FAGE DETECT

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*The candidates confirm that the work submitted is their own and appropriate credit has been given where reference has been made to work of others

Plagiarism Free Certificate

This is to certify that, I Muhammad Humza Riaz Son of Muhammad Riaz Anwar, group leader of FYP under registration no FYP – BCSM – F21 – 014 at Computer Science Department, The Superior University, Lahore. I declare that my FYP report is checked by my supervisor.

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Project Report

FAGE DETECT

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Dedication

This work is dedicated to all those people in my life who supported me And prayed for me in my tough times. To all those people who wanted me to succeed in my life. Especially my parents who made me this much capable and helped me in my hardships. All teachers who Helped us along the way especially Sir Talha Amjad our supervisor, his dedication towards us is really remarkable.

Acknowledgements

We extend out thanks to all concerned persons who co-operated with us in the completion of our project. We submit our heartiest gratitude to our Supervisor, Sir Talha Amjad, for his sincere guidance and help in completing this project. His confidence and encouragement proved a huge motivator for us in providing a quality Documentation on time. His suggestions and constructive criticism contributed in evolution of ideas regarding the research project.

We express our deep and sincere gratitude to our friends and seniors who helped us in the content analysis and provided their support at all times. We would like to thank our teachers, Ma'am Amna Zeeshan and Sir Talha Amjad for their assistance in the research work particularly in the collection and analysis of required data.

We aim also thankful to my parents for their support and encouragement at the times when we lost my morale. Their financial support and patience throughout the research project enabled us to deliver our best.

Muhammad Humza Riaz

Executive Summary

Face detection applications use algorithms and ML to find human faces within larger images, which often incorporate other non-face objects such as landscapes, buildings and other human body parts like feet or hands. Face detection algorithms typically start by searching for human eyes -- one of the easiest features to detect. The algorithm might then attempt to detect eyebrows, the mouth, nose, nostrils and the iris. Once the algorithm concludes that it has found a facial region, it applies additional tests to confirm that it has, in fact, detected a face. To help ensure accuracy, the algorithms need to be trained on large data sets incorporating hundreds of thousands of positive and negative images. The training improves the algorithms' ability to determine whether there are faces in an image and where they are.

To ensure or project is able to get the required knowledge from the faces which will be shown to it we will use the very popular AI type used specially for this purpose which is A convolutional neural network (CNN) this is a type of artificial neural network used in image recognition and processing that is specifically designed to process pixel data. An R-CNN generates region proposals on a CNN framework to localize and classify objects in images. Age is an important attribute of identity and social interaction as well for medical processing. Age estimation from the face by intelligent human-machine interfacing is required to capture picture that may contains different parts as well the human face. This proposed application can be used in security, parks, shopping malls and swimming pools entrances, and medical clinics. Now in order to understand the working of the project first we need to understand how the project will operate. This project operates on the basis of Computer Vision, it 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

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Chapter 1

Introduction

Chapter 1: Introduction

These days, mobile phone is one of the fastest medium of technology in the world with global outreach of up to 90%. This makes it an enormous warehouse for customer's information. That is, each action taken by the client (short message service (SMS), decision or web session) gets recorded. There are many types of data used mainly by Social Media Industries. This data contains a lot of information, (type of event, who is involved in this event, datetime, cell identifier where this event has taken place). This raw data represents a valuable source for analyzing human and social behavior. For a long time there had been many changes in technology and day by day we are getting near the future of AI where we can determine the needs of customers by just using their basic info. The photographs in these classes have some variations in look, noise, pose, and lighting which can have an effect on the power of these manually designed laptop vision ways to accurately classify the age and gender of the photographs. Recently, deep learning-based ways have shown encouraging performance during this field particularly on the age and gender classification of unfiltered face pictures.

1.1. Background

In the age of data driven solution, the customer demographic attributes, such as gender and age, play a core role that may enable companies to enhance the offers of their services and target the right customer in the right time and place. In the marketing campaign, the companies want to target the real user. This work proposes a method that predicts users' gender and age based on their behavior and looks. The main contribution of this work is the improvement in the accuracy in terms of user gender prediction and user age prediction based on convolution neural networks and end-to-end solution that approaches customer data from multiple aspects in the today's world of internet. This will not help in targeting the right customer but will also give user the right choice of as to what he actually wants. This will not only help in marketing but also in security procedures and protocols.

1.2. Motivations and Challenges

Facial analysis from pictures has gained heaps of interest as a result of it helps in many completely different issues prefer ad targeting for purchasers, higher content recommendation system, security police work, and alternative fields additionally. Age and gender are a very important part of facial attributes and identifying them are the very basic of facial analysis and a required step for such tasks. Several firms square measure exploitation these varieties of tools for various functions creating it easier for them to figure with customers, cater to their desires higher and build a good expertise for them. Overall our motivations are straight and it could benefit many organizations but still there are some hurdles that we face like there is still not so much knowledge for mobile implementation of the project and the processing power and hardware that can make the project easy to implement is quite large.

1.3. Goals and Objectives

The software under development is using the AI based algorithm CNN (Convolutional Neural Networks). This Algorithm specializes in Face and Image Detection.

It consist of one level:

1. User

The Software includes

- Face Detection & Recognition
- Age Prediction
- Gender Prediction
- The User level UI
- No Registration is required

The basic Goal is to achieve the almost perfect estimation in gender and age detection and give full response to the user by providing the user Simple and intuvative Application which is both perfectly operational and in fully working state.

1.4. Literature Review/Existing Solutions

Over the last fifteen years, many items of analysis are revealed on facial age estimation. The algorithms sometimes take one among 2 approaches: age bracket or age-specific estimation. The previous classifies an individual as either kid or adult, whereas the latter is additional precise because it tries to estimate the precise age of an individual. Every of those approaches are often additional rotten into 2 key steps: feature extraction and pattern learning/classification. 2 feature extraction techniques are employed in the literature: native and holistic. The native approach, additionally referred to as the part-based or analytic approach, concentrates on salient elements of the face, like the facial measurement and wrinkles. Gender classification is additionally approached in 2 major steps: feature extraction and classification. Feature extraction techniques rumored within the literature are often categorized into geometric and look based mostly.

1.5. Gap Analysis

1. **Problem of Reliability:** Current system is not reliable. It seems to vary in quality from one month to the, next. Sometimes it gives good output, but sometimes the output is worst.
2. **Problem of Accuracy:** There are too many mistakes in reports.
3. **Problem of timeliness:** In the current system the reports and output produced is mostly late and in most of the cases it is useless because it is not on time.
4. **Problem of Validity:** The output and reports mostly contains misleading information. The customer's information is sometimes not valid.
5. **Problem of Economy:** The current system is very costly. We have to spend lots of money to keep the system up and going, but still not get the desired results.
6. **Problem of Capacity:** The current system is suffering from problem of capacity also. The staff for organization is very less and the workload is too much. Few people cannot handle all the work.

1.6. Proposed Solution

We want to introduce a mobile app or if being specific we want to give the stores and marketing teams the opportunity to know there customers beforehand and give them the right choice of what do they actually want. This will greatly revolutionize our current way of living not only this it will help the Big and Small brands to help pick the right customer when he or she walks into their shop but will also help customers if a salesmen gives them the right choice of what do they actually want to wear. The software systems of facial recognition analysis usually include several separate neural networks. One of them identifies the person, another one determines the gender, etc. We will try our best to make this purposed solution available to even the low – end devices. As it will be a mobile app so the data we will give to it will be our picture which the software will take into consideration and hence forth give the result as to what the age of the person is and what is it's gender we will alongside our project also give updates to our current system.

1.7. Project Plan

As this is our university – based semester project .So, after suggestions of our supervisor and Panel we will make sure to add maximum investor to invest in our system. Slowly and after the completion of our First Phase of Investment we will also add a mobile Application which will be available to both on Google Play store and Apple's App Store. We will have to purchase host and domain for our application so that all the Data which is to be stored in our system can also be stored on the cloud based Database. Later on we will add more features on our Application on all the given platforms which is Windows, Mac, iOS and Android from time to time according to the latest technology trends. These Updates will be given to our Customers through regular Security Updates.

1.7.1. Work Breakdown Structure

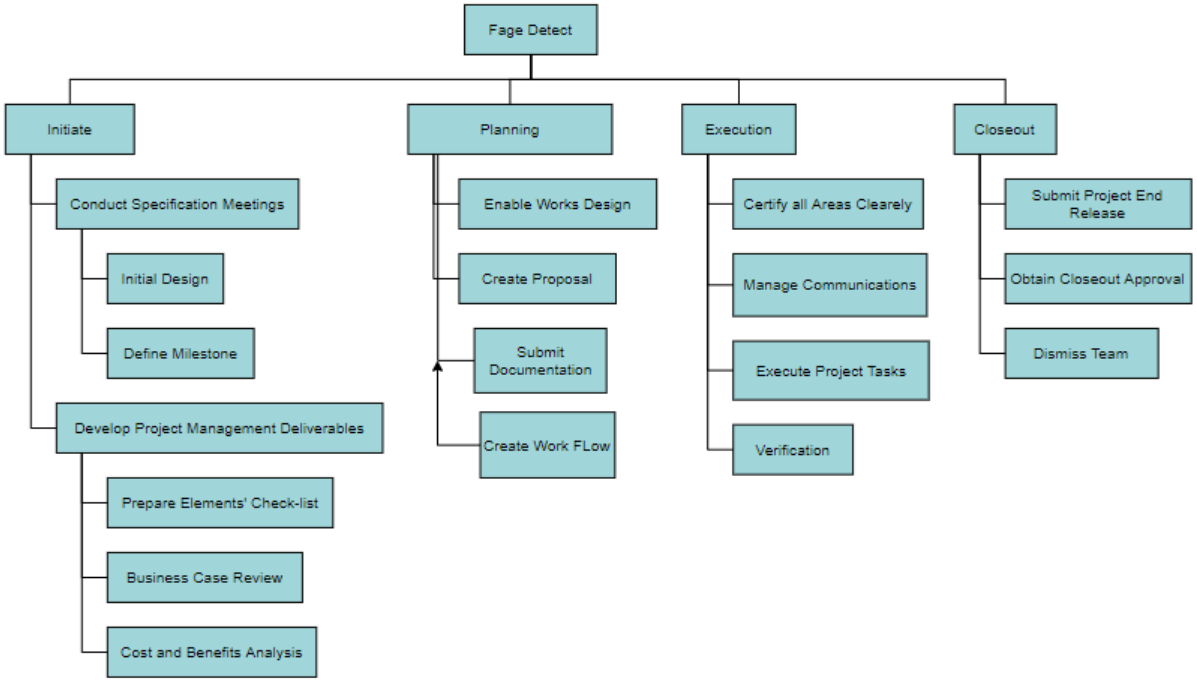

Figure 1: Work Breakdown Structure

1.7.2. Roles & Responsibility Matrix

Table 1: Roles & Responsibility Matrix

Project Name: Fage Detect			
Prepared by: Muhammad Humza Riaz			
Date: 29/11/2021			
PERSON / PHASE	**M. Humza Riaz**	**Ata – UR – Rehman**	**M. Naveed Shakir**
Requirements	P/A/R	P/R	P/R
Functional	P/I	R	P/A
Design	P/I/A/R	R/A	I/R
Development	P/I/A	R/A	I/A
Testing	P/I/A	R/I	R/I

P = Participant **A =** Accountable **R =** Review Required

I = Input Required

1.7.3. Gantt Chart

Activity	Start date	Duration
Planing	3/5/2019	5
Requirement elicitation	3/15/2019	10
local host connection	3/18/2019	3
DB connectivity	3/19/2019	1
Interface designing	3/23/2019	4
online test report planing	3/25/2019	2
online test report design	3/30/2019	5
OTR implementation	4/5/2019	5
View /delete /update classes	4/11/2019	6
Doctors schedualing report	4/19/2019	8
online Appoinments system de	4/24/2019	5
OPS implementation	4/26/2019	2
testing	4/30/2019	4
deployement	5/1/2019	1

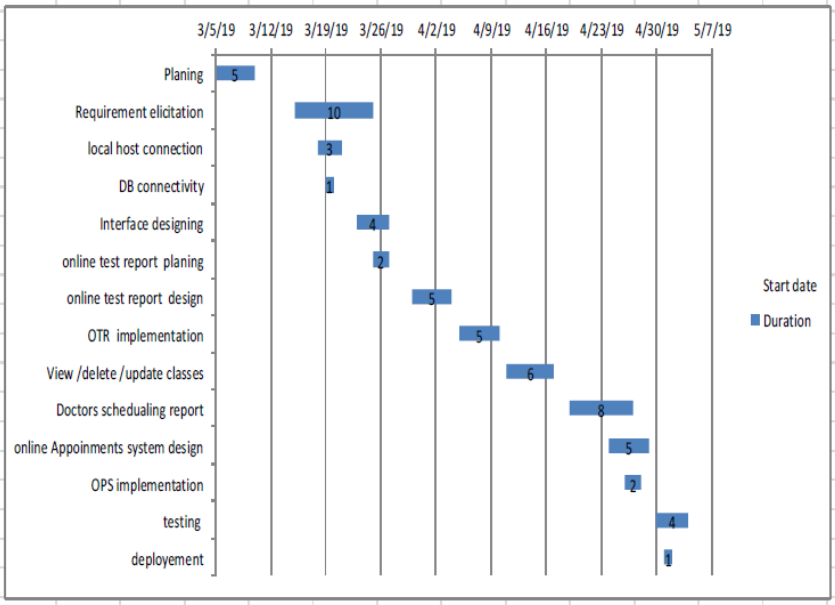

Figure 2: Gantt Chart

1.8. Report Outline

It's confirmed that the data provided in this project is accurate to our knowledge and the data provided of the user is confidential and will not be used by any organization and company without the users consent. This article includes all the information of our project which includes:

- Introduction
- Functionality software
- Provide facilities
- Information about how the software will work

Chapter 2

Software Requirement Specifications

Chapter 2: Software Requirement Specifications

2.1. Introduction

In this part of the Documentation, we will discuss about the Software Requirement Specification that what kind of strategies and options we have opted to complete the Software. It will also tell or be able to the user that how and what kind of system is used to complete this approach.

2.1.1. Purpose

Many companies are using these kinds of tools for different purposes making it easier for them to work with customers, cater to their needs better and create a great experience for them. It is easier to identify and predict needs of people based on their gender and age. We want to introduce a mobile app or if being specific we want to give the stores and marketing teams the opportunity to know there customers beforehand and give them the right choice of what do they actually want. This will greatly revolutionize our current way of living not only this it will help the Big and Small brands to help pick the right customer when he or she walks into their shop but will also help customers if a salesmen gives them the right choice of what do they actually want to wear. The software systems of facial recognition analysis usually include several separate neural networks. One of them identifies the person, another one determines the gender, etc. We will try our best to make this purposed solution available to even the low – end devices. As it will be a mobile app so the data we will give to it will be our picture which the software will take into consideration and hence forth give the result as to what the age of the person is and what is it's gender we will alongside our project also give updates to our current system.

2.1.2. Document Conventions

Standards that we used to make this document are:

- *Paragraph Text 12pt*
- *Font Style Calibri*
- *Line Spacing 1.5*

Alignment Justified Requirement According to the Priority:

- Customer Ease
- Record Security
- Face Data Management
- Age Data Management
- Gender Data Management

2.1.3. Intended Audience and Reading Suggestions

This document is intended for developers, project managers, users, testers and documentation writers. For better clarifications read the abstract of the document given in the start. You can have a better understanding of the document by simple reading the first two lines of each topic. This is just a simple step to begin with which will help the intended readers of this document to read about what the software will be used for and how it is operated.

2.1.4. Product Scope

Scope of this Project is any person with the basic sense of using mobile application can easily use it and can give his/her picture to the mobile application to analyze.

- ✓ Customer Ease
- ✓ Record Security
- ✓ Face Detection
- ✓ Gender Detection

Goals:

Our goal is to make an efficient software which will be AI based which will not only increase and make our knowledge related to the project more accurate but will also give us opportunity to add more features to it with time.

Business Strategy:

Providing new functionalities in the existing solutions in an effective way. Such that our software can provide more and reasonable productive changes in the current environment which will help not only us but more students to learn from it. As it will be an open – source project on git hub with code and documentation.

2.1.5. References

https://www.koombea.com/blog/benefits-of-facial-recognition-in-mobile-app/

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https://itsourcecode.com/free-projects/python-projects/gender-and-age-detection-opencv-pythonwith-source-code/#google_vignette

https://www.analyticsvidhya.com/blog/2021/07/age-and-gender-detection-using-deep-learning/

https://github.com/shubham0204/Age-Gender_Estimation_TFAndroid/tree/master/app/src/main/java/com/ml/projects/age_genderdetection

https://programming.vip/docs/face-detection-and-age-and-gender-recognition-based-on-androidopencv.html

2.2. Overall Description

2.2.1. Product Perspective

Age and gender detection module is part of the ASSVS project which will enable quick identification of age and gender of the persons present in the videos. The module will get input from Face detection module in the form of facial region. After age and gender detection, the module will be providing the keyword output to natural language generation module for further processing.

2.2.2. Product Functions

The system functions can be described as follows:

Face Detection: When a person gives his photo or any photo from his/her gallery they will be given prompt if they want to enter their data in the software. This small notification gives this me message and assures the user that there data will not be given to anyone or shared with anyone without their consent.

Age Prediction: Once the user gives the permission to the application to give his/her data the Age prediction Algorithm will work to estimate the age of the user this algorithm will include some of the math functions to perform more effectively.

Gender Prediction: After Age detection the gender detection algorithm will wok which will see from the photo using CNN if the face in question ranks up – to the software standard and check to see any irregularities from the picture if there aren't any the software will work fine but if there is there error message will be generated.

Report Generation: The system generates reports on the following information: Age and gender. It prints out all the information of the user in question and gives it's feedback.

2.2.3. User Classes and Characteristics

As the system or this application is going to be get used by tech enthusiasts or basic researcher mostly and there isn't much going to be provided by this application except for basic working of Face and Age detection so the UI will be intuvative and very simple to use with the functionality to add more features later on as there is a lot research that can be held even after this project is made.

User Interface:

The User interface of this App will consist of basic functionality which will be either get the picture from gallery or take to the photo from within the app from where the basic algorithms will work and give the predicted results.

2.2.4. Operating Environment

The Software requires the basic Android compatible Environment preferably Android 9 and above. The hardware should at least have powerful chipset to operate smoothly with 4 GB or above RAM and 60 MB or above Disk Space. The Software should with all these requirements will work properly and smoothly without any deficiency.

2.2.5. Design and Implementation Constraints

The software will only have the issue if it is not operated in the Recommended requirements. As there is not external involvement in this project so the software will work without any external policy involvement. Yes the software will have issue if it is not updated regularly and maintained by the Software Developers.

2.2.6. User Documentation

These are user documentation list. As follow:

- Minimum hardware and software requirements
- Installation guide
- How to start the system?
- How to use different features of the system
- Screenshots explaining main features of the system
- Example inputs and outputs
- Explanations of error messages and troubleshooting guides
- Information to contact the developer of the system if an undocumented question arises

2.2.7. Assumptions and Dependencies

- It is assumed that compatible Android devices will be available before the system is installed and tested.
- It is assumed that the User will have enough to effectively use the system.

2.3. External Interface Requirements

2.3.1. User Interfaces

User interface is the screen which will interact with the user, it has to be interesting so that it will entice its user to use it. It should also be easy to use and navigate so that the user is not Project confused. Help dialogue boxes should be available if any help needed. User can distinguish all operation easily because of arranging of all the components.

2.3.2. Hardware Interfaces

Only the recommended configuration (basic requirements of a computer system and mobile phones) no other specific hardware is required to run the software. For this application user simply needs an Android or IOS phone with minimum 2GB RAM and 2 GHz processor, also active mobile connection and GPS is also needed.

2.3.3. Software Interfaces

Interfaces of this application will be user friendly so that the user could easily interact with system. User will be able to identify all of the functionality separately.

- Operating Systems for PC
- IOS and Android operating systems for mobile application
- 2 to 3 buttons to operate the whole application

2.3.4. Communications Interfaces

This Project is very much depended on its Database where when the data is entered it will make the data and it's Information available to its' users. Also when we will add the functionality of Login or Sign-Up whenever a user logs in it will also have an automated message generated and sent to the e-mail of the user as Security is our No.1 Priority.

2.4. System Features

Functional Requirements:

There are different functions that the system will perform both on the front-end of the application and the back-end operations:

- Start Page (This page contains 2 buttons)
    - Take Picture
    - Choose from Gallery

- User will be able to take picture using the mobile camera from within the app.
- User will have option to choose picture from Mobile Gallery
- There will be Results Page that will give information about the Picture in question
- On the back-end different operations will occur
    - Face Recognition
    - Age Predication
    - Gender Recognition

- The system will recognize the Face from the Picture using CNN
- After detecting face Age Algorithm will work on it.
- After Age, Gender Algorithm will work to check if the subject is Male/Female.
- The above functionality will be achieved using AI algorithm CNN which will work with OpenCV to perform different tasks.

Non - Functional Requirements:

Performance of this application is very efficient and responsive. It takes about 0.0002 seconds in response from backend to server. All functions are responsive and take less than no time and are very accurate experience and performance vise.

- Maintainability
- Availability
- Capacity
- Reliability

2.4.1. System Feature 1

Application Management:

2.4.1.1 Description and Priority

This part of the software will perform the simple task of saving and keeping and taken photos from within the app.

2.4.1.2 Stimulus/Response Sequences

- Press Camera Button
- Use Mobile Camera

2.4.1.3 Functional Requirements

Table 2: System Feature 1 Functional Requirements

REQ-SF2-1:	Taking Photos
REQ-SF2-2:	Saving in Gallery
REQ-SF2-3:	Giving Unique ID to the photo
REQ-SF2-4:	Save or Delete the photo
REQ-SF2-5:	Use Photo

2.4.2 System Feature 2

Description of Photo:

2.4.2.1 Description and Priority

In this part the user will be able to see the details of the photo like what is it's age and gender which the software will provide.

2.4.2.2 Stimulus/Response Sequences

- User will be able to see the Picture detail
- User will be able to see estimations provided

2.4.2.3 Functional Requirements

Table 3: System Feature 2 Functional Requirements

REQ-SF2-1:	Picture details will be provided
REQ-SF2-2:	Estimations of the photo based on the application is provided

2.5 Other Nonfunctional Requirements

2.5.1 Performance Requirements

Performance of this application is very efficient and responsive. It takes about 0.0002 seconds in response from backend to server. All functions are responsive and takes less than no time and is very accurate experience and performance vise.

- Maintainability
- Availability
- Capacity
- Reliability

2.5.2 Safety Requirements

Following are the safety requirements:

- There should be option to select or remove the photo from the app.
- Option to save picture details
- Gallery cannot be accessed without the user permission

2.5.3 Security Requirements

Security is one of our top priorities no data will be shared and be transferred to the other applications even the gallery will be accessed with the users' own permission. All the data will only be saved in the users' own mobile. This will solve all of the security problems as their data will be stored in a Local Database.

2.5.4 Software Quality Attributes

Quality attribute requirements such as those for performance, modifiability, security, reliability and usability have a significant influence on the software architecture of the system.

2.5.5 Business Rules

As it is simply our FYP so we yet have to make business rules but further in future. To write the business rules one should know the basic business environment in which we are going to give our product. Business Rules are the part which can be discussed with a Business Student and know the basic Information of the Business studies.

2.6 Other Requirements

As all the user data is going to be saved in the local storage of the their own mobile so Security will be of no issue. One the application will be pressed it will show the user the loading page after that user will be given options from which the user wants to upload photo. When the Photo of the user is selected the Algorithms will work on it and will produce the results related to the image on the new Page.

Chapter 3

Use Case Analysis

Chapter 3: System Analysis

This chapter is all about analysis of Age and Gender Detection System. It contains use cases and test cases in full description. We are going to cover context models, interaction model, behavior model, structured models, model-driven engineering.

3.1. Use Case Model

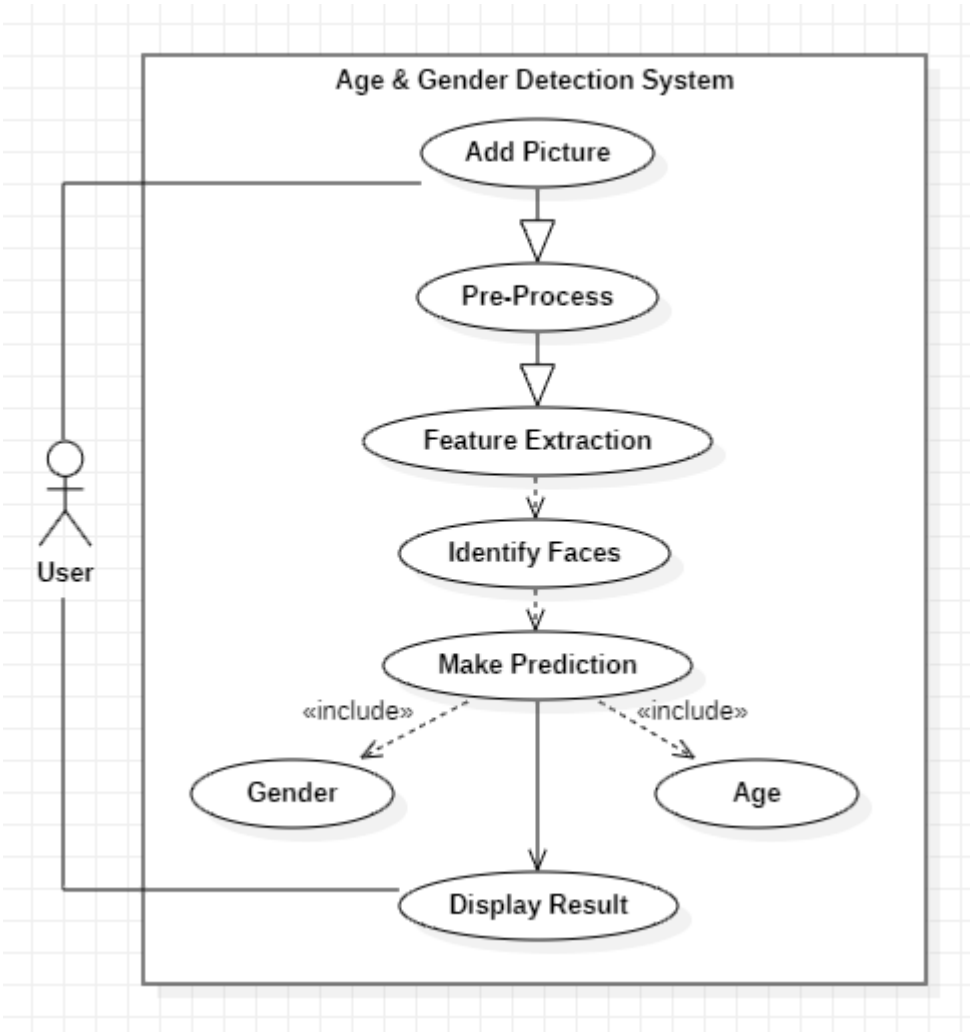

Figure 3: Use Case Model

3.2. Use Cases

3.2.3. Use Case for User

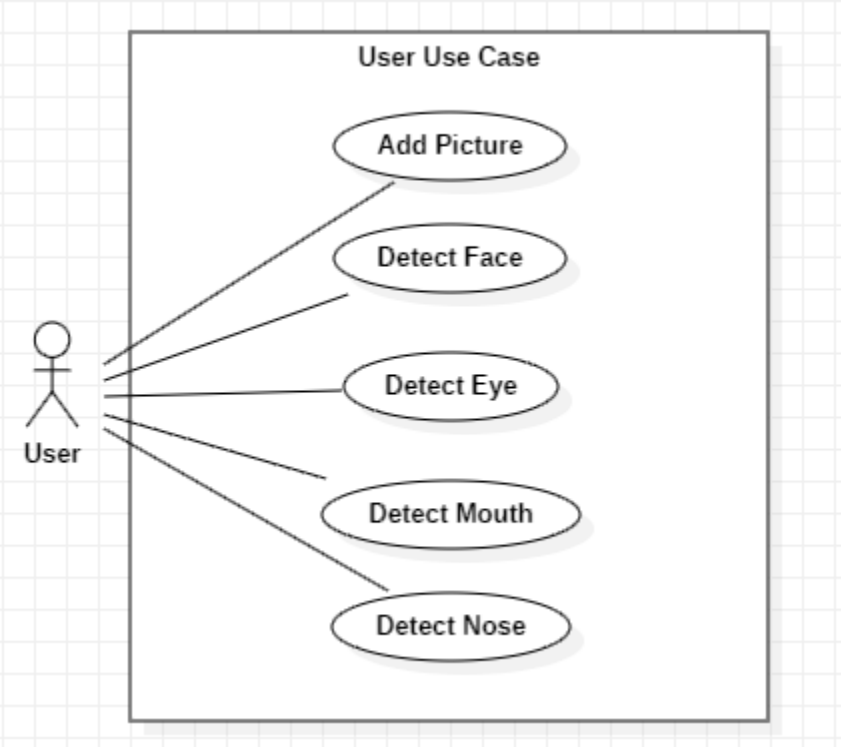

Figure 4: Use Case for User

3.3. Fully Dressed Use Case

Table 4: Fully Dressed Use Case

Uses Case Name	Age and Gender Detection System
Created by	Ata Ur Rehman
Creation Date	28- 11- 2021
Actors	User, System,
Description	In above use case diagram, the implementation contain six steps. • User select the image of human being • System receive input from the user • In this stage system extract all the feature which is define in the system about image processing. • Identify faces and prepare these images for the 2 deep learning models, i.e. age and gender • Send processed faces to the models and receive prediction outcomes • Render prediction outcomes on the screen
Data	User select any human image, System predict age and gender of selected image.
Pre-Condition	To use the software the user must know about the system procedure.
Post-Condition	The system is capable of handling the image which is enter by user, predict age and gender about that image.
Primary Actor	System
Secondary Actor	User

Chapter 4

System Design

Chapter 4: System Design

This Chapter is all about the diagrams for our project. The purpose to create each diagram is to clearly define what and when the project will do what and how the project will be taken ahead. There is much that is yet to understand about the project so with the most basic knowledge of our FYP we have created few of the diagrams which will tell us and define our project to the users or more advance people such as computer developers.

4.1. Architecture Diagram

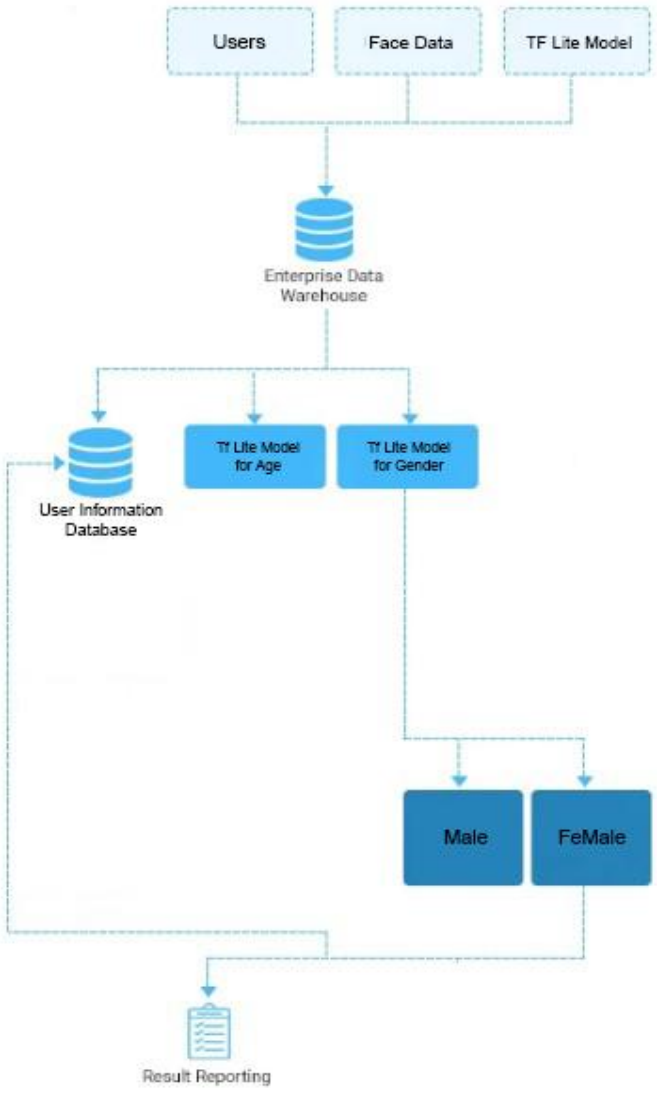

Figure 5: Architecture Diagram

4.2. Domain Model

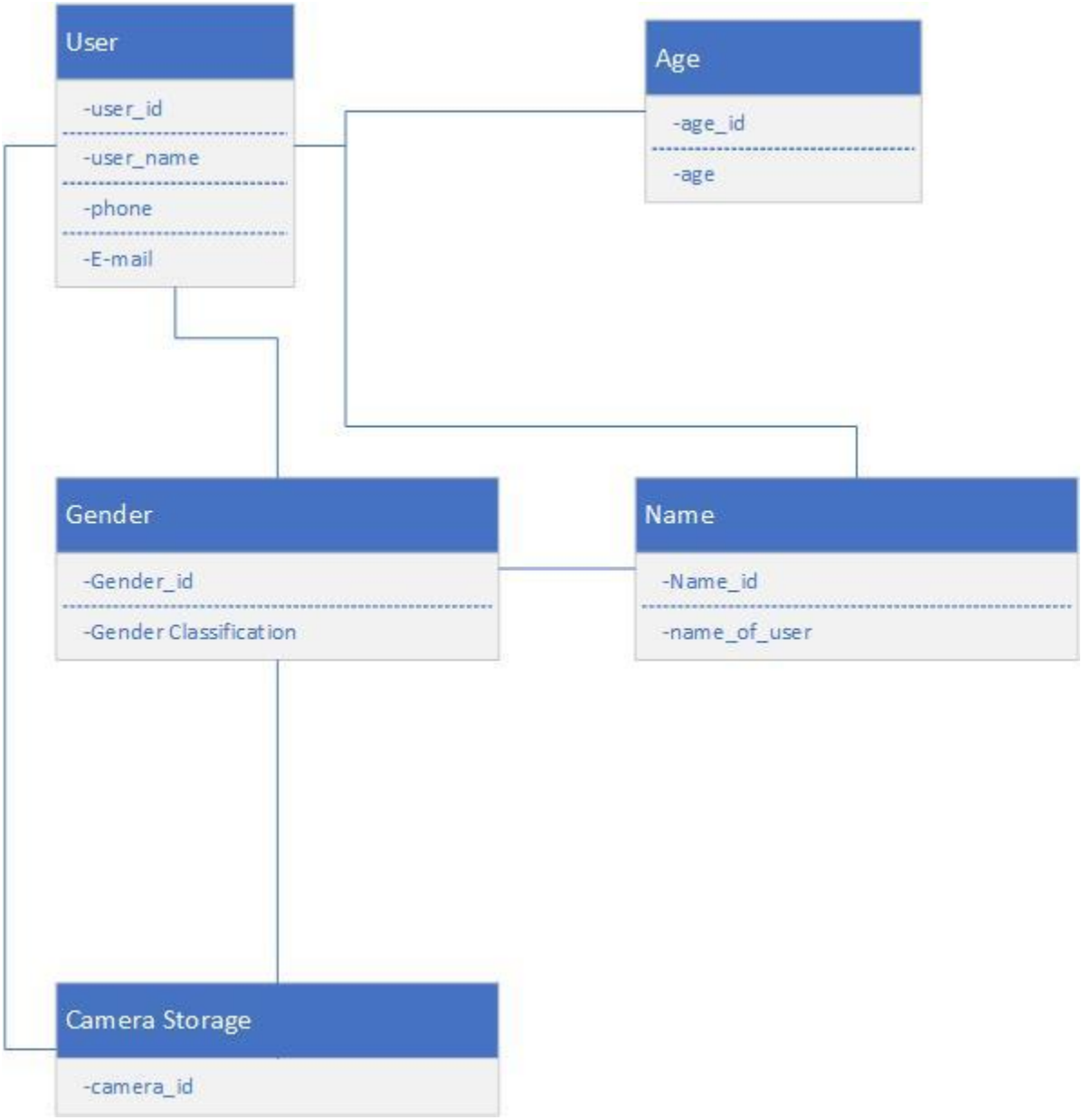

Figure 6: Domain Model

4.3. Entity Relationship Diagram

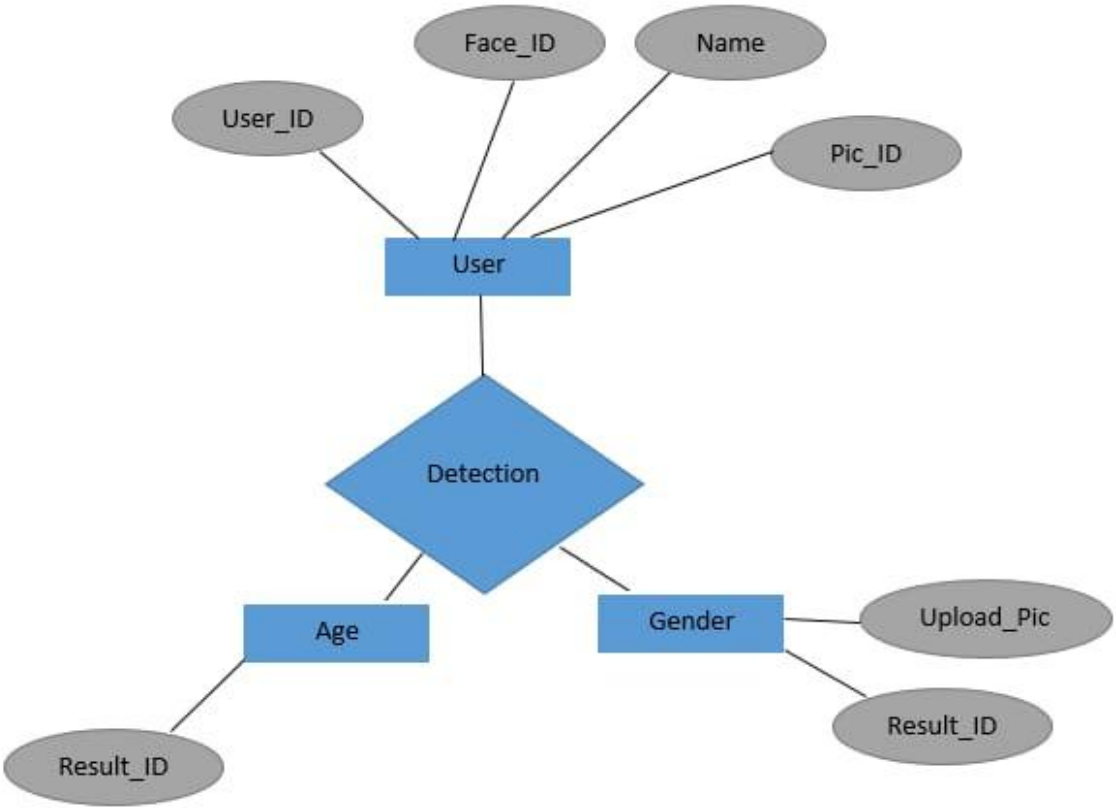

Figure 7: Entity Relation Diagram

4.4. Class Diagram

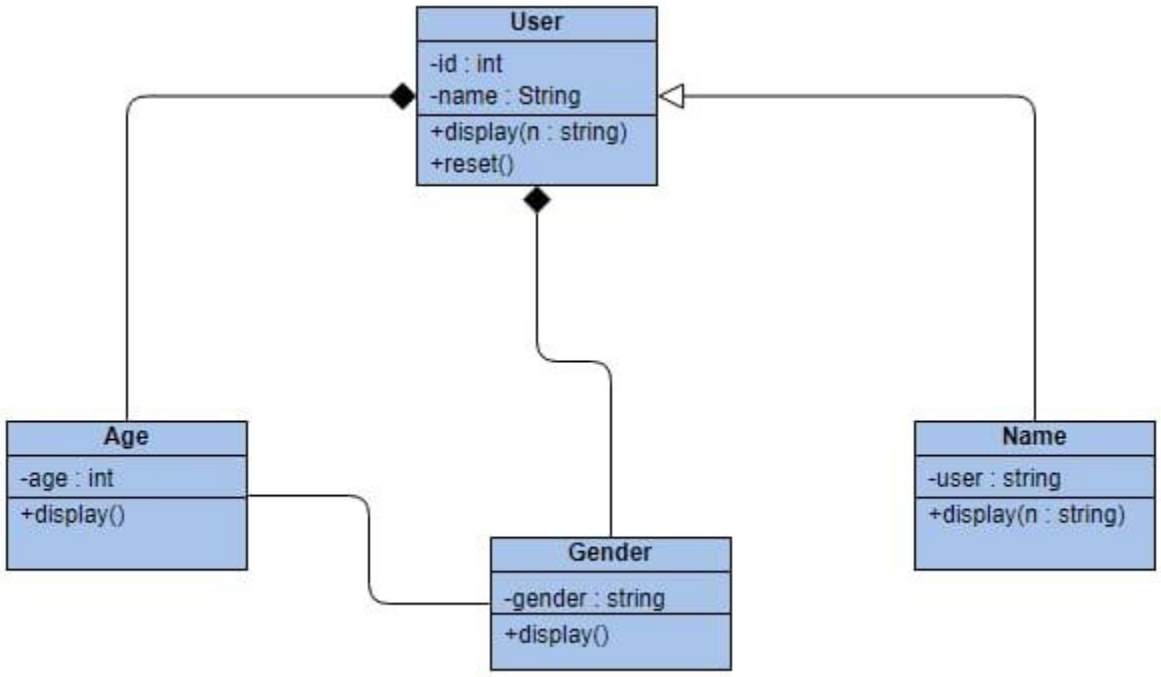

Figure 8: Class Diagram

4.5. Sequence / Collaboration Diagram

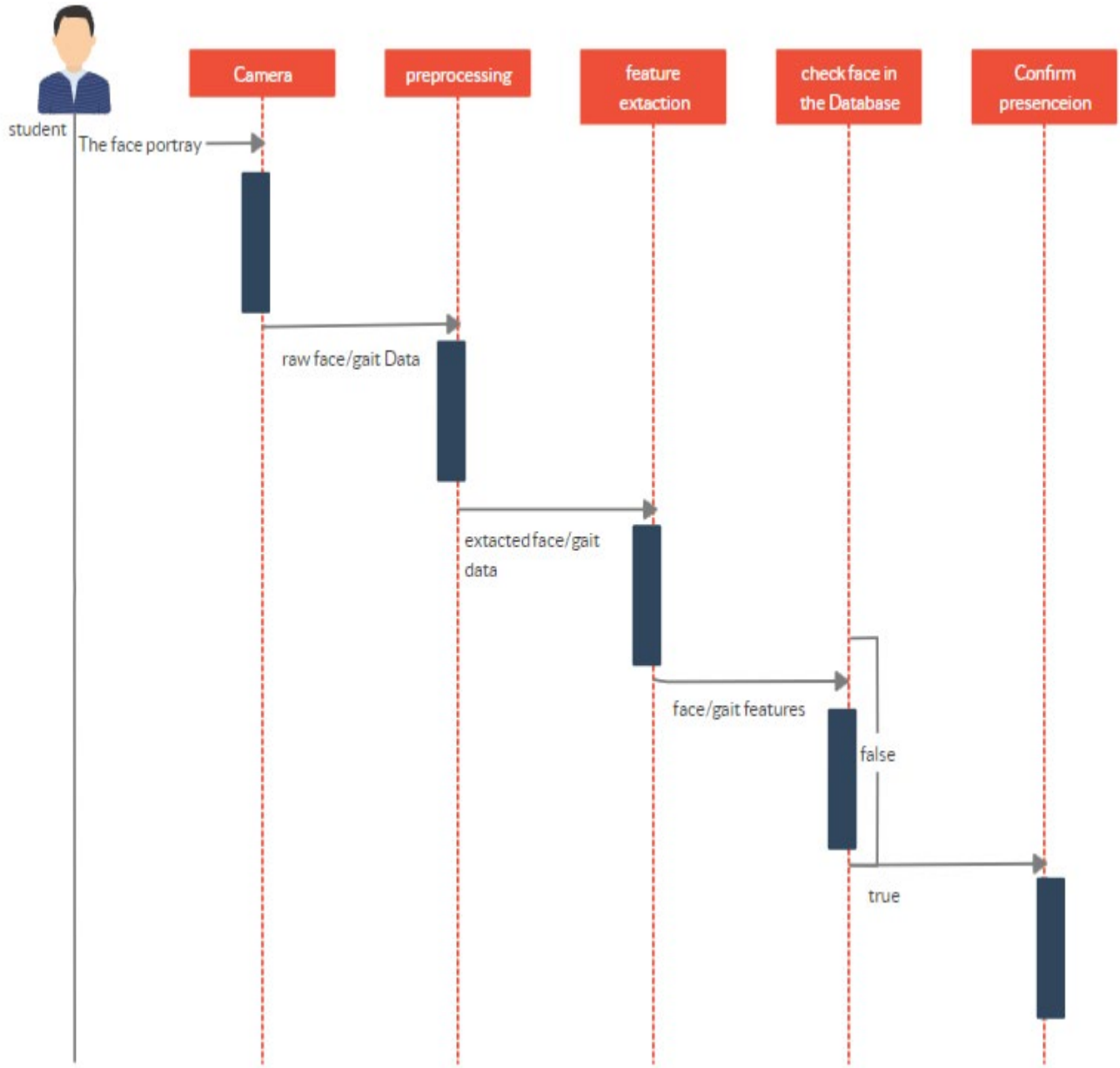

Figure 9: Main Sequence Diagram

4.5.1 Sequence For different operations

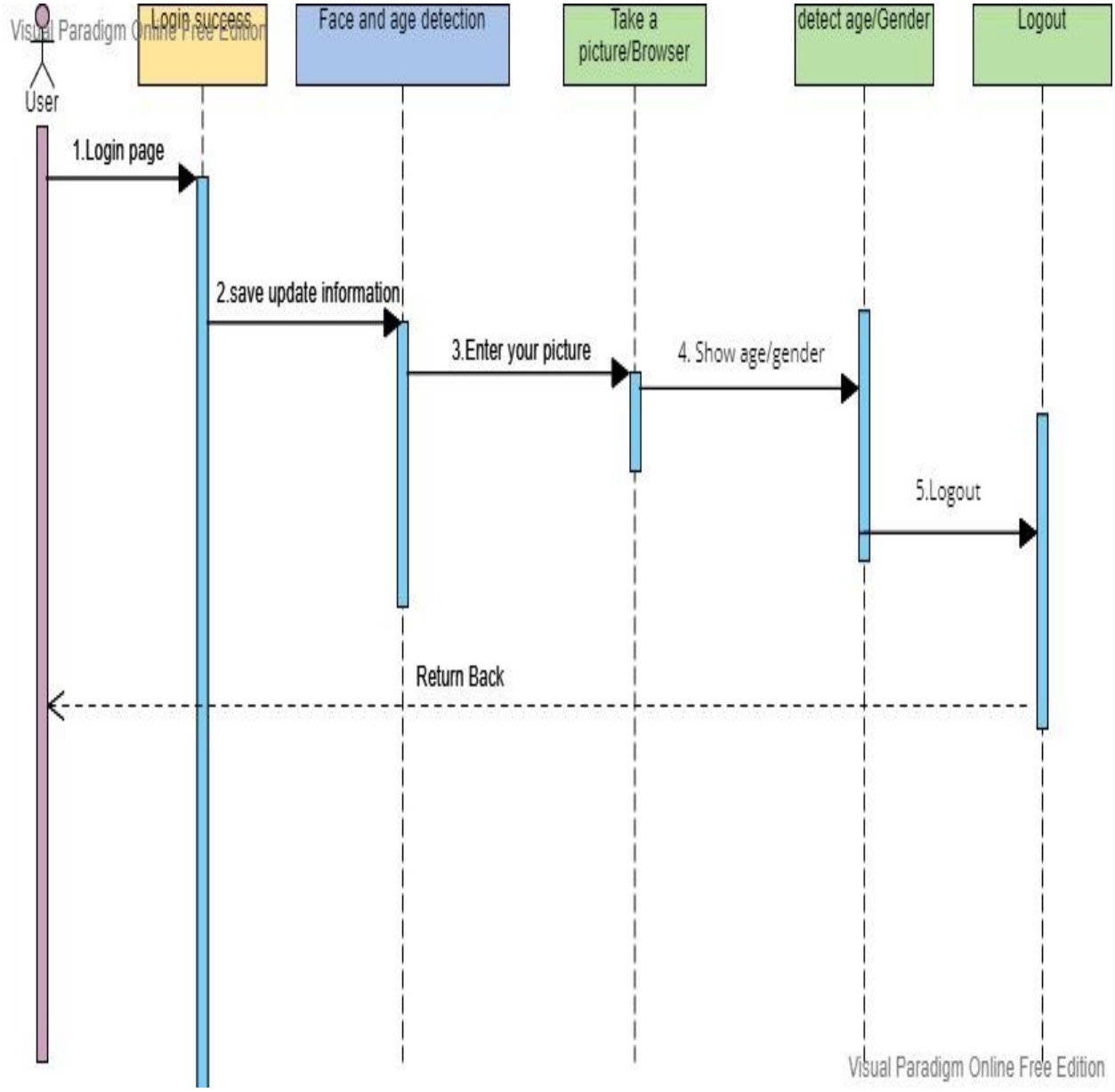

Figure 10: Sequence Diagram for Age & Gender

4.6 Operation contracts

Figure 11: Operational Contracts

4.7 Activity Diagram

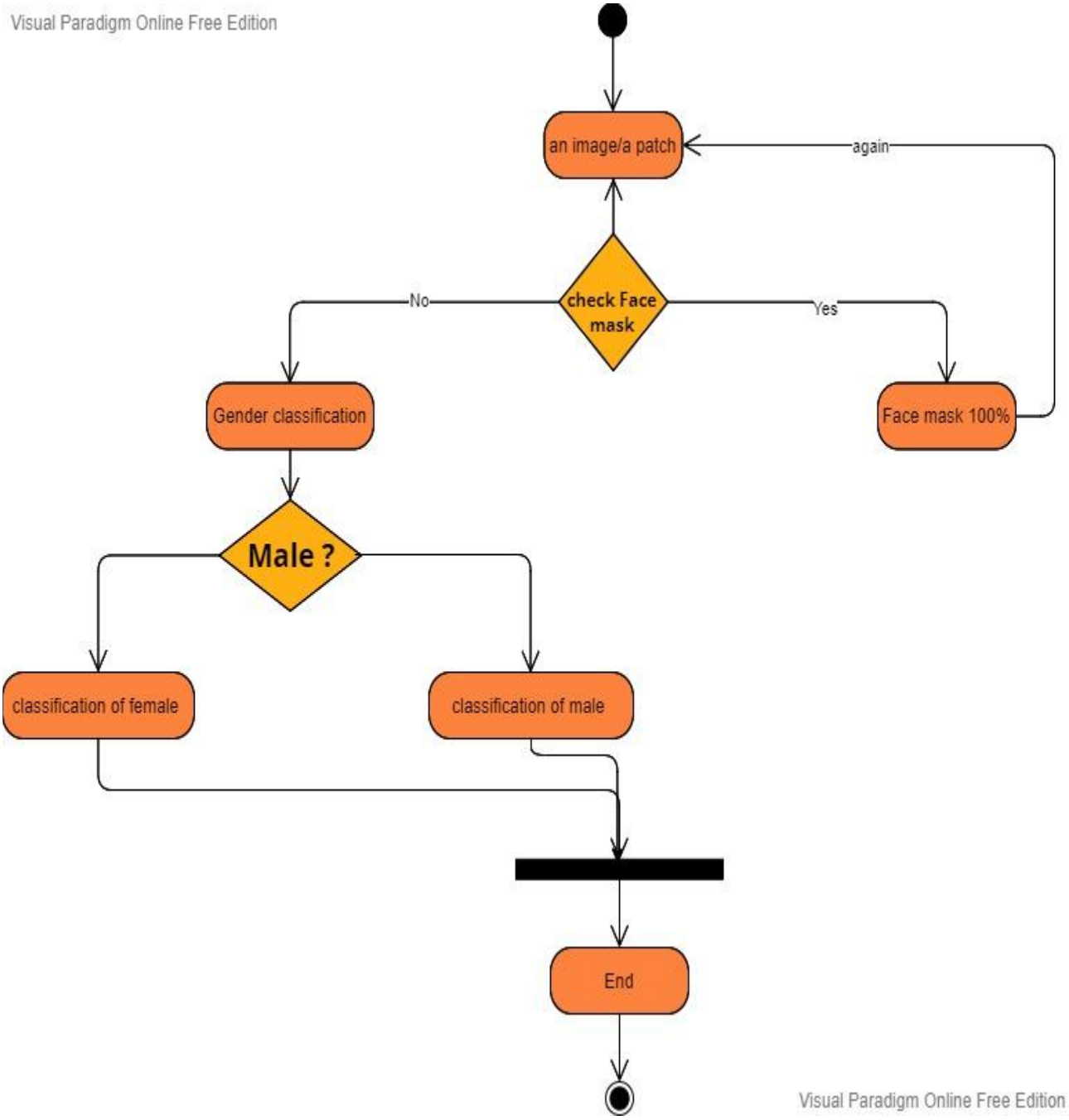

Figure 12: Activity Diagram

4.7.1 Activity Diagram for GYM

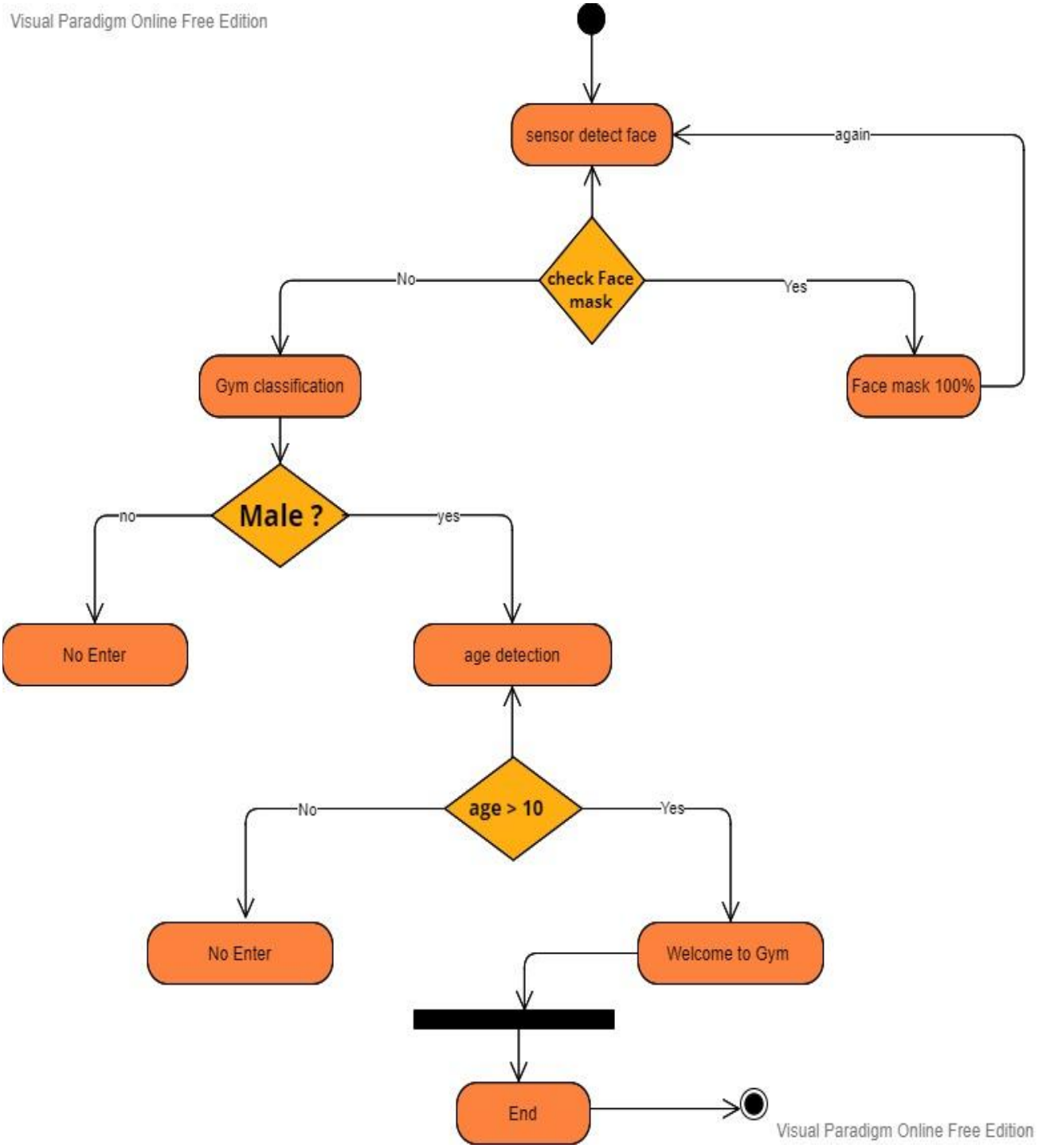

Figure 13: Activity Diagram for GYM

4.8 State Transition Diagram

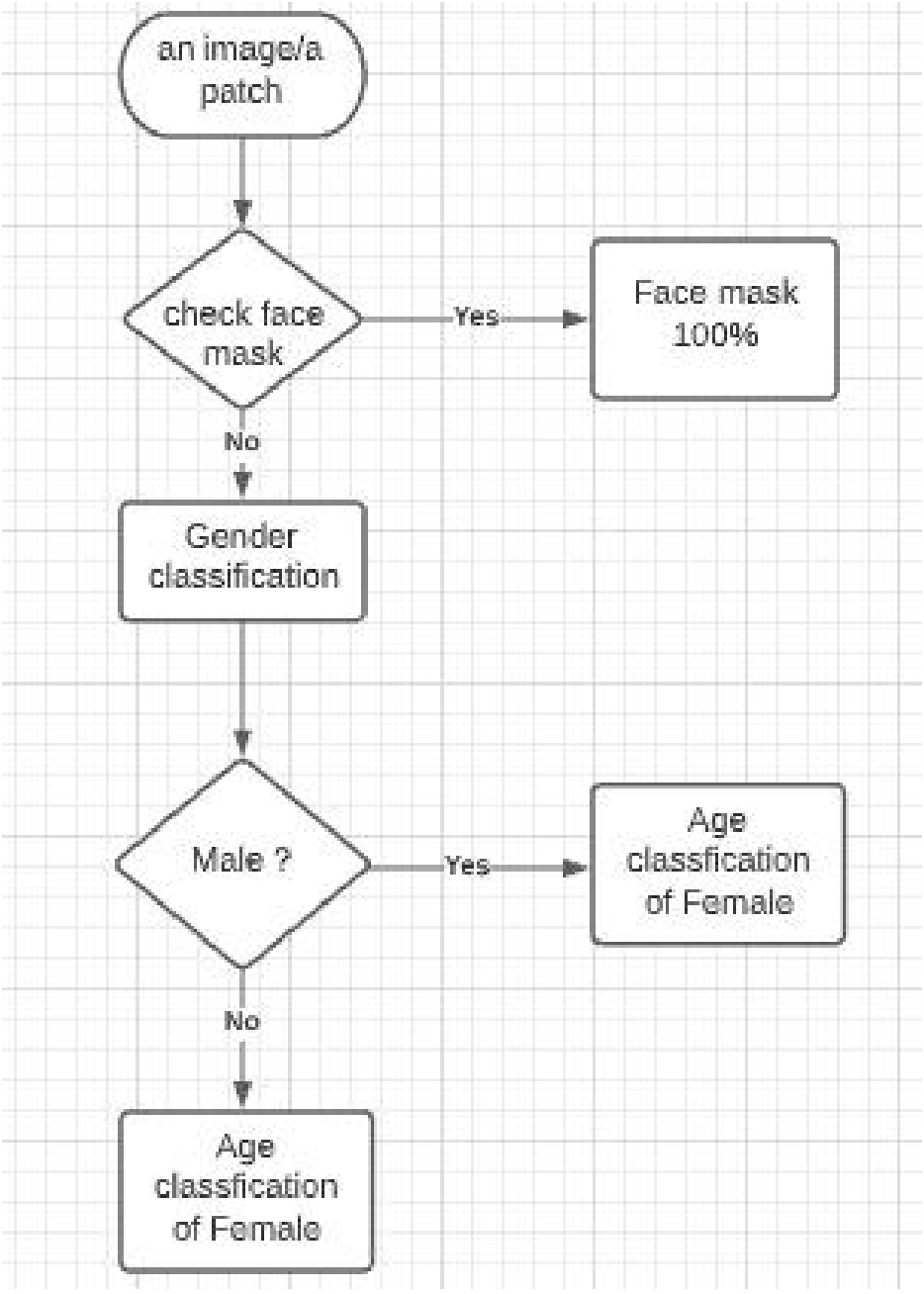

Figure 14: State Transition Diagram

4.9 Component Diagram

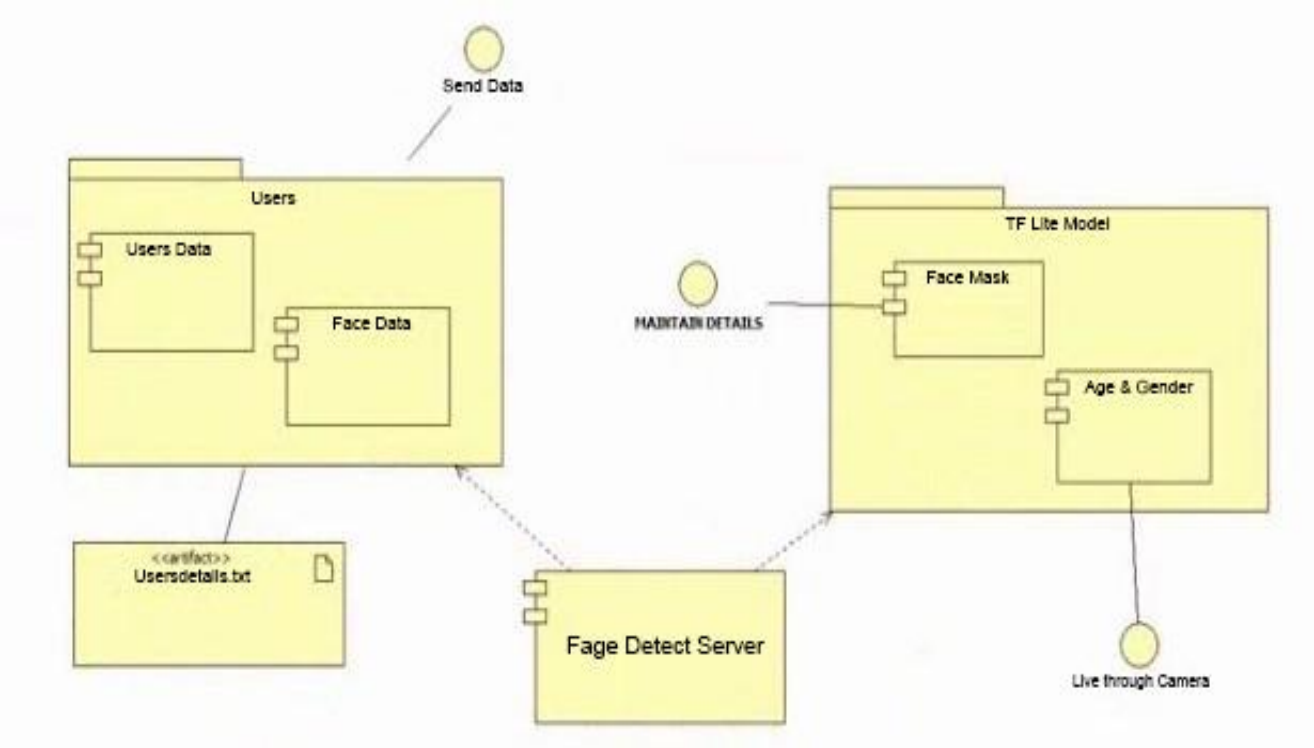

Figure 15: Component Diagram

4.10 Deployment Diagram

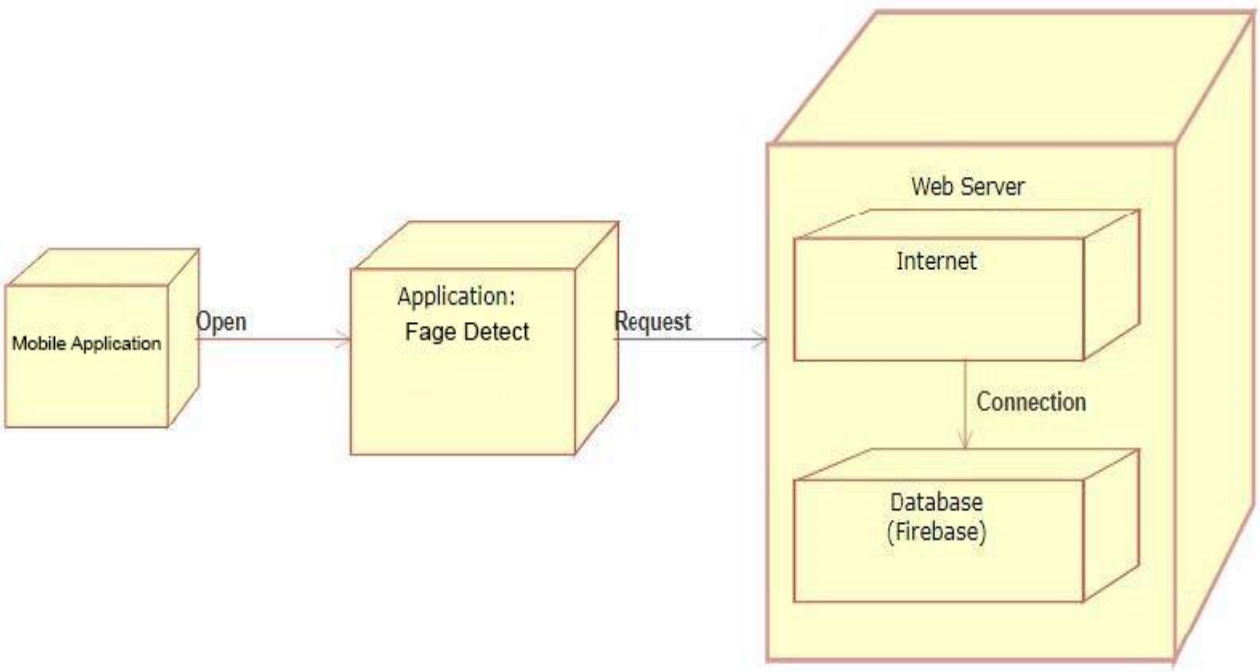

Figure 16: Deployment Diagram

4.11 Data Flow diagram

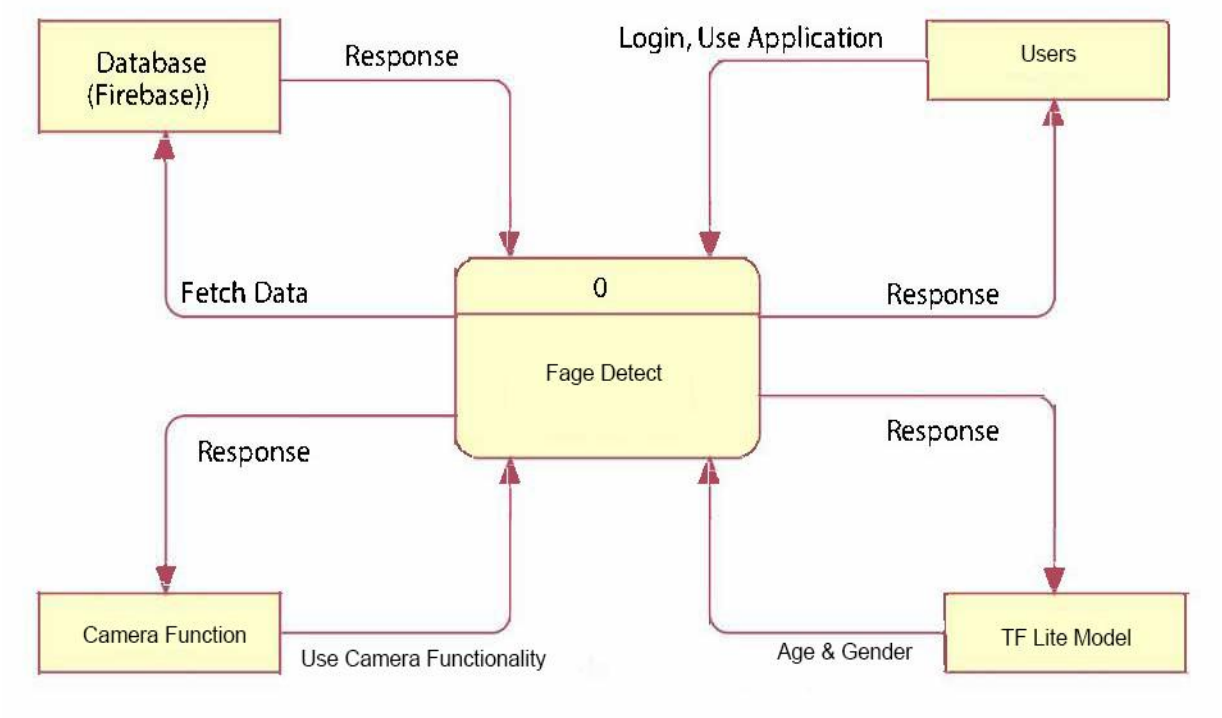

Figure 17: Data Flow Diagram

Chapter 5

Implementation

Chapter 5: Implementation

In this documentation we talk about different features of the current program “Face and age detection”. You know that This system is overall based upon different working software and languages which we combined to achieve the fully developed software. These all features were achieved using different set of software’s at different points. The details of these software’s will be discussed below. and different operation perform in different domain.

5.1. Important Flow Control/Pseudo codes

Different types of Flow of Control which are given below:

- Sequential Flow
- Selection or Conditional Flow
- Iterative Flow

```
ageModel = "age_net.caffemodel"
ageNet = cv.dnn.readNet(ageModel, ageProto)
ageList = ['(0 - 2)', '(4 - 6)', '(8 - 12)', '(15 - 20)', '(25 -
32)', '(38 - 43)', '(48 - 53)', '(60 - 100)']
ageNet.setInput(blob)
agePreds = ageNet.forward()
age = ageList[agePreds[0].argmax()]
print("Gender Output : {}".format(agePreds))
print("Gender : {}".format(age))
label = "{}, {}".format(gender, age)
cv.putText(frameFace, label, (bbox[0], bbox[1]-20),
cv.FONT_HERSHEY_SIMPLEX, 0.8, (255, 0, 0), 3, cv.LINE_AA)
cv.imshow("Age Gender Demo", frameFace)
```

5.2. Components, Libraries, Web Services and stubs

- Firebase Components for storing data in the Database
- Converting KERAS to TFlite for Mobile Detection
- Web services required by Google Collab

5.3. Deployment Environment

The project is target at Audience and the gym management system because of the features that it contains and so on the features will increase as per the Audience and the gym management system. The software also contains the ability to have custom build features in it but for that the costumer may have to contact the developers. The Development Environment used in this is python language and data base are MSQL. and the feature and Requirements is update according to the Audience and customer Requirement.

5.4. Tools and Techniques

Languages used in Gender and age detection:

- Android Studio
- Fire Base
- Python Scripts running in Java using TFLite

5.5. Best Practices / Coding Standards

Defined Life Cycle and Milestones

- Stable Requirements
- Defined Organization, systems and Roles
- Quality Assurance
- Planned Commitments
- Scope and Mission

5.6. Version Control

A system of version control is useful for documents which are likely to be revised and redrafted and where you might need to keep a record of how the document changed over time. It is important that the system is applied systematically and consistently, particularly when a document is updated by different people and at different times. Version Control is usually beneficial for documents such as policies, procedures or regulations.

Chapter 6

Testing and Evaluation

Chapter 6: Testing and Evaluation

In this chapter we are going to talk about different tests and procedures we went our app through as it was a Mobile Application so it needed multiple devices and also multiple operating systems that are currently available in Android Application. As of now our app works from Android 7.1 to Android 12 and we hope to keep sending updates to our app so that it can work on more than these systems.

6.1. Use Case Testing

Table 5: Use Case Testing

Creation Date	05-17-2022							
Reviewed By	M. Humza Riaz							
Reviewed Date	06-22-2022							
Test Scenerio Description	**Test Case ID**	**Test Case Description**	**Test Steps**	**Test Data**	**Pre-Condition**	**Post-Condition**	**Expected Result**	**Status**
Add Picture	TC-FYL-01	Upload the Face of Human being into the system	1. Upload the photo by clicking on the button upload Photo 2. Select the Photo from your System	User Picture	1. User must have a valid and correcponding test Data	User able to view the result	Age & Gender	Pass
Face Camera	TC-FYP-02	Open the App and Face the Back Camera towards the human being	1. Open the App 2. Face the Camera towards the human being	Live Picture of the human being as seen by the camera	1. User must have a valid and correcponding test Data	If valid face is shown the result will be displayed else no data on the screen will be shown	Age & Gender	Pass
Check Failure	TC-FYP-03	Open the Application upload or Face the Camera App	1. Open the App 2. Face the Camera towards the human being OR 3. Upload the photo by clicking on the button upload Photo	Live Picture of the human being as seen by the camera OR User Picture	If user has passed incorrect data	Error is shown to user	Error message: The picture uploaded is not correct OR Blank Screen	Fail

6.2. Equivalence partitioning

In this section we will see how different conditions work on our Software as we give different sets of instructions to our system.

Table 6: Equivalence Partitioning

	Equivalence Partitioning	
VALID	**INVALID**	**INVALID**
Gender	**Animals**	**Objects**

6.3. Data Flow testing

```
threadsTextView = findViewById(R.id.threads);
plusImageView = findViewById(R.id.plus);
```

Table 7: Data Flow Testing

Variable Name	Defined At	Used At
threadsTextView	4	12
plusImageView	5	13

6.4. Unit Testing

This here is a testing for cropping he image so that our program can pick it up and analyze the photo the cropping should be done such that only face is remaining in the picture.

```
public void setUp() throws IOException {
  detector =
    TFLiteObjectDetectionAPIModel.create(
      InstrumentationRegistry.getInstrumentation().getContext(),
      MODEL_FILE,
      LABELS_FILE,
      MODEL_INPUT_SIZE,
      IS_MODEL_QUANTIZED);
  int cropSize = MODEL_INPUT_SIZE;
  int previewWidth = IMAGE_SIZE.getWidth();
  int previewHeight = IMAGE_SIZE.getHeight();
```

```
  int sensorOrientation  = 0;
  croppedBitmap  = Bitmap.createBitmap(cropSize,  cropSize, Config.ARGB_8888);

  frameToCropTransform  =
      ImageUtils.getTransformationMatrix(
          previewWidth,  previewHeight,
          cropSize, cropSize,
          sensorOrientation,  false);
  cropToFrameTransform  = new Matrix();
  frameToCropTransform.invert(cropToFrameTransform);
}
```

6.5. Integration Testing

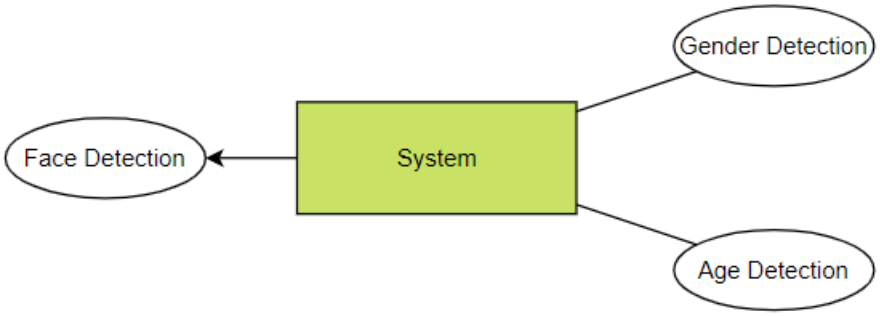

Figure 18: Integration Testing

Chapter 7

Summary, Conclusion and Future Enhancements

Chapter 7: Summary, Conclusion & Future Enhancements

7.1. Project Summary

Face detection applications use algorithms and ML to find human faces within larger images, which often incorporate other non-face objects such as landscapes, buildings and other human body parts like feet or hands. Face detection algorithms typically start by searching for human eyes -- one of the easiest features to detect. The algorithm might then attempt to detect eyebrows, the mouth, nose, nostrils and the iris. Once the algorithm concludes that it has found a facial region, it applies additional tests to confirm that it has, in fact, detected a face. To help ensure accuracy, the algorithms need to be trained on large data sets incorporating hundreds of thousands of positive and negative images. The training improves the algorithms' ability to determine whether there are faces in an image and where they are.

7.2. Achievements and Improvements

- Incorporate application development into business strategic planning
- Change the scope of responsibilities for application developers
- Stick with vendor best practices
- Be judicious in how you employ “custom” code
- Document
- Standardize mobile devices
- Evaluate application utility

7.3. Critical Review

This documentation asserts that the software research literature describes open source software development (OSSD) as a homogenous phenomenon. Through a discourse analysis of the software research literature, it is argued that the view of software product as a homogenous phenomenon is not grounded in empirical evidence. Rather, it emerges from key assumptions held within the SE research discipline about its identity and how to do SE research. As such, it is argued that the view of OSSD as a homogenous phenomenon may constitute a systematic bias

in the SE research literature. Implications of this are drawn for future SE research to avoid reproducing this bias.

7.4. Lessons Learnt

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.

7.5. Future Enhancements/Recommendations

Finally, we use the original dataset (OIU-Audience 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-Audience 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.

Appendices

Appendix A: Information / Promotional Material

Our Promotional Material currently includes different things all these promotional materials are used or some of them will be used in our FYP Campaigns. These materials are just to elaborate and present the idea to the basic human being who does not know about the technology and it's working.

A.1. Standee

Reference and Bibliography

Reference and Bibliography

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