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Modern Academy
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Modern Superjet Services

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Abstract

The Corona virus has infected many people, as it was difficult to move from one place to another under the current conditions, but our project will facilitate travel comfortably and safely, taking good precautionary measures and obligating passengers to wear a muzzle.

Modern superjet services is a web and mobile application that helps people of all ages to book and travel easily as it allows them to find the perfect safe flight that best suits their needs. Flights are made to more than 15 provinces, and each province has several pick-up and drop-off points. There are three types of buses, and each bus has different services to meet the needs of the traveler. The traveler can easily search for the flight by entering the place and date of travel or through the offers presented to him on the offers page, then choose the most appropriate flight and specify the number and places of seats. Then fill out the traveler's application form and upon submission, the ticket will appear with the traveler's data in terms of name, phone number, email, etc. It contains flight data in terms of location to and from, flight timings, bus type, menu requests, etc. The ticket also contains a unique QR code consisting of the name and phone number of the passenger to be allowed on the bus. We provide a strong system for the bus door in order to maintain the safety of everyone, as passengers are not allowed to enter if the mask is not worn, and this is confirmed by the passenger standing in front of a camera at the bus door and scanning his face. If he is wearing a mask and confirms his presence through the code, the door will be opened in this case Just. We also offer a smooth driving system, so the timing of the trip and its arrival on time are taken care of, as we provide the trip driver with a system to determine the shortest suitable route and avoid traffic congestion by displaying the GPS system.

Structure of the document:

This document will be split into Six main Chapters

Chapter 1: Introduction

Chapter 2: Survey and Historical data

Chapter 3: Software life cycle and Analysis

Chapter 4: Design

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Chapter 1

Introduction

1.1 Modern Superjet Services

- When we wanted to choose a graduation project for the last year, we decided that we wanted something that would solve a real problem that exists in the world and at the same time, the problem should have to do with the crisis of the spreading Corona virus so that we can accompany the outside countries in solving problems related to this epidemic.
- Since we love to travel and move, and this matter faltered during the epidemic, we decided to make a project in the field of transportation that would help us to overcome this ordeal smoothly, so the idea came to build a "**Modern Superjet Services**".
- Modern Super Jet Services is a travel reservation program that offers a wide range of services to help the traveler enjoy safe travel and meet all his requirements.

1.2 Problem Definition

1. The spread of the Corona virus (Covid-19) has raised the fears of millions of people traveling or moving through all means of transportation, especially after some governments imposed restrictions on travel, and asked their citizens to stay in their homes, while others stressed the commitment to some general precautions when moving. However, there was a category Some people didn't take it seriously.
2. Therefore, we wanted to oblige everyone to take precautionary measures without affecting their daily plan and to continue with it as it was before the pandemic.

3. We are currently suffering from severe overcrowding and stampede while booking any means of transportation due to the lack of organization, which leads to increased mixing of people with each other, delaying people's interests and wasting their time and effort.
4. Buses do not bother to arrive on time, it may take a longer journey than their scheduled time, due to not taking into account the traffic congestion.
5. If the ticket is damaged, there is no other solution unless you redo the booking process and pay again.
6. Some mistakes occur from the staff, as a shortage of menu meals may appear as a result of the family exceeding the maximum number of meals set for them, and therefore some travelers will not take their share of meals.

1.3 Solutions Approach

- It will be easy for the traveler to find suitable trip for him.
- we have the ability to book a ticket "with a unique QR code for everyone" from the website or app and choose the flight to be purchased.
- The code can be replaced in the device in case it is closed by printing the code on paper, and the ticket can be replaced in case of damage by using the device and opening its own page to take its code
- We help maintain the health of the traveler, so he does not open the door until he passes the scanner to make sure that he is wearing a mask.
- We reduce the mistakes that may occur from the staff, so a menu has been added during the booking steps and is added with the ticket until each passenger's request is adhered to
- to reduce traffic congestion, we use an algorithm to organize buses at the point of rest.

1.4 Objectives Of The Project

1. Saving effort and time for the traveler.
2. It makes it easier for users to obtain their tickets in the simplest way. All they have to do is specify the location and date, determine the number of individuals, fill out a form with their personal information, determine the method of payment, and then get their own ticket immediately.
3. The ticket contains a code consisting of the name and phone number and the passenger is not allowed to ride without it as it is the only way to confirm his attendance.
4. Taking precautionary measures for public safety, as it is absolutely ensured that no one rides without wearing a mask.
5. Attention is given to the arrival of the bus at the specified time for the trip through the driver's walking with Algorithm to know the shortest paths leading to the place to be reached with the GPS feature to avoid places with traffic jams.

1.5 Advantages

- We want to change our country into a smart country and direct all community service organizations to use digital devices.
- The design has ease of performance and attention to user experience to help users of all ages to book easily with no effort.
- The ability to filter the results based on the type of bus, where each ticket contains a color assigned to the type of bus.

- There is a section dedicated to offers and trip discounts with general information about the place to attract tourists to this place and its advantages
- The code can be scanned from any device and also can be scanned on paper
- The driver drives the bus according to the GPS device to avoid congestion and arrive on time for his trip.
- This QR code is used to confirm your attendance. The passenger is not allowed to ride without this code. It is also not allowed to ride without the mask, as the face is scanned by mask detection.
- We use a QR code, as it can store a lot of information from letters and numbers.

1.6 Tools

Product Perspective: A booking application contains the following:

- Driver: It includes all the Drivers in the application .
- Traveler: It includes all the travelers in the application .
- Admin: It includes all the admins in the application.

1.6.1 Application Function

- By using this System/Application the traveler has to sign up/sign in so he can use all the features, he can choose travel destination that he wants then apply to it, Also he can see all the Tickets about this trip.
- After selecting his trip that he wants and select a seat then submit the form application, he will get the ticket with his information.
- By using this System/Application the Driver has to sign in so he can use GPS traffic page while he drives
- By using this System/Application the admin has to sign in so he can view forms.

1.6.2 Main Work

Adobe XD: is a vector-based digital design tool for sites and programs. Use it to create and collaborate on everything from prototypes into mockups to full designs. XD stands for “Experience Design,” and is Adobe’s successful new all-in-one UX/UI solution to quickly go from concept to prototype in designing sites, mobile apps, and much more.

Adobe XD is designed and constructed with cellular and net experiences in your mind, but the applications for it go much farther. Globally, design teams are leveraging the strong features in Adobe XD for their full experience design procedure and a whole lot more.

This Program Provides:

- Stacks and Padding
- Components & States
- 3D Transforms
- Shareable Libraries
- Plugins
- Prototype



Visual Studio Code: is a dual-licensed source-code editor made by Microsoft for Windows, Linux and macOS. In the Stack Overflow 2019 Developer Survey, Visual Studio Code was ranked the most popular developer environment tool, with 50.7% of 87,317 respondents reporting that they use it. Visual Studio Code is a source-code editor that can be used with a variety of programming languages, including Java, JavaScript, Go, Node.js, Python and C++. It is based on the Electron framework, which is used to develop Node.js Web applications that run on the Blink layout engine. Visual Studio Code employs the same editor component (codenamed "Monaco") used in Azure DevOps (formerly called Visual Studio Online and Visual Studio Team Services).



Visual Studio Code

Android Studio: Is the official integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development.

It is available for download on Windows, macOS and Linux based operating systems or as a subscription-based service in 2020. It is a replacement for the Eclipse Android Development Tools (E-ADT) as the primary IDE for native Android application development



Spyder: is an open-source cross-platform integrated development environment (IDE) for scientific programming in the Python language.

Spyder, the Scientific Python Development Environment, is a free integrated development environment (IDE) that is included with Anaconda. It includes editing, interactive testing, debugging, and introspection features.

Spyder is a free and open source scientific environment written in Python, for Python, and designed by and for scientists, engineers and data analysts. It features a unique combination of the advanced editing, analysis, debugging, and profiling functionality of a comprehensive development tool with the data exploration, interactive execution, deep inspection, and beautiful visualization capabilities of a scientific package.

Spyder is extensible with first-party and third-party plugins, includes support for interactive tools for data inspection and embeds Python-specific code quality assurance and introspection instruments, such as Pyflakes, Pylint and Rope. It is available cross-platform through Anaconda, on Windows, on macOS through MacPorts, and on major Linux distributions such as Arch Linux, Debian, Fedora, Gento Linux, OpenSUSE and Ubuntu



The Arduino IDE: The development of electronics is now easier thanks to arduino software (IDE), and arduino boards (hardware) . This set help to build digital and interactive devices with the help of other components.

The arduino software (IDE) is an open source software, which is used to programme the Arduino boards, and is an integrated development environment, developed by arduino.cc. Allow to write and upload code to arduino boards. And it consist of many libraries and a set of examples of mini projects.[1]

arduino software (IDE) is compatible with different operating systems (Windows, Linux, Mac OS X), and supports the programming languages (C/C++).

The Arduino software is easy to use for beginners, or advanced users. It uses to get started with electronics programming and robotics, and build interactive prototypes.

So Arduino software is a tool to develop new things. and create new electronic projects, by Anyone (children, hobbyists, engineers, programmers, ... etc).



MATLAB: is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation.[2]

Using Matlab For: (Analyze data, Develop algorithms, Create models and applications).

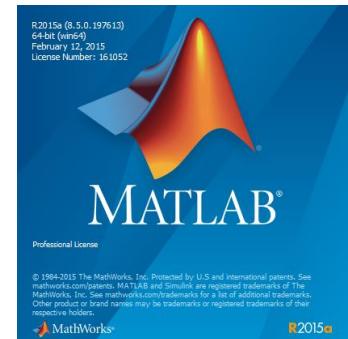
MATLAB lets you take your ideas from research to production by deploying to enterprise applications and embedded devices, as well as integrating with Simulink® and Model-Based Design.[3]

MATLAB is designed for the way you think and the work you do, so learning is accessible whether you are a novice or an expert.

There are many programming languages used worldwide. Matlab gives us many advantages compared to other coding software languages. But this may vary depending on the purpose of use. It can only make it easier for you to do what you need.[4]

The MATLAB system consists:

- The MATLAB language
- The MATLAB working environment
- Handle Graphics
- The MATLAB mathematical function library
- The MATLAB Application Programmer's Interface (API)



1.6.3 Website Content

The **front-end** of a website is merely how the information is presented to the users, and it fetches everything from the backend to display in user browsers.

HTML (HyperText Markup Language) is used to design web pages using a markup language. Hypertext defines the link between the web pages. A markup language is used to define the text document within tag which defines the structure of web pages. HTML is a markup language that is used by the browser to manipulate text, images, and other content to display it in the required format.

CSS (Cascading Style Sheets) is a stylesheet language used to design the webpage to make it attractive. The reason for using CSS is to simplify the process of making web pages presentable. CSS allows you to apply styles to web pages. More importantly, CSS enables you to do this independent of the HTML that makes up each web page.

JavaScript (JS) is a lightweight, interpreted, or just-in-time compiled programming language with first-class functions. JavaScript is a prototype-based, multi-paradigm, single-threaded, dynamic language, supporting object-oriented, imperative, and declarative (e.g. functional programming) styles.[5]



Font Awesome is the Internet's icon library and toolkit, used by millions of designers, developers, and content creators.

Font Awesome contains over 7,000 new icons, so you're sure to find what you need for your project. Plus they're more consistent and easier to use.

Font Awesome 6 makes it even easier to use icons where you want to. More plugins and packages to match your stack. Less time wrestling browser rendering.



The backend of a website is the place that contains all the data and relevant information that is to be shown to the visitors with the help of a browser and Code written by back-end developers helps to communicate the database information to the browser.

The PHP Hypertext Preprocessor (PHP) is a programming language that allows web developers to create dynamic content that interacts with databases.

PHP is a server side scripting language that is embedded in HTML. It is used to manage dynamic content, databases, session tracking, even build entire e-commerce sites.[6]

It is integrated with a number of popular databases, including MySQL, PostgreSQL, Oracle, Sybase, Informix, and Microsoft SQL Server.



Laravel is a web application framework with expressive, elegant syntax. We've already laid the foundation — freeing you to create without sweating the small things.

Laravel is a web application framework with expressive, elegant syntax. We believe development must be an enjoyable, creative experience to be truly fulfilling. Laravel attempts to take the pain out of development by easing common tasks used in the majority of web projects, such as authentication, routing, sessions, and caching.[7]



MySQL Language is an open-source relational database management system (RDBMS). Its name is a combination of "My", the name of cofounder Michael Widenius's daughter, and "SQL", the abbreviation for Structured Query Language. MySQL is free and open-source software under the terms of the GNU General Public License, and is also available under a variety of proprietary licenses. MySQL is a component of the LAMP web application software stack (and others), which is an acronym for Linux, Apache, MySQL, Perl/PHP/Python. MySQL is used by many database-driven web applications, including Drupal, Joomla, phpBB, and WordPress. MySQL is also used by many popular websites, including Facebook, Flickr, MediaWiki, Twitter, and YouTube.



XAMPP stands for Cross-Platform (X), Apache (A), MySQL (M), PHP (P) and Perl (P). is a free and open-source cross-platform web server solution stack package developed by Apache Friends, consisting mainly of the Apache HTTP Server, MariaDB database, and interpreters for scripts written in the PHP and Perl programming languages. Since most actual web server deployments use the same components as XAMPP, it makes transitioning from a local test server to a live server possible.



1.6.4 Mobile Content

Flutter using dart:

Is an open-source UI software development kit created by Google. It is used to develop cross platform applications for Android, iOS, Linux, Mac, Windows, Google Fuchsia, and the web from a single codebase. Flutter apps are written in the Dart language and make use of many of the language's more advanced features.[8] On Windows, macOS, and Linux Flutter runs in the Dart virtual machine, which features a just-in-time execution engine. While writing and debugging an app, Flutter uses Just In Time compilation, allowing for "hot reload", with which modifications to source files can be injected into a running application. Flutter extends this with support for stateful hot reload, where in most cases changes to source code are reflected immediately in the running app without requiring a restart or any loss of state.[9]

Flutter has more app-specific libraries, more often on user interface elements like:

- Widget: common app elements, like the Text or ListView.
- Material: containing elements following Material design, like FloatingActionButton.
- Cupertino: containing elements following current iOS designs, like CupertinoButton.



Dart Is a programming language designed for client development, such as for the web and mobile apps. It is developed by Google and can also be used to build server and desktop applications. Dart is an object-oriented, class-based, garbage-collected language with C-style syntax. Dart can compile to either native code or JavaScript. It supports interfaces, mixins, abstract classes, reified generics, and type inference.

Coding in Dart look Like most ALGOL languages (like C# or Java):

The entry point of a Dart class is the main() method. This method acts as a starting point for Flutter apps as well.

Dart classes only support single inheritance. There can be only one superclass for a particular class but it can have many implementations of Interfaces.

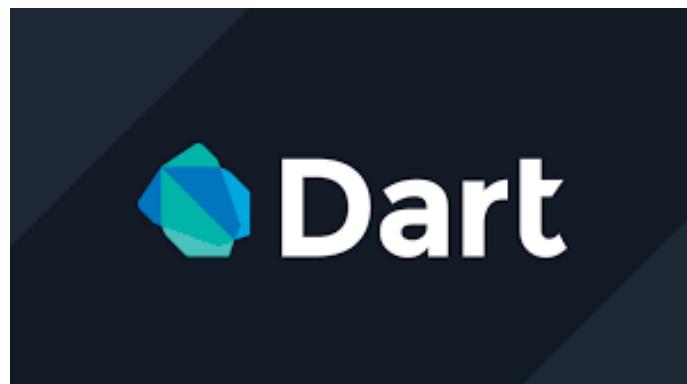
Abstraction works in a similar manner, allowing abstract classes and interfaces.

Unlike them (and sometimes a bit like JavaScript).

Dart has type inference. The data type of a variable need not be explicitly declared, as Dart will “infer ”what it is. In Java, a variable needs to have its type explicitly given during declaration.

For example, String something; But in Dart, the keyword is used instead like so, var something;. The code treats the variable according to whatever it contains, be it a number, string, bool or object.

-All data types are objects, including numbers. So, if left uninitialized, their default value is not a 0 but is instead null.



1.6.5 Artificial intelligent Content

Python is a high-level scripting language. It has a growing ecosystem of libraries, frameworks, and tools. These tools and libraries are equipped with pre-written codes, that help users to perform a myriad of functions while saving an adequate amount of time spent in code generation.[10]

OpenCV (Open source computer vision library) is a library of programming functions mainly aimed at real-time computer vision. The library is cross platform. OpenCV was built to provide a common infrastructure for computer vision and applications. The library has more than 2500 optimized algorithms, which includes a comprehensive set of both classic and state-of-the-art computer vision and machine learning algorithms. These algorithms can be used to detect and recognize faces, identify objects, track moving objects, etc.

TensorFlow is an open source framework developed by Google researchers to run machine learning, deep learning and other statistical and predictive analytics workloads. Like similar platforms, it's designed to streamline the process of developing and executing advanced analytics applications for users such as data scientists, statisticians and predictive modelers. Google has also used the framework for applications that include automatic email response generation, image classification and optical character recognition, as well as a drug discovery application that the company worked on with researchers from Stanford University.[11]

Keras (is one of the high level neural networks APIs) a deep learning API written in Python, running on top of the machine learning platform TensorFlow. It was developed with a focus on enabling fast experimentation. Being able to go from idea to result as fast as possible is key to doing good research.[12]

Keras contains numerous implementations of commonly used neural-network building blocks such as layers, objectives, activation functions, optimizers, and a host of tools to make working with image and text data.[13]

Imutils is a series of convenience functions to make basic image processing functions such as translation, rotation, resizing, skeletonization, and displaying Matplotlib images easier with OpenCV and both Python 2.7 and Python 3.

Data Sets Used:

This dataset consists of 4095 images belonging to two classes:

- with_mask: 2165 images
- without_mask: 1930 images



Training:

Transfer learning:

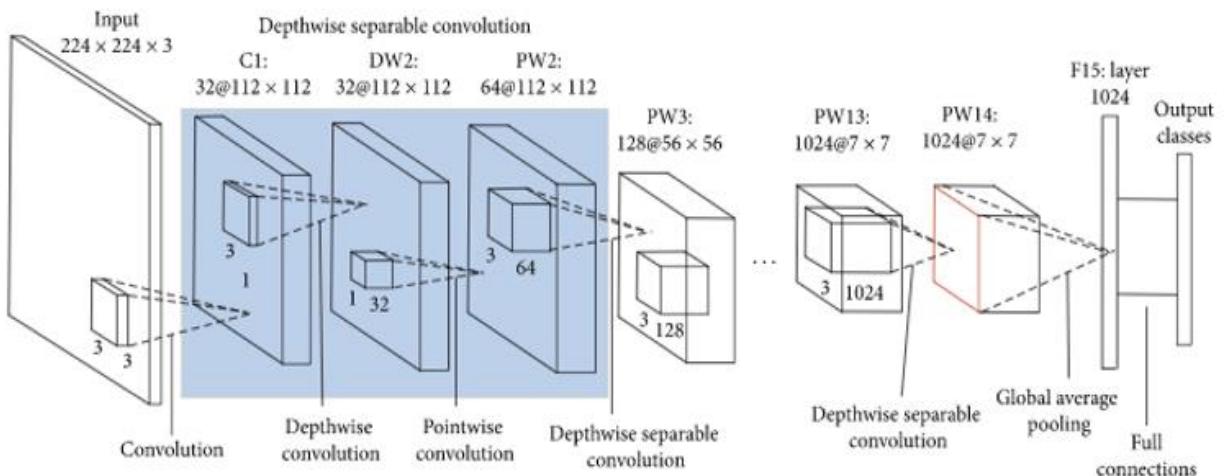
This is a common method in Deep Learning because of the enormous resources and time needed to develop the neural network models required for such tasks

Three benefits to using Transfer Learning

- save time in building the model (where as we saw earlier we have built a came out layer and a hidden layer just before it).
- we don't need a lot of data.
- save time to train the model where the model starts in the first epoch during high accuracy training.

MobileNetV2 classifier is a convolutional neural network architecture used best for embedded vision applications.[14]

- It consists of 3 layers where first layer is of 1×1 convolution with ReLU.
- Second layer is depthwise convolution layer and the third layer is again of convolution but with non-linearity. Our base model is capped with Average Pooling, Flatten, Dense, Dropout functions as well as Softmax as activation function.



MobileNet-V2 Architecture

1.6.6 Algorithm Content

Particle swarm is a population-based algorithm. In this respect it is similar to the genetic algorithm. A collection of individuals called particles move in steps throughout a region. At each step, the algorithm evaluates the objective function at each particle. After this evaluation, the algorithm decides on the new velocity of each particle. The particles move, then the algorithm reevaluates.

The inspiration for the algorithm is flocks of birds or insects swarming. Each particle is attracted to some degree to the best location it has found so far, and also to the best location any member of the swarm has found. After some steps, the population can coalesce around one location, or can coalesce around a few locations, or can continue to move.[15]

The particle swarm function attempts to optimize using a Particle Swarm Optimization Algorithm.

Group optimization and Ensemble Learning

Many of you have heard about ‘No Free Lunch (NFL)’ in machine learning. It speaks that no single model works best for all possible situations. We can also say that all optimization algorithms perform equally well when averaged across all potential problems.

The last statement that I have written isn’t self-explanatory with the example of flock of bird. Why do we need optimization in machine learning or deep learning? To train a model, we must define a loss function to measure the difference between our model predictions. [16]

Our objective is to minimize or optimize this loss function so that it will be closer to 0. Maybe you have heard about a term called ‘Ensemble Learning.’ If you have not, then let me explain you. ‘Ensemble’ is a French word—meaning ‘Assembly.’

It speaks about learning in a group or crowd. It is like you are trying to train a model with the help of multiple algorithms. So, what type of benefit are we going to get here? A single base learner is a weak learner. But, when we combine all these vulnerable learners, they become strong learners. They become strong learners because their predictive power, accuracy, precision are high. And the error rate is less. We call this type of combined model ‘Meta-learning’ in machine learning. It refers to learning algorithms that can learn from other learning algorithms. It decreases variance, decreases bias, and improves prediction. Now, when you achieve that, that’s your ultimate ‘Nirvana’ moment as a data analyst.

[17]

Neighborhood Topologies

A neighborhood must be defined for each particle. This neighborhood determines the extent of social interaction within the swarm and influences a particular particle’s movement. Less interaction occurs when the neighborhoods in the swarm are small. For small neighborhoods, the convergence will be slower, but it may improve the quality of solutions. The convergence will be faster for more prominent neighborhoods, but the risk that sometimes convergence occurs earlier.

Advantages of Particle Swarm Optimization:

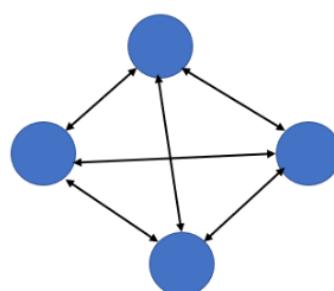
- Insensitive to scaling of design variables.
- Easily parallelized for concurrent processing.
- Derivative free.
- Very few algorithm parameters.
- A very efficient global search algorithm.

The difference between PSO and Genetic Algorithms (GAs) is that GAs it does not traverse the search space like birds flocking, covering the spaces in between.

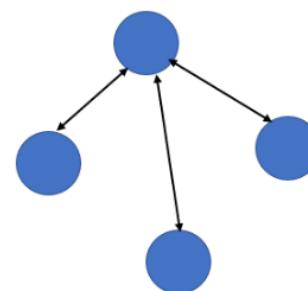
The operation of GAs is more like Monte Carlo, where the candidate solutions are randomized, and the best solutions are picked to compete with a new set of randomized solutions. Also, PSO algorithms require normalization of the input vectors to reach faster “convergence” (as heuristic algorithms, both don’t truly converge). GAs can work with features that are continuous or discrete.

Genetic Algorithms (GAs) and PSOs are both used as cost functions, they are both iterative, and they both have a random element. They can be used on similar kinds of problems. The difference between PSO and Genetic Algorithms (GAs) is that GAs it does not traverse the search space like birds flocking, covering the spaces in between. The operation of GAs is more like Monte Carlo, where the candidate solutions are randomized, and the best solutions are picked to compete with a new set of randomized solutions. Also, PSO algorithms require normalization of the input vectors to reach faster “convergence” (as heuristic algorithms, both don’t truly converge). GAs can work with features that are continuous or discrete.

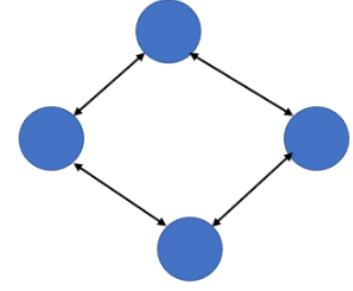
Also, In PSO, there is no creation or deletion of individuals. Individuals merely move on a landscape where their fitness is measured over time. This is like a flock of birds or other creatures that communicate.



Star Topology



Wheel Topology



Ring Topology

Chapter 2

Survey & Historical data

2.1 Historical data

We take some ideas from this websites, we adjust and add more features to be more easier and flexible.

2.1.1 Go Bus

Go Bus is an Egyptian shareholding company working in the field of public transport under the supervision of the Ministry of Transport.

It provides technical solutions by using information and communication technology to improve passenger transportation services and works on developing its benefits for the public to simplify their lives.

The image shows a screenshot of the Go Bus website. At the top, there is a navigation bar with links for Company, FAQ, Terms, Policy, Contact us, and a link to "الذهب إلى العربية" (Go to Arabic). Below the navigation bar, there are links for Home, Travel Destination, and Go Bus Stations, along with a LOGIN button. On the left side, there is a large orange box titled "Book Go Bus". Inside this box, there are two tabs: "ONE WAY" (which is selected) and "ROUND TRIP". Below the tabs are fields for "From" (Luxor) and "To" (Cairo (Tahrir)). There is also a "Departure Date" field set to "Mon 2 May 2022" and a "Choose Return Date" link. A "Passengers" field shows "1" with plus and minus buttons. At the bottom of the orange box is a green "Show Trips" button. To the right of the orange box is a large image of a yellow and white double-decker bus. The bus has the text "Book Your Go Bus Now!" and "Book your bus with your credit card in less than two minutes." The bus is shown from a three-quarter rear angle, driving on a road. In the bottom right corner of the image, there is a small watermark that says "Activate Windows" and "Go to Settings to activate Windows".

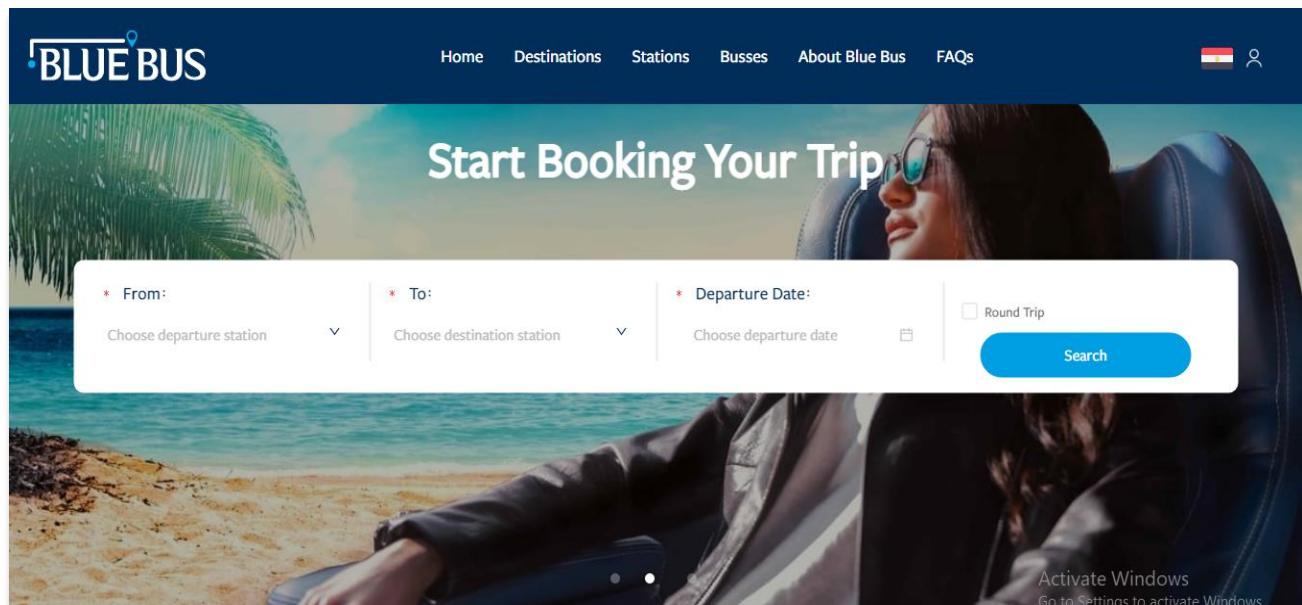
2.1.2 Blue Bus

Blue Bus is a premier public transport company, providing luxurious yet affordable long distance travel in Egypt connecting Greater Cairo.

As the Middle Eastern most promising transportation company it adopts technology that enriches their customer experience, from booking till reaching destinations.

Their highly trained staff deliver a luxurious service.

As well as, their professional drivers ensure safe and punctual trips, with the quality their passengers deserve.



2.1.3 Swvl

Swvl is a transformative tech-enabled mobility platform based in Dubai that enhances the safety, reliability, and convenience of mass transit in some of the world's most challenging and complex emerging markets.

Swvl currently operates in 115 cities across Europe, Africa, Asia, the Middle East, and Latin America.

The differentiated proprietary technology stack features dynamic routing and pricing for both driver supply and customer demand; smart assignment technology that optimizes the driver experience.

The screenshot shows the Swvl mobile application's booking interface. At the top, there is a red header bar with the Swvl logo on the left, language and location settings (Egypt, EN), and a LOGIN button on the right. Below the header is a large white search box with the placeholder text "Book Your Travel Ride Now". Inside the search box, there are fields for "Select Date" (set to "Wed, May 4th"), "Passengers" (set to "1"), and a "SEARCH NOW" button. Above the search box, there are two input fields: "Cairo" with a blue dot icon and "Mansoura" with a grey dot icon. Below the search box are three service highlights: "Arrive on Time" (with a bus icon and a checkmark), "Your Comfort Matters" (with a person sitting in a chair icon), and "Live Tracking" (with a bus icon and a map icon). A small note on the right says "Activate Windows Go to Settings to activate Windows".

Chapter 3

Software life cycle & Analysis

3.1 Project Development Methodology (phases)

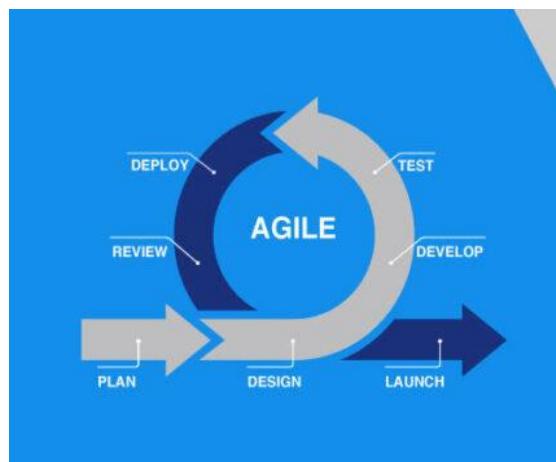
The characteristics of the agile methodology in software development, it helps to maximize the productivity as the project is divided into short iterations.

3.1.1 Software Developments Method :

The systems development life cycle (SDLC), or software development process in systems engineering, information systems and software engineering, is a process of creating or altering information systems, and the models and methodologies that people use to develop these systems. It consists of a set of steps or phases in which each phase of the SDLC uses the results of the previous one.

Agile software development refers to a group of software development methodologies based on iterative development, where requirements and solutions evolve through collaboration between self-organizing cross-functional teams.

Agile methods or Agile processes generally promote a disciplined project management process that encourages frequent inspection and adaptation, a leadership philosophy that encourages teamwork, self-organization and accountability, a set of engineering best practices intended to allow for rapid delivery of high-quality software, and a business approach that aligns development with customer needs and company goals. Agile development refers to any development process that is aligned with the concepts of the Agile Manifesto.[18]



3.1.2 Software Lifecycle Phases :

The agile lifecycle is a structured series of stages that a product goes through. It consists of six phases

- Requirements collection
- Design
- Coding
- Testing
- Implementation And Maintenance
- review

Requirements Phase: Stakeholders conduct an overall project assessment to determine the time and resources required for the development process. At the same stage, the owner assesses the risks and prioritizes the various functions depending on their business value.

Design Phase: The software owner meets with the software development team and introduces them to the requirements outlined in the first step. The group then discusses the sequence for introducing functions and identifies the essential tools – the programming language, syntax libraries, and basic frameworks. At the same stage, software development teams can prototype the expected user interface.

Coding Phase: After agreeing on the plan with the customer, the team develops the product itself. The product is delivered in stages, in separate sprints, each designed to improve the current version of the product. The initial release is likely to undergo many changes to provide improved functionality and new features.

Testing Phase: At this point, the product becomes available to consumers, so the team must conduct a series of tests to ensure that the software is fully functional. If potential bugs or flaws are found, the developers will fix them immediately. At this stage, they also collected consumer feedback.

Implementation And Maintenance Phase: The software is now fully deployed and available to customers. This action puts him in the maintenance phase. During this phase, the software development team provides ongoing support to keep the system running smoothly and fix any new bugs. Over time, further iterations are possible to update an existing product or add other functionality.

Review Phase: That is the last stage of the Agile development cycle. After completing all the previous stages of development, the development team presents to the owner the result achieved in meeting the requirements. After that, the Agile software development phases start over – either with a new iteration or moving to the next stage and scaling Agile.

3.2 Requirements

3.2.1 Requirements Analysis:

The first step in building a desired software product is to extract its requirements. While consumers may feel they understand what the programmed is supposed to accomplish, recognizing incomplete, unclear, or conflicting requirements may need expertise and experience in software engineering.

3.2.2 System Requirements:

- Software:
 - For the PCs need them with Windows 7 or Higher for the web application but we request higher for the mobile application to have higher performance in the Android studio.

- For constructing the database we need MY SQL.
- For designing the interface and prototype of the web application and mobile application we use Adobe Xd
- For developing the web application we use HTML, CSS, JS, PHP
- For the mobile application we used flutter
- For algorithm we used swarm algorithm
- For database we used Mysql
- For artificial intelligence we used Tensorflow, Keras, OpenCV, MobileNetV2, Imutils

- Hardware:

When the passenger arrives on the bus, he will need to scan the ticket code in order to open the door, then we will make sure that the person is wearing the mask to enter the bus.

Real-time mask detection is accomplished by an artificial intelligence–enabled analysis that detects objects in the field of view, recognizes them as human and determines whether they are wearing a mask or not. The first step to recognize the presence of a mask on the face is to detect the face, which makes the strategy divided into two parts: 1. To detect faces 2. To detect masks on those faces, For building face mask based door system, This system contains mainly four devices.

They are:

- | | |
|----------|--------------------|
| • Servo | • Arduino Uno. |
| • webcam | • 64-bit processor |
| • buzzer | • Power Supply |
| • LCD | |

I used Arduino Uno to control servo, camera, LCD and buzzer. If someone appears in front of the entrance wearing a mask properly, covering both their mouth and nose, then they will be let in.

At the same time my display will show “Mask Detected”. But if someone appears without a mask then they will be denied entry, at the same time the system would display “Please wear mask” while the buzzer would alarm the person.

3.2.3 Software Requirements Specification:

- **Functional Requirements**

- System Admin :
 - Sign In
 - View traveler application form
- System Traveler :
 - Sign In
 - Sign Up
 - View Tickets
 - Select ticket
 - Select seat
- System Driver :
 - Sign In
 - View GPS traffic

- **Nonfunctional Requirements**

- Usability: The system have friendly and sooth interface that makes the user find what he wants without any effort
- Availability: The system will be available on 24 hours on 7 days this will be on the semester only.
- Supportability: The system will be built using many tools like MY SQL for database, HTML and PHP for website & Flutter for mobile app & Tensorflow, OpenCV for AI

3.2.4 System Users:

In the system we have three main users:

1- Admin.

2- Driver.

3- Traveler.

3.2.5 Tools:

- For Web and app design and prototype using AdobeXd
- For Web Development (Front-end) using Visual Studio Code:
 1. HTML Language (Hyper Text Markup Language).
 2. CSS (Styling Language).
 3. Java Script (Scripting Language).
- For Web Development (Back-end) using Visual Studio Code: PHP (programming language) - Laravel 8.
- For Mobile Application using Android Studio: Flutter.
- For databases using XAMPP: Mysql (for storing the social network data)
- For Ai using Spyder: Tensorflow, Keras, OpenCV, MobileNetV2, Caffe Model
- For Algorithm using Swarm

3.3 System Design :

The purpose of Design phase is to plan a solution for a problem specified by the requirements. System design aims to identify the modules that should be exist in the system, the specification of those modules and how they interact with each other to produce the results. The goal of the design process is to produce a model that can be used later to build that system. The produced model is called design of the system.

System design is the process of defining the architecture, components, modules, interfaces and data for a system to satisfy specified requirements.

Normally, the design proceeds in two stages:

- Physical design is a graphical representation of a system showing the system's internal and external entities and the flow of data into and out of these entities. An internal entity is an entity within the system that transforms data. To represent it, we use diagrams like use case diagrams, etc.
- Database design: It's the implementation of the schema into a database.

Chapter 4

Design

4.1 Flow Chart Diagram (Software)

The flowchart shows the steps as boxes of various kinds, and their order by connecting the boxes with arrows. This diagrammatic representation illustrates a solution model to a given problem. Flowcharts are used in analyzing, designing, documenting or managing a process or program in various fields

Flowcharts are used in designing and documenting simple processes or programs. Like other types of diagrams, they help visualize what is going on and thereby help understand a process, and perhaps also find less-obvious features within the process, like flaws and bottlenecks.

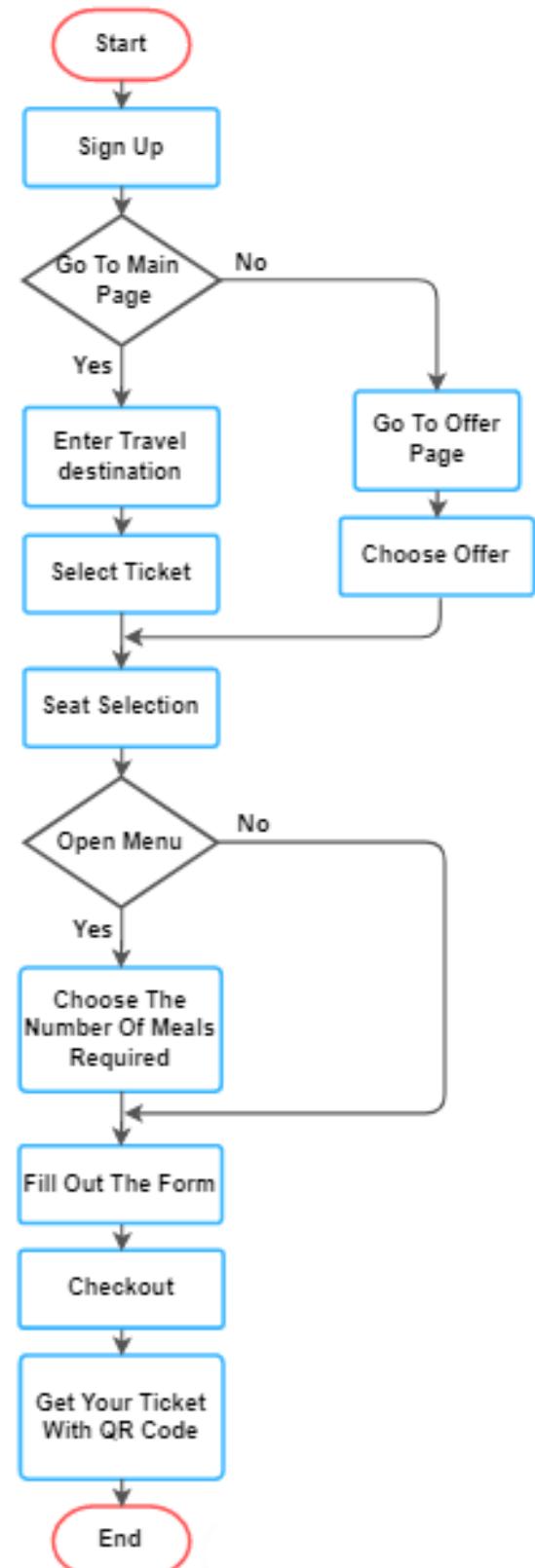


Figure 4.1 Flow chart of software

4.2 Flow Chart Diagram (Hardware)

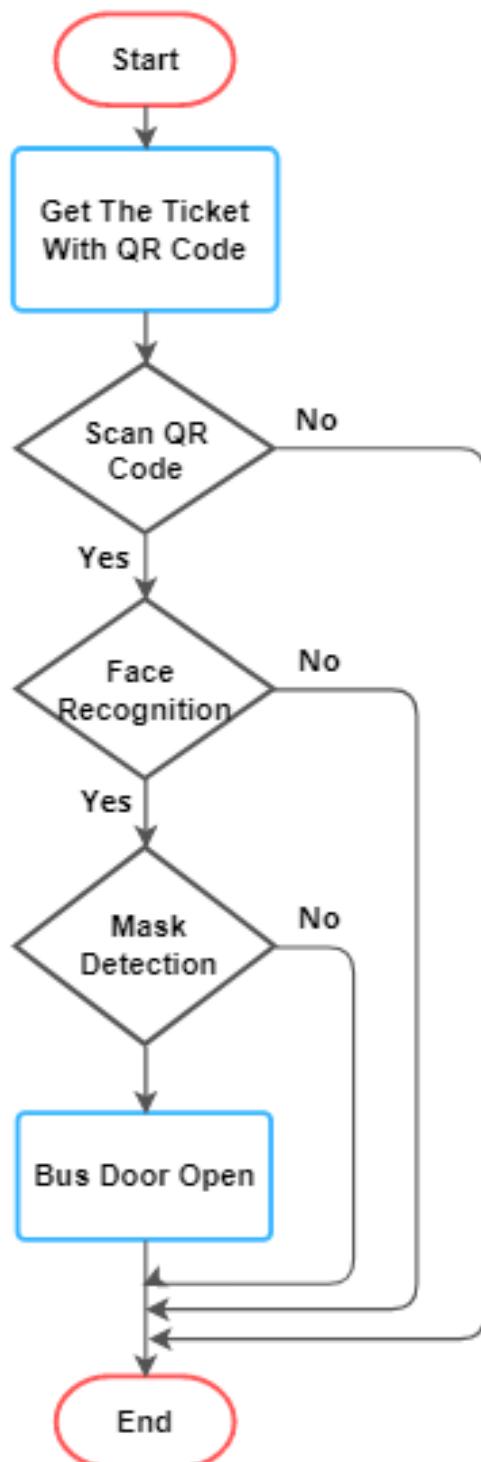


Figure 4.2 Flow chart of hardware

4.3 Flow Chart (face mask detection)

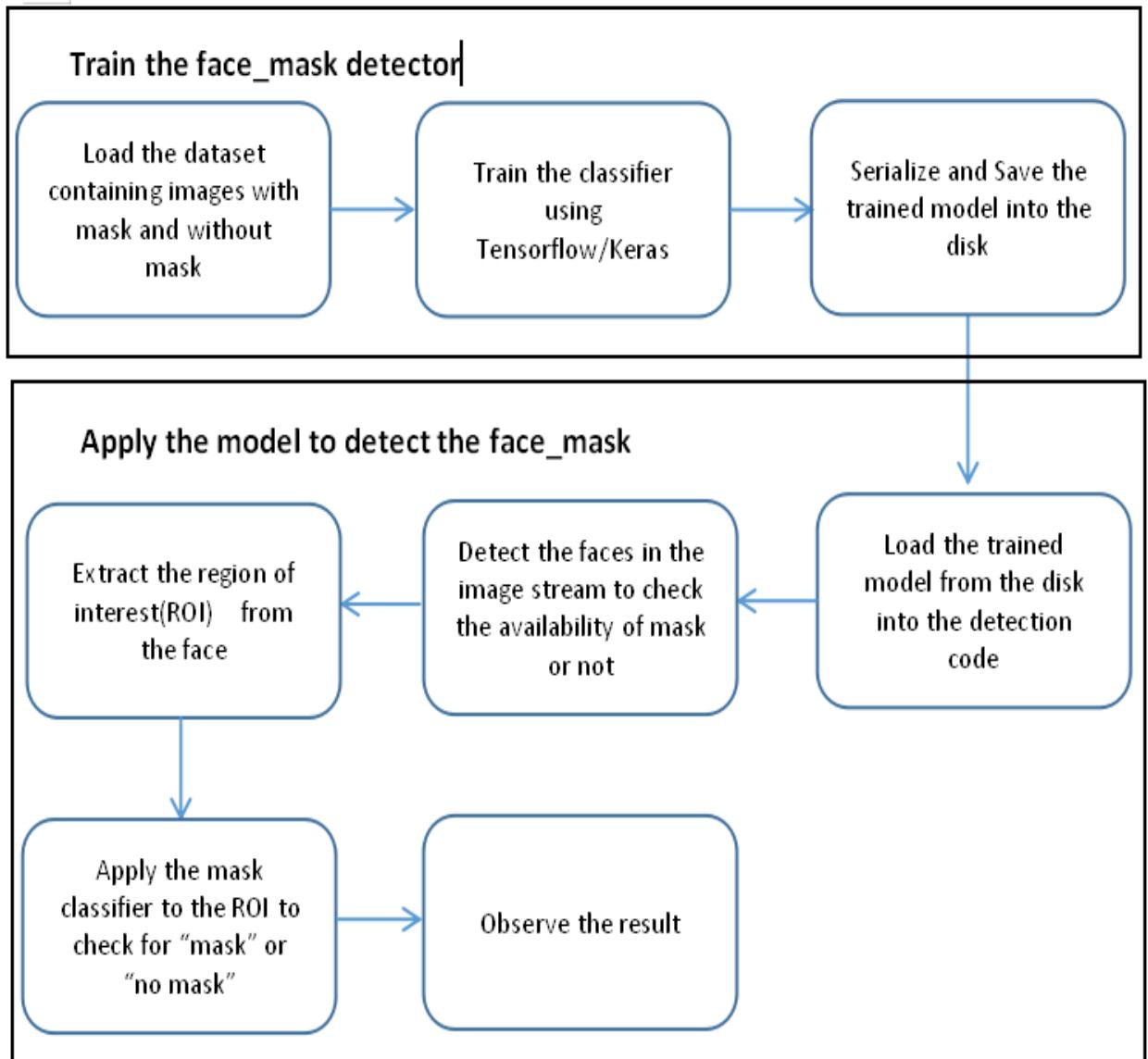


Figure 4.3 Flow chart of mask detection

4.4 Entity relationship diagram (ERD):

An Entity Relationship Diagram (ERD) is a visual representation of different entities within a system and how they relate to each other.

They are widely used to design relational databases. The entities in the ER schema become tables, attributes and converted the database schema. Since they can be used to visualize database tables and their relationships it's commonly used for database troubleshooting as well.

Entity relationship diagrams are used in software engineering during the planning stages of the software project. They help to identify different system elements and their relationships with each other.

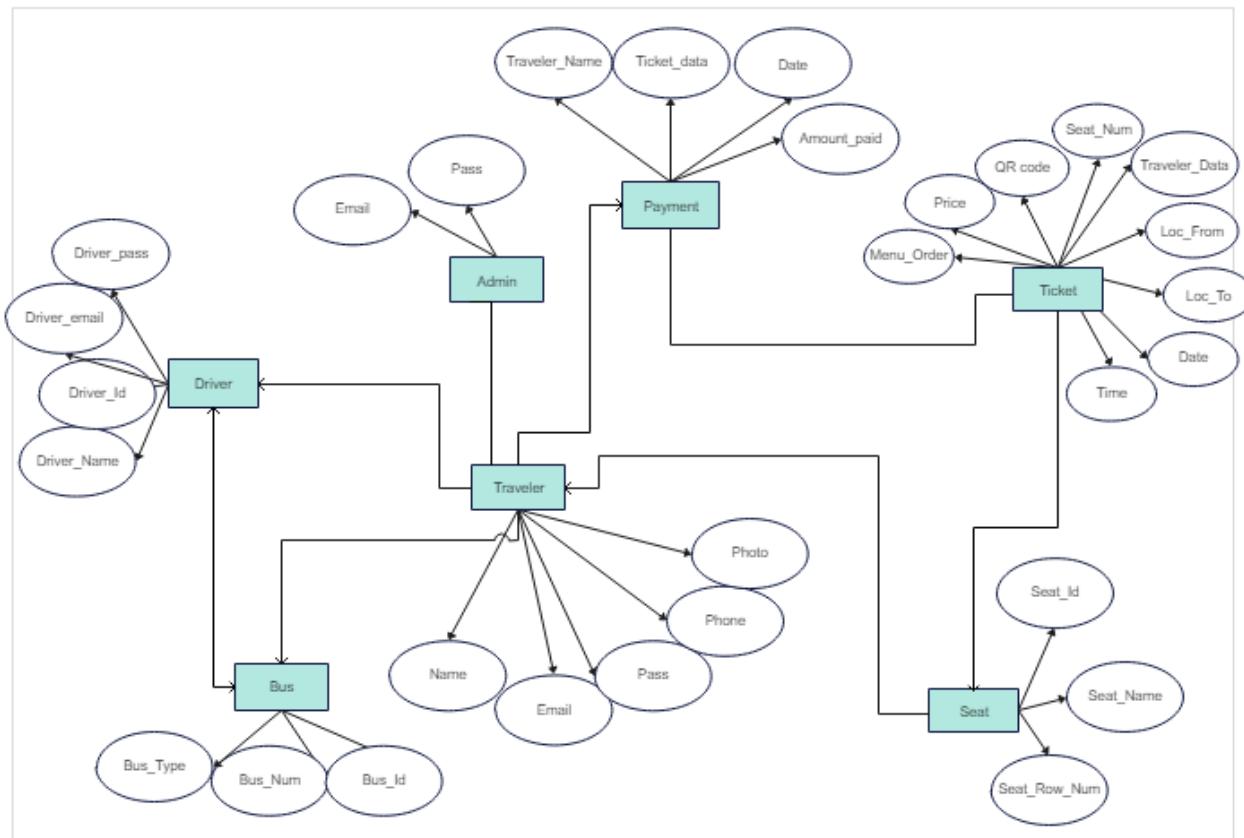


Figure 4.4 ERD

4.5 Sequence diagram

Sequence Diagrams are interaction diagrams that detail how operations are carried out. They capture the interaction between objects in the context of a collaboration. Sequence Diagrams are time focus and they show the order of the interaction visually by using the vertical axis of the diagram to represent time what messages are sent and when.

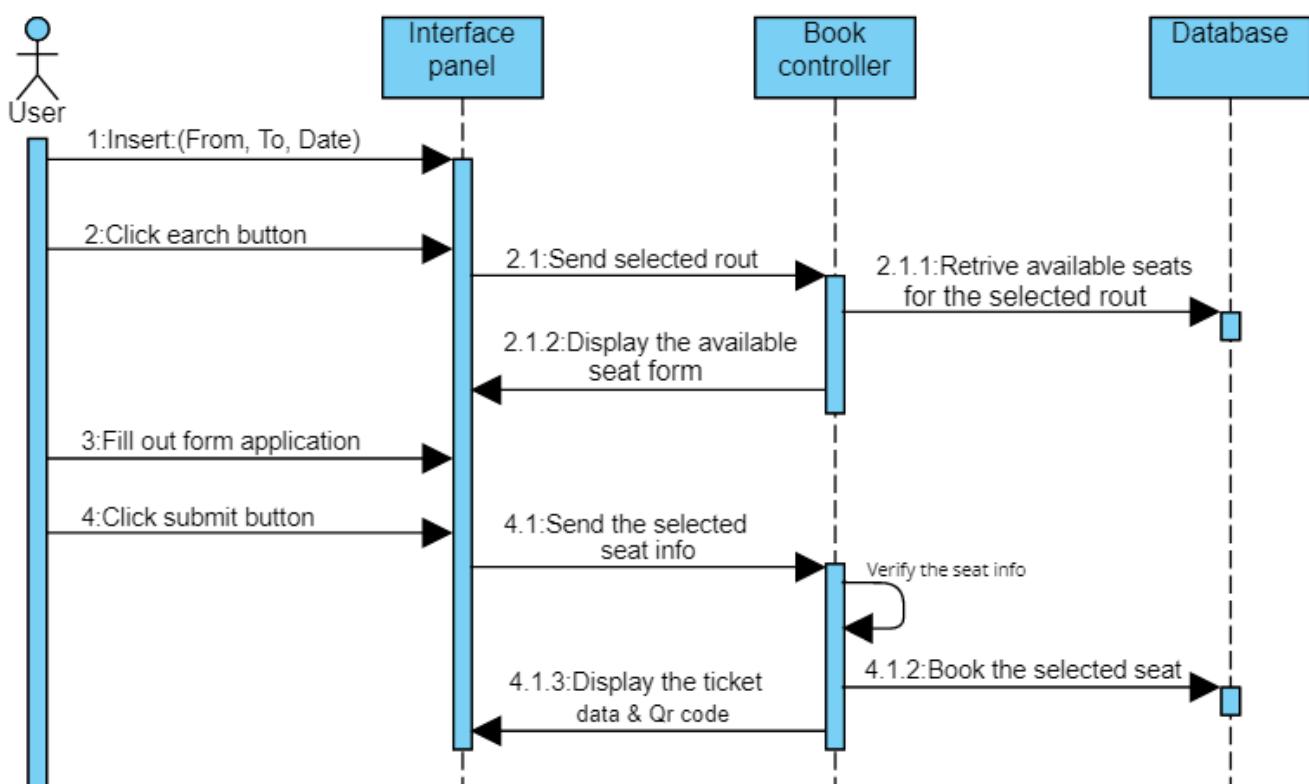


Figure 4.5 sequence diagram

4.6 Use Case Diagram

use case diagram is the primary form of system/software requirements for a new software program underdeveloped. Use cases specify the expected behavior (what), and not the exact method of making it happen (how). Use cases once specified can be denoted both textual and visual representation (i.e. use case diagram). A key concept of use case modeling is that it helps us design a system from the end user's perspective. It is an effective technique for communicating system behavior in the user's terms by specifying all externally visible system behavior.

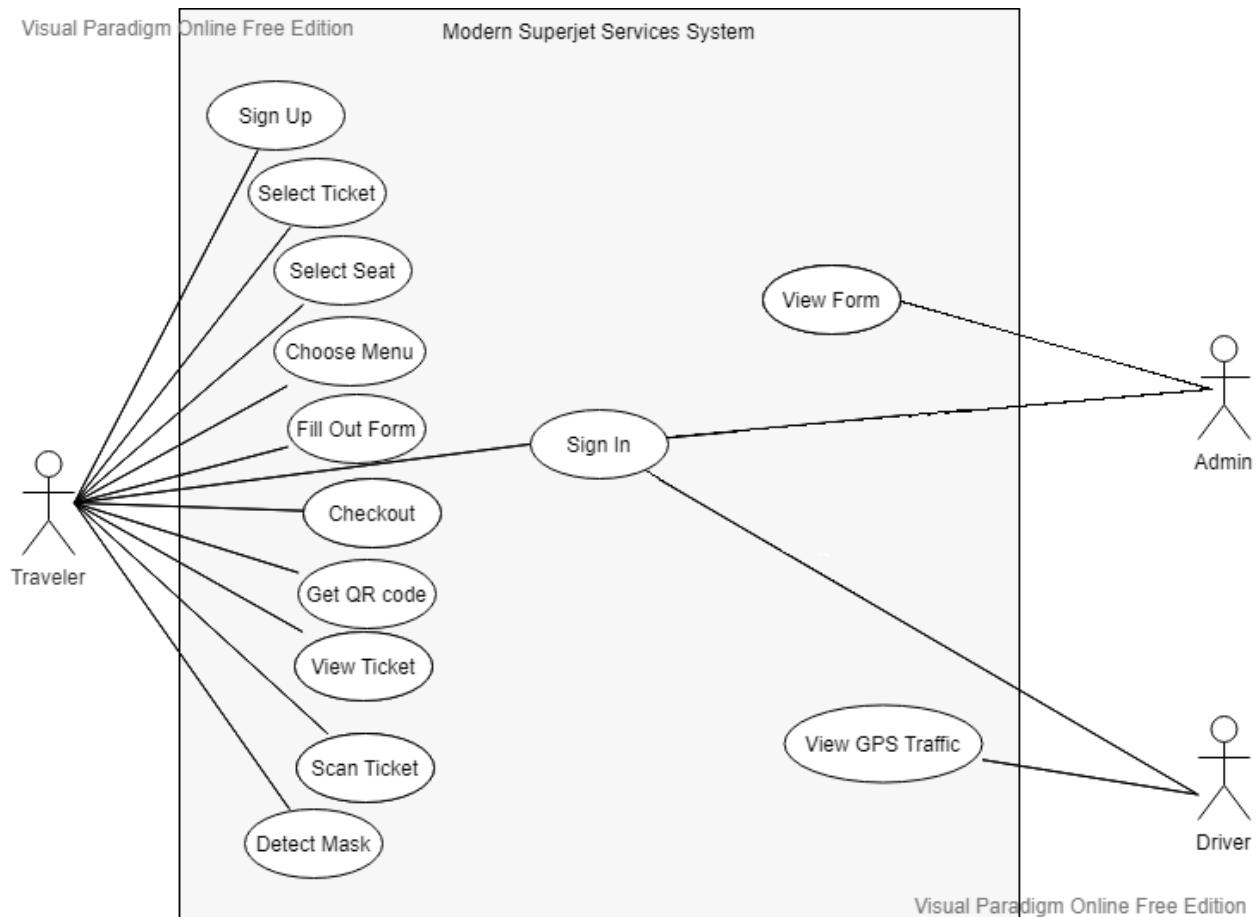


Figure 4.6 Use case diagram of database

4.7 The relation between tables in our Database

The design of the database is called a schema. This tells us about the structural view of the database. It gives us an overall description of the database. A database schema defines how the data is organised using the schema diagram. A schema diagram is a diagram which contains entities and the attributes that will define that schema. A schema diagram only shows us the database design. It does not show the actual data of the database. The schema represents the relationship between these tables.

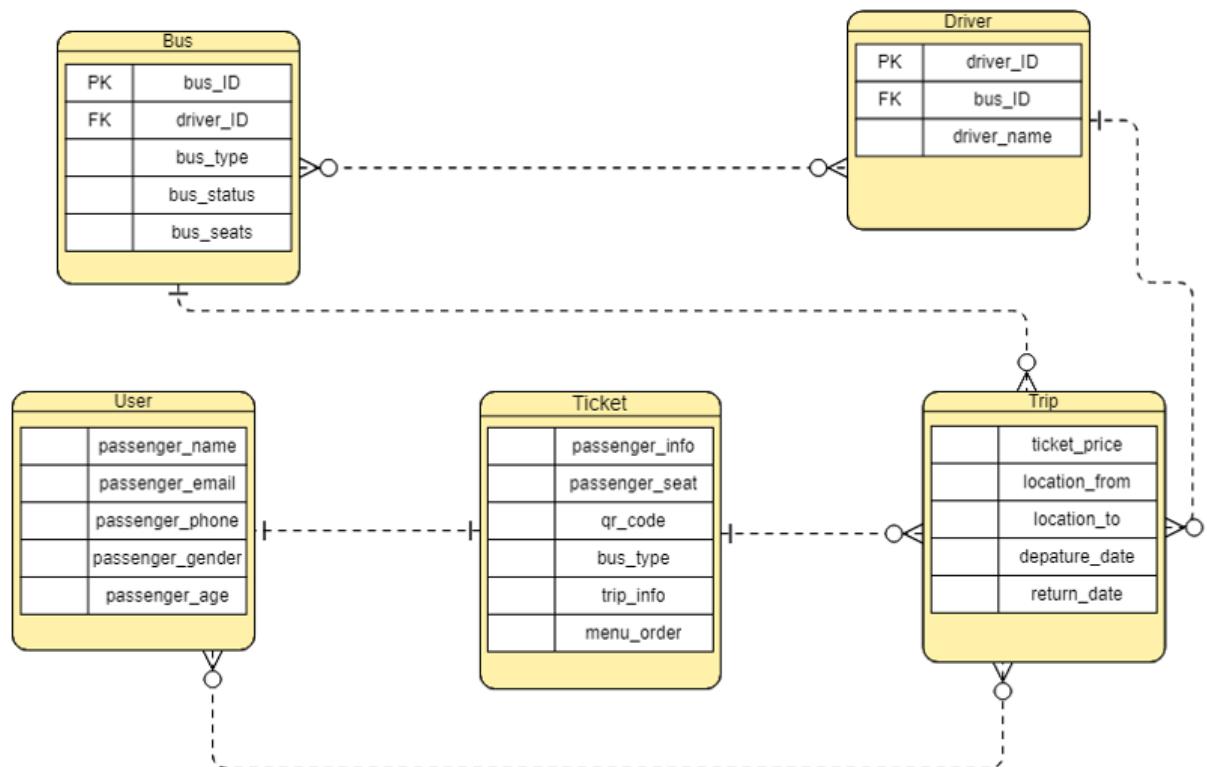


Figure 4.7 schema of database

4.8 Tables Schema.

SELECT * FROM `crud`											
<input type="checkbox"/> Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]											
<input type="checkbox"/> Show all Number of rows: 25		Filter rows: Search this table		Sort by key: None							
+ Options											
←	→	id	email	password							
<input type="checkbox"/>		Edit		Copy		Delete	9	mariam@gmail.com	ahahah		
<input type="checkbox"/>		Edit		Copy		Delete	10	soso@gmail.com	soso12		
<input type="checkbox"/>		Edit		Copy		Delete	11	testuser@yahoo.com	mo123		
<input type="checkbox"/>		Edit		Copy		Delete	12	mosalah@gmail.com	momo12		
<input type="checkbox"/>		Edit		Copy		Delete	13	yoyo@gmail.com	1234dd		
<input type="checkbox"/> Check all		With selected:			Edit		Copy		Delete		Export
<input type="checkbox"/> Show all Number of rows: 25		Filter rows: Search this table		Sort by key: None							

SELECT * FROM `form`										
<input type="checkbox"/> Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]										
<input type="checkbox"/> Show all Number of rows: 25		Filter rows: Search this table		Sort by key: None						
+ Options										
←	→	id	fullname	email	phonenum	uploadpic	cardnum	md	ccv	promocode
<input type="checkbox"/>		Edit		Copy		Delete	3	mariamahmed	mariam@gmail.com	01117777755 1653699641.jif
<input type="checkbox"/>		Edit		Copy		Delete	4	ahmedmahmoud	ahmed@gmail.com	5412-5412-5412-5412 01/09 412 112233
<input type="checkbox"/>		Edit		Copy		Delete	5	mariamezz	mariamezz@gmail.com	01112334455 1653699772.jif 5577-5577-5577-5577 01/09 577 123456
<input type="checkbox"/>		Edit		Copy		Delete	6	hosneyali	hosney@gmail.com	74627468242 1653699891.jpg 5412-5412-5412-5412 00/99 122 676879
<input type="checkbox"/>		Edit		Copy		Delete		Export		
<input type="checkbox"/> Show all Number of rows: 25		Filter rows: Search this table		Sort by key: None						

Figure 4.9 Form application table

Chapter 5

System Implementation

5.1 Design

It was used adobe xd to build the web and application design and made more than 20 frames consisting of animations and prototype.

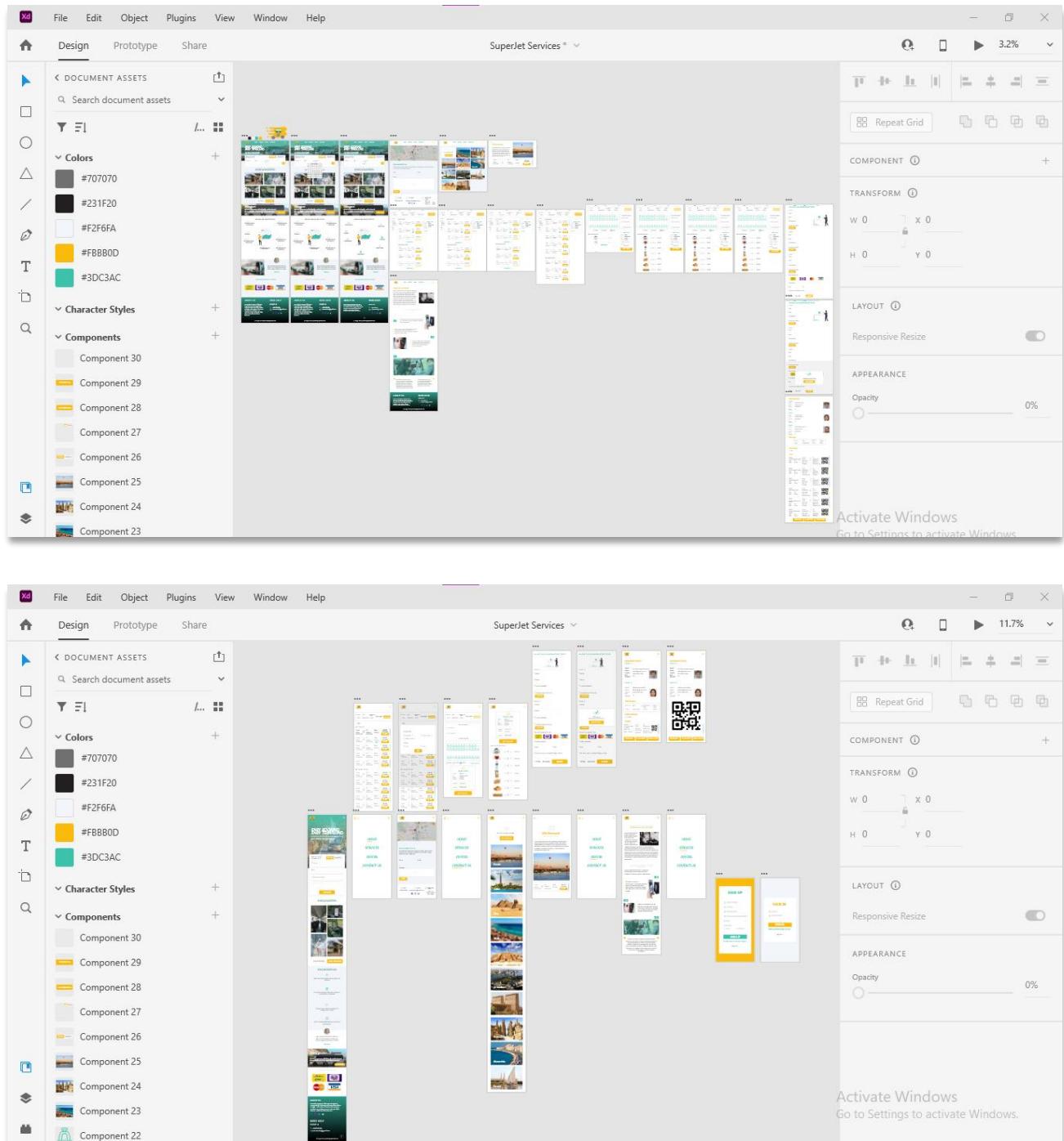


Figure 5.1 Frames of design

5.1.1 Web Design

The user can sign up or log in by filling these forms and if one of the fields is empty or wrong, an alert is displayed to notify the user.

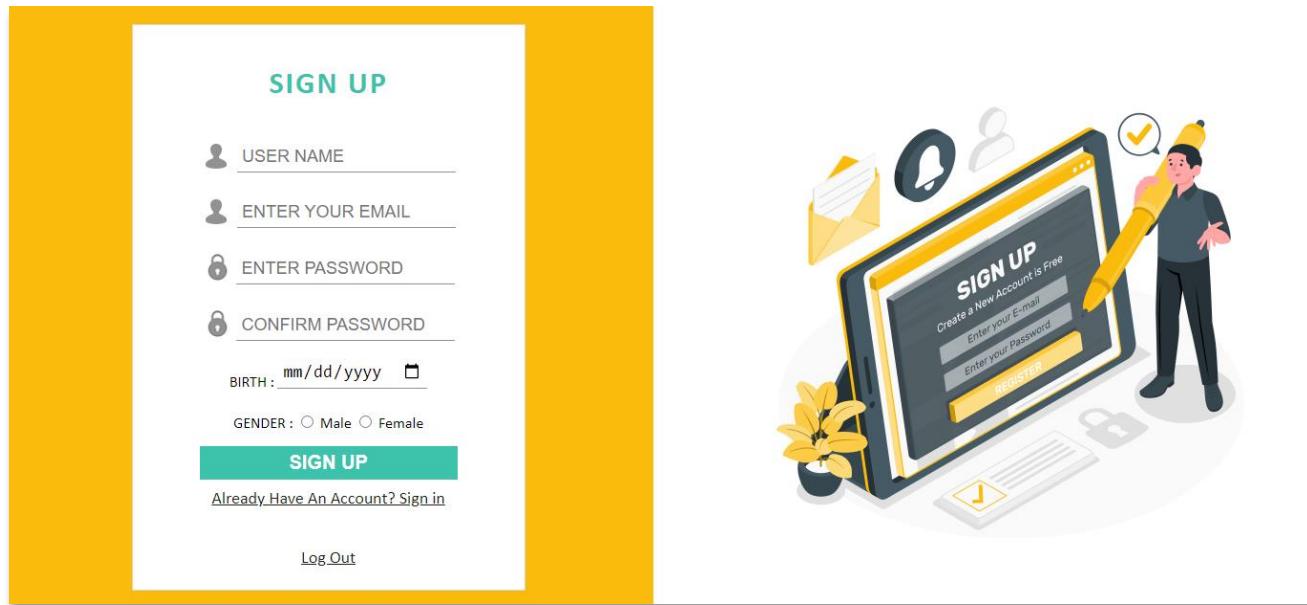


Figure 5.2 Sign up page design for web

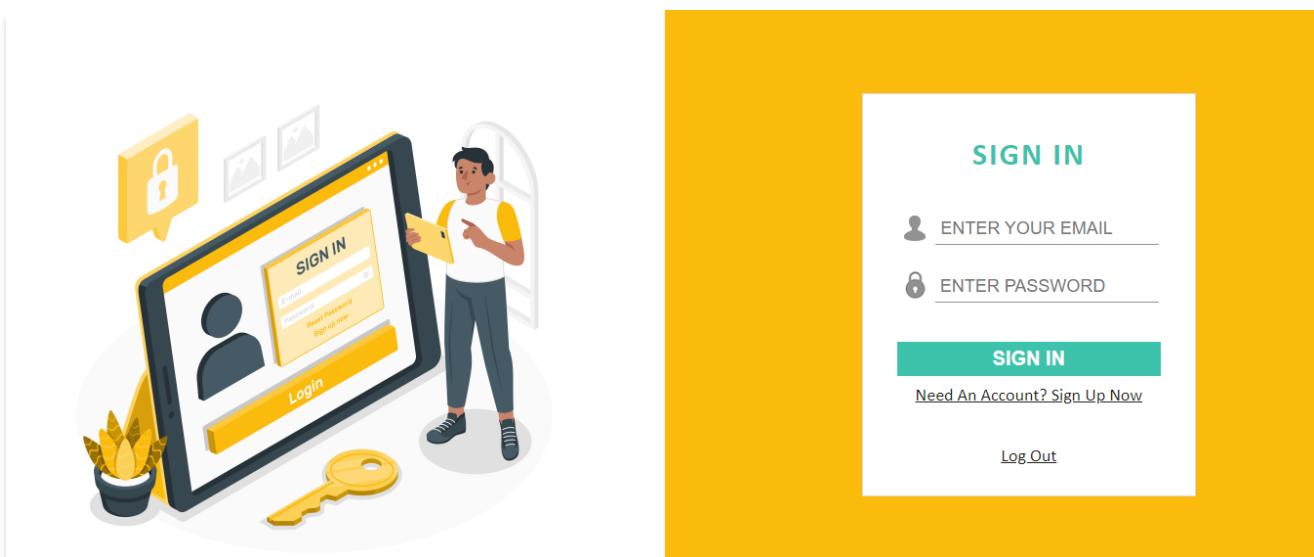


Figure 5.3 Sign In page design for web

The home page of the site, which presents an overview of it and its advantages.

**EASY BOOKING
EASY TRAVELLING**

GET YOUR TICKET NOW!

BOOK A TICKET
And Select A Trip

From To Departure Date Return Date

From Place Enter Place mm/yy/yy yy/yy

WHAT WE OFFER
SEE WHAT WE CAN DO FOR YOU!

We provide distinguished services that exceed our customers' expectations and expectations to become the easiest and safest solution. Such as services inside the bus and taking precautionary measures. We also excel in organizing appointments, scanning codes and more, and always strive to become a leading company in the field of passenger transportation services by all means using all modern technologies to provide comfort and luxury to our customers.

[READ MORE](#) [OUR SERVICES](#)

Contact us

We are available 24/7 via the hotline or send your comment via this email superservice@gmail.com or by phone +201157659421

[CONTACT US](#)

WHY CHOOSE US
SEE WHAT WE CAN DO FOR YOU!

- HIGH QUALITY
- EASY TO USE
- QR TICKET
- SMART GATE
- SAVE MONEY
- COMFORTABLE
- ON TIME

I loved dealing with the company and its comfort and luxury services, and I advise everyone to deal with the company

- Martina -

COOPERATE WITH

ABOUT US

We are an Egyptian Joint stock company that works in the field of passenger transport. and provide technical solutions using technology to improve passenger transportation services, to develop its services for the public to simplify their lives.

NEED HELP

CONTACT US

Phone: +201157659421
Email: superservice@gmail.com

Social Media: [Facebook](#) [Instagram](#) [Twitter](#) [LinkedIn](#)

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Figure 5.4 Main page design for web

Services page describes the services provided by the project to the user and the steps that will be taken when boarding the bus

WHAT WE ARE DOING

Our mission is to provide comfortable and safe transportation services that our customers can rely on, and therefore we always follow up on the needs of our customers and review the provision of our services on an organized basis and appropriate for all needs, we are working to provide reliable transportation services for passengers at any time and anywhere to meet the needs of all our customers and apply sound business principles in order to always be ahead. Our principle is the comfort and well-being of our customers.

OUR SERVICES

01

We work on a strong organization and the convenience of our customers, so when you get on the bus your code will be scanned to confirm your presence

02

Taking precautionary measures All passengers are checked before entering the bus and make sure that they are wearing a mask through mask detection

03

And also to confirm the identity of the person, we use a face recognition scanner by comparing the person with the image that he uploaded while booking the ticket, So make sure to upload an image of you with a high quality and the date it was taken is not far away

“
That You Can Communicate With Your Family And Friends Without Worry. And Because We Know That Most Of Our Customers Travel In Order To Enjoy Spending Time With Family Or Friends, We At Go Bus Take Care Of The Value Of The Time You Spend With Your Family And Friends. Therefore, We Have Provided You With A Business Class Service For Family And Friends, With Facing Seats To Provide A Family Atmosphere For Our Customers. This Service Is Also Provided With Hot Drinks And A Free Meal During The Flight So That Our Client Gets The Best Luxury Services.
”

ABOUT US

We are an Egyptian joint stock company that works in the field of passenger transport, and provide technical solutions using technology to improve passenger transportation services, to develop its services for the public to simplify their lives.

NEED HELP

CONTACT US

+201157659421
 superservice@gmail.com

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Figure 5.5 Services page design for web

57

Offers page displays offers and discounts on trips, as well as general information about the landmarks of the place to educate tourists about the beautiful landmarks of Egypt

The screenshot shows the 'OFFERS' section of a travel website. At the top, there's a navigation bar with icons for a bus, 'HOME', 'SERVICES', 'OFFERS' (which is underlined), 'CONTACT US', a bell, and a user profile icon.

On the left, there's a promotional code section with a QR code, a 'Z' logo, and a button to 'CREATE CODE'. Below it are several thumbnail images of Egyptian landmarks:

- Dhab**: A coastal town with traditional wooden houses built on stilts over the water.
- Sharm Elsheikh**: A view of ancient stone structures, likely a temple or ruins.
- Aswan**: Hot air balloons floating over the Nile River.
- Horus**: A rock-cut temple complex.
- Alexandria**: A coastal city with modern buildings and a long pier.
- Cairo**: The Qaed Ibrahim Mosque and the Minaret of Al-Azhar.
- 6 October**: An aerial view of a modern urban area.
- Fauom**: A sailboat on the water with minarets in the background.
- Giza**: The Great Pyramids and the Sphinx.

In the center, a detailed offer for Giza is displayed:

15% Discount
Get a Promotional code dummy

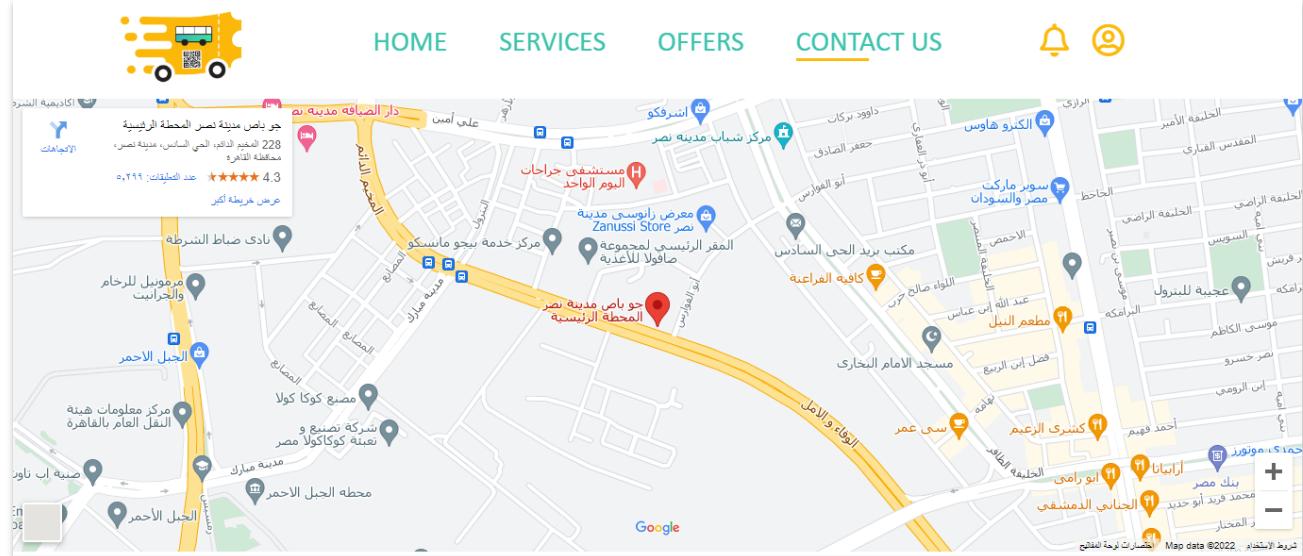
The text describes Giza as a destination for sports enthusiasts, particularly skydiving and mountain climbing, due to its wind speed and surrounding mountains. It also mentions the desert nature and mild climate, famous for tourist villages and hotels.

From	To	Date	100 EGP for a seat
Cairo 02:10 PM	Dhab 04:30 PM	12 Oct	SELECT

On the right, there's a large image of a coastal resort with thatched-roof buildings and a clear blue sea.

Figure 5.6 Offers page design for web

Here we explain how to reach us through our main location, working times, and also to place any complaints or feedback.



SEND MESSAGE TO US

If there is a question regarding our services, information on booking and purchasing tickets, leave us a message and you will receive a response as soon as possible

Name

Email

Message

Type Here...

SUBMIT

 **PHONE**
+023 333 333

 **E-MAIL**
superservice@gmail.com
   

 **WORKING TIME**
FROM - TO
8:00 Am - 4:00 Pm
MON - WED

Figure 5.7 Contact page design for web

The user selects his location, the location he wants to travel to, the date of the day, and whether he wants to book a return ticket.

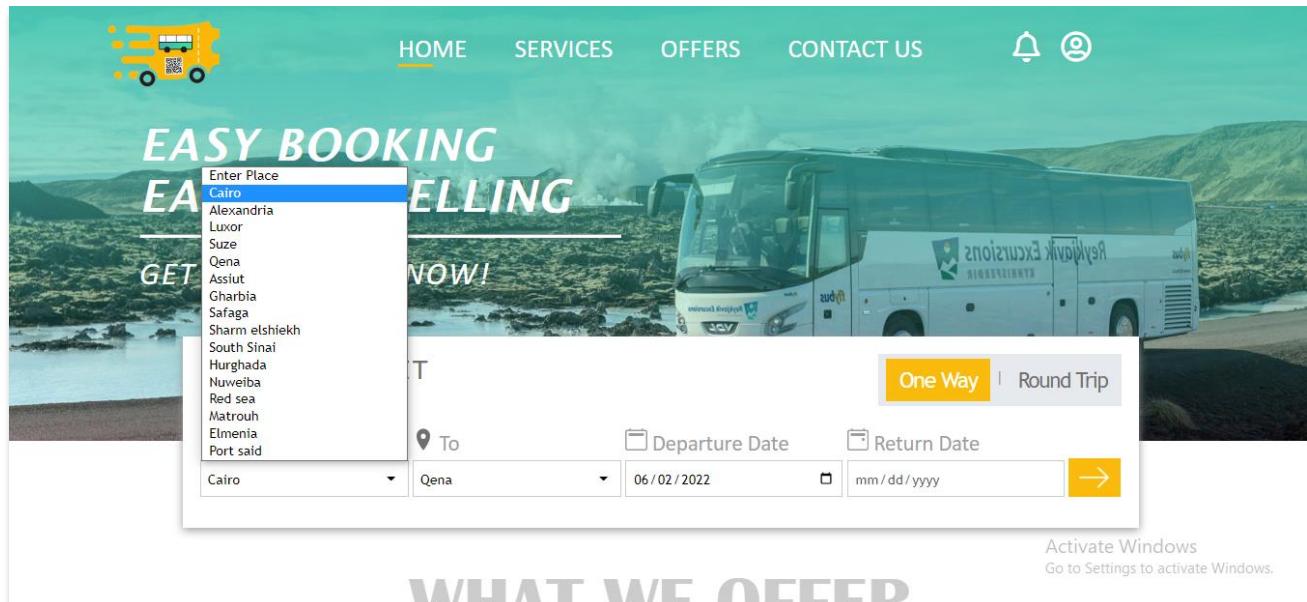


Figure 5.8 Search from home page design for web

- Then the user follows the following steps to get the ticket.
- There is an indicator that shows the number of steps and how far you have progressed, this gives the user a hint of simplicity and ease of booking and encourages them not to be too lazy to book.

- The user begins to choose the most appropriate trip for him and to facilitate the search process, the trips can be filtered according to the type of bus, where each ticket is colored according to the color of the type of bus

The screenshot shows a travel booking interface for selecting a bus ticket. At the top, there are search fields for 'From' (Cairo), 'To' (Qena), 'Departure Date' (2022-06-02), and 'Return Date?'. A yellow 'EDIT SEARCH' button is on the right. Below this is a 'GO TICKET' section with a 'Filter' sidebar for 'SuperJet' (All, Classic, Deluxe, Elite). The main area lists eight bus trip options with icons, details, and 'SELECT' buttons. To the right is a summary box for 'SELECT A TRIP' with fields for 'FROM Cairo', 'TO Qena', 'Date 2022-06-02', and 'Return'. It also shows a 'TOTAL' section.

From	To	Date	Price	Action
tahrir 1:50am	sidi abdelraheem 9:50am	2022-06-02	255EGP for a seat	SELECT
tahrir 9:55pm	sidi abdelraheem 5:55am	2022-06-02	170EGP for a seat	SELECT
tahrir 11:34pm	sidi abdelraheem 7:34am	2022-06-02	415EGP for a seat	SELECT
nasr city 1:04am	sidi abdelraheem 9:04am	2022-06-02	415EGP for a seat	SELECT
nasr city 2:35am	sidi abdelraheem 10:35am	2022-06-02	255EGP for a seat	SELECT
nasr city 10:40pm	sidi abdelraheem 6:40am	2022-06-02	170EGP for a seat	SELECT
almaza 12:19am	sidi abdelraheem 8:19am	2022-06-02	415EGP for a seat	SELECT
giza 9:10pm	sidi abdelraheem 5:10am	2022-06-02	170EGP for a seat	SELECT

Figure 5.9 Select ticket page design for web

Tickets are classified according to the type of bus. Each bus has a specific color that appears on the ticket, and the data can be filtered to allow you to better analyze your data. When filtering data, only rows that meet the filter criteria will display and other rows will be hidden

The screenshot shows a user interface for selecting a bus ticket. At the top, there are search fields for 'From' (Cairo), 'To' (Qena), 'Departure Date' (2022-06-02), and 'Return Date?'. A yellow 'EDIT SEARCH' button is on the right. Below this is a 'Filter' section with a 'SuperJet' dropdown and buttons for 'All', 'Classic', 'Deluxe' (which is selected), and 'Elite'. To the right, a 'GO TICKET' section displays two trip options for a 'SuperJet' bus from Cairo to Qena on June 02, 2022. Each trip is priced at 255EGP for a seat. Two orange 'SELECT' buttons are provided for each trip. On the far right, a summary box titled 'SELECT A TRIP' shows the selected details: From Cairo, To Qena, Date 2022-06-02, and Return. It also includes a note to activate Windows and a link to do so.

From	To	Date	Price
Cairo	Qena	2022-06-02	255EGP for a seat
	Sidi Abdelraheem	2022-06-02 09:50am	255EGP for a seat
	Sidi Abdelraheem	2022-06-02 10:35am	255EGP for a seat

SELECT A TRIP

From Cairo
To Qena
Date 2022-06-02
Return

TOTAL

Activate Windows
[Go to Settings to activate Windows.](#)

Figure 5.10 filtering from select ticket page design for web

2. The number of seats is determined and meals can be added through the menu

The screenshot shows a travel booking interface. At the top, there's a search bar with fields for 'From' (Cairo), 'To' (Qena), 'Departure Date' (2022-06-02), and 'Return Date?'. A teal button labeled 'EDIT SEARCH' is next to it. Below the search bar, there are two rows of 12 seat icons each. The first row has 11 green icons and 1 blue icon. The second row has 11 green icons and 1 yellow icon. Below these rows are three status indicators: 'Solid Out' (grey backpack icon), 'Selected' (green backpack icon), and 'Available' (yellow backpack icon). To the right, a sidebar titled 'SELECT A TRIP' shows the same travel details and a 'TOTAL 87' summary. A large orange button labeled 'GET TICKET' is at the bottom of the sidebar. Below the sidebar, the text 'Click Here To Add Menu Check' is visible. The main area below the seat selection is titled 'Menu's Service' and lists six food items with quantity selection buttons and prices in EGP.

Item	Quantity	Price (EGP)
Coffee	<input type="button" value="-"/> 0 <input type="button" value="+"/>	25 EGP
Tea	<input type="button" value="-"/> 2 <input type="button" value="+"/>	20 EGP
AquaFina Water	<input type="button" value="-"/> 0 <input type="button" value="+"/>	10 EGP
Juvelia Orange Juice	<input type="button" value="-"/> 1 <input type="button" value="+"/>	7 EGP
Sandwich (with meat and vegetables)	<input type="button" value="-"/> 1 <input type="button" value="+"/>	40 EGP
Croissant	<input type="button" value="-"/> 0 <input type="button" value="+"/>	30 EGP
Submarine Sandwich	<input type="button" value="-"/> 0 <input type="button" value="+"/>	23 EGP

Figure 5.11 Select seat page design for web

- Fill out the application form with your information, upload your photo and choose the payment method. When you leave a field blank or fill it wrong, an alert is shown to let the user know and the submission will not be accepted unless all field are filled correctly.

1 2 3 4

FILL OUT THE APPLICATION TO GET TICKET

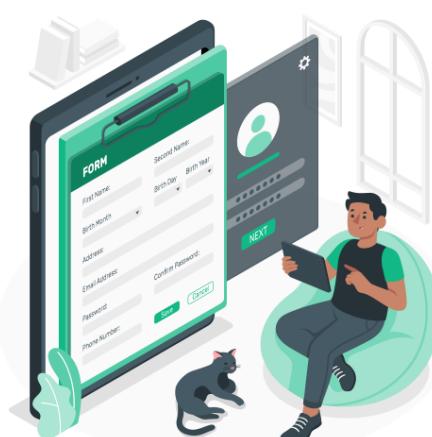
TICKET 1

*FULL NAME :
marim mohamed ezz

*EMAIL :
marimezzaldin670@gmail.com

*PHONE NUMBER :
01011437392

*UPLOAD YOUR PICTURE
Choose File Advan...rt.jpg



*CARD NUMBER :
3444-4444-4444-4444

YOU ARE USING AMERICAN EXPRESS CARD !



*M/D : *CCV
77/88 666

DO YOU HAVE PROMOTIONAL
PROMO CODE

TOTAL \$



SUBMISSION SUCCEDED!
Your Form Have Been Confirmed
VIEW TICKET

Figure 5.12 Form application page design for web

4. Finally, a ticket appears for the user with all the data and a QR code where they can download the code to print or share.[19]

The image shows a ticket page design for a web application. At the top, there is a horizontal teal bar with four numbered circles (1, 2, 3, 4) indicating a process flow. Circle 4 is labeled "Final Step!". Below the bar, the page is divided into sections:

- PASSENGER DETAILS**:
TICKET 1
NAME: marim mohamed ezz
EMAIL: marimezzaldin670@gmail.com
PHONE: 01011437392
SEAT NUMBER: A7,B7,C7
- TRIP DETAILS**:
From: Cairo To: Qena Departure Date: 2022-06-02
- MENU ORDER**:
Coffe : 0
Tea : 2
Water : 0
Juice : 1
toast : 1
Crusoe : 0
sandwich : 0
- TICKET**:
A summary box contains:

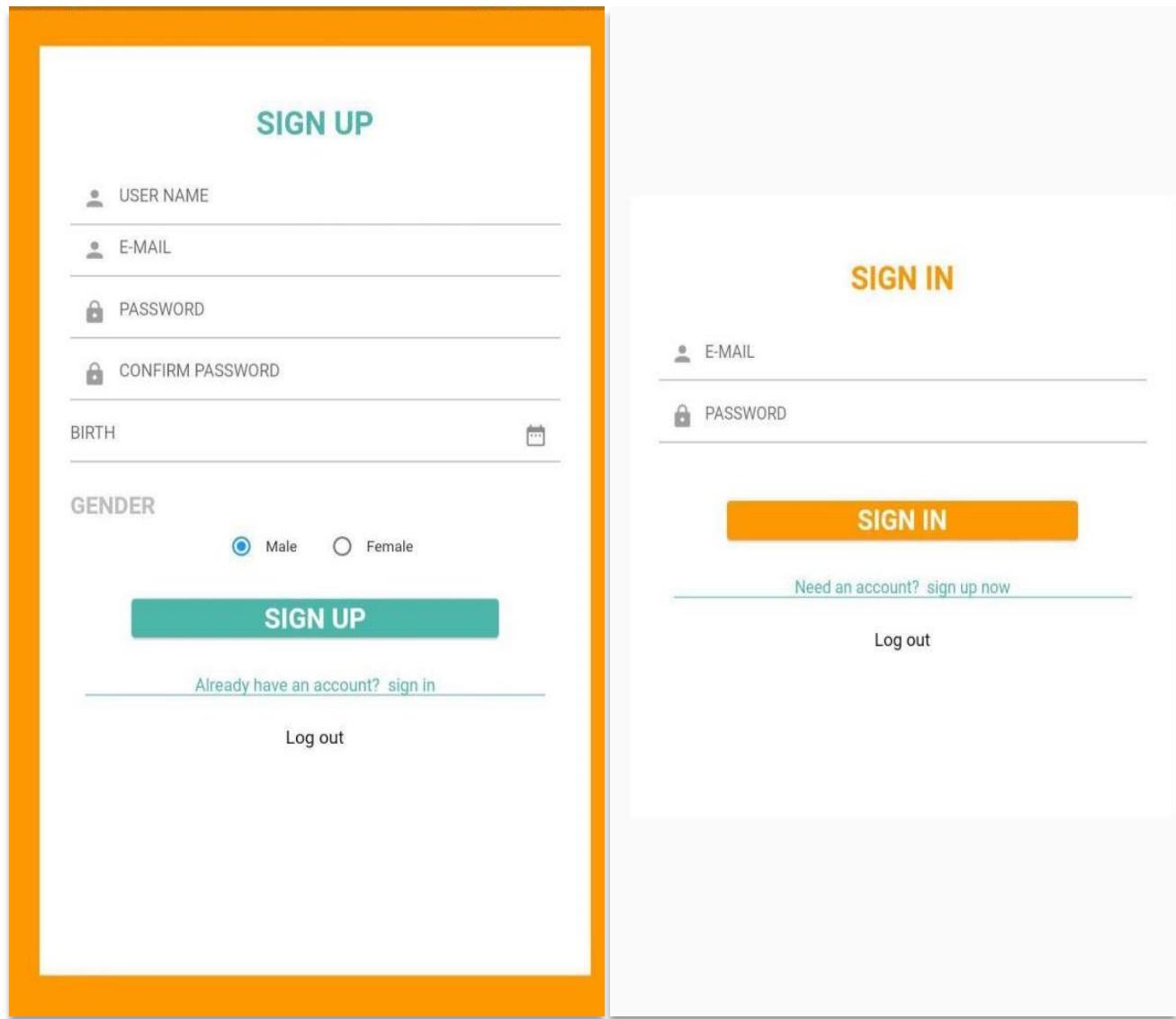
NAME marim mohamed ezz	FROM Cairo	TO Qena
SEAT A7,B7,C7	Time	Time
DATE 2022-06-02	PICK UP	DROP OFF

A large QR code is displayed to the right of the summary box.
Below the summary box are two buttons: "Download" and "Share Ticket".
At the bottom left is a link "GO BACK".

Figure 5.13 View ticket page design for web

5.1.2 Mobile App Design

The user can register or login to their account through these forms.



The image displays two mobile application screens: a "SIGN UP" screen on the left and a "SIGN IN" screen on the right. Both screens have a light gray background with orange borders.

SIGN UP Screen:

- Header:** "SIGN UP" in green text.
- Fields:** "USER NAME" (with user icon), "E-MAIL" (with user icon), "PASSWORD" (with lock icon), and "CONFIRM PASSWORD" (with lock icon).
- Date Input:** "BIRTH" field with a calendar icon.
- Gender Selection:** "GENDER" section with "Male" (radio button) and "Female" (radio button) options. "Male" is selected.
- Buttons:** A large teal "SIGN UP" button at the bottom, and a smaller "Log out" button below it.
- Links:** "Already have an account? [sign in](#)" link.

SIGN IN Screen:

- Header:** "SIGN IN" in orange text.
- Fields:** "E-MAIL" (with user icon) and "PASSWORD" (with lock icon).
- Buttons:** An orange "SIGN IN" button at the bottom, and a "Log out" button below it.
- Links:** "Need an account? [sign up now](#)" link.

Figure 5.14 Sign up & sign in page design for app

User can search about the trip that he wants then select one way/round trip, Also he can Select the date for this trip, and contact with the company.

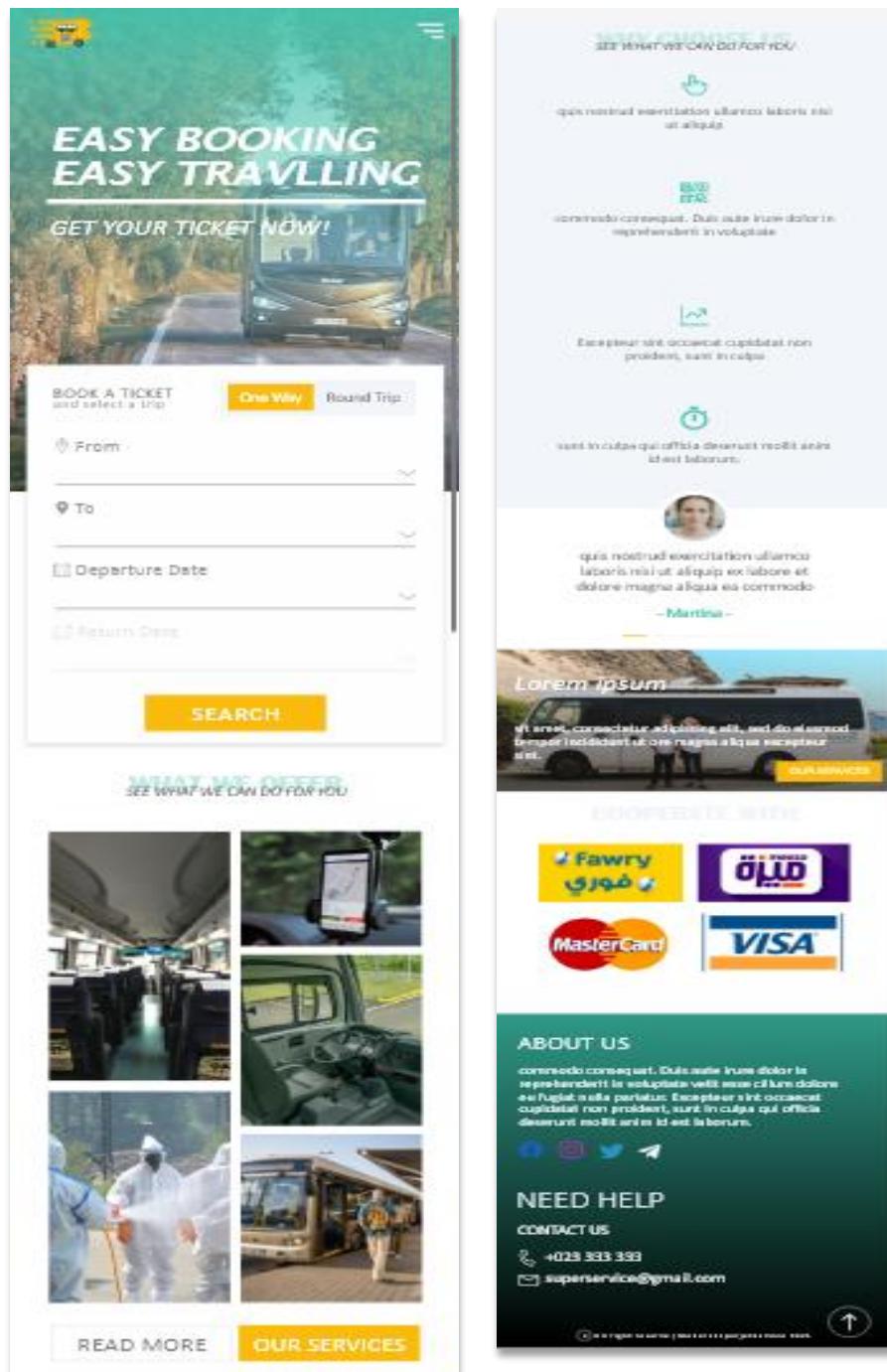


Figure 5.15 Main page design for app

The user can select the pick up point/ drop off point then select the best superjet then select the best seat for him from the available seats, option to view menu or get ticket.

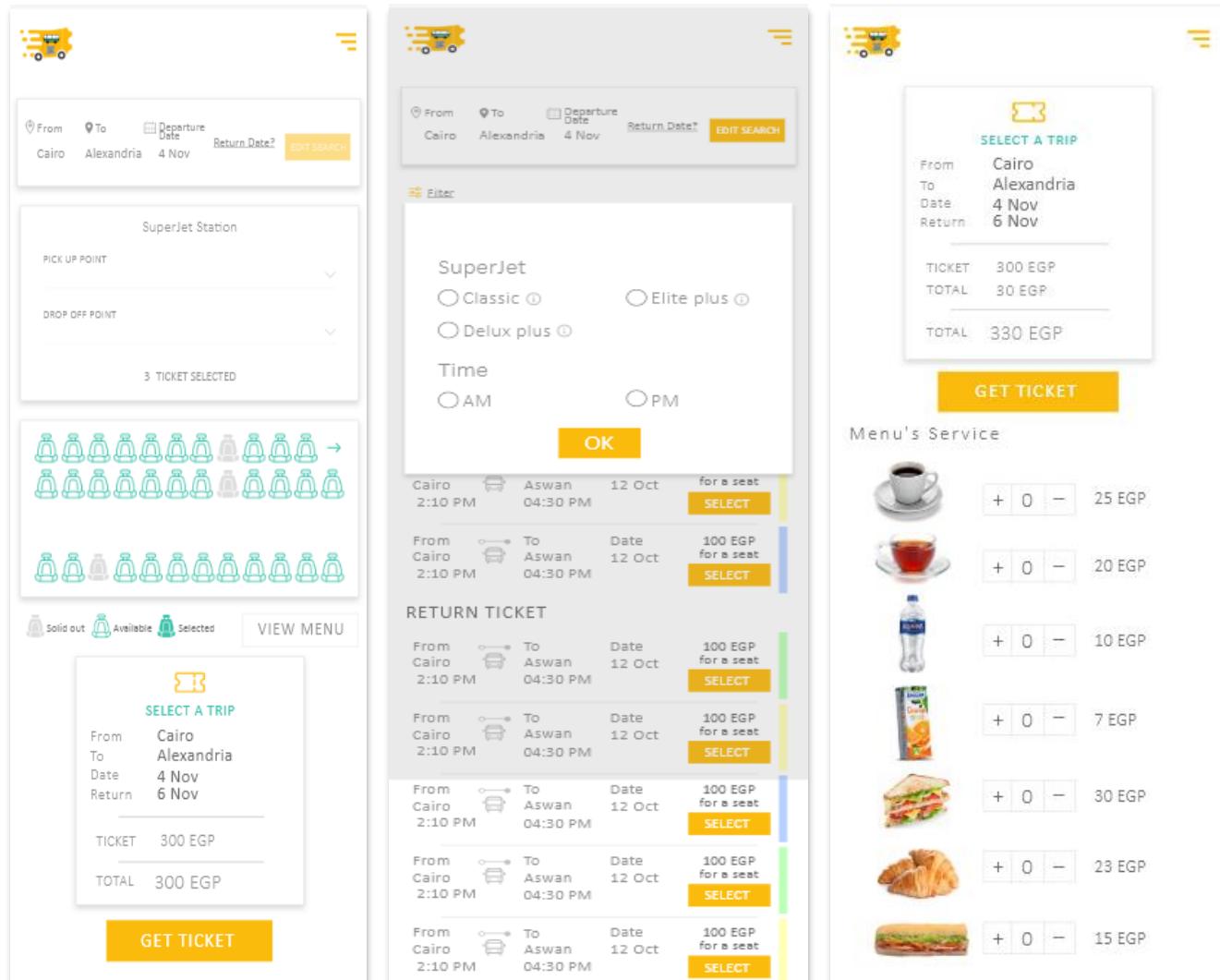


Figure 5.16 Select seat page design for app

The user fills out his personal information and selects the best way to pay then submits and views ticket. Then he sees the details of his ticket and trip so he can download/share/cancel ticket.

FILL OUT THE APPLICATION TO GET TICKET



TICKET 1

• NAME

• EMAIL

• PHONE NUMBER

• UPLOAD YOUR PICTURE

TICKET 2

• NAME

• EMAIL

• PHONE NUMBER

• UPLOAD YOUR PICTURE

• SELECT PAYMENT TYPE    

• CARD NUMBER

• M/D • CCV

• DO YOU HAVE A PROMOTIONAL CODE

TOTAL 350 EGP

PASSENGER DETAILS

TICKET 1

NAME	Ali Mohamed Ahmed
EMAIL	Moh@gmail.com
PHONE	01034345356
SEAT NUMBER	21



TICKET 2

NAME	Nada Essam Said
EMAIL	Nada2@gmail.com
PHONE	01037455936
SEAT NUMBER	22



TRIP DETAILS

From	To	Departure Date	Return Date
Cairo	Alexandria	4 Nov	4 Nov

MENU ORDERS

2 Coffee

TICKET

NAME	From	To
Ali Mohamed Ahmed	Cairo	Alexandria
Seat 21	PICK UP 02:10 PM	DROP OFF 04:30 PM
Date 4 Nov	Ramses	Muharram Bk



PASSENGER DETAILS

TICKET 1

NAME	Ali Mohamed Ahmed
EMAIL	Moh@gmail.com
PHONE	01034345356
SEAT NUMBER	21



TICKET 2

NAME	Nada Essam Said
EMAIL	Nada2@gmail.com
PHONE	01037455936
SEAT NUMBER	22

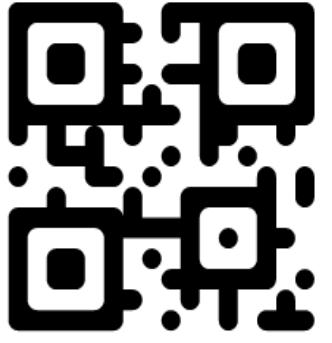



Figure 5.17 Form application & view ticket page design for app

5.2 Ai & Embedded system

As the world enters the phase of lifting the ban on its public facilities and institutions and recycling its economic wheel after the decline in the spread of the coronavirus, however, the lifting of this ban does not mean that the virus is over and has not spread again, so measures must be applied simultaneously with the lifting of the ban on the wearing of muzzles and hand paws and maintain a safe distance between people to ensure that this virus does not spread again, we present to you a system of artificial intelligence to monitor the extent to which people are obliged to wear facial muzzles, as this system connected with cameras located in door of the bus to ensure all passenger wear mask.

Steps to create the form in general:

1. Building a model whose task is to classify whether a person wears a mask or not by Python and train him on dataset using tensorflow library and Keras.
2. Ensure the efficiency of the model through accuracy account.

The previous model can be achieved in two ways:

- discover the masks in the pictures. • discover the masks in the videos.

Steps to create the form in particular:

we will divide the project into two separate parts so that each section has its own steps:

- Training: It is a stage of training model so that the special dataset is first loaded and the face mask (face with mask/without mask) is classified, and then the training of the model on these data then we have finished designing a classifier capable of knowing whether the person may wear a mask or not, then we save the trained model in memory.
- Deployment: At this stage we will apply this model to people's pictures, where in the beginning we discover the face and then classify the face if it is with a mask or not.

5.3 Code Snippets

```
> index.html x
< index.html > html > body > div.select > form > div.inlineSelect > div.custom-select > select#location2
 54
 55      <form onsubmit="return checkForm()" action="select_ticket/part1.html"> <!--Form of search-->
 56      <div class="inlineSelect">
 57
 58          <span class="icons">
 59              <img alt="Search icon" data-bbox="168 116 218 148" style="width: 25px; height: 25px;"/>
 60              <span>From</span>
 61
 62          </span><label>From</label>
 63
 64
 65      <div class="custom-select" >
 66
 67          <select name="location1" id="location1" required="required"> <!--Selection of first place (From)-->
 68              <option value="">Enter Place</option>
 69              <option value="Cairo">Cairo</option>
 70              <option value="Alexandria">Alexandria</option>
 71              <option value="Luxor">Luxor</option>
 72              <option value="Suze">Suze</option>
 73              <option value="Qena">Qena</option>
 74              <option value="Assiut">Assiut</option>
 75              <option value="Gharbia">Gharbia</option>
 76              <option value="Safaga">Safaga</option>
 77              <option value="Sharm elshiekh">Sharm elshiekh</option>
 78              <option value="South Sinai">South Sinai</option>
 79              <option value="Hurghada">Hurghada</option>
 80              <option value="Nuweiba">Nuweiba</option>
 81              <option value="Red sea">Red sea</option>
 82              <option value="Matrouh">Matrouh</option>
 83              <option value="Elmenia">Elmenia</option>
 84              <option value="Port said">Port said</option>
 85
 86          </select>
 87      </div>
 88
 89  </div>
```

Figure 5.18 Form Selection of Home page using HTML

```
ART 2 > seat.html > html > body > div#myrow.ticketscontainer > div.seatscontainer > div.row1 > la  
83     <div class="ticketscontainer" id="myrow"> <!--Seats container-->  
84  
85         <div class="seatscontainer">  
86  
87             <div class="row1">  
88                 <label class="containerseat">  
89                     <input type="checkbox" value="A1" >  
90                     <span class="checkmark"></span>  
91                 </label>  
92                 <label class="containerseat" >  
93                     <input type="checkbox" value="A2" >  
94                     <span class="checkmark"></span>  
95                 </label>  
96                 <label class="containerseat" >  
97                     <input type="checkbox" value="A3" >  
98                     <span class="checkmark"></span>  
99                 </label>  
100                <label class="containerseat" >  
101                    <input type="checkbox" value="A4" disabled> <!--Disable this seat-->  
102                    <span class="checkmark"></span>  
103                </label>  
104                <label class="containerseat" >  
105                    <input type="checkbox" value="A5" disabled>
```

Figure 5.19 Seats container using HTML

```

JS seat.js X
PART 2 > JS seat.js > bt.addEventListener('click') callback
20  /** Seat Checked ***/
21
22  const bt = document.querySelector('#passticvalue');
23  bt.addEventListener('click', function() {           // When click on button Get Ticket
24      let checkboxes = document.querySelectorAll('input[type="checkbox"]:checked');
25      let output = [];
26      checkboxes.forEach((checkbox) => {           // Check on seat
27          output.push(checkbox.value);             // Save seat value (the number of seat) at => output
28      });
29      if(!output.length)                         // if output is empty (none of seats are checked)
30      {
31          alert('You Must Choose A Seat!');        // Display message and stay at the same
32          document.getElementById('samepage').href='#'; // page until one of the seats is checked
33      }
34      else
35      {
36          alert('Your Seat Number : ' + output); // Else (seat is checked) display message of seat
37          // number and go to next page
38          localStorage.setItem("seatnum", output); // Store seat number to localstorage for view ticket page
39          document.getElementById('samepage').href='../form application/index.html';
40      }
41  });
42
43  /** Calculate Menu ***/
44
45  //Number of item of each product * Price
46  document.getElementById('addtototal').addEventListener('click',function(){
47      document.getElementById('passtotal').innerHTML=
48          document.getElementById('inputwater').value * document.getElementById('pricewater').value
49          + document.getElementById('inputtea').value * document.getElementById('pricetea').value
50          + document.getElementById('inputcoffe').value * document.getElementById('pricecoffe').value
51          + document.getElementById('inputjuice').value * document.getElementById('pricejuice').value
52          + document.getElementById('inputtoast').value * document.getElementById('pricesan2').value
53          + document.getElementById('inputcrusoe').value * document.getElementById('pricecrusoe').value
54          + document.getElementById('inputsandwich').value * document.getElementById('pricesan1').value;
55
56      // Store how much items been selected at localstorage for view ticket page
57      var setcoffenum =document.getElementById('inputcoffe').value;
58      localStorage.setItem("coffeget", setcoffenum);
59

```

Figure 5.20 Seats container using JavaScript.[20]

```

[] data.json M X
select_ticket > [] data.json > ...
2229
2230     "alexandria_to_south_sinai" : [{"from":"alexandria","pickup":"moharam bek",
2231                                         "to":"south sinai","dropoff":"dahab",
2232                                         "stime":"11:00pm","etime":"7:00am",
2233                                         "price":325,"bustype":"deluxe"},,
2234         {"from":"alexandria","pickup":"abees",
2235                                         "to":"south sinai","dropoff":"dahab",
2236                                         "stime":"10:30pm","etime":"10:30am",
2237                                         "price":325,"bustype":"deluxe"}]
2238     ],
2239
2240     "south_sinai_to_alexandria" : [{"from":"south sinai","pickup":"dahab",
2241                                         "to":"alexandria","dropoff":"moharam bek",
2242                                         "stime":"7:00pm","etime":"7:00am",
2243                                         "price":325,"bustype":"deluxe"}]
2244     ],
2245
2246     "alexandria_to_suez" : [{"from":"alexandria","pickup":"moharam bek",
2247                                         "to":"suez","dropoff":"porto elsokhna",
2248                                         "stime":"8:05am","etime":"12:05pm",
2249                                         "price":270,"bustype":"deluxe"},,
2250         {"from":"alexandria","pickup":"moharam bek",
2251                                         "to":"suez","dropoff":"porto elsokhna",
2252                                         "stime":"11:59pm","etime":"3:59am",
2253                                         "price":270,"bustype":"deluxe"},

2254         {"from":"alexandria","pickup":"abees",
2255                                         "to":"suez","dropoff":"porto elsokhna",
2256                                         "stime":"7:35am","etime":"10:35am",
2257                                         "price":270,"bustype":"deluxe"},,
2258         {"from":"alexandria","pickup":"abees",
2259                                         "to":"suez","dropoff":"porto elsokhna",
2260                                         "stime":"11:29pm","etime":"2:29pm",
2261                                         "price":270,"bustype":"deluxe"}]
2262     ],
2263
2264
2265     "suez_to_alexandria" : [{"from":"suez","pickup":"porto elsokhna",
2266                                         "to":"alexandria","dropoff":"moharam bek",
2267                                         "stime":"12:55am","etime":"9:30pm",
2268                                         "price":220,"bustype":"deluxe"},,
2269         {"from":"suez","pickup":"porto elsokhna",
2270                                         "to":"alexandria","dropoff":"moharam bek",
2271                                         "stime":"6:00pm","etime":"2:30pm",
2272                                         "price":220,"bustype":"deluxe"}]
2273     ],
2274
2275     "cairo_to_matrouh" : [{"from":"cairo","pickup":"tahrir",
2276                                         "to":"matrouh","dropoff":"marsa matrouh",
2277                                         "stime":"8:19am","etime":"1:19pm",
2278                                         "price":100,"bustype":"deluxe"}]

```

Figure 5.23 Some of our location data using JSON

```
9     class SignIn extends StatelessWidget {
10       @override
11     Widget build(BuildContext context) {
12       return Scaffold(
13         body: Center(
14           child: Container(
15             margin: EdgeInsets.only(top: 20, left: 20, right: 20),
16             padding: EdgeInsets.only(top: 30, left: 30, right: 30),
17             width: Get.width,
18             height: Get.height*.6,
19             color: Colors.white,
20             child: SingleChildScrollView(
21               child: Column(
22                 children: [
23                   SizedBox(height: Get.height*.03),
24                   Text('SIGN IN', style: TextStyle(
25                     fontSize: 30,
26                     fontWeight: FontWeight.bold,
27                     color: mainColor
28                   ), // TextStyle, Text
29                   SizedBox(height: Get.height*.03),
30
31                   TextFormField(
32                     keyboardType: TextInputType.emailAddress,
33                     decoration: InputDecoration(
34                       prefixIcon: Icon(Icons.person, color: Colors.grey, ),
35                     hintText: 'E-MAIL'
```

Figure 5.21 Sign in code using widgets in flutter

```
children: [
  SizedBox(height: Get.height*.03),
  Text('SIGN UP', style: TextStyle(
    fontSize: 30,
    fontWeight: FontWeight.bold,
    color: secondColor
  ), // TextStyle, Text
  SizedBox(height: Get.height*.03),

  TextFormField(
    keyboardType: TextInputType.name,
    decoration: InputDecoration(
      prefixIcon: Icon(Icons.person, color: Colors.grey, ),
      hintText: 'USER NAME'
    ), // InputDecoration
  ), // TextFormField

  TextFormField(
    keyboardType: TextInputType.emailAddress,
    decoration: InputDecoration(
      prefixIcon: Icon(Icons.person, color: Colors.grey, ),
      hintText: 'E-MAIL'
    ), // InputDecoration
  ), // TextFormField
  SizedBox(height: Get.height*.01),
```

Figure 5.22 Sign up code using flutter

```

68
69 # load the MobileNetV2
70 baseModel = MobileNetV2(weights="imagenet", include_top=False,
71     input_tensor=Input(shape=(224, 224, 3)))
72
73 headModel = baseModel.output
74 headModel = AveragePooling2D(pool_size=(7, 7))(headModel)
75 headModel = Flatten(name="flatten")(headModel)
76 headModel = Dense(128, activation="relu")(headModel)
77 headModel = Dropout(0.5)(headModel)
78 headModel = Dense(2, activation="softmax")(headModel)
79
80 # place the head FC model on top of the base model
81 model = Model(inputs=baseModel.input, outputs=headModel)
82
83 # freeze layer they will not be updated during training
84 for layer in baseModel.layers:
85     layer.trainable = False
86
87 # compile
88 print(" compiling model...")
89 opt = Adam(lr=INIT_LR, decay=INIT_LR / EPOCHS)
90 model.compile(loss="binary_crossentropy", optimizer=opt,
91     metrics=["accuracy"])
92
93 # train
94 print("training head... ")
95 H = model.fit(
96     aug.flow(trainX, trainY, batch_size=BS),
97     steps_per_epoch=len(trainX) // BS,
98     validation_data=(testX, testY),
99     validation_steps=len(testX) // BS,
100    epochs=EPOCHS)
101
102 # predictions on testing set
103 print(" evaluating network... ")
104 predIdxs = model.predict(testX, batch_size=BS)
105

```

Figure 5.24 Apply mobileNet

- Downloading MobilNetV2 Classifier is a pre-trained CNN model that we will use to build the current model.
- Building a Fully Connected network.
- Pre-Processing data pre-processing.

Downloading the MobileNet form, a CNN network that has already been trained on the ImageNet data set, taking into account the output layer is ignored include_top=False.

1. Build a new output layer that corresponds to the images in the dataset of the COVID-19 face mask detector.
2. We removed the output layer of the MobileNet model because this model is pre-trained on 1,000 types of images (cat pictures, dogs, traffic lights . . . Etc.) therefore, it categorizes the image entered into one of 1,000 categories (i.e. the output layer contains 1,000 nerves), which is not consistent with our model because we want in this model to classify the image entered into two main categories, either with_mask or without_mask i.e. making the output layer contain two main nerves.

```
109     # classification report
110     print(classification_report(testY.argmax(axis=1), predIdxs,
111                               target_names=lb.classes_))
112
```

Figure 5.25 Import the Scikit-Learn library to print a report on the model's performance.

```
76     # load face detector model from disk
77     prototxtPath = r"face_detector\deploy.prototxt"
78     weightsPath = r"face_detector\res10_300x300_ssd_iter_140000.caffemodel"
79     faceNet = cv2.dnn.readNet(prototxtPath, weightsPath)
80
81     # load the face mask detector model from disk
82     maskNet = load_model("mask_detector.model")
83
```

Download the Face Detection Form from OpenCV, a pre-trained model, It relies on a single Shot MultiBox Detector, using the ResNet-10 model. for the prototxt file, the model structure defines the order of the difficult cells in each layer, the patterns of communication between layers, activation functions, and how to convert the network of its inputs into outputs. the caffemodel file contains the weights of the actual layers.

```

97
98     for (box, pred) in zip(locs, preds):
99         # unpack the bounding box and predictions
100        (startX, startY, endX, endY) = box
101        (mask, withoutMask) = pred
102
103        # determine label and color we wil use to draw
104        # the bounding box and text
105        label = "Mask" if mask > withoutMask else "No Mask"
106        color = (162,228,184) if label == "Mask" else (0, 0, 255)
107
108        # probability label
109        label = "{}: {:.2f}%".format(label, max(mask, withoutMask) * 100)
110
111        # display the label and bounding box rectangle
112
113        cv2.putText(frame, label, (startX, startY - 10),
114                    cv2.FONT_HERSHEY_SIMPLEX, 0.45, color, 2)
115        cv2.rectangle(frame, (startX, startY), (endX, endY), color, 2)
116
117
118        cv2.imshow("welcome", frame)
119        key = cv2.waitKey(1) & 0xFF
120
121
122
123        if key == ord("e"):
124            break
125
126        # do a bit of cleanup
127        cv2.destroyAllWindows()
128        vs.stop()

```

Figure 5.26 detect mask

determine whether the face contains a mask or not based on the expected value of the mask detector form, If the face contains a mask, the mint-green color is tested, but if the face does not contain a mask, the red color is chosen.[21]

Calculate the probability of expecting the model.

Placing text on the image reflects the probability of predicting the form, as well as placing a rectangular frame around the face using the openCv library.

Mask

No Mask

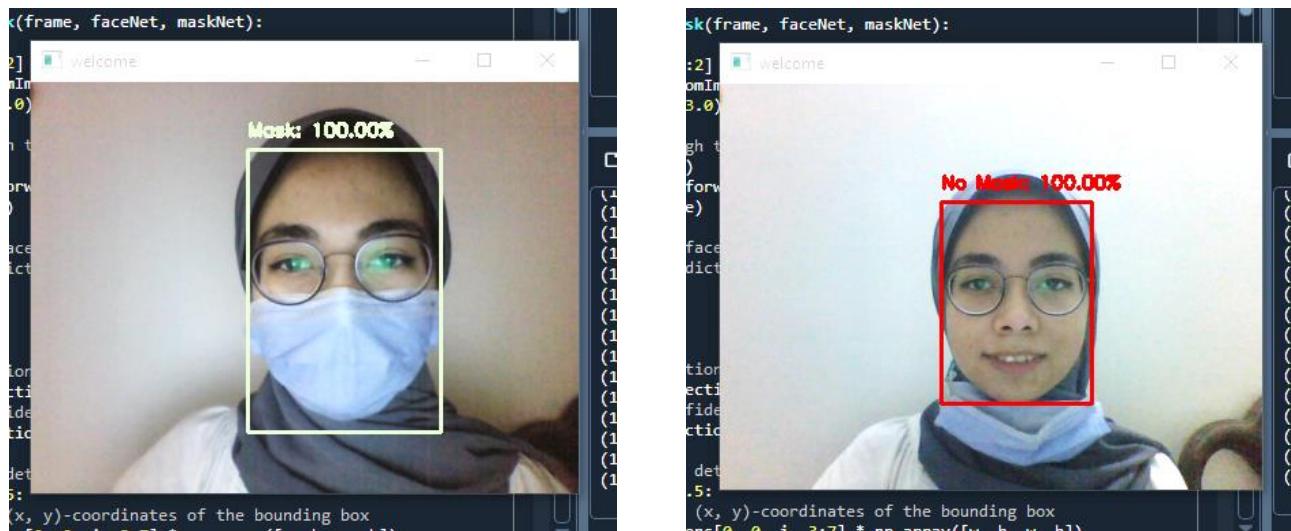


Figure 5.27 Mask detection output[22]

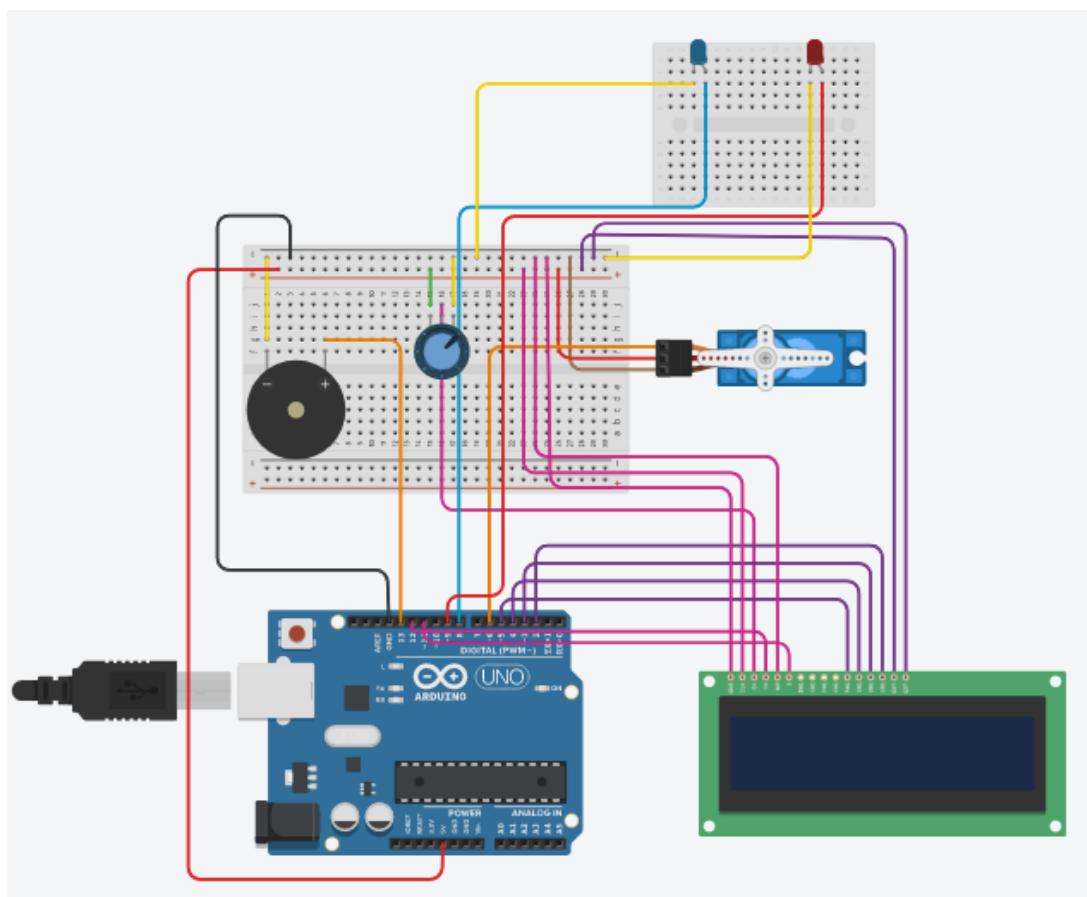
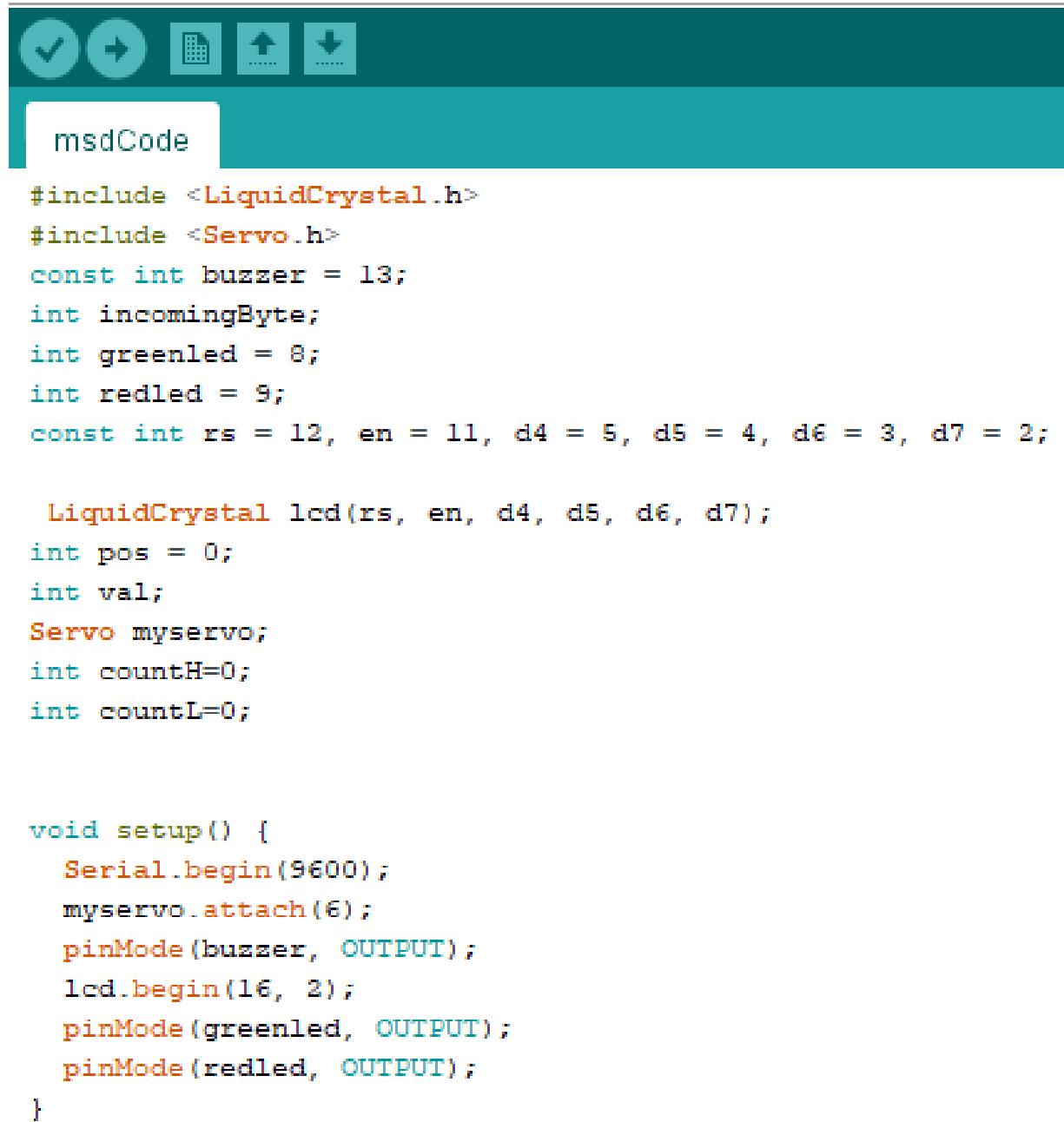


Figure 5.28 Door system sketch[23]

If the traveler is not wearing a mask, the buzzer will sound an alarm, but if he is wearing a mask, the servo will open and then close as soon as the person in front of the camera moves



The screenshot shows the Arduino IDE interface with a dark teal header bar containing five icons: a checkmark, a refresh, a file, an upload arrow, and a download arrow. Below the header is a light blue toolbar with a magnifying glass icon. The main workspace has a dark teal background. The title bar says "msdCode". The code itself is written in C++ and defines variables for pins, initializes a LiquidCrystal display, and sets up serial communication and servo attachments. It includes a setup() function that begins serial communication at 9600 baud, attaches the servo to pin 6, sets the buzzer pin as an output, initializes the LCD, and sets the green and red LED pins as outputs. The loop() function reads incoming bytes from the serial port, checks the value of the green LED, and controls the servo and LED pins based on the input.

```
#include <LiquidCrystal.h>
#include <Servo.h>
const int buzzer = 13;
int incomingByte;
int greenled = 8;
int redled = 9;
const int rs = 12, en = 11, d4 = 5, d5 = 4, d6 = 3, d7 = 2;

LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
int pos = 0;
int val;
Servo myservo;
int countH=0;
int countL=0;

void setup() {
  Serial.begin(9600);
  myservo.attach(6);
  pinMode(buzzer, OUTPUT);
  lcd.begin(16, 2);
  pinMode(greenled, OUTPUT);
  pinMode(redled, OUTPUT);
}


```

Figure 5.29 Door system using arduino ide

```

void loop() {

    if (Serial.available() > 0) {
        incomingByte = Serial.read();
        if (incomingByte == 'H') {
            noTone(buzzer);
            digitalWrite(greenled, HIGH);
            digitalWrite(redled, LOW);
            lcd.clear();
            lcd.setCursor(0, 0);
            lcd.print("Mask Detected");
        }
        if (incomingByte == 'L') {
            tone(buzzer,523, 300);
            delay(500);
            digitalWrite(redled, HIGH);
            digitalWrite(greenled, LOW);
            lcd.clear();
            lcd.setCursor(0, 0);
            lcd.print("Please Wear Mask");
        }

        if (incomingByte == 'H') {
            if(pos!=0 && countH==0){
                myservo.write(0);
                //delay(15);
                countH=1;
            }
            if (incomingByte == 'H') {
                if(pos!=0 && countH==0){
                    myservo.write(0);
                    //delay(15);
                    countH=1;
                }
            }

            for (pos = 0; pos <= 180; pos += 10) {
                myservo.write(pos);
                //delay(2);
                //currentPos=pos;
            }
        }
        else if (incomingByte == 'L') {
            if(pos!=180 && countL==0){
                myservo.write(180);
                //delay(15);
                countL=1;
            }
            for (pos = 180; pos >= 0; pos -= 10) {
                myservo.write(pos);
                //delay(2);
            }
        }
    }
}

```

```

Editor - C:\Users\Admin\Untitled3.m
Untitled3.m Untitled.m Untitled2.m Untitled3* + | %% LOCALIZATIONS
65 - for iter = 1 : iterations
66 -
67     %% evaluating position & quality ---
68 -     for i = 1 : swarm_size
69 -         swarm(i, 1, 1) = swarm(i, 1, 1) + swarm(i, 2, 1)/1.3;      %update x position
70 -         swarm(i, 1, 2) = swarm(i, 1, 2) + swarm(i, 2, 2)/1.3;      %update y position
71 -         x = swarm(i, 1, 1);
72 -         y = swarm(i, 1, 2);
73 -
74 -         val = (x - 15)^2 + (y - 20)^2;          % fitness evaluation (you may replace this objective function with
75 -
76 -         if val < swarm(i, 4, 1)                  % if new position is better
77 -             swarm(i, 3, 1) = swarm(i, 1, 1);      % update best x,
78 -             swarm(i, 3, 2) = swarm(i, 1, 2);      % best y positions
79 -             swarm(i, 4, 1) = val;                % and best value
80 -         end
81 -     end
82 -
83 -     [temp, gbest] = min(swarm(:, 4, 1));      % global best position
84 -
85     %% updating velocity vectors
86 -     for i = 1 : swarm_size
87 -         swarm(i, 2, 1) = rand*inertia*swarm(i, 2, 1) + correction_factor*rand*(swarm(i, 3, 1) - swarm(i, 1, 1)) +
88 -         swarm(i, 2, 2) = rand*inertia*swarm(i, 2, 2) + correction_factor*rand*(swarm(i, 3, 2) - swarm(i, 1, 2)) +
89 -     end
90 -
91     %% Plotting the swarm

```

Figure 5.30 Swarm algorithm using matlab

searches for the easiest way to pass through to get rid of traffic congestion using matlab

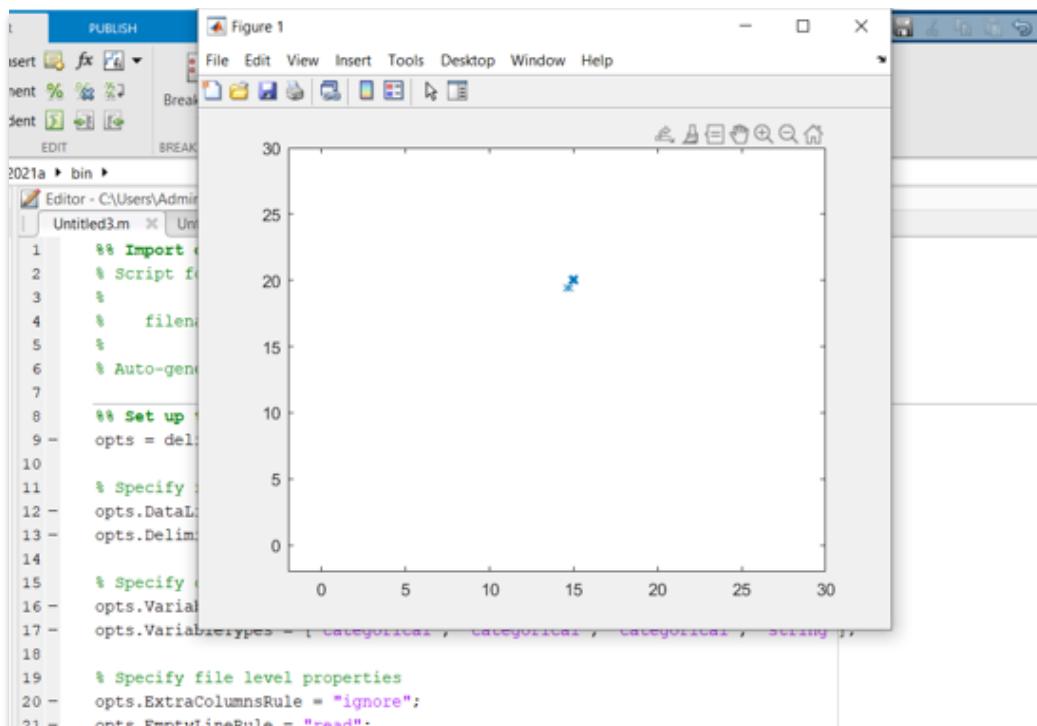


Figure 5.31 Swarm algorithm output

Chapter 6

Conclusions & Future Work

6.1 Conclusion

Online Bus Ticket Reservation System being a web based system and mobile application that ensures that the company would be able to transform most of the processes carried out manually into automated, error-free and easy to use operations in the organization especially in the area of transportation; also it would be able to generate report for the management decision purpose.

Also To mitigate the spread of COVID-19 pandemic, measures must be taken. We have modeled a face mask detector using SSD architecture and transfer learning methods in neural networks. To train and test the model, we used the dataset that consisted of 2164 masked faces images and 1930 unmasked faces images. These images were taken from various resources like Kaggle and RMFD datasets. The model was inferred on images and live video streams. To select a base model, we evaluated the metrics like accuracy, precision and recall and selected MobileNetV2 architecture with the best performance having 99% precision and 99% recall , The training accuracy of the model was around 99%. It is also computationally efficient using MobileNetV2 which makes it easier to install the model to embedded systems.

we focuses in this project on reducing the fatigue faced by the conductor with the use of face recognition system in the bus stops thus eliminating the conductor from the buses. It also provides an overview of how a technology such as face recognition system can be used in day to day life in public transport making the transportation system smarter and easier to use part of the project is intelligent system that consists of two main controllers, they are designed smartly to control the traffic on the street where all the networks of the system are trained individually and then collected to gathers to produce one intelligent system that has the ability to reduce the congestion of the traffic at the street.

6.2 Future Work

A facial recognition system: is a technology capable of matching a human face from a digital image or a video frame against a database of faces, typically employed to authenticate users through ID verification services, works by pinpointing and measuring facial features from a given image.

As the passenger enters the bus stop through the automated entry gates, passengers face is recognised by the FRS and the face details are matched with the Unique Identity database to confirm the passenger's authenticity.



It's estimated that it only takes 200 milliseconds for passengers to step on the door and face recognition to get on the bus, So passengers can enjoy a smart and fast ride experience for meaningless payment. Which wastes time.

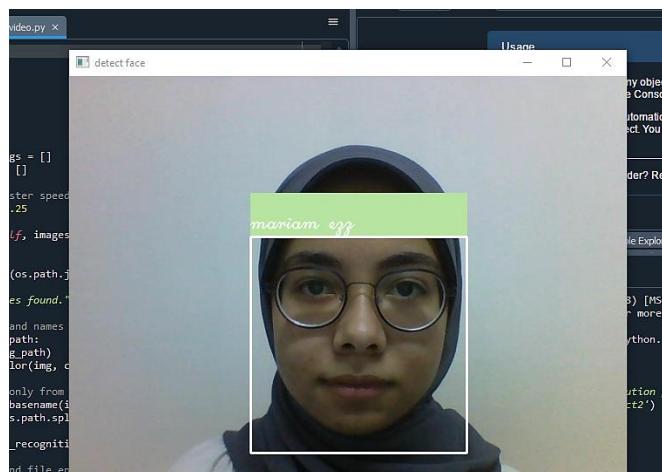


Figure 5.32 Face recognition output

To perform face recognition in video streams we using:

- OpenCV
- Python
- Deep learning

Data Sets Used: face_recognition_30 | Kaggle

To perform face recognition with Python and OpenCV we need two additional libraries: (dlib, face_recognition)

The dlib library:

Dlib is an open source suite of applications and libraries written in C++ under a permissive Boost license. Dlib offers a wide range of functionality across a number of machine learning sectors, including classification and regression, numerical algorithms such as quadratic program solvers, an array of image processing tools, and diverse networking functionality, among many other facets.

Dlib also features robust tools for object pose estimation, object tracking, face detection (classifying a perceived object as a face) and face recognition (identifying a perceived face). Though Dlib is a cross-platform resource, many custom workflows involving facial capture and analysis (whether recognition or detection) use the OpenCV library of functions, operating in a Python environment.

Maintained by Davis King, contains our implementation of “deep metric learning” which is used to construct our face embeddings used for the actual recognition process. Facial Detection and Recognition With Dlib | Width.ai

The face_recognition library:

Created by Adam Geitgey, wraps around dlib’s facial recognition functionality, making it easier to work with. face-recognition · PyPI

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