Surveillance Face Detection(Gender & Age Prediction)

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Project Code:

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Submission Date:
>   November 04, 2019

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Project Manager's Signature

Definition of Terms, Acronyms and Abbreviations

Term	Description
CNN	Convolutional Neural Network
GA	Genetic Algorithm
PCA	Principle Component analysis

Table of Content

1. Introduction

1.1 Purpose of Project

The purpose of this project to capture the human face and that captured face matched with the database data sets. Is face matched the system show the name of the person, gender of the person, and tells the predicted age of the person. This document is primarily proposed for the detection of human face by the machine learning algorithms. The aim of this project is to build intelligent machine that tells the gender and predicted age of the person whom face is captured by the camera.

1.2 Project Overview

The face detection project includes the gender and age prediction tell by the use of algorithms in the project. It help of face landmark sand nodes detects the object face. It exploits global face features using techniques of Gabor Wavelet, PCA, Neural Networks, GA, CNN, novel techniques, distance formula help to judge the exact location of nodes and orthogonal locality preserving projections. This could be used for security purpose detection purpose now a day.

1.3 Scope

The project highlights the agent learn face features and generates the information related to gender of the person who are captured in the camera. Using biological and psychological judgement in prediction and machine learning algorithms are also use in the prediction. Our agent becomes intelligent with the help of learning algorithms that tells us the age of the person.
Face detection algorithm can't predict gender and age with 100% efficiency.

2. Functional Requirements

- Face detecting through camera.
- Match face nodes with sample data.
- Gender Detection from Face Image
- Age Detection from Face Image
- Generate and display results.

3. Non-functional Requirements

3.1 Performance Requirements

The performance of the system is expected well that tells about the face detection with much of accuracy. However, system characteristics of this intelligent agent includes the speed of outcome, capacity, reliability and precision of software. We try to make all the above define characteristics efficient at maximum level of success.

3.2 Safety Requirements

Our whole work is carry out on the system and our system in this documentation act as the intelligent agent and doing all job in well-defined manner. Make sure your camera working good and not form blur picture because due to this the system or coded information not gives efficient result.

3.3 Security Requirements

This type of project mostly used in the security system and huge size of database is working or integrated in it for the purpose to enhance the security. Passwords and encrypted data in it uses because only technical and authorized person able to operate this system.

3.4 User Documentation

It includes:

- *Functional Requirement*
- *System structure*
- *Use Case Description*
- *Project Scope*
- *Safety & Security Requirement*

4. Assumptions and Dependencies

One assumption about the product is that it will always use digital cameras and those devices have scanning module. If devices do not have high-speed digital scanning module, for example the users might have a device with (144px, 240px) resolution-scanning module, there may be scenarios where application could not able to predict accurately because of scanning minimum number of nodes. Another assumption is to clear the blur images for getting maximum number of nodes by using magnification and resolution tools and algorithms.

Our project depends upon digital cameras and other scanning devices.

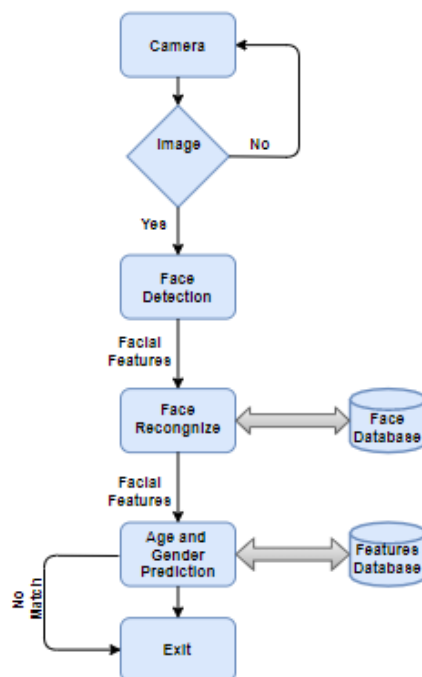# 5. System Architecture

5.1   Flowchart

Figure 1: Data flow diagram

5.2 System Structure

Face detection algorithm based on 2-tier architecture. It is working with in a single system. It do not need any server for database.

6. Use Cases

6.1 Use Case Diagrams
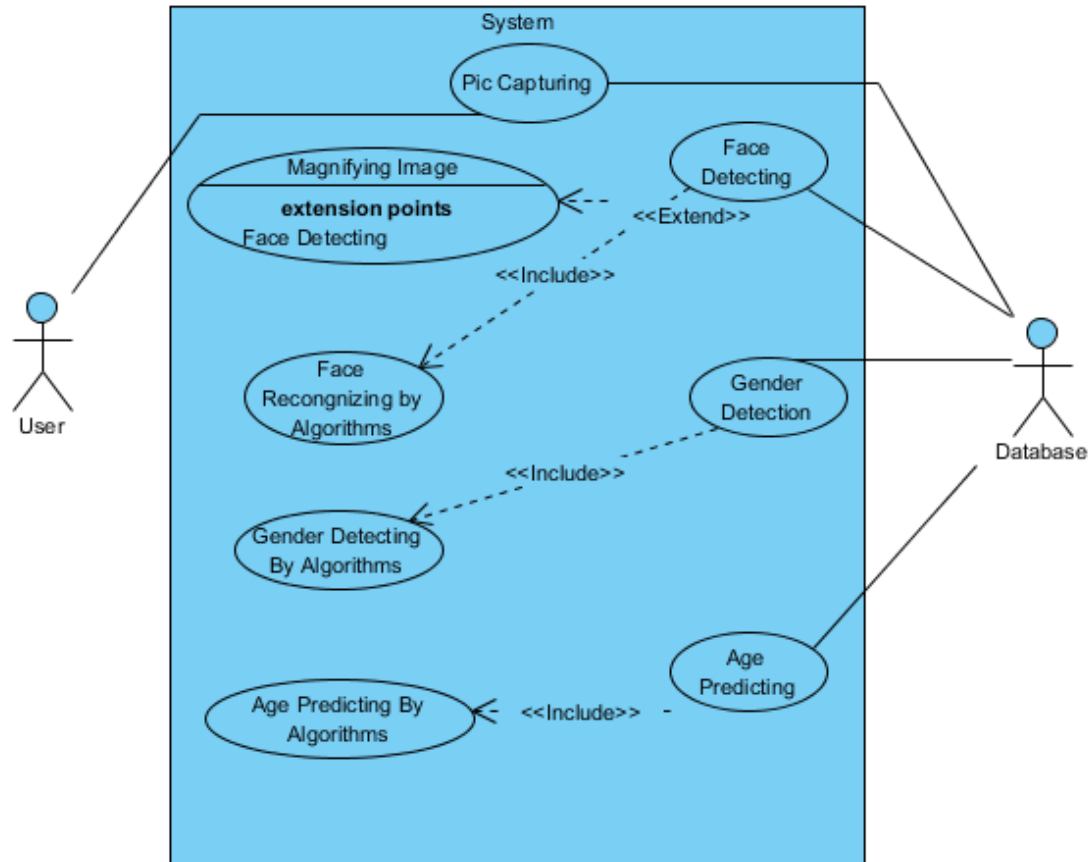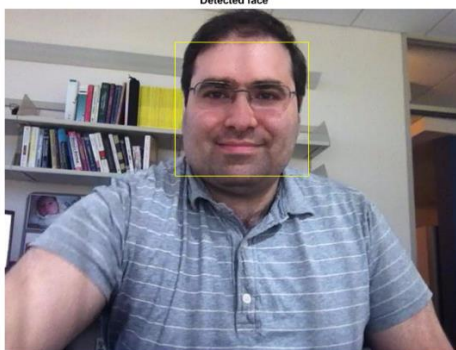
Figure 2: Use Case Diagram.

6.2 Use Case Description
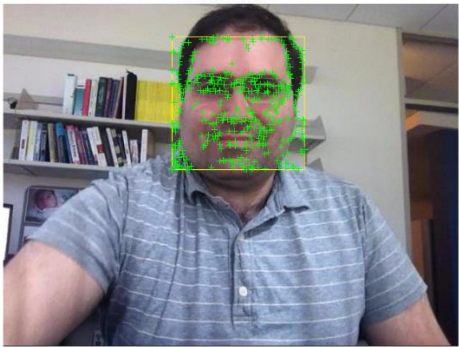
<Face detection>	
Actors:	*User(Primary),Database(Secondary)*
Feature:	-
Use case Id:	*1*
Pre-condition:	Camera must be in working state
Scenarios: *A number of algorithms are working on gender detection and age prediction.*	
Step# **Action**	**Software Reaction**

1.	*User look into the digital scanning device*	*System will capture the nodes of face and match the face from database, predict gender and age*
Post Conditions		
Step#	**Description**	
1.	*Algorithms successfully executed.*	
Use Case Cross referenced	-	
User Interface reference	-	
Concurrency and Response • It will process on multiple detected faces. • It will generate result on real time.		

7. Graphical User Interfaces

Face Detection	
Interface Id.	*1*
Use case Reference	Figure 2: Use Case Diagram
Snapshot	

Detected face

Data dictionary reference	
Label	**Data dictionary identifier**
1	*Refer to fields in data dictionary*

Features Detection	
Interface Id.	*2*
Use case Reference	Figure 2: Use Case Diagram
Snapshot	

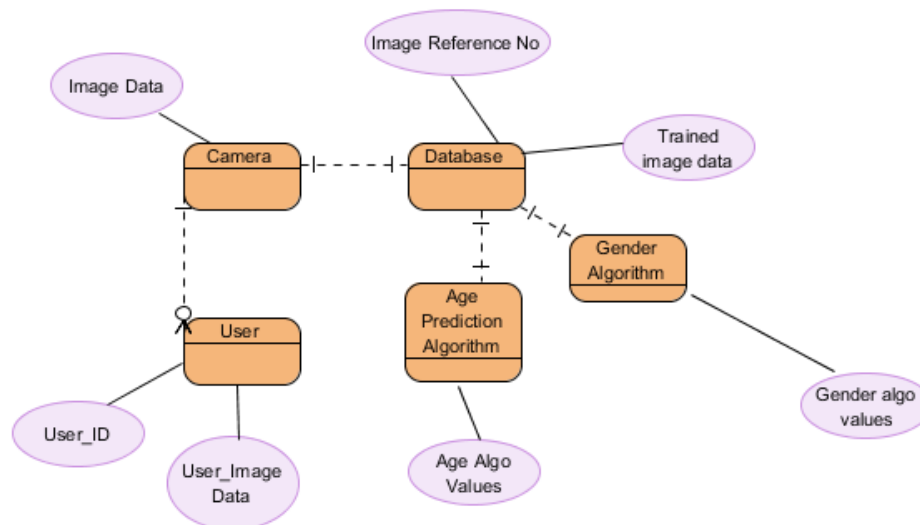| Data dictionary reference	
Label	**Data dictionary identifier**
1	*Refer to fields in data dictionary*

8. High Level Design

8.1 ER Diagram

Figure 3: Entity Relationship Diagram

8.2 Data Dictionary.

8.2.1 Data 1

First data collected in our project with the camera.

Then we use database for the storage of information in files and different algorithms perform its task to predict gender and age of the person standing in front of camera.

Data 1	
Name	*Image node gathering*
Alias	*Image data.*
Where-used/how-used	*Gather node related data of image will be used for matching of our dataset nodes for age and gender prediction*
Content description	*Image will be converted into gray scale binary values*
Supplementary information	*Data of image nodes will be represented in numeric matrix form*

.

9. Requirements Traceability Matrix

Sr.#	Feature	Use case ID	UI ID	Priority	Build Number	Use Case Cross reference (Related Use Cases)
1	Face detection	01		One	-	-

10. Risk Analysis

- *Our Face Detection project have chances of wrong prediction of gender and age, which is a risk factor for our project.*
- *The moving face can cause the wrong calculation of age and gender by getting wrong points of nodes in real time.*
- *40% – 45% chance that effects the calculation of predicted age and gender of a real time face due to moving face nodes.*
- Using of Vendor True **Identification** Rate (98%) which gives much better performance compared with an average 66%.

11. Cost Estimation Sheet

1.	Software development cost	300$
2.	Packaged software	40$
3.	Client	
4.	Misc.	10$
		Total cost = 350$

12. Summaries

Lucy Nwosu et al [1] this paper proposed the working related to the facial expressions based on the deep convolutional neural networks. In the face two main focused features are eyes and mouth both are taking part in judging the facial expression. When both terms integrated then the final output is emerging out form the database. In this two datasets are formed for every person first one is JAFFE and second one is CK+ both help us to recognize the face of male and female. Against every person, both databases are designed for getting the result. This gives 97.05% accurate result.

Grigory Antipov [2] progress the artificial neural networks (deep learning) boosted the work to recognize the face of human as well as estimating the age of the person, that are shown in the picture. Deep learning and CNN has currently become the model of the human image based object. Anthropometry based features are play the essential role to judge the fiducial points with the help of topological differences that helps to calculate age factor or understand the gender in the picture. Cranial shapes help to evaluate age up to the 18 years after that the cranial shapes gives not accurate results. Different techniques like ICP, OLPP, PCA etc. helps to find almost accurate results.

Dipesh Vaya & Teena Hadpawat work to recognize the face by using PCA approach with the Combination of Euclidian, city block and Mahalanobis distance. The appearance and feature of face are detected with the help of Geometric and Photometric methods. Almost matching image face is selected from the database. Image I s classified by different distance measuring factors. PCA (principle component analysis) is the foremost eminent technique for recognition and comparison. The Eigen face method is for the compression or information reduction way in detection method. PCA with Euclidian distance gives 80% accuracy while PCA with Mahalanobis distance shows 92.5% accuracy during face recognition.

Huany et al [3] proposed method that is space search optimized polynomial neural network classifier (PNNC) based on data processing and stimultaneous turning strategy. On the other hand, he also introduce the concept of fuzzy wavelet polynomial neural networks. Above methods able to train the system to recognize the eye region based on face image in database. Torricelli et al. had to proposed eye blinking process. Lee et al. proposed threshold values to find eye closing states. Test on still imaging applied and it give 94.5% good result but not give efficient result on moving images.

Ishita et al [4] proposed proposed different methods to explore the feasibility of implementing the raspberry pi based on face and age prediction using conventional face detection and recognition techniques like Haars detection and PCA. Use this method because it enhance the security level of any E-devices. Haars feature based detection is applied on the image the positive and negative images are extracted out. Then all possible extracted images are used to calculate and judge the plenty of matched feature and PCA used Eigen vector or values method to extracted the feature that are matched with the image in the database. If image matched then the pic is glow and show result "present" on screen.

Dr.Rajesh A [5] works on the prediction of human gender. Many researches are made for the detection of human face but this paper explain the method how to investigate the human gender. Weber's local descriptor used for sexual orientation acknowledgment. It takes critical properties and judge the human gender. Neural network classifier also helpful in this research to disclose the way to investigate the human gender (male or female).Face Granulation highlights and segregate the nearness varieties and match data from the given database and predict the result. After this, the system gives good results.

Momotaz begam and M.imdadul [6] works Human face detection using linear regression, PCA, Clustering, Fuzzy logics and Computer vision to judge face and age of the human with the help of the machines. Fuzzy C-means clustering work on human face and gives 92.5% results. Nodes and Eigen

vectors helps in these techniques to evaluating the data the Gabor wavelet also helps to find the face of human and aging factors that appears on the face of human. The Discrete wavelet transformation turns the result 94.5% in the face detection method.

Mourad et al [7] explain methods like PCA, GA, DCT to investigate the human features and aging features to predict the age. In this research paper novel based technique using Genetic Algorithm to evaluate the sections of the human face. Genetic Algorithm helps us to find the face form the given database and selected the outputs and the extracted data from the output of selection is cross over and almost matched data is selected out from the database and the selected image mutation is applied on it. DCT in it is used to judge the features of human form database, gives almost better rarest, and DCT helps to predict the human age by the help of frequency lines.

Priya et al [8] introduce deep neural networks that are helpful for face detection convolutional neural networks (CovNets) deep networks that has been proved the successful for matching the face features of the person. Deep neural networks is human inspired algorithm to design patterns and investigate the result and its accuracy level is up to 97.45% good to judge the face of human. Nodes help to design pattern. DNN and CovNets makes the process lighter and faster.

Anjith George et al [9] introduced Wide Multi-Channel Presentation Attack detection on database which contain the wide variety of 2D and 3D pictures and face is recognized and after all steps results are disclose Presentation attack detection, CovNets, Anti- spoofing, multi-channel sensor use in this research paper. PDA provide visible spectrum images means also working on the moving images and grayscale images also detected by this technique. This research gives the better end better result for achieving our targeted goals. Works on still as well as moving images and the accuracy rate is much better than all previous researches.

Sudha et al [10] works on deep learning neural networks and investigate the images at every angle or perspective of the face and output gets out after testing is ones that are more accurate. Datasets are formed in this technique different datasets are used to find out best one result from the database. Yale faces, or face, labeled faces in the wild from the database is detected and extracted good results. Eigen values, local binary patterns, CNN is used for face detection problem.

Conclusion Extracted from Research Papers:
From the above area of study, I am able to understand the worth of that particular topic. Now I apply different features extraction techniques like PCA, haarscascading and neural networks. So, working criteria of above named techniques is implementing in our project. Those ways help to construct our topic of project. Through these, we are able to predict the gender and age of the person who is in the picture or standing in front of the camera. Above techniques collectively gives much efficient result to us.

13. References:

Ref. No.	Document Title	Date of Release/ Publication	Document Source
01	Deep Neural Network for Human Face Recognition	Feb 06,2018	Vol.8, No.1, pp.63- 71, 2018.DOI: 10.5815/ijem. ii

Ref. No.	Document Title	Date of Release/ Publication	Document Source
02	IEEE transactions on neural networks	Jan 01,1997	Page # 98-113
03	Classifying facial actions.	1999	-
04	Robust Real-Time Face Detection	2008	International Journal of Computer Vision.
05	Automatic Age Estimation System for Face Images	Aug 29, 2012	International Journal of Advanced Robotic Systems
06	Euclidean & Geodesic Distance between a Facial Feature Points in Two-Dimensional Face Recognition System	*2016*	*International Arab Conference on Information Technology*
07	FACE DETECTION AND RECOGNITION USING RASPBERRY PI	Dec 16, 2016	pages 83–86. IEEE, URL: http://ieeexplore.ieee.org /document/8009092.
08	Human Face Detection Based on Combination of Linear Regression, PCA and Fuzzy C-Means Clustering	July 07, 2019	International Journal of Computer Science and Information Security (IJCSIS), Vol. 17

14. Appendices

Risk Driver: *"Something existing in the* **project** *environment that leads one to believe that a particular* **risk** *would occur."*

Neural Networks: *A* **neural network** *is a series of algorithms that endeavors to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates.*

ERD: *An* **entity-relationship diagram** *(***ERD***) is a data modeling technique that graphically illustrates an information system's entities and the relationships between those entities.*

Vendor True Identification: *It is an algorithm, which is use for face recognition methods. It uses working of convolutional neural network in deep learning.*