption and thought regarding the works and aspects of dimensions by that very field. This is the reason, for a better understanding of the exploration works in this particular field we have concentrated on the connected papers.

My examination work comprises of face recognition technique. separate element from picture like figuring eigen images utilizing PCA(Principal Component Analysis) and Single Value Decomposition. Classification is performed by SVM approach. To comprehend the fundamental tasks of these algorithm several image processing, factual, information mining techniques must be perceived. I have likewise contrasted and the consequence of face acknowledgment with various calculation. That haven't been done in any of these papers. The vast majority of the works have been finished with one data set.

2.4 Scope of the Problem

In this situation I've to,

Collect Right Data Set.

Analysis and Cleaning Data.

Structuring and Feature Extraction

Predicating result

This following work needs huge amount of time and the right resources.

So, at this time we finished the entire work. Yet, that really set aside more effort to follow through with each job as a rule. In the end we finished our venture with time yet not the objective.

2.5 Challenges

In project "Face Identification utilizing Image Processing and Gender Classification" will be done to make it profoundly trying for us for the face. For appropriate execution, our human face must be appropriately recognized and the substance of the individual as well as shows the Gender about the person. Here are some challenges that I have face during the project,

I) Looking for specific types of Datasets.

II) Analysis and Cleaning Data.

III) Structuring and Include Extraction

IV) Select Right Algorithm for the Model

V) Predicating result and examination the result

VI) Tuning The Model

Prerequisite:

The main test was to perceive a face that was prepared first. Then, at that point, the distinguishing face shows the individual's gender effectively and thus we really want the proper face highlights to recognize.

Time scheduling:

It was a troublesome test, since this is the fundamental undertaking that will be finished in our project. In case i can't finish the time, it might be a major obstacle for my work. Thus, I managed my time and undertaking tasks to finish the whole work to finish practically everything.

Correspondence:

To satisfy my venture, I have experienced different issues and each time I talked about the issues with my manager. He has given the ideal choice to finish my task accurately.

Abilities for the Project:

A task in some cases requires abilities that require the undertaking. Along these lines, we wanted some ability and we accomplished that ability to finish our task and we examined everyone of the issues and chose

CHAPTER-03

RESEARCH METHODOLOGY

3.1 Introduction

In the earlier, I've discussed works that are related of face detection and gender recognition system. I've also explained some different types of procedures that were used -previous. In this chapter, we will discuss the procedure that I've used to develop this system. When we studied related works of our system then we came to know about some different algorithms which can be used for developing face detection and gender recognition system. After that study, we decided to select a specific algorithm. We have used the Haar cascade classifier for detecting faces and the SVM algorithm for recognizing Gender. I will discuss briefly my used algorithms in the net part of this chapter.

3.2 Research Subject, Instrumentation and Technical Approach

Research Subject: Face Identification and Gender Classification using Image Processing and SVM.

Instrumentation:

Computer with good configuration.

Using computer we calculate all the processes.

Configuration:

Processor: Core i3 or upper version.

Ram: Four or upper.

GPU: It will be faster if the GPU is enabled.

Tools and Language:

I) Python and Anaconda and Jupyter Notebook

Algorithms, Techniques:

I) Haar Cascade Classifier (Frontal-Face)

Haar Cascade classifiers are a powerful way for object recognition. This technique was proposed by Paul Viola and Michael Jones in their paper Rapid Object Detection utilizing a Boosted Cascade of Simple Features. Haar Cascade is an AI based methodology where a great deal of positive and negative pictures are utilized to prepare the classifier. In Haar Cascade Objects are arranged on extremely basic elements as a component to encode specially appointed space information and work a lot quicker than pixel framework. The element is like haar channels, henceforth the name 'Haar'. An illustration of these elements is a 2-square shape highlight, characterized as the distinction of the amount of pixels of region inside the square shape, which can be any position and scale inside the first picture. 3-square shape and 4-square shape highlights are likewise utilized here.
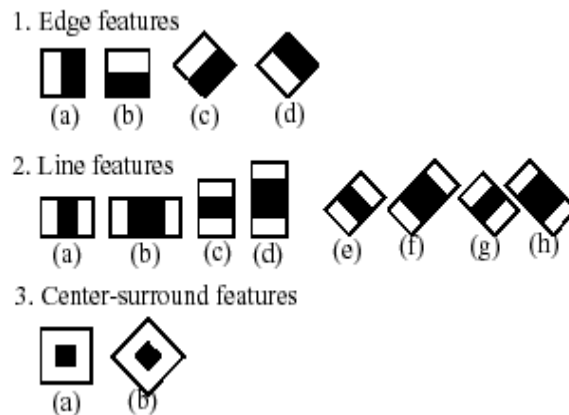
Fig 3.1: Haar Features

A cascade classifier refers to the link of a few classifiers organized in progressive requests. It settles on enormous quantities of little choices with regards to whether or not it's the item. The design of the course classifier is of a ruffian decision tree.
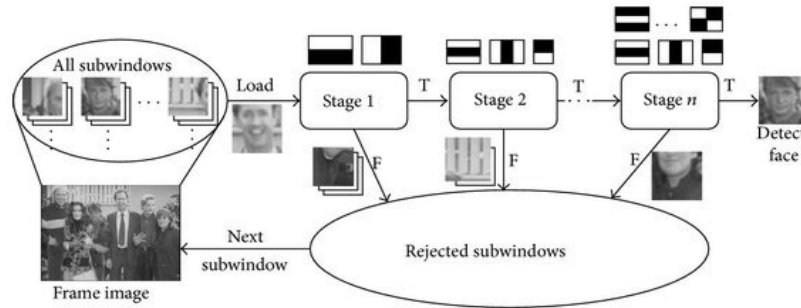
Fig 3.2: Haar Cascade Architecture

**II) Exploratory Data Analysis (EDA)**

Exploratory Data Analysis (EDA) is a methodology for information investigation that utilizes an assortment of methods to

1. maximize insight into data collection.

2. reveal fundamental structure.

3. separate significant variables.

4. identify exceptions and abnormalities.

5. test hidden suppositions.

6. create parsimonious models.

7. decide optimal factor settings.

IV) Features Extraction Method (PCA and Eigenfaces)

The utilize of eigenfaces is commonly called Principal Component Analysis (PCA). With the assistance of PCA, the pictures must be utilized of the same degree and they are normalized to line up the eyes and mouth of the interior of the subjectinterior the pictures. The estimation of the data utilizing data compression nuts and jolts is diminished utilizing PCA which reveals the first compelling moo dimensional structure of facial designs. Utilizing this moo estimation structure precisely breaks down the stand-up to structure into orthogonal and uncorrelated components known as eigenfaces. Utilizing this strategy the confront picture can be talked to as a weighted entirety or incorporate a vector of the eigenfaces which can be put away in a 1-D cluster. To preserve a key removed from the down and out execution of the coming about the picture, the PCA approach requires the total frontal go up against to be shown each time. This strategy diminishes the specified data to recognize the person to 1/1000 th of the displayed information. This strategy diminishes the specified data to recognize the person to 1/1000 th of the displayed information. Feature Extraction using PCA The Principal Component Analysis highlights extraction strategy utilized in this paper is one of the famous extraction techniques. The PCA technique decreases the components of information with a minimal measure of data loss. This technique is utilized in many fields, like bio-metrics, feature extraction, image processing, data compression, etc. In the PCA technique, faces are linear combinations of mixes of eigenvector loads called Eigenfaces. This eigenvector is a covariance matrix from the image data set. The number of images in the information base will be as old as the number of Eigenfaces got. Besides, is an illustration of element extraction utilizing the face identification system utilizing the Principal Component Analysis (PCA) strategy. Eigenface idea is develop a low-dimensional linear subspace that contains the vast majority of the face images conceivable.
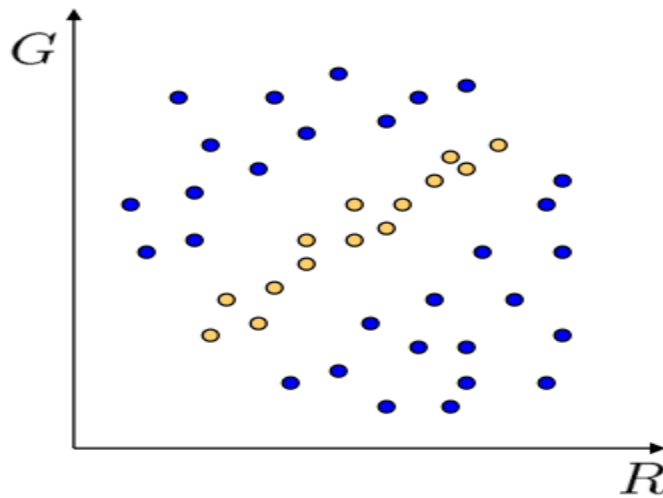
Fig 3.3: 1D subspace arguably suffices

IV) Support Vector Machine (SVM)

Support vector machines (SVMs) are characterized to address a classical two-class design acknowledgment issue. Altering SVM to go up against affirmation by changing the understanding of the result of an SVM classifier and formulating a representation of facial pictures that's concordant with a two-class issue. Standard SVM returns parallel esteem, the lesson of the question. To get ready our SVM calculation, we define the issue in a substitute space, which explicitly catches the dissimilarities between two facial images. This is often a takeoff from standard confront space or view-based strategies, which encode each facial picture as a diverse point of view on a confront.

3.3 Work Flow
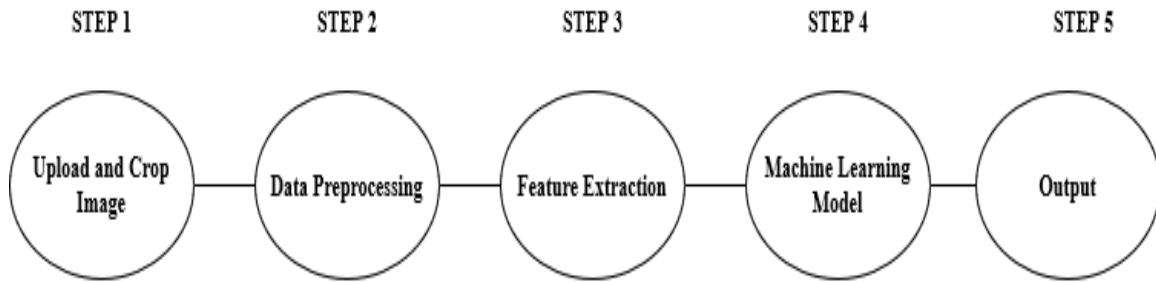
MACHINE LEARNING MODEL FLOW

Fig 3.4: ML Model Working Flow

3.4 Data Collection and Procedure

To find the right type of data I look through some data sets. Finally, I found the right types of data in "https://data.vision.ee.ethz.ch/cvl/rrothe/imdb-wiki/"[23]. What is later I found in Kaggle under the gender/face recognition dataset. Here we have both 7000 male and female images in a total of 14000 images.

3.5 Applied Mechanism

Upload and Crop Image

This is the initial step of the project. I will transfer the picture to the Project. It is a simple front image of a person. The picture type should be JPEG or PNG. Intensity, assessing transmission map, and explaining pictures.

RGB/BGR to grey scale

The picture is passed to the pipeline model. Understanding Data is an unquestionable requirement inside the task life cycle. We need to comprehend the information beginning from area information. We will deal with the picture taken as info. It very well may be in RGB or BGR format. The digital pictures are utilized to address multi-dimension arrays. We will change over that picture into grayscale utilizing the cv2 library. The grayscale

picture is a two-dimension cluster. The function used to change over the picture into a grayscale is given :-

```
def pipeline_model(img,color='rgb'):

    if color == 'bgr':

        gray = cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)

    else:

        gray = cv2.cvtColor(img,cv2.COLOR_RGB2GRAY)
```

Image Data Analysis and Prepossessing

In this stage, we will be chipping away at the gray scale picture which is removed from the information picture which is gotten from the above strategies. There are four sorts of investigation that need to perform on the extricated picture for better direction. In Defining Transformation, we will track down the state of the picture. We will observe the ideal size from the histogram and box plot. Hazed Removal (Noise Remove) progression, we will eliminate commotion from the picture by changing light Picture Segmentation: In this progression, we will be partitioning the picture into different sections . The objective of the section is to rearrange and additionally dimension change of an image into more significant and more straightforward to analyze. Image segmentation is commonly used to find objects and boundaries (lines, bends, and so forth) in images. All the more unequivocally, picture division is the foremost common way of doling out a title to each pixel in a picture to such an degree that pixels with a comparative stamp share particular qualities.

Object Detection: Face identification is a Computer Technology being utilized in an assortment of utilization that recognizes human faces in digital images. Python library OpenCV will be utilized for face identification. We will recognize the face from the grayscale picture utilizing the cv2 library. We will perform moreover techniques on that face identified utilizing the given capacity:-

haar = cv2.CascadeClassifier('model/haarcascade_frontalface_default.xml')

faces = haar.detectMultiScale(gray,1.5,5)
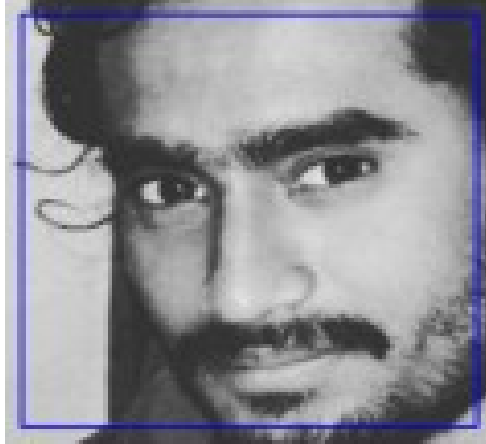
Fig 3.5: Cropped Image

Feature Extraction

We can't clearly recognize faces that were cleaned and expelled faces question location methods techniques with Machine Learning models. We ought to remove the highlights from the confront. The Highlight extraction strategies we utilized are an Eigen pictures approach. An eigenface is the title given to a bunch of eigenvectors when utilized within the computer vision issue of human face acknowledgment. We are going to get the eigenvectors from the covariance lattice of the likelihood spread over the high-dimensional vector space of confronting pictures. This produces angle diminish by permitting the more unassuming course of action of introducing pictures to address the primary planning pictures. The Classification can be fulfilled by differentiating how faces are tended to by the introduced set.
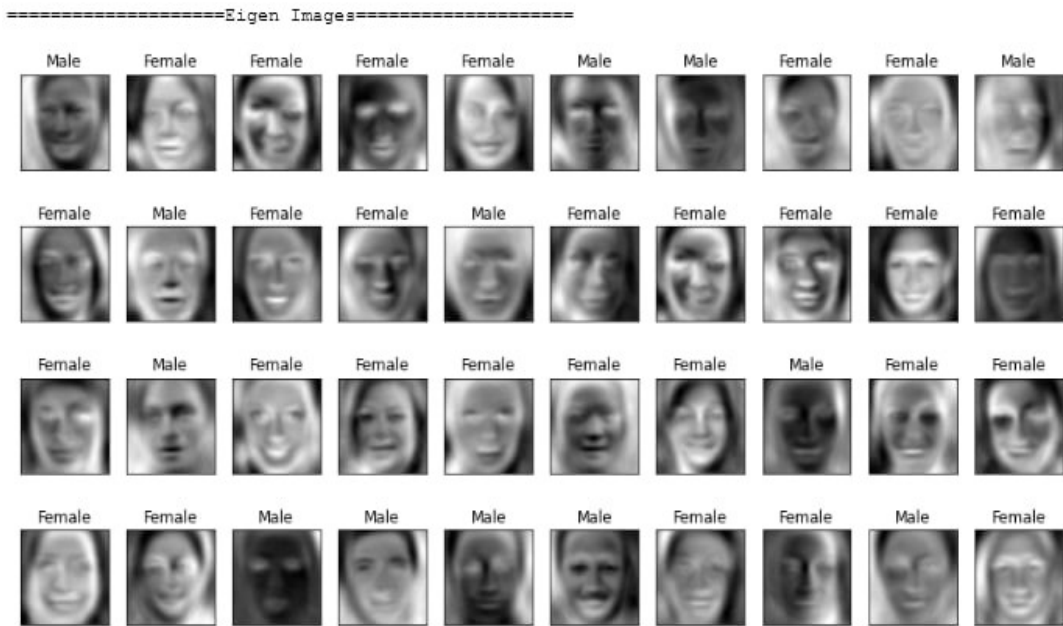
Fig 3.6: Eigen Images

Predictive Model and Output

We have trained a Machine Learning model with the Eigen image information. There are many Machine Learning models but for this project, I will utilize SVM. In this stage, we will recognize the gender of each face utilizing a prepared SVM model. Presently there each Face is perceived exclusively in this stage. Now, this is the last period of the task, We have performed out every one of the strategies. We will show the Gender of the Image and the predicted score.
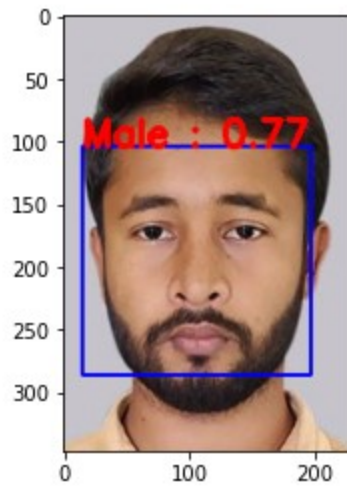
Fig 3.7: Gender and predicted score.
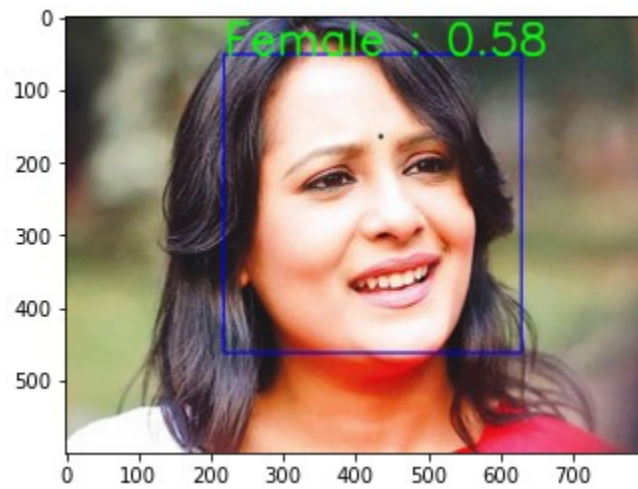
Fig 3.8: Gender and predicted score.

Data Flow

Fig 3.9: Data Flow.

CHAPTER-04

EXPERIMENTAL RESULTS

4.1 Introduction

In this segment, we describe Experimental Results, Descriptive Analysis, and Summary. In the exploratory outcome, we examine the table and in the clear analysis, I'll talk about the equation of calculating accuracy.
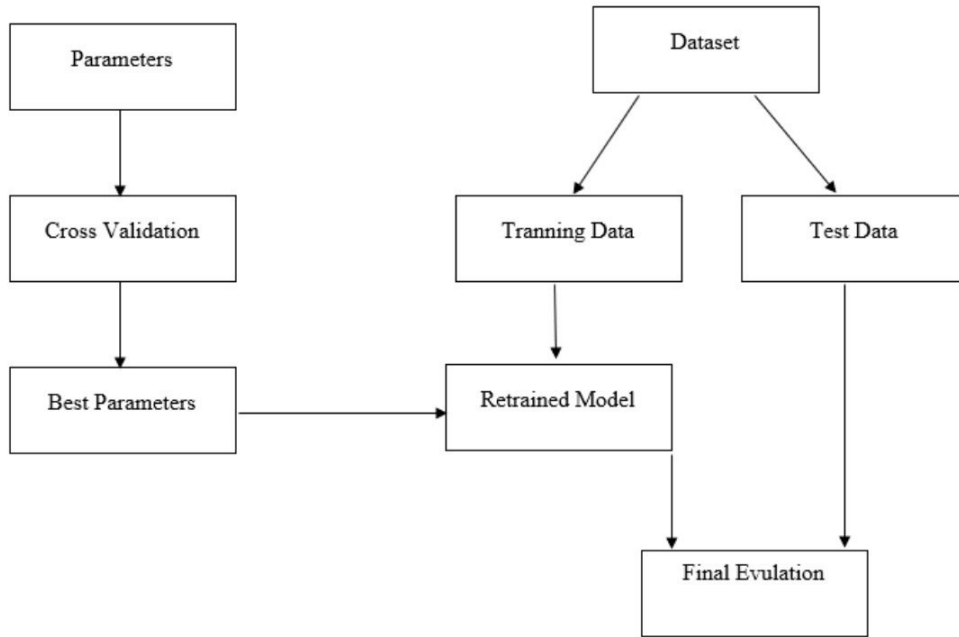
4.2 Experimental Results and Analysis

In this model, we have 4360 training samples. The accuracy of the model training data is more than 86%. And we have 1091 samples of test data, where the accuracy rate is more than 78%. and In this model Kappa Score is 0.5921876178267099 and AUC score is 0.90 .

To evaluate the model we need to find,

I) Confusion Matrix

II) Classification report

III) Kappa Score

IV) AUC

Confusion Matrix

Positive Value	Negative Value	Total Predicate Value
292	82	374
569	149	718
861	231	1092

Table 4.1 : Confusion Matrix

Classification report

	Precision	Recall	f1-score	support
Male	0.824513	0.671202	0.740000	441.000000
Female	0.802183	0.903226	0.849711	651.000000
Accuracy	0.809524	0.809524	0.809524	0.809524
Macro avg	0.813343	0.787214	0.794855	1092.000000
Weighted avg	0.811201	0.809524	0.805405	1092.000000

Table 4.2 : Classification Report

[24] from bellows table, this related work shows that SVM is much efficient and works better in certain conditions from other algorithms.

Number of component	PCA+KNN	PCA+SVM	Overall Accuracy for Independent test with PCA+SVM
20	68.89	86.67	86.67
30	73.33	88.89	86.67
40	73.33	93.33	90.00

Table 4.3 : The performance of PCA, KNN, and SVM

From another paper [25] "Gender Identification from Smart Phone Usage Using Machine Learning Algorithm" we can compare this table with our Machine Learning models results. Overall the Accuracy rate is good.

Algorithm name	Result	Average
Naive Bayes	74.5327%	74.5327%
SLR	76.6355%	75.8177%
SMO	75.0000%	
KNN	82.7103%	82.7103%
Ada Boost	74.7664%	76.3240%
Bagging	78.2710%	
Stacking	75.9346%	
DT	79.2056%	79.1277%
Random Forest	84.1121%	
REP Tree	74.0654%	

Table 4.4: Comparison Table

4.3 Discussion

Overall Accuracy Rate is good and error is significantly low which means in most of the cases our system can get each individual classified with his and her gender identity. Using various images we measure our system's accuracy and with every step of measurement, we get a good result. So that this model is a good model.

CHAPTER-05

IMPACT ON SOCIETY

5.1 Impact on Society

Gender be identified using Face Recognition is an apparatus in a bigger tool compartment of arrangements. Similarly as with any incredible innovation, assuming it winds up in some unacceptable hands, it very well may be tricky. For the time being, I accept, it is staying put as it works on the progression of individuals' lives and can possibly quietly secure people. At the point when we don't comprehend a shift of conduct and the positive effect it can have, we as a general public, consistently need to stand up. Schooling is the essence of this obstruction and when society perceives the staggering advantages presented because of facial acknowledgment we will actually want to move past the psychological obstacles.

5.2 Ethical Aspects

Face recognition and gender Classification is a technique for distinguishing or confirming the personality of a person by utilizing their face because of man-made reasoning. Face acknowledgment is assuming an expanding part in law authorization, line security, and different purposes all throughout the planet. In spite of the fact that it enjoys many benefits and advantages, it actually raises some moral worries.

One of the significant moral issues is security. When somebody has your face printed, they may get your name, your age, your birth date, and afterward, they can track down your social record, and even track you in the road, track your home area, and so on They may even open your telephone and financial balance. For instance, Alipay, China's driving web-based paid arrangement, declared a significant move up to its "Grin to Pay" administration in 2018, expecting to make its face acknowledgment process more available to dealers and clients. This facial acknowledgment installment is by all accounts extremely advantageous and safe, yet assuming somebody post on his/her selfie on the social record that anybody can see and save, others may attack his/her Alipay record and pay with the unmistakable face, without expecting to include the password. Besides,

another moral issue is about reconnaissance in the face of acknowledgment innovation. China likewise utilizes face acknowledgment to fine traffic violators and "disgrace" jaywalkers. In Shanghai, individuals consistently observe that they get the message to illuminate that they ran a red light at a specific time on a specific road. This is on the grounds that the camera catches their face and remembers it from the information base. On one hand, this computerized reasoning innovation can assist with directing public requests. Then again, this may cause individuals to have the sensation of living under observation, even in the open arena.

CHAPTER-06

SUMMARY, CONCLUSION

6.1 Summary of the Study

In this Gender classification project, I've made this which identifies Gender utilizing SVM model. It will track down the essence of the human and foreseeing the Gender. However I've have attempted to make proficient model yet there are a few conditions for this product to work:-

•Image of the human appearances ought to be spotless and clear.

•Image quality ought to be high.

6.2 Conclusions

Face Identification and Gender Classification model can be proven as the best system for finding human gender. There is a lot of alternative systems. Among them, face recognition is the best system. By using the system, the chance of detecting and finding faces is easy and effective. Also, it needs less time than other available systems. In a real-time scenario, this system has better detection and recognition rate.

6.3 Implication for Further Study

My proposed method still lacks to detect and recognize every face. Along these, there are as yet numerous things to improve. I can improve different models until we get a more accurate rate of detection.

REFERENCES

[1] Sandeep Kumar, Sukhwinder Singh and JagdishKumar, "Gender Classification Using Machine Learning with Multi-Feature Method",978-1-7281-0554-3/19/ @ 2019 IEEE

[2] Jinhyeok Jang, Hyunjoong Cho, Jaehong Kim, Jaeyeon Lee, andSeungjoon Yang, "Facial Attribute Recognition by RecurrentLearning With Visual Fixation",IEEE TRANSACTIONS ON CYBERNETICS, VOL. 49, NO. 2, FEBRUARY 2019.

[3] George Azzopardi, Antonio Greco, Alessia Saggese And Mario Vento, "Fusion of Domain Specific and Trainable Features for Gender Recognition from Face Images",IEEE Access, VOLUME 6, 2018.

[4] Juan E. Tapia And Claudio A. Perez, "Clusters of Features Using Complementary Information Applied to Gender Classification From Face Images",IEEEAccess, VOLUME 7, 2019.

[5] Juan E. Tapia, Claudio A. Perez and Kevin W. Bowyer, "Gender Classification from the Same Iris Code Used for Recognition", IEEE Transactions on Information Forensics and Security, Vol. 11, No. 8,

August 2016.

[6] Ahmad Jamal KHDR and Cihan VAROL,"Age and Gender Identification by SMS Text Messages",978-1-5386-6878-8/18/©2018 IEEE.

[7] Lin Yuan, Fanglin Chen, Ling-Li Zeng, Lubin Wang, and Dewen Hu,"Gender Identification of Human Brain Image with A Novel 3D Descriptor",IEEE/ACM Transactions On Computational Biology And Bioinformatics, VOL. 15, NO. 2, MARCH/APRIL 2018.

[8]Jiale Chen, Sen Liu, Zhibo Chen, "Gender Classification In Live Videos",978-1-5090-2175-8/17/@2017 IEEE.

[9] Shannon Silessi, Cihan Varol, Murat Karabatak, "Identifying Gender from SMS Text Messages", 15th IEEE International Conference on Machine Learning and Applications, 2016.

[10] LahoucineBallihi, Boulbaba Ben Amor, Mohamed Daoudi,"Boosting 3-D-Geometric Features for Efficient Face Recognition and Gender Classification", IEEE Transactions On Information Forensics And Security, VOL. 7, NO. 6, DECEMBER 2012.

[11] Huaining Cheng, and Kathleen M. Robinette, "Gender Recognition Using 3-D Human Body Shapes", IEEE Transactions on Systems, Man, and Cybernetics—Part C: Applications and Reviews, VOL. 41, NO. 6, NOVEMBER 2011.

[12] ErnoMakinen and RoopeRaisamo,"Evaluation of Gender Classification Methods with Automatically Detected and Aligned Faces", IEEE Transactions on Pattern Analysis and Machine Intelligence, VOL. 30, NO. 3, MARCH 200.

[13] Ali Khan, S., Ahmad, M., Nazir, M., and Riaz, N. (2014, January 13). A comparative analysis of gender classification techniques. Middle-East Journal of Scientific Research, 2010.

[14] Samuel Manoharan, "Image Detection Classification and Recognition for Leak Detection in Automobiles", Journal of Innovative Image Processing (JIIP), vol. 1, no. 02, pp. 61- 70, 2019.K. Elissa, "Title of paper if known," unpublished.

[15] Lian, H.-C., and Lu, B.-L. (2007, December). Multi-view gender classification using multi-resolution local binary patterns and support vector machines. Inter-national Journal of Neural Systems,17,479–487. https://doi.org/10.1142/S0129065707001317.

[16] Md. Khalid Rahmani, M.A. Ansari and Amit Goel, "An efficient indexing algorithm for CBIR", Proceedings – 2015 IEEE International Conference on Computational Intelligence and Communication Technology CICT 2015, pp. 73-77, 2015.

[17] Cao Qiong, Shen Li, Xie Weidi, Omkar M Parkhi and Andrew Zisserman, "VGGFace 2: A dataset for recognising faces across pose and age", IEEE Conference on Automatic Face and Gesture Recognition, 2018.

[18] Junjue Wang, Brandon Amos, Anupam Das, Padmanabhan Pillai, Norman Sadeh and Mahadev Satyanarayanan, "Enabling Live Video Analytics with a Scalable and Privacy-Aware Framework", ACM Transactions on Multimedia Computing Communications and Applications (TOMM), vol. 14, no. 3s, pp. 64, 2018.

[19] Arsha Nagrani, Samuel Albanie and Andrew Zisserman, Seeing Voices and Hearing Faces: Cross-modal biometric matching, 2018, [online]

[20] Miss. Vaishnavi Y. Mali Student of Electronics Department Walchand College of Engineering Sangli, Indi. "Human Gender Classification using Machine Learning" International Journal of Engineering Research and Technology (IJERT) ISSN: 2278-0181 Vol. 8 Issue 12, December-2019

[21] Ignat, A., and Coman, M. (2015). Gender recognition with gabor filters. In E-Health and Bioengineering Conference (EHB) (pp. 1–4). IEEE press.

[22] Deniz, O., Bueno, G., Salido, J., and De laTorre, F. (2011, September). Face recognition using Histograms of Oriented Gradients. Pattern Recognition Letters,

32(12), 1598–1603. 17(6), 479–487, https://doi.org/10.1016/j.patrec.2011.01.004

[23] https://data.vision.ee.ethz.ch/cvl/rrothe/imdb-wiki/

[24]Miss. Vaishnavi Y. Mali, Dr. Babasaheb G. Patil, "Human Gender Classification using Machine Learning" International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181

[24]OMPARISON BETWEEN DIFFERENT FACE-RECOGNITION TECHNIQUE WITH DIFFERENT CLASSIFIER by Mehedi Hasan Rajon, Parvez Rana Sabbir, Mahmudul Haque Shetul

[25] Gender Identification from Smart Phone Usage Using Machine Learning Algorithm by Johora Akter Polin, Omayer Khan

[26]"Gender Classification using SVM With FlaskAkhil Maheshwari," Dolly Sharma, Ritik Agarwal, Shivam Singh, Loveleen Kumar

APPENDIX

Train ML model

```python
import warnings
warnings.filterwarnings('ignore')
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.decomposition import PCA
%matplotlib inline
```

```python
data = np.load('data/data_pca_50_y_mean.pickle.npz')
data.files
```

```
['arr_0', 'arr_1', 'arr_2']
```

```python
X = data['arr_0']
y = data['arr_1']
mean = data['arr_2']
```

```python
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(X,y,test_size=0.2,stratify=y)
x_train.shape, x_test.shape, y_train.shape, y_test.shape
```

```
((4367, 50), (1092, 50), (4367,), (1092,))
```

Traning the model

support vector machine (SVM)

```python
from sklearn.svm import SVC
```

```python
model = SVC(C=1.0, kernel='rbf', gamma=0.01, probability=True)
```

```python
model.fit(x_train,y_train)
print('Trained Sucessfully')
```

```
Trained Sucessfully
```

```python
### Score of traing data & test data

model.score(x_train, y_train)
```

```
0.8639798488664987
```

```python
model.score(x_test, y_test)
```

```
0.7884615384615384
```

```
# classification report

cr = metrics.classification_report(y_test,y_pred,target_names=['male','female'],output_dict=True)
pd.DataFrame(cr).T
```

|	precision	recall	f1-score	support
male	0.780749	0.662132	0.716564	441.000000
female	0.792479	0.874040	0.831264	651.000000
accuracy	0.788462	0.788462	0.788462	0.788462
macro avg	0.786614	0.768086	0.773914	1092.000000
weighted avg	0.787742	0.788462	0.784943	1092.000000

```
# Kappa Score

metrics.cohen_kappa_score(y_test,y_pred)
```

```
0.5496400719856029
```

```
array([[ 292,  149,  441],
       [  82,  569,  651],
       [ 374,  718, 1092]], dtype=int64)
```

```
plt.imshow(cm)
for i in range(3):
    for j in range(3):
        plt.text(i,j,'%d'%cm[i,j])
plt.xticks([0,1])
plt.yticks([0,1])
plt.xlabel('predicted Values')
plt.ylabel('True Values')
plt.show
```

```
<function matplotlib.pyplot.show(close=None, block=None)>
```
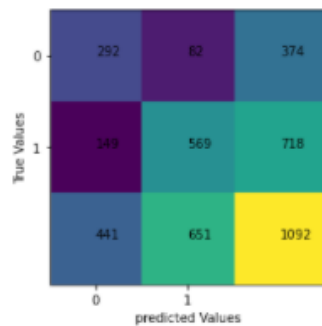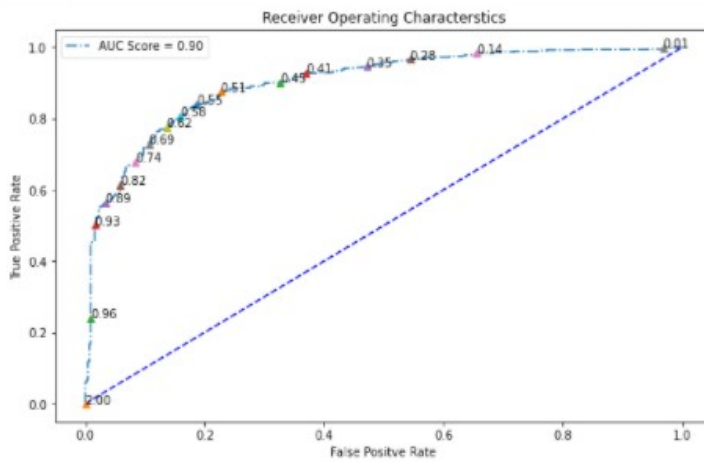
```
# roc and auc
fpr,tpr,thresh = metrics.roc_curve(y_test,y_prob[:,1])
auc_s = metrics.auc(fpr,tpr)
plt.figure(figsize=(10,6))
plt.plot(fpr,tpr,'-.')
plt.plot([0,1],[0,1],'b--')
for i in range(0,len(thresh),20):
    plt.plot(fpr[i],tpr[i],'^')
    plt.text(fpr[i],tpr[i],"%0.2f"%thresh[i])

plt.legend(['AUC Score = %0.2f'%auc_s])

plt.xlabel('False Positve Rate')
plt.ylabel('True Positive Rate')
plt.title('Receiver Operating Characterstics')
plt.show()
```

Pipeline Model

```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import sklearn
import pickle
import cv2
from PIL import Image
%matplotlib inline
```

```python
# Load all model
haar = cv2.CascadeClassifier('model/haarcascade_frontalface_default.xml')

#pickel files
mean = pickle.load(open('model/mean_preprocess.pickle','rb'))

model_svm = pickle.load(open('model/model_svm.pickle','rb'))

model_pca = pickle.load(open('model/pca_50.pickle','rb'))

print('Model loaded Sucessfully')
```

Model loaded Sucessfully

```python
gender_pre = ['Male', 'Female']
font = cv2.FONT_HERSHEY_SIMPLEX
```

```python
def pipeline_model(img,color='rgb'):
    if color == 'bgr':
        gray = cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
    else:
        gray = cv2.cvtColor(img,cv2.COLOR_RGB2GRAY)

    faces = haar.detectMultiScale(gray,1.5,3)
    for x,y,w,h in faces:
        cv2.rectangle(img,(x,y),(x+w,y+h),(0,0,255),2)
        roi = gray[y:y+h,x:x+w] # croping image
        roi = roi / 255.0 # normalization (0-1)

        if roi.shape[1]>100:
            roi_resize = cv2.resize(roi,(100,100),cv2.INTER_AREA)
        else:
            roi_resize = cv2.resize(roi,(100,100),cv2.INTER_CUBIC)

        roi_reshape = roi_resize.reshape(1,10000) # 1x10000


        roi_mean = roi_reshape - mean #subtract with mean

        eigen_image = model_pca.transform(roi_mean) # get eigen image

        results = model_svm.predict_proba(eigen_image)[0] # pass to ml model (svm)

        predict = results.argmax() # 0 male, 1 feamle
        score = results[predict]

        text = '%s : %0.2f'%(gender_pre[predict],score)

        cv2.putText(img,text,(x,y),font,1,(0,0,255),2)
    return img
```
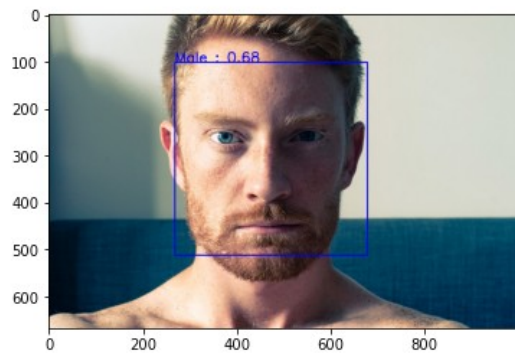
```
# test data
test_data_path = 'data/male_02.jpg'
color = 'bgr'
img = Image.open(test_data_path)

img = np.array(img)


img = pipeline_model(img)
plt.imshow(img)
```

<matplotlib.image.AxesImage at 0x16f8e6d4970>

test model in video

```
cap = cv2.VideoCapture('data/video.mp4')

while True:
    ret, frame = cap.read()

    if ret == False:
        break

    img = pipeline_model(frame,color='bgr')
    cv2.imshow('Gender Detector',frame)
    if cv2.waitKey(20) == 27: #esc key
        break
cv2.destroyAllWindows()
cap.release()
```

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Gender Identification

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