Parshvanath Charitable Trust's
A. P. SHAH INSTITUTE OF TECHNOLOGY, THANE
(All Programs Accredited by NBA)
Department of Information Technology

Machine learning based Autonomous Riding System

Group No. 3

Om Bheda – 19204011
Fenil Bhimani – 19204012
Amey Mohite – 18104067

Project Guide – Prof. Apeksha Mohite

Contents

1- INTRODUCTION

- The main motive behind selecting this topic is the fast-moving progress of applied artificial intelligence (AI) and the predicted importance of autonomous vehicles on the future, from independent mobility for non-drivers and low-income individuals, reduced pollution, traffic and parking congestion to increased safety on the roads. Autonomous vehicles are also predicted to be relied on in some of the most complex human planned endeavors, such as space exploration. The meteoric rise of AI along with deep learning (DL) methods and frameworks, have made possible the creation of such an autonomous vehicle without expensive laboratories and years of research.
- The system which we are going to build is an autonomous vehicle and more specifically, a self-driving RC car. The goal of the project is to build a model capable of navigating through the map autonomously, while demonstrating the capability to perform behaviors such as lane following, dynamic actions with respect to environment changes. The project will go through the entire process of building such a vehicle, starting from the RC car model and the embedded hardware platform, to the orchestration end-to-end machine learning algorithms and a user application.

2-OBJECTIVES

- To design, fabricate and develop a completely autonomous scaled down vehicle using latest trends in the field of Computer Vision, AI and Embedded Systems as per the feasibility.
- To apply an algorithm that can find the shortest path with respect to distance in the scaled down map created.
- To orchestrate a system that detects, identifies, and follows the traffic signs and rules on the roads.
- To create a system that morally and ethically takes dynamic action for any implausible condition that occurs.
- To provide user with an application interface that has an overwrite command with higher priority than the system commands.
- To understand new technologies, hardware and implement the same in a feasible manner.
- To manage the entire project in a professional manner by cost management, team management and waste management strategies.

3-PROBLEM DEFINITION

- Every year, traffic accidents account for 2.2% of global deaths. That stacks up to roughly 1.3 million a year — 3,287 a day. On top of this, some 20–50 million people are seriously injured in auto-related accidents each year. The root of these accidents? Human error.
- Unintentional or foolish interruptions caused by the pedestrians, domestic animals and other drivers on road results in accidents and loss of both health and wealth.
- In 2020, 10,010 four-wheelers were towed away for wrong parking and a fine of Rs 85,73,642 was recovered.
- People having disabilities require drivers to carry them around or have to modify their cars with attachments which costs them a lot of money.

4-TECHNOLOGICAL STACK

Hardware –

- GSM Module
- Output Devices (LED's, Buzzers, etc)
- Li-Po Batteries
- PCA9685
- Servo Motor
- Battery operated DC Motor
- Electronic Speed Controller
- Nvdia Jetson Nano 2GB Developer Kit
- Camera + LiDAR – environment sensing

4-TECHNOLOGICAL STACK

Software –

- Flutter
- Firebase
- Python
- OpenCV2
- Tensorflow
- Keras Framework
- Jetpack SDK – OS development Board
- You Only Look Once Algorithm (YOLO) – object detection
- Dijkstra Algorithm – shortest path finding

5- PROPOSED SYSTEM ARCHITECTURE/WORKING

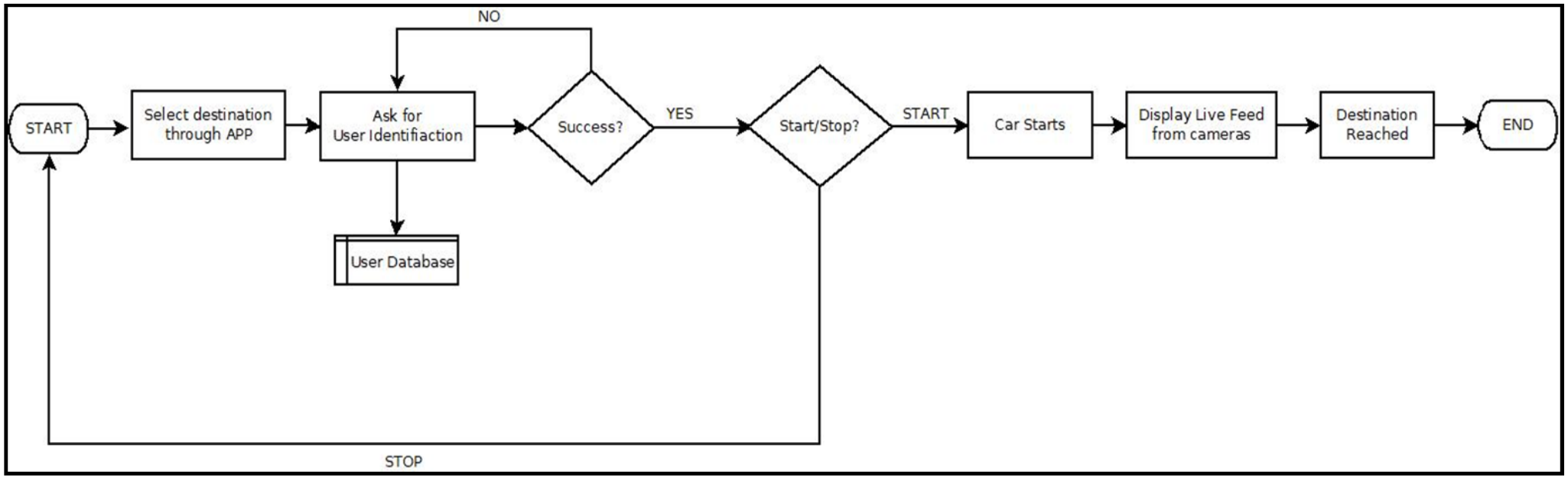

Figure 5.1 – application flow

6- PROPOSED SYSTEM ARCHITECTURE/WORKING

Working of Application:

The system proposed by our team will have an application which can

control the car. The application will have following features –

1. It will have a GUI interface through which the user can select its destination.
2. As soon as user selects the destination, user needs to be validated. Once user is authenticated, then only user can start its journey. Validation will be done through the database.
3. User can stop the car or can overwrite the system commands; this feature is given by our team so that if any implausible condition occurs and if the machine gets confused on which thing to act-on then the user can take the decision.

5- PROPOSED SYSTEM ARCHITECTURE/WORKING

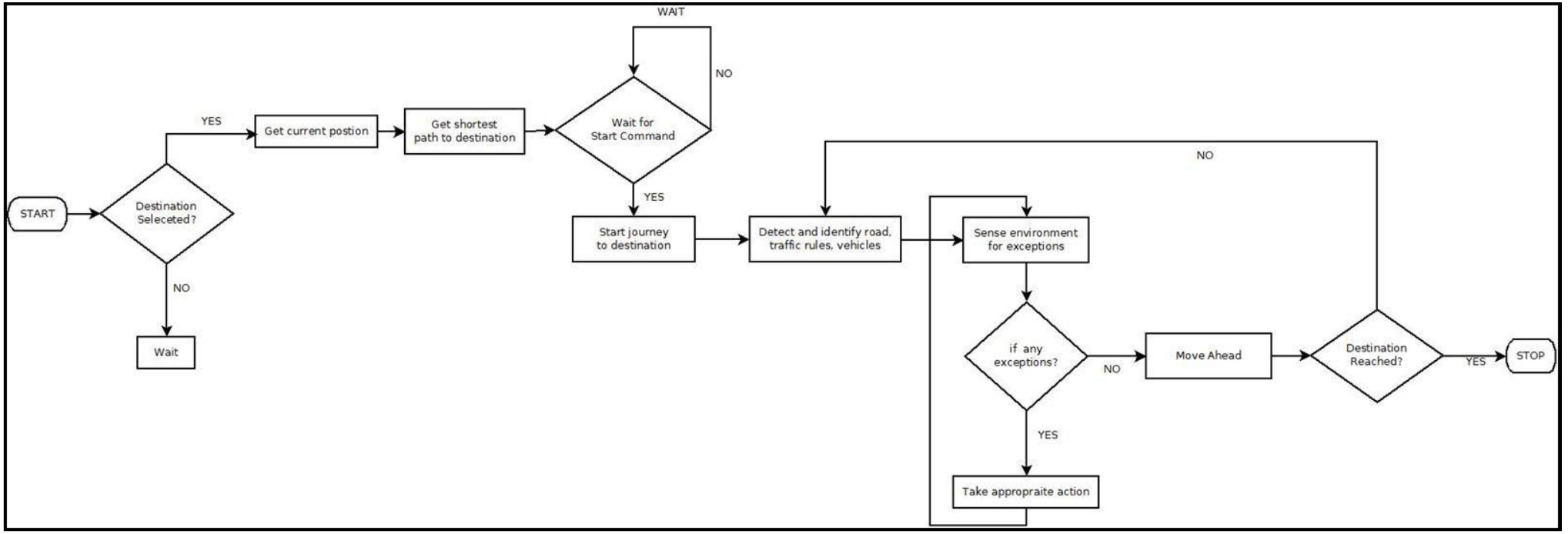

Figure 5.2 – vehicle flow

5- PROPOSED SYSTEM ARCHITECTURE/WORKING

Working of Vehicle:

1. The vehicle will first check if the destination is selected by user or not. If not, then the vehicle will wait for the destination to be selected.
2. If yes, then it will first check which destination is selected and it will determine its shortest path using the shortest path algorithm.
3. It will wait for the start command from the user. If the start command is sensed by the vehicle, then it will start its journey.
4. As soon as it starts its journey, it will detect and identify the roads, vehicles and traffic signs.
5. It will continuously sense the environment and will if there any exceptions occurred. If not, then it will continue its journey.
6. If yes, then it will take appropriate actions till the exception is not fully encountered by it.
7. If the destination is reached then it will notify the user that “Destination is Reached”.

5- PROPOSED SYSTEM ARCHITECTURE/WORKING

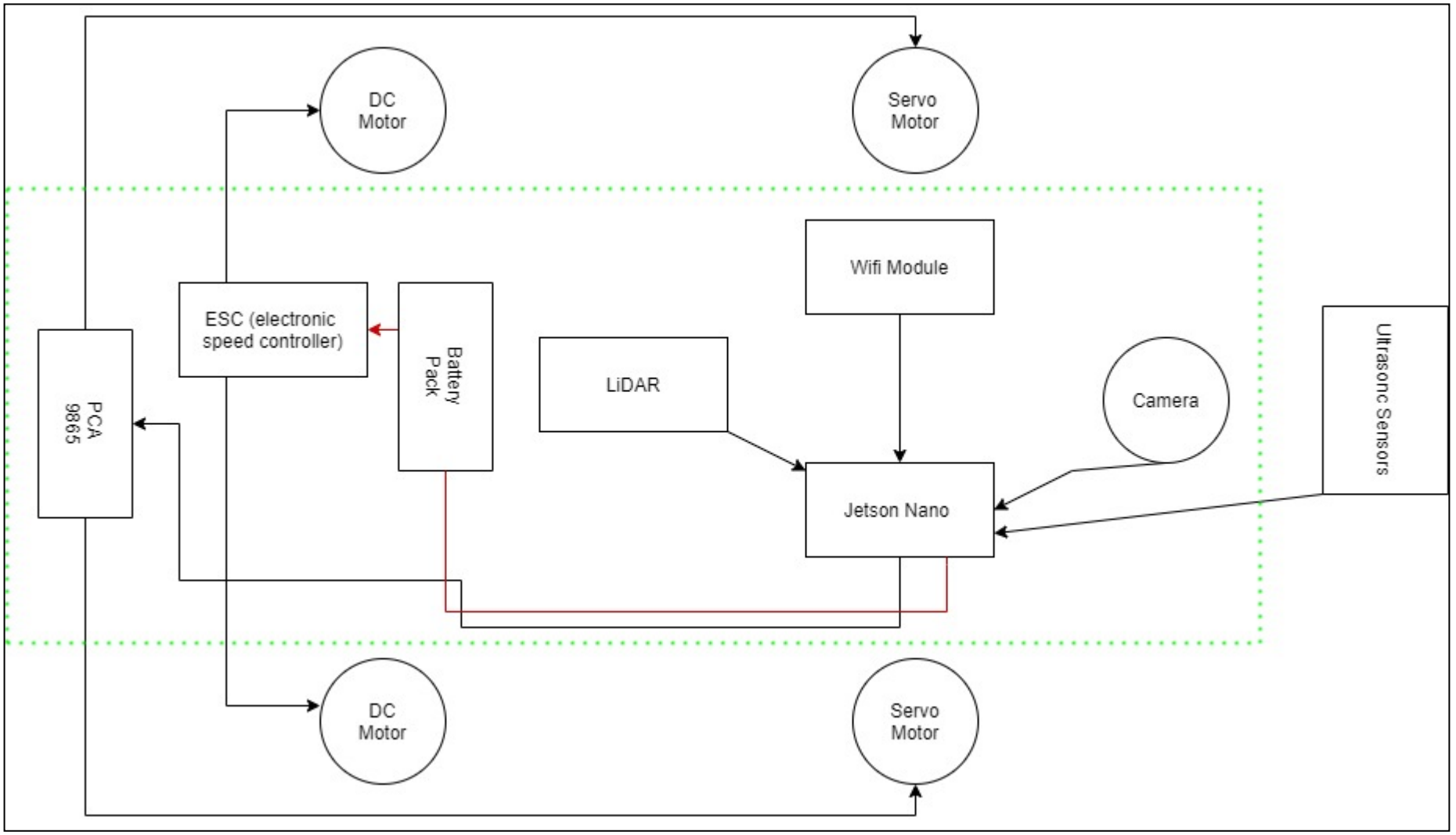

Figure 5.3 – Car architecture

6- DESIGN DEMONSTRATION

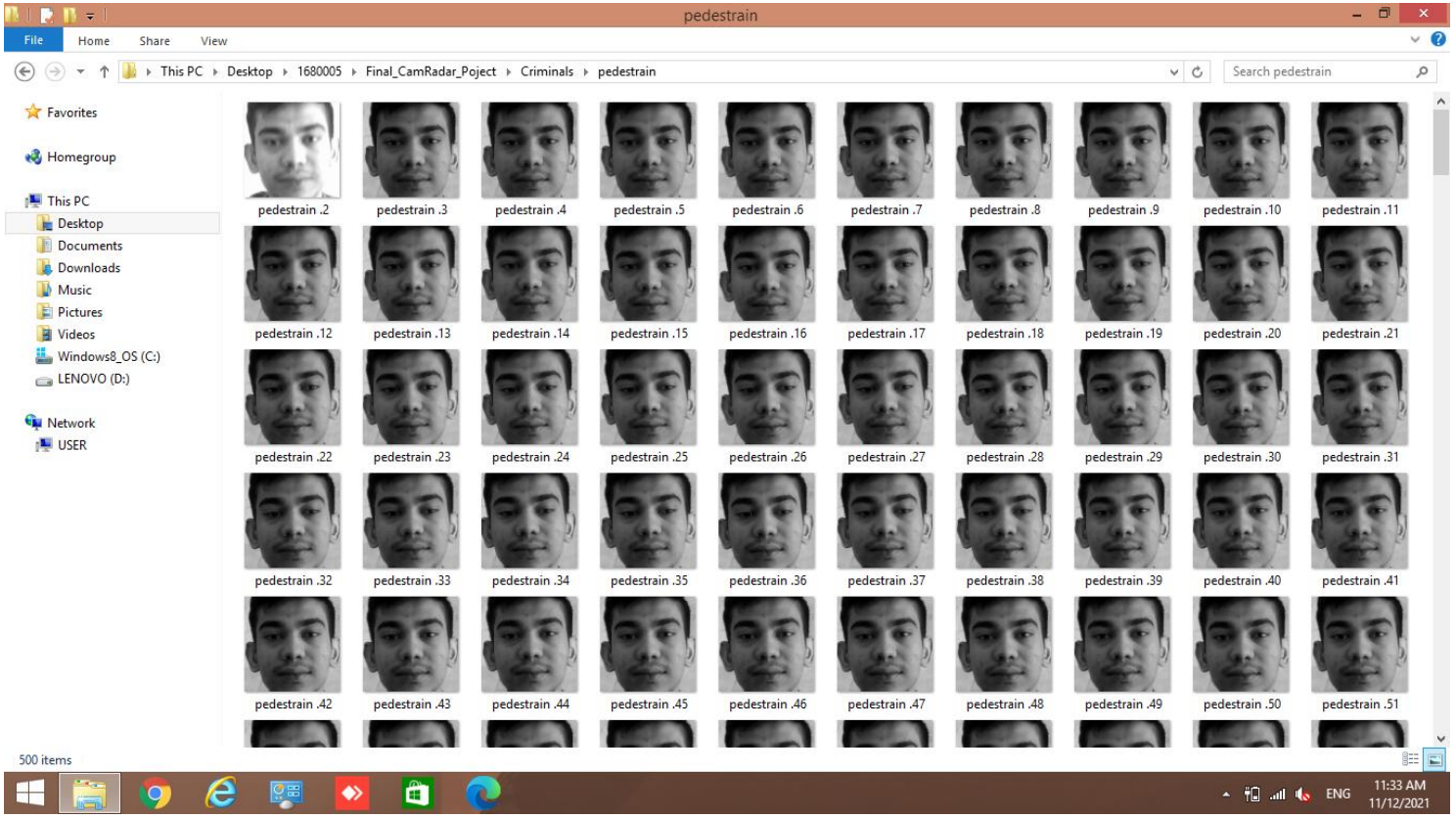

Figure 6.1 – Dataset Creator

6- DESIGN DEMONSTRATION

❖ OUTPUT :

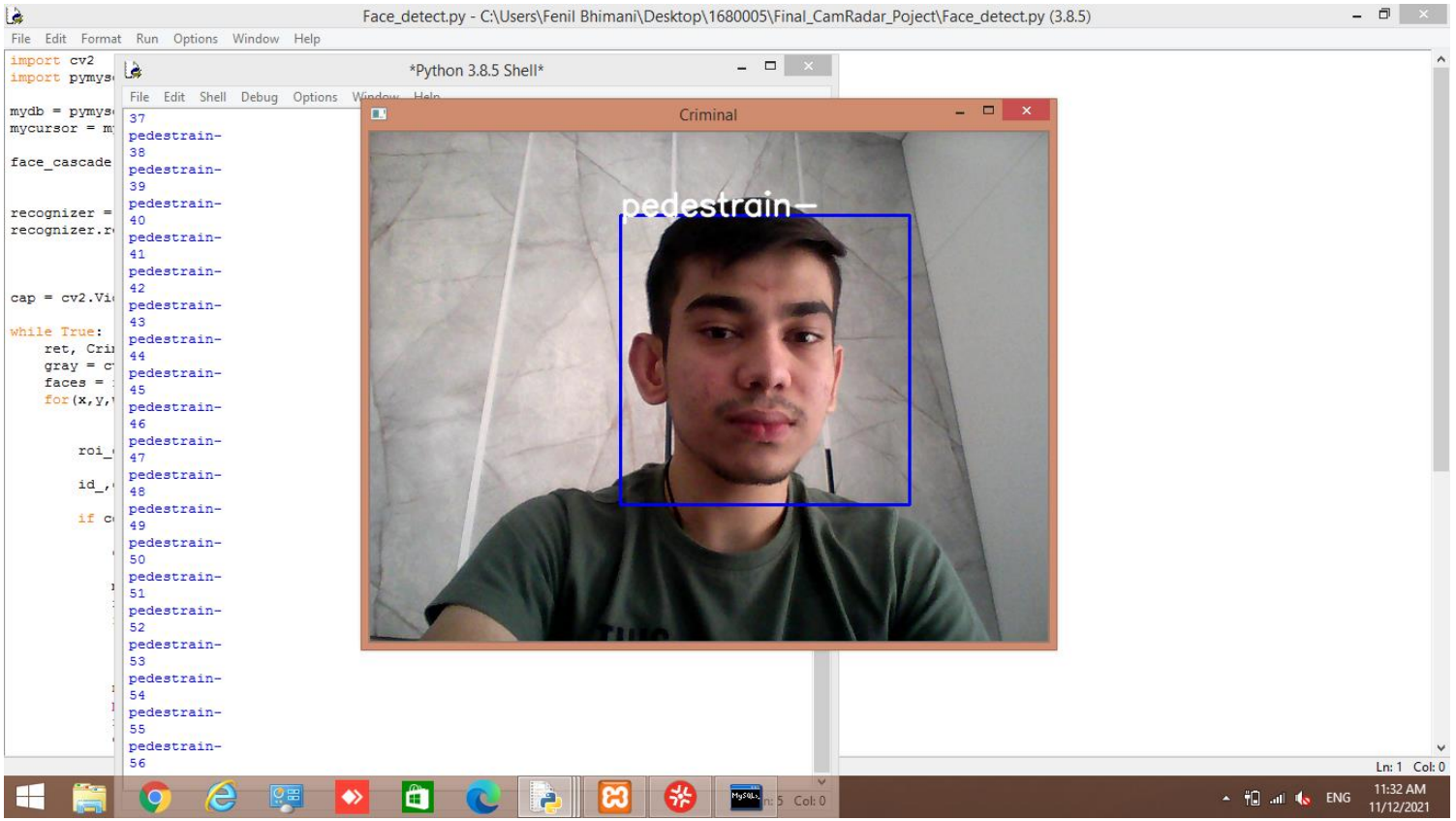

Figure 6.2 - Output

6- DESIGN DEMONSTRATION

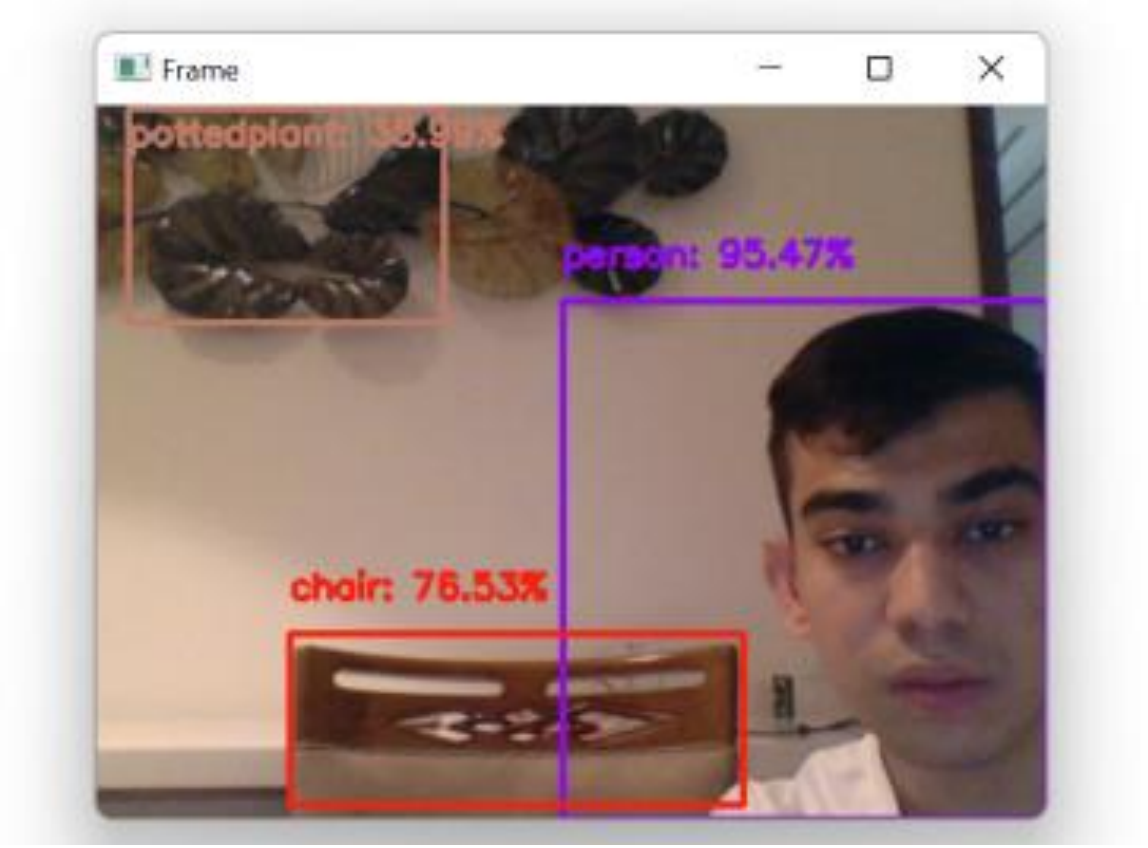

Figure 6.3- Output

6- DESIGN DEMONSTRATION

❖ OUTPUT :

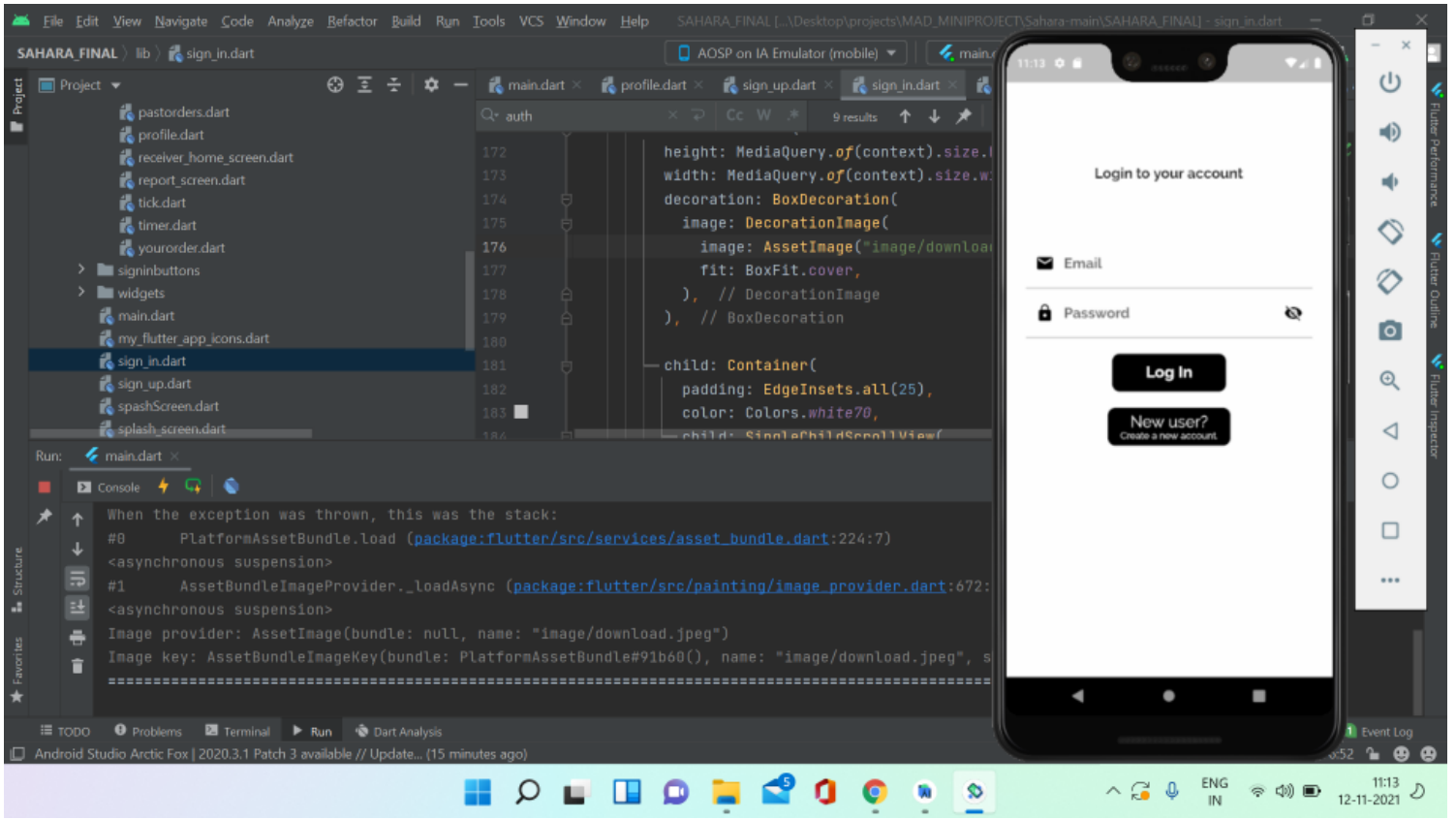

Figure 6.4 – Mobile Application

6- DESIGN DEMONSTRATION

❖ OUTPUT :

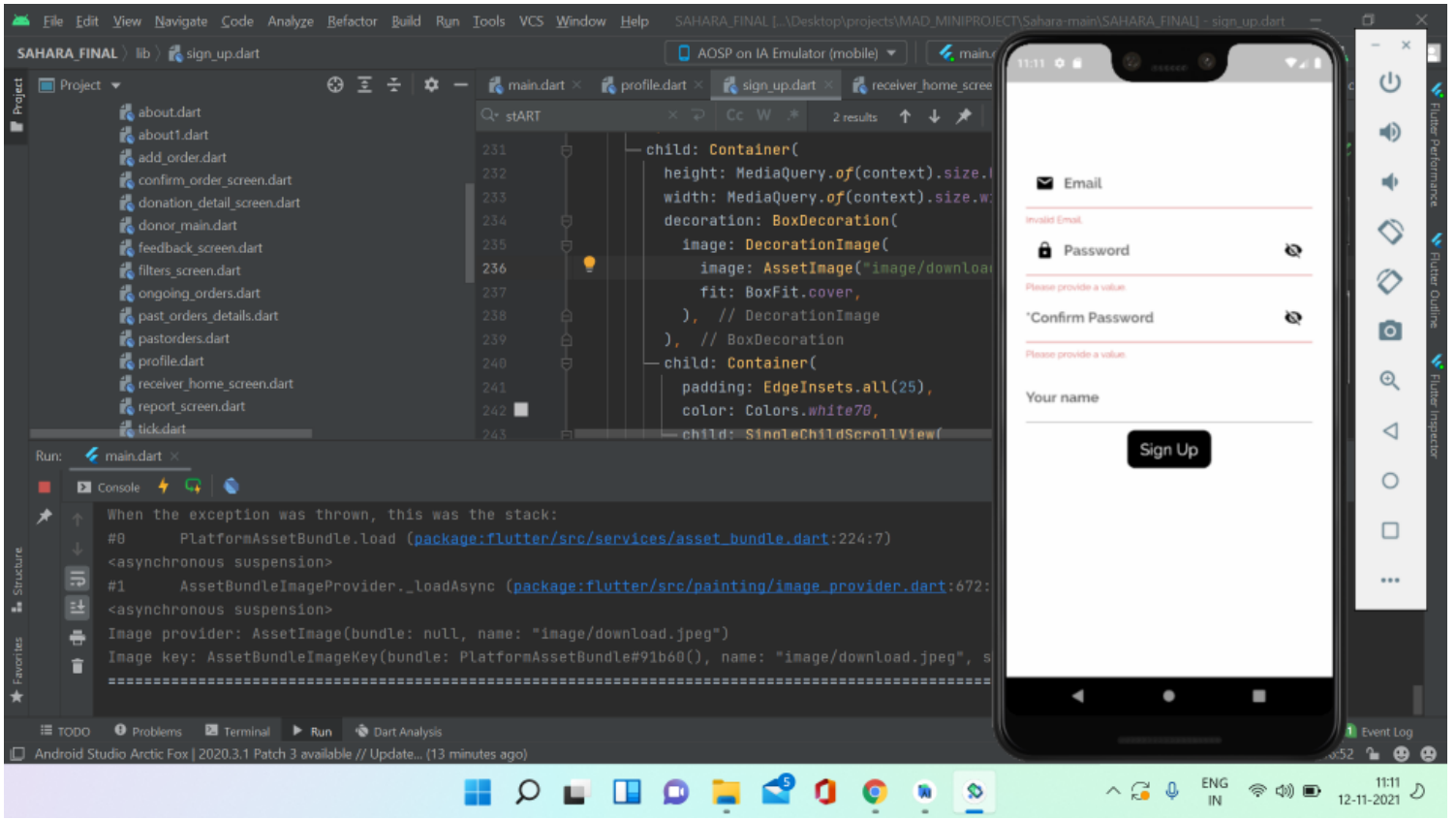

Figure 6.5 – Mobile Application

6- DESIGN DEMONSTRATION

❖ OUTPUT :

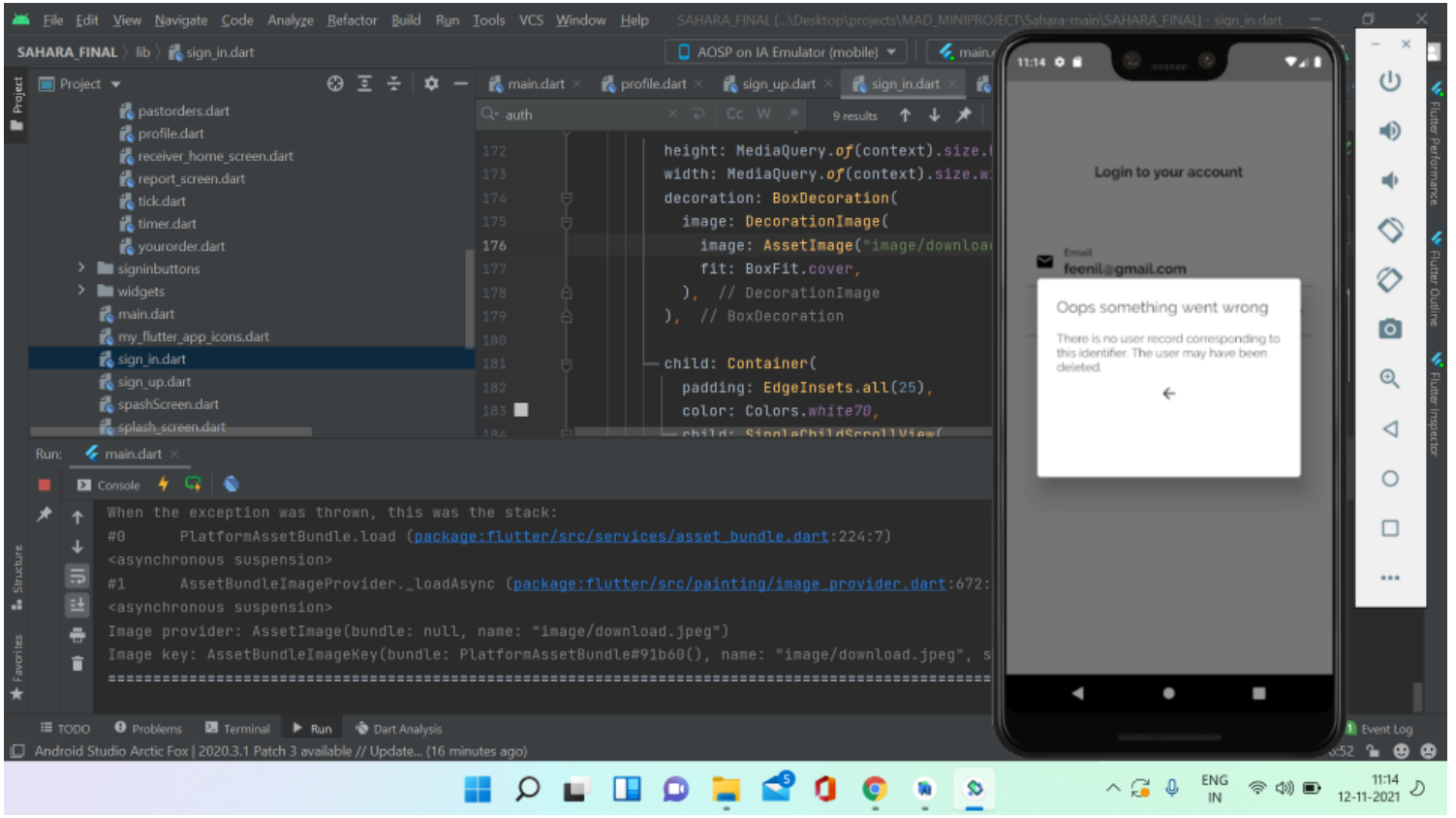

Figure 6.6 – Mobile Application

6- DESIGN DEMONSTRATION

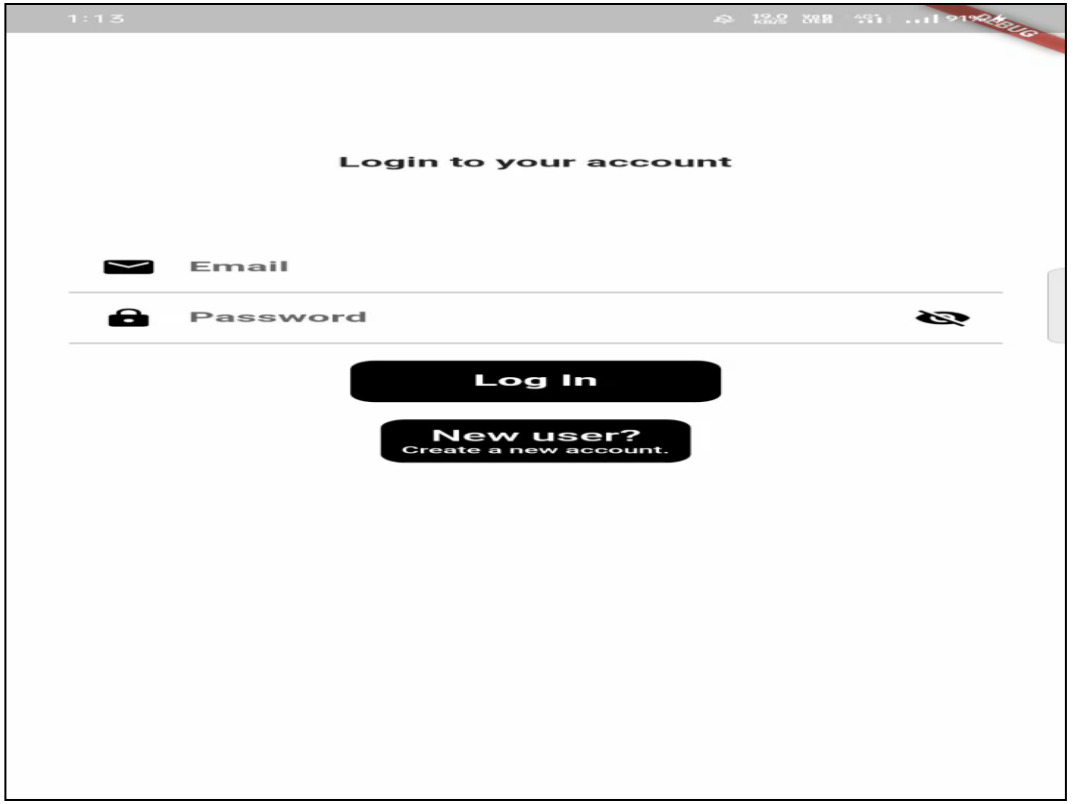

Figure 6.7 – Mobile Application

6- DESIGN DEMONSTRATION

Input Video **Output Video**

Figure 6.8 – Lane Detection

7-PROJECT IMPLEMENTATION STATUS

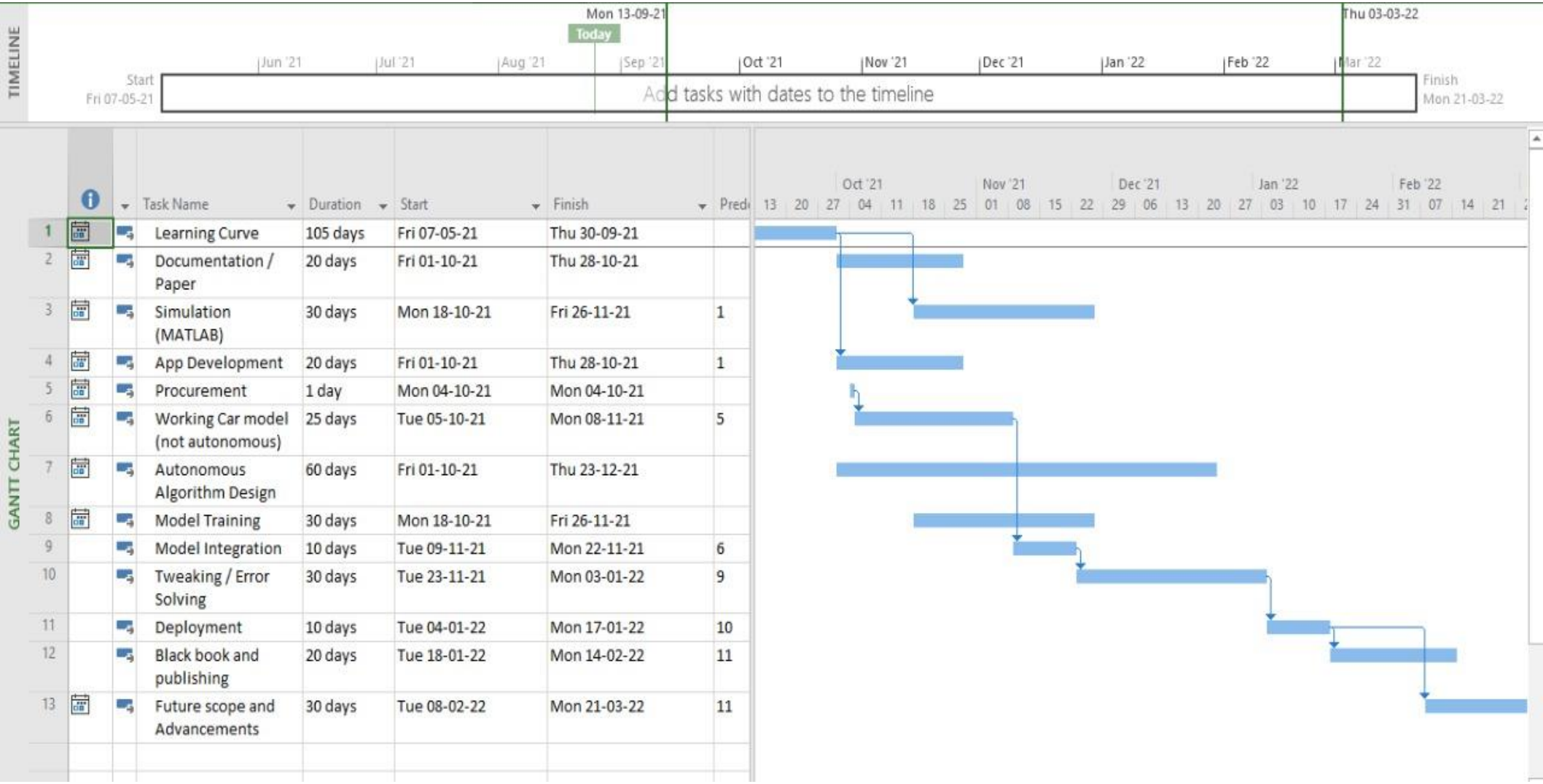

Figure 7.1 – Gantt chart

8- STATUS OF PAPER DRAFT & TARGET CONFERENCE

Paper Status – Submitted.

Conference Name – 2022 IEEE 7th International conference for Convergence in Technology (I2CT).

Thank You...!!