AGE AND GENDER PREDICTION USING CONVOLUTIONAL NEURAL NETWORK

A PROJECT REPORT

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BONAFIDE CERTIFICATE

Certified that this project report titled **"AGE AND GENDER PREDICTION USING DEEP LEARNING"** is the Bonafide work of "**M.Shraddha (20BAI10034), Lakshay Tyagi(20BAI10173), Nishi Jain(20BAI10196), Hemanth Varma(20BAI10225)"** who carried out the project work under my supervision. Certified further that to the best of my knowledge the work reported at this time does not form part of any other project/research work based on which a degree or award was conferred on an earlier occasion on this or any other candidate.

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LIST OF FIGURES

LIST OF ABBREVIATIONS

Sl. No.	Abbreviation	Full form
1	CV	Computer Vision
2	IDE	Integrated Development Environment
3	HTML	Hypertext Markup Language
4	ETC	Et cetera
5	CSS	Cascading Style Sheet
6	GB	Giga Bytes

ABSTRACT

Age and Gender are the central features of our personality and a significant element of our social life. A prediction model, able to accurately predict age and gender can play a vital role in the advancement of many fields, such as health, cosmetics, electronic commerce etc. Artificial intelligence age and gender predictions stand at a crucial position in the human-machine interface growth. Additionally, an accurate model can be used for safety purposes such as detecting fake accounts on different social media platforms. The prediction of people's age and gender is an ongoing and active problem of research. Though there have been a number of methods suggested by researchers to solve this problem, here a deep learning algorithm is used to extract the age and gender, using images. It has been made a classification problem to guess the age and gender with utmost accuracy and overcome the challenges of makeup, lightning, obstructions, facial expressions etc.

Overall, the purpose of this model is to predict the age and gender of a person. Safety being the paramount, the model can be used to eliminate unreal accounts online and increase the authenticity of the user, ultimately making social media platforms more trustworthy and safer to use. The methodology used here for the same is deep learning algorithms. The problem has been accounted as a classification one instead of a regression one. Along with this, a user interface has been built to smooth the use of the model.

CONTENTS

Chapter 1

PROJECT DESCRIPTION AND OUTLINE

1.1 Introduction

The aim is to predict the age and gender of individuals using image data sets. The main concern is to process the image. The upgrading of image pictures taken from the camera sources, from satellites, airplanes, and the images caught in everyday life is called picture processing. Processing of the image based on the analysis undergoes many different techniques and calculations. Digital formed pictures need to be carefully imagined and studied. For gender prediction, the model will predict in the categories of whether the picture is male or female. For age prediction, it will predict the age of the person in the image in the following ranges i.e., 0-2, 4-6, 8-12, 15-20, 25-32, 38-43, 48-53, 60-100.

1.2 Motivation for the work

In the era where privacy and security are paramount, a model which can add value to the society in order to escalate transparency of the users would be of great help. A growing number of applications, especially after the increase in social media, are being concerned with automatic age classification. In smart applications, such as access control, human computer interaction, enforcement, marketing intelligence and visual supervision, etc., it is important to make age

evaluation using facial image. So, this need of the hour has motivated our team to proceed in our project.

1.3 **Introduction of techniques used in project**

Deep learning algorithms are used to predict the age and gender. Basically, it is OpenCV age detection using deep learning. Deep learning is the class of machine learning algorithms that uses multiple layers to progressively extract the higher-level features from the raw input. As for this model, quality image processing is the key, deep learning has been used so as to get better at results. For example, in image processing, lower layers may identify edges, while higher layers may identify the concepts relevant to a human such as digits or letters or faces.

Another technique used is OpenCV, OpenCV being a great tool for image processing and performing computer vision tasks, helps to even better the quality of result. It is an open-source library that can be used to perform tasks like face detection, objection tracking, landmark detection, and much more.

1.4 **Problem Statement**

The reliability of existing models that predominantly use regression models makes it cumbersome to yield accurate output. Sometimes, humans may struggle to correctly identify the age of the person on the first go, so machines are bound to face challenges. Thus, categorizing the work as a classification problem may serve the problem and may yield more authentic outcomes.

1.5 **Objective of the work**

The objective of the work is to build an age and gender predictor using deep learning algorithms which can primarily serve in making social media platforms more authentic and transparent. Also, it can be used in the growth of human machine interface.

1.5 **Summary**

Automatic age and gender classification has become relevant to an increasing amount of applications, particularly since the rise of social platforms and social media. Nevertheless, performance of existing methods on real-world images is still significantly lacking, so here using more advanced technologies of artificial intelligence, a model is built to get utmost accuracy.

Chapter 2

RELATED WORK INVESTIGATION

2.1 **Introduction**

The researchers have suggested a number of methods to solve the problem, but the criteria and actual performance is still inadequate. Here, the prediction is done using a deep learning algorithm. Instead, in many works, machine learning has been primarily used, in which a statistical pattern recognition approach is used. Some existing works also focus on using the Convolutional Neural Network (ConvNet/CNN), a deep learning algorithm for extracting the features from images. This CNN algorithm requires much less preprocessing than other classification algorithms.

2.2 **Core Area of Project**

The domain of the project is deep learning. Deep Learning can be considered as a subset of machine learning. It is a field that is based on learning and improving on its own by examining computer algorithms. While machine learning uses similar concepts, deep learning works with artificial neural networks, which are designed to imitate how humans think and learn.

2.3 **Existing approaches**

An existing approach is using machine learning algorithms for age and gender prediction emphasizing on libraries like Keras and TensorFlow. Also, for user interface, the framework used in

this project is Flask but an alternative existing approach is Django. Also, one of the existing approaches is to use a regression model instead of making it a classification problem as done here.

2.4 **Pros and cons of the stated approaches**

Pros of using machine learning approaches are:

- It can train on lesser data.
- It takes less time to train.

Cons of using machine learning approaches are:

- It used algorithms to parse data, learn from that data, and make informed decisions based on what has been learned.
- The output is in numerical form for classification and scoring applications.
- It has limited tuning capability for hyperparameter tuning.

Pros of taking the problem as regression and not classification:

- It could give the exact age of the individual.

Cons of taking the problem as regression and not classification:

- If an exact age number is given as output, the probability of getting it correct would be less and hence it could question the efficiency of the model to an extended extent.

2.5 **Issues and observations from investigation**

Based on our research, the issues of better accuracy and limited tuning capability can be solved using deep learning ways. It is because of the fact that deep learning structures algorithms are used in layers to create an artificial neural network that can learn and make intelligent decisions on its own. Also, it can yield output in any form including free form elements such as free text and sound. Here rather than having an exact age number, age brackets have been discretized, ultimately making it a classification problem instead of a regression problem.

2.6 **Summary**

There are existing works that solve age and gender prediction by considering it a regression problem but age prediction is inherently subjective and based solely on appearance, considering it as a classification problem helped serve the purpose more.

Chapter 3

REQUIREMENTS ARTIFACTS

3.1 **Hardware requirements**

- System: intel i5 2.1 GHZ
- Memory: 8GB
- Hard Disk: 1TB

3.2 **Software requirements**

- Operating System: Windows 8 and above
- Domain: Deep Learning
- Scripts: Python, HTML, CSS, JavaScript
- Tools: Anaconda Navigator, Jupyter Notebook IDE, Visual Code Studio
- Libraries: OpenCV, Argparse, Flask

3.3 **Specific project requirements**

In this python project, the models are trained by Tal Hassener and Gil Levi. The Adience dataset is used here. The dataset serves as a benchmark for face photos and is inclusive of various real-world imaging conditions like noise, lighting, pose, and appearance. The images have been collected from Flickr albums and distributed under the Creative Commons (CC) license. It has a total of 26,580 photos of 2,284 subjects in eight age ranges (as mentioned above) and is about 1GB in size. The models that are used had been trained on this dataset.

Chapter 4

DESIGN METHODOLOGY AND ITS NOVELTY

4.1 **Methodology**

Typically, the age and gender prediction has been implemented as a two-stage process:

Stage1: Detect faces in the input image.

Stage2: Extract the face of interest and apply the age and gender detector algorithm to predict the age and gender of the person

4.2 **User Interface Designs**

For the user interface, a flask framework has been used. Flask is a small and lightweight Python web framework that provides useful tools and features that make creating web applications in Python easier. It gives developers flexibility and is a more accessible framework for new developers since you can build a web application quickly using only a single Python file. Also, HTML, CSS and JavaScript have been used for structural and design purposes.

Fig 1: User Interface

4.3 **Functional Model Design**

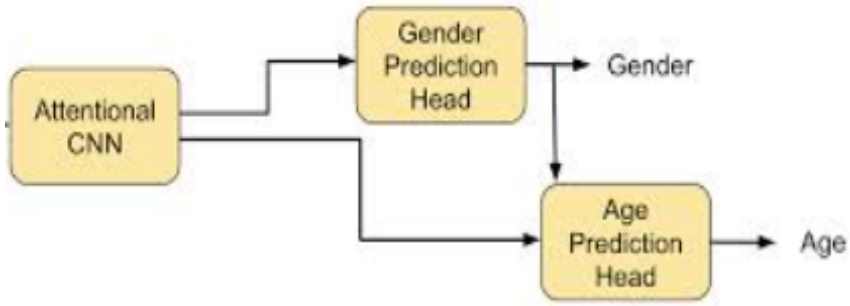

Fig 2: Module Workflow

4.4 **Software Architectural Design**

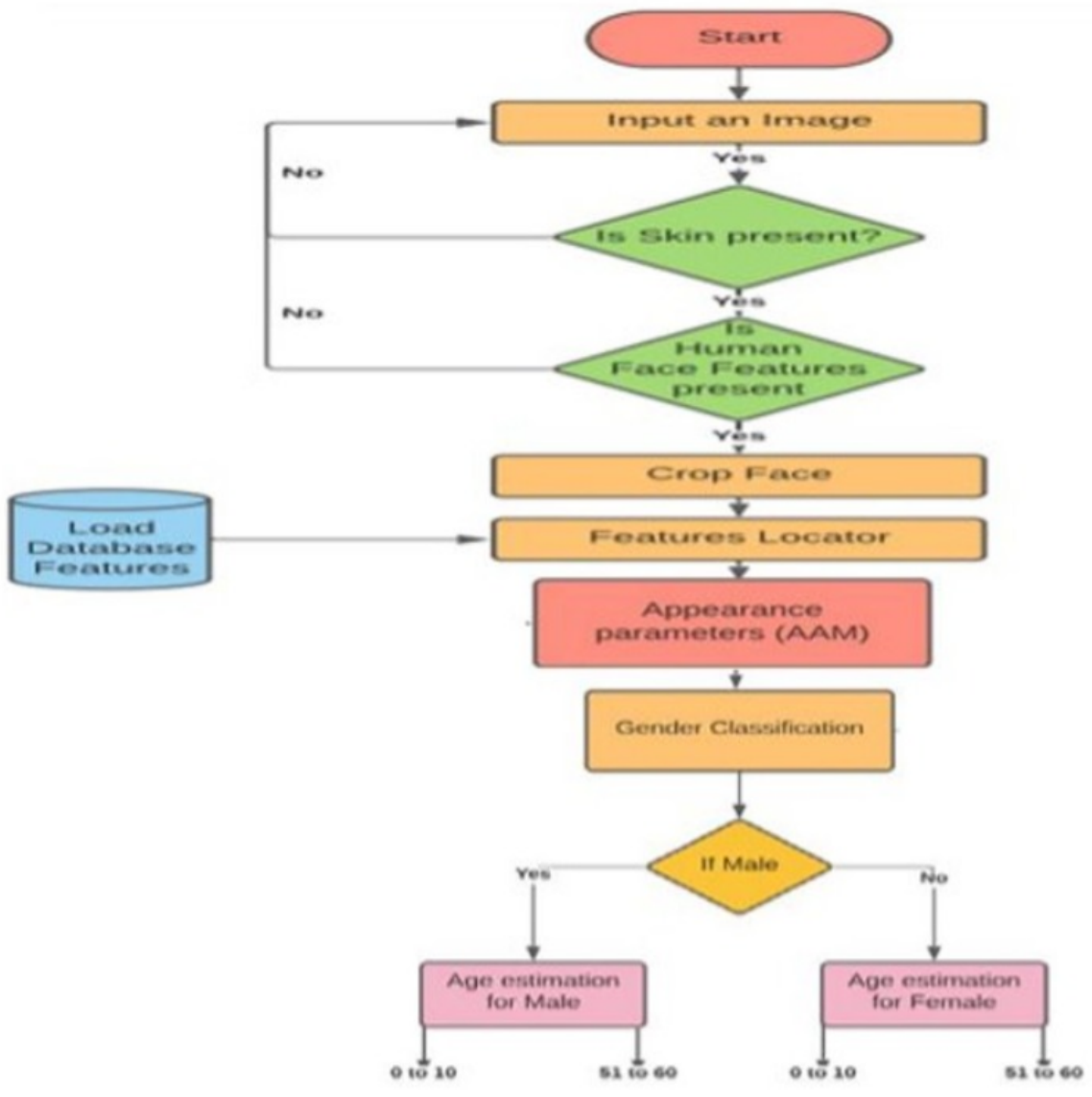

Fig 3: System Architecture

4.5 **Summary**

The work of the project has been divided into steps as mentioned before. Along with this, the novelty of the project also stands at a pivotal position. The prediction model is worth using this at various social networking platforms to make ids more authentic and to remove fake accounts.

Chapter 5

TECHNICAL IMPLEMENTATION AND ANALYSIS

5.1 **Outline**

In this project, Convolutional Neural Network (ConvNet/CNN), a deep learning algorithm for extracting the features from images has been used. This CNN algorithm requires much less preprocessing than other classification algorithms.

5.2 **Technical coding**

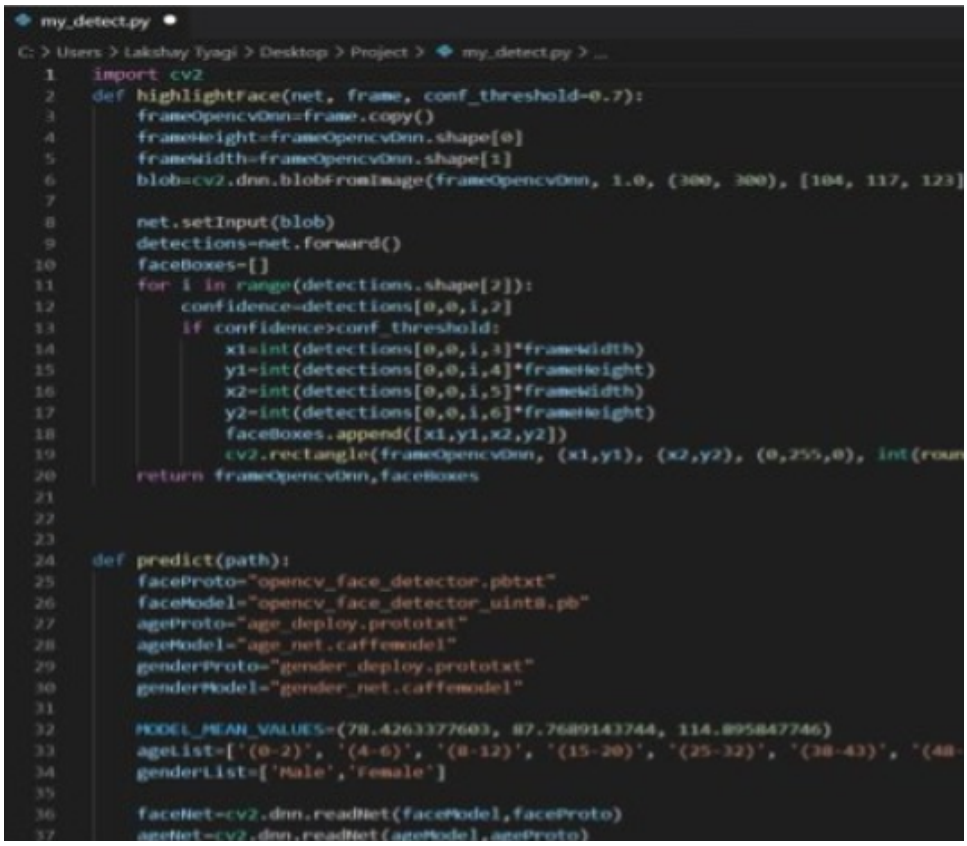

Fig 4.1: Technical Coding Part-I

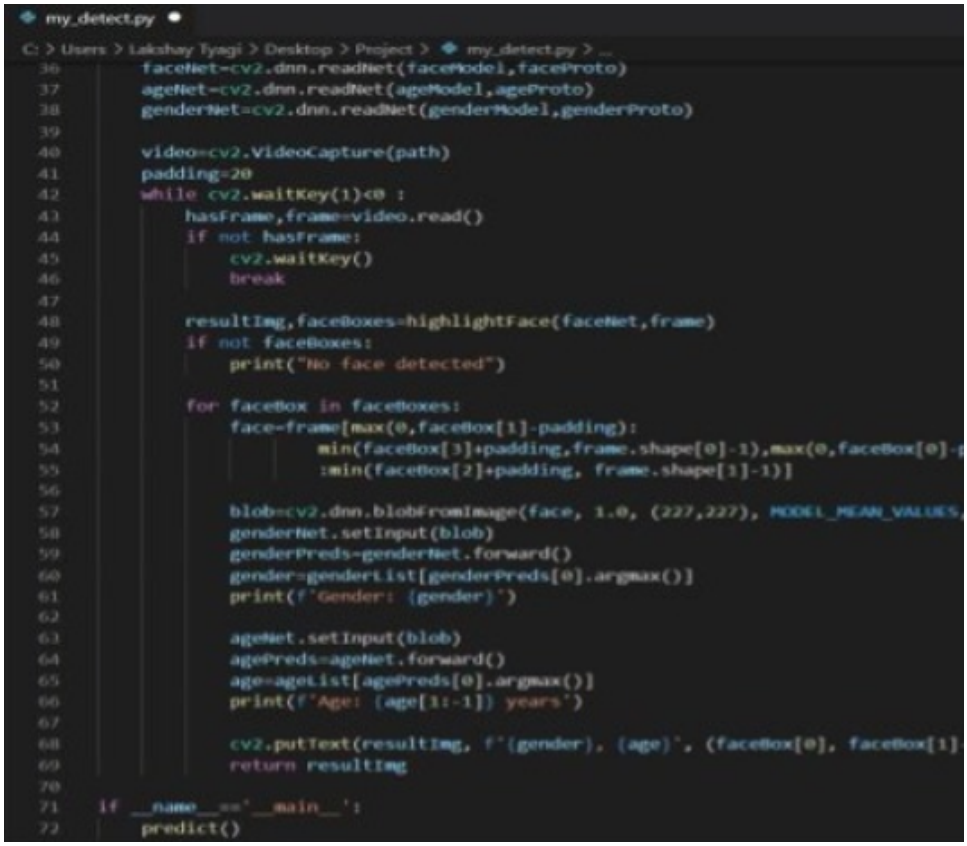

Fig 4.2: Technical Coding Part-II

5.3 **Test and validation**

The code has been tested on various images which are being further verified too. For gender prediction, the model is predicting in the categories of whether the picture has male or female. For age prediction, it is predicting the age of the person in the image in the following ranges i.e., 0-2, 4-6, 8-12, 15-20, 25-32, 38-43, 48-53, 60-100.

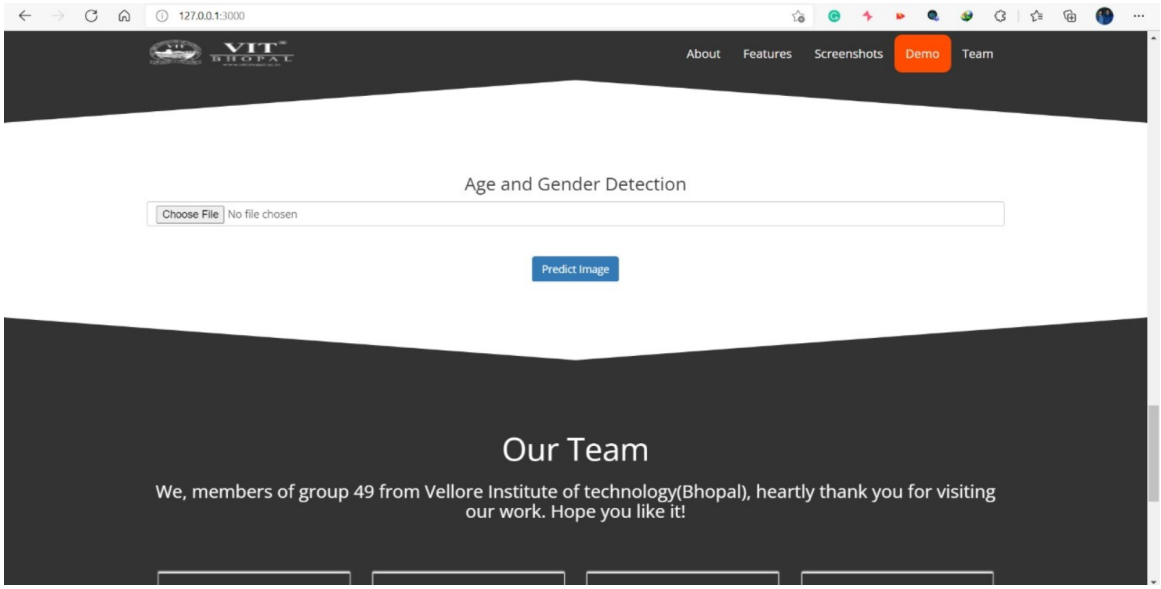

Fig 5: Demo Page

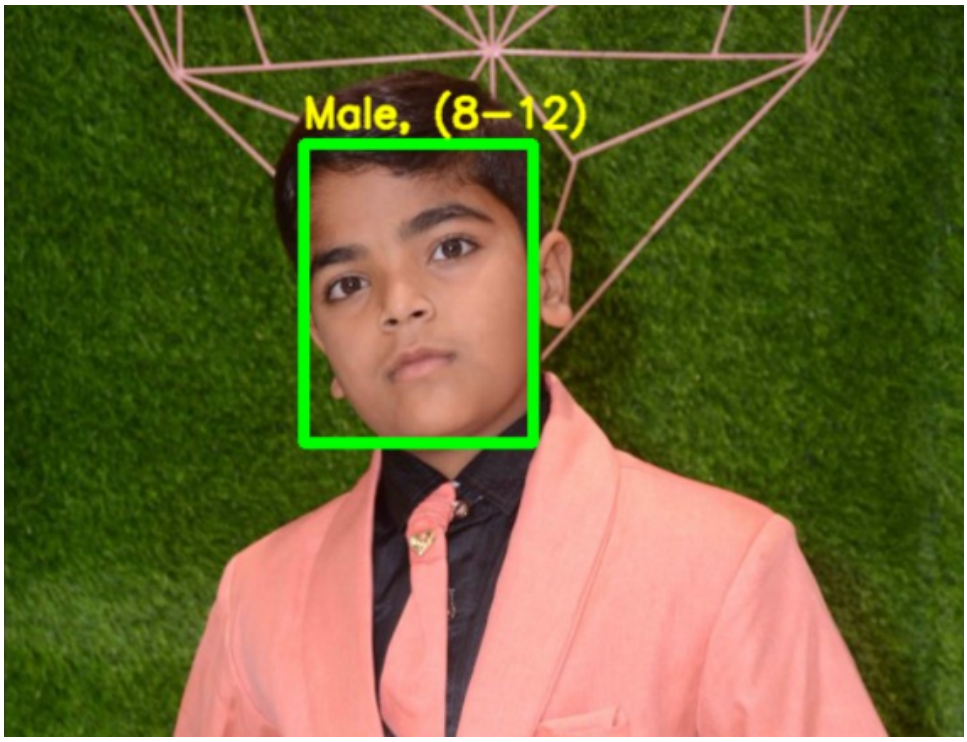

Fig 6: Code Output

Chapter 6

PROJECT OUTCOME AND APPLICABILITY

6.1 **Key implementation outlines of the system**

The project of age and gender can be applied in numerous ways such as:

- Health sector, Cosmetics
- Electronic commerce
- Human-machine interface growth
- Business sector

6.2 **Project applicability on real-world applications**

This project can play a key role in solving a real-life problem, i.e., to increase transparency and accountability of people on media platforms and to prevent any fake profiles being created. This can help in achieving an environment on social media platforms and keep our generation safe and sound.

Chapter 7

CONCLUSION AND RECOMMENDATION

7.1 **Limitation/constraints of the system**

The model proposed has been developed carefully and error-free while being efficient. During this research, we proposed a model to estimate people's age by feeding the CNN image dataset, a deep learning algorithm.

7.2 **Future enhancements**

In this project, there is ample scope for further development. In all, the accuracy of the model is decent and better than many existing models but can be further improved by using more data, data increase and better network architecture. Other than this classification model, a regression model may also be used, if enough data is available.

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