Tribhuvan University

Texas International College

A Final Year Project Report
On
E-Nagarik SEWA: A FACE RECOGNITION-BASED APPOINTMENT SYSTEM

Under the Supervision of
Mr. Rom Kant Pandey
Asst. Prof., Central Department of Education, TU

Submitted To:
Department of Computer Science and Information Technology
Texas International College

In partial fulfillment of the requirement for the Bachelor Degree in Computer Science and Information Technology

Submitted By:
Aakash Khadka (15561/074)
Sudeep Kharel (15601/074)
Vishal Purkuti (15606/074)

April 9, 2022

SUPERVISOR'S RECOMMENDATION

I hereby recommend that the report prepared under my supervision by Aakash Khadka (TU Exam Roll No. 15561/074), Sudeep Kharel(TU Exam Roll No. 15601/074), and Vishal Purkuti (TU Exam Roll No. 15606/074) entitled **"E-Nagarik Sewa: A face recognition based appointment system"** in partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Information Technology be processed for evaluation.

Mr. Rom Kant Pandey
Asst. Professor,
Central Department of Education
Tribhuvan University
Kirtipur, Nepal

LETTER OF APPROVAL

This is to certify that this project was prepared by Aakash Khadka (TU Exam Roll No. 15561/074), Sudeep Kharel(TU Exam Roll No. 15601/074), and Vishal Purkuti (TU Exam Roll No. 15606/074) entitled "**E-Nagarik Sewa: A face recognition based appointment system**" in partial fulfillment of the requirement for the degree of B.Sc. in Computer Science and Information Technology has been well studied. In our opinion, it is satisfactory in the scope and quality as a project for the required degree.

Mr. Rom Kant Pandey
Project Supervisor
Asst. Professor,
Central Department of Education
Tribhuvan University
Kirtipur, Nepal

Mr. Kumar Poudyal
HoD, Department of CSIT
Texas International College
Chabahil, Kathmandu

Mr. Sarbin Sayami
External Supervisor
Asst. Prof.
CDCSIT, Tribhuvan University
Kritipur, Nepal

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Similarly, we would also like to thank our BSc. CSIT Head, **Mr. Kumar Poudyal**, for providing all the required guidance and facilities. Finally, we would like to share our appreciation for all of our classmates from the batch of 2074 for their support and help. We hope that all of us will achieve more in our future endeavors.

Our parents were our first teachers and they have provided us with such a great exposure that has helped us bloom. Their precious suggestions and guidelines motivated us to work on this project with great interest. We would like to thank our parents for their continuous support. Finally, we would like to thank all our friends, relatives, teachers, and everyone who contributed to this project directly and indirectly.

Date: April 2022

Sincerely,
Aakash Khadka(15561/074)
Sudeep Kharel(15601/074)
Vishal Purkuti(15606/074)

ABSTRACT

Local governments are the foundations of public service delivery. Despite the massive development in ICT in Nepal, E-governance is not developed as expected. Service delivery in local governing bodies is still traditional and time-consuming. E-Nagarik Sewa provides a web application that allows citizens to fix an appointment with service providers in local governing bodies on the basis of their availability. E-Nagarik Sewa is a face recognition-based appointment system where employees' availability is checked using the face recognition system.

Face recognition system is the foundation for the appointment system. The availability of employees is shown through face recognition which generates time slots for appointments on a particular day. Employees can confirm the appointment by sending email to citizens. Similarly, citizens can confirm their availability through the check-in feature of the web application. Moreover, the main aim of this project is to develop a problem-solving system to ease public service delivery.

Keywords: *Appointment, Face-recognition, deep learning, python, dot net*

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LIST OF ABBREVIATIONS

AI	: Artificial Intelligence
ASP	: Active Server Pages
CNN	: Convolutional Neural Network
CSS	: Cascading Style Sheets
DFD	: Data Flow Diagram
EER	: Extended Entity Relationship
FK	: Foreign Key
GUI	: Graphical User Interface
HTML	: Hypertext Markup Language
ICT	: Information and Communication Technologies
MSSQL	: Microsoft Structured Query Language
MVC	: Model View Control
PK	: Primary Key
RGB	: Red Green Blue
SGD	: Stochastic gradient descent
UI	: User Interface
UId	: User Id

Chapter 1: INTRODUCTION

1.1 Background

"E-Nagarik Sewa" is a web-based application and a separate desktop based face recognition system that is present in the government office. The face recognition system recognizes the employee and shows the employee's availability in the web application interface. Therefore, citizens can fix appointments for getting public service from the web application. The project implements a face recognition system based on machine learning to recognize employees and specific time slots are given to citizens for fixing appointments with available employees. Government officers can check the list of appointments assigned to them and send citizens an invitation email to confirm the appointment with the required details. Citizens can also confirm their availability in the office premises when they reach the office.

Haar Cascade is used to extract face images whereas the Histogram Equalization algorithm is used for image enhancement in data preprocessing. The dataset is used to train a CNN and develop employee face recognition models. Then, the model is tested using the test dataset and finally, the model is ready to recognize employees. When an employee is recognized by the face recognition system the attendance is updated automatically for the respective employee, then only citizens can fix an appointment from available time slots.

1.2 Problem Statement

The Local government provides various services to citizens such as vital registration, application letters, social security, etc. Traditionally citizens visit local bodies to receive required service without knowing the availability of the service provider i.e government employee. Citizens do not know whether they will get the required service on a particular day or not. There is always a communication gap between the service provider and citizens. Citizens are not properly informed about the service delivery and the availability of the concerned authority.

In Nepal, almost all local government bodies have their own web portal for sharing various plans and policies of the government. But the essential service delivery process is still ineffective and time-consuming. Citizens are unsatisfied with the current service delivery model of local bodies. Citizens are compelled to visit government offices multiple times for a single service without certainty of getting service. This leads to massive trust issues between local government and general citizens.

1.3 Objectives

Following are the objectives of the project:

- To recognize the service provider's face for availability in local government body.
- To show the availability of service provider in web portal.
- To allow citizens to fix an appointment for vital registration in specifically available time slots.

1.4 Scope and Limitations

1.4.1 Scope

The major scopes of E-Nagarik Sewa are:

- Recognize the face of government employees and show the entry and exit time.
- The availability of service providers is shown for the current day only.
- Citizens can fix an appointment for vital registration from specific time slots.

The major limitations of E-Nagarik Sewa are:

- This system is useful only for vital registration in local government.
- It does not keep the attendance records of employees.
- E-Nagarik Sewa is available only in English language.

1.5 Development Methodology

E-Nagarik Sewa is developed using an iterative development method. Iterative software development begins with planning and continues through iterative development cycles involving continuous user feedback and the incremental addition of features concluding with the deployment of completed software at the end of each cycle.

E-Nagarik Sewa is planned for a gradual increase in feature additions and a cyclical release and upgrade pattern. Numerous versions are released after testing and analyzing the present system. Iterative and incremental software development begins with planning and continues through iterative development cycles involving continuous user feedback and the incremental addition of features concluding with the deployment of completed software at the end of each cycle. E-Nagarik Sewa is deployed in a real-world server with live testing and feedback being generated and implemented in the next release.

1.6 Report Organization

The overall organization of the report is as follows:

Chapter 1: Introduction
This chapter describes the project briefly with objectives, problem statement, scope, limitation, and development methodology.

Chapter 2: Background Study and Literature Review
The background section is the brief and descriptive first part of the report for the description of fundamental theories, general concepts, and terminologies related to the project. Literature review of the projects is used for review of similar or relevant projects, theories, and results by other researchers.

Chapter 3: System Analysis
This chapter is concerned with requirements and feasibility studies. Functional and nonfunctional requirements are explained and analyzed. Similarly, feasibility studies like technical, operational, economic, and schedule feasibility are analyzed.

Chapter 4: System Design

This chapter is concerned with the elaborated design of the model architecture, data used, and implementation process used throughout the project.

Chapter 5: Implementation and Testing

It includes software tools, dependencies, and hardware tools used to implement the system. It also consists of different levels of tests carried out to test the model built for face recognition and appointment management.

Chapter 6: Conclusion and Future Recommendations

This chapter includes the report's conclusion and the further work that can be done concerning the enhancement of the project.

Chapter 2: BACKGROUND STUDY AND LITERATURE REVIEW

2.1 Background Study

E-Nagarik Sewa is designed for the local government to provide a web platform to citizens where they can fix an appointment on the basis of the availability of government employees. The system implements a face recognition system for the availability of employees. The intraday appointment system allows citizens to choose a specific time slot of the day and available service and service providers.

Nepal is divided into 77 districts & 753 local levels (including 6 metropolises, 11 sub-metropolises, 276 municipalities, and 460 rural municipalities)[1]. Local bodies provide various administrative services to general citizens. Municipality and its ward office is the lowest administrative unit of Nepal where citizens get necessary services. But service delivery is not effective due to the traditional management of service delivery without the use of an appointment system. The availability of concerned government officers is not known until we reach the office for service. Despite having a web portal of almost all municipalities of Nepal, people are not getting benefits in terms of service delivery. So an interactive appointment system, E-Nagarik Sewa can be a bridge for better service delivery.

2.2 Literature Review

E-Nagarik Sewa is designed to address the problems faced by the citizens in local government offices. The project is aimed to show the availability of government officials and help to fix appointments. We studied various systems that provide appointment services to analyze and get inspired by them.

The government of India started 'MyVisit'[2] as an initiative to facilitate the common man. 'MyVisit' facility enabled the citizens to have a smooth and simple process of making an appointment. It acted as a bridge to the gap between the Government and the common man and has enhanced the opportunity of a common man to meet a government officer, hassle-free. However, My Visit has a difficult user interface and has complex appointment scheduling process.

The Bagmati province government has also started an appointment management system in the transport management office from august 2021. They provide the token for the appointment for services like driving license distribution, copy, renewal, verification, and retrial. The citizens can get the services provided by the department at the provided date and time. However, there is stability and user experience problem that needs to be corrected for better results.

Most of the appointment systems were traditional and machine learning was rarely used in any system. E-nagarik Sewa aimed to utilize face recognition system to enhance the appointment process by showing the availability of service providers to service seekers. LeCun designed the first classifier with a single-layer model with no preprocessing dataset [3]. What followed afterward was the development of a large number of classifiers using different approaches. The neural network-based model kept on rising and outperforming the earlier models. We preferred to choose ResNet over other models as it is one of the best performing model on ImageNet, with a 3.6% top-5 error rate[4].

Chapter 3: SYSTEM ANALYSIS

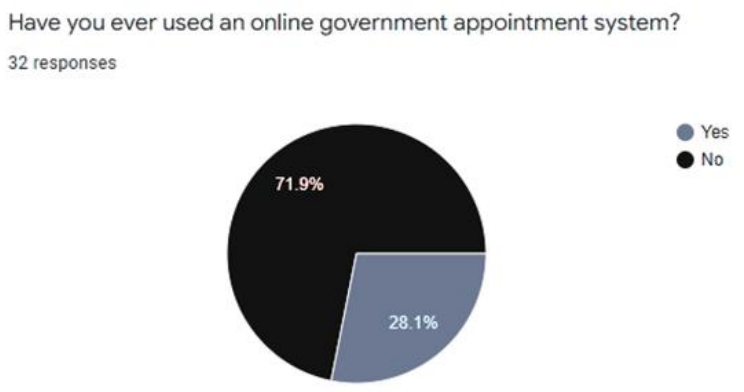
3.1 System Analysis

3.1.1 Requirement Analysis

Data Collection

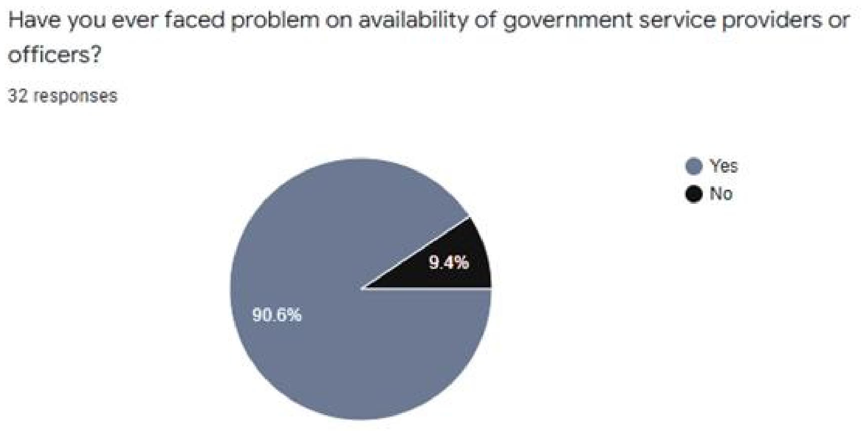
A questionnaire was created in google forms and shared through the internet. It consists of a series of questions on the subject matter used with the intention of collecting information from respondents.

The following questions were included in the questionnaire:
1. Have you ever used an online government service?
2. Have you ever faced a problem on the availability of government service providers
3. Have you ever used an online government service?
4. Are you satisfied with the current local government service?(yes/no)



Have you ever used an online government appointment system?

32 responses



Have you ever faced problem on availability of government service providers or officers?

32 responses

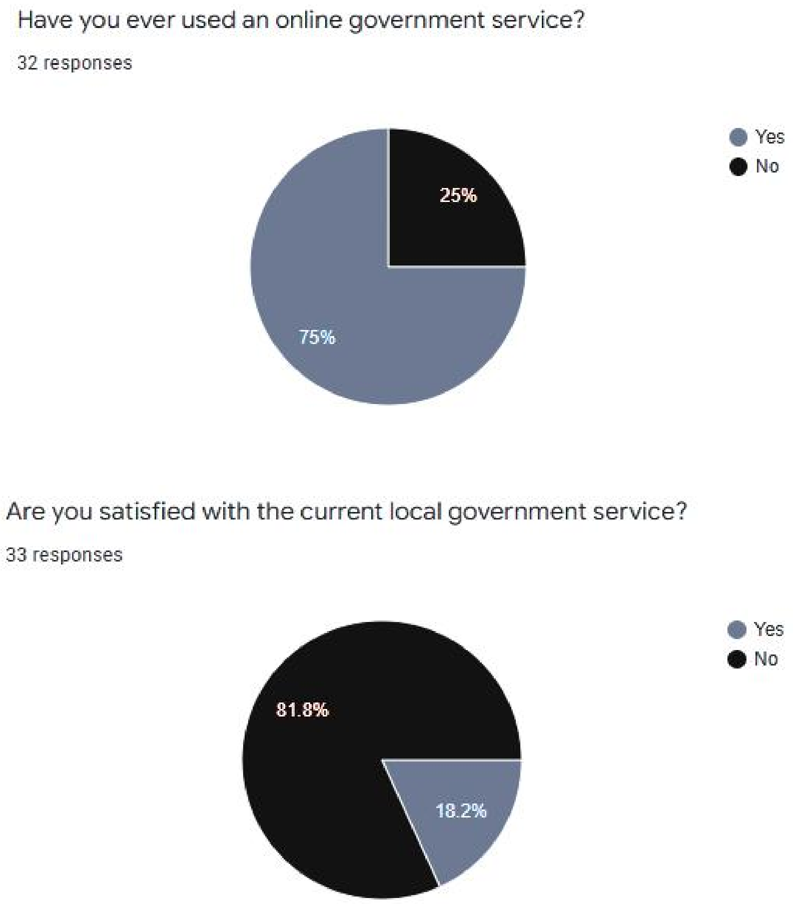


Figure 1:Questionnaire Response

After collecting the data, we came to know that a government appointment system is needed to provide services effectively and efficiently.

I. Functional Requirements

Following are the functional requirements of the project

Table 1: Functional Requirement

SN	Name	Use Case	Action/ Process	Constraints	Dependency
1	User Registration	Citizen Register in system	Fill the form Name: Email: Address:	Should not leave required field empty	Must have valid email

			Phone:		
2	Login	Citizen/ Employee can login	Provide Email and password	Must provide authentic credentials	Must have confirmed email.
3	Face Recognition	Employees can show their faces.	Check for the registered face.	Only employees will have the profile details.	Must have a verified account.
4	Profile Update	Registered users can update profile entities: phone number, name, profile image and address	User selects to update profile	Email cannot be changed.	Must have logged in session
5	Employee Availability check	Citizens can check availability of employees for required service	Check the availability section	Employees' details cannot be known without being available.	Must have at least one employee available.
6	Available time slot for appointment	Citizens can select time slots for required service	Check the available time slot.	Already used slots will not be available.	Required Employee must be present in office
7	Citizen availability in office	Citizens and employees can confirm the availability of	Update the availability.	It can be done from anywhere.	Citizens must have appointment

		citizens in the office.			
8	Appointment confirmation by employee	Employees can confirm the appointment and send email	Email is sent to citizens by the employee.	First Citizens availability should be checked.	Citizens must have appointment
9	Email confirmation by citizen	Citizens can confirm their email	Confirm email of enagarik sewa.	Email should be confirmed first.	Citizens must have valid email
9	Appointment Cancellation by employee	Employee can cancel the specific appointment	Cancellation of appointment	Cancellation email will not be sent.	Citizens must have appointment
10	Appointment Cancelation by citizen	Citizens can cancel their appointment	Cancelation of appointments.	Should be canceled before being confirmed by the employee..	Citizens must have appointment
11	Role Management by admin	Admin can add, remove and edit roles	Create and update roles.	Cannot be maintained by other users.	Must be registered user

I. Non Functional Requirements

E-Nagarik Sewa focuses on providing quality functions by specifying the following features:

i)Mobile and Web-friendly

E-Nagarik Sewa must be mobile and web-friendly. It should be responsive on various devices like mobile, laptop, tablet, etc.

ii)Usability

E-Nagarik Sewa should provide conditions for its users to perform the task safely, effectively, and efficiently while enjoying the experience.

iii)Scalability

E-Nagarik Sewa can add many other government services apart from vital registration in the future.

iv)Security

E-Nagarik Sewa can provide email validation for the registration of users. It will provide roles-based authorization to deny access to critical data.

v)Availability

The system works 24 hours a day so that general users and service providers can access the system and use the system.

3.1.2 Feasibility Analysis

After knowing about the requirement specification of our project, the next phase is to examine the feasibility of the system. Feasibility analysis can be categorized as technical, operational, economic, schedule, and social feasibility.

I. Technical

E-Nagarik Sewa is a complete web application. The main technologies and tools that are associated with this project are as follows.

- HTML,CSS, Bootstrap,Javascript
- Python

- C#,ASP .NET Core,Visual Studio
- Adobe XD
- Web Cam
- Diagram drawing tools
    - Draw.io, Whimsical

All technologies mentioned above are freely available and the technical skills required are easily learnable and manageable. The web application will be hosted in a free web hosting platform Smarter ASP .NET Core for the initial phase of development and testing. Later the application can be hosted in a safe and secured web hosting platform at a reasonable cost. Moreover, the bandwidth required in this application is very low, since it doesn’t incorporate many multimedia aspects.

From the above prospect, it is clear that the project is technically feasible.

II. Operational

E-Nagarik Sewa is designed to maintain the complexity at a very low level. The web application is user-friendly and easily operable with minimum digital knowledge. Usability is highly maintained, making GUIs easy to use. The web application is responsive on different devices like computers, laptop, tab, mobile phones etc. This responsiveness makes the application easily operable on any digital device.

The project is flexible and expandable so it is operationally feasible for developers to update and upgrade the existing application with already learned skills. Since the appointments are managed and fixed automatically, minimal human resource is enough for content management. A Secure and fast hosting platform along with a webcam is enough to operate the application.

III. Economic

E-Nagarik Sewa is a web application so the associated hosting cost is a major cost for its operation. Since the system does not consist of many multimedia data transfers, bandwidth required for the operation of this application is very low.

Calculating Costs:

Project Management:

Salary of three members Rs10000 each for 12 months

Total Salary= 3*10000*12=Rs 360000

Average Annual Income= 1582314.375/ 5 = 104940.375

ROI = (Average Annual Income/Amount Invested)*100%

= (104940.375/440400)*100%

= 23.8284% (Annually)

Payback Period= 2 years.

From the technical feasibility study it is clear that very low cost is associated with the implementation of the system. Minimum cost is associated with the hardware requirements like web camera and working computer in government offices.

IV. Schedule

E-Nagarik Sewa project is initiated from mid-April and is expected to complete in mid-December. The following Gantt chart shows the expected timeline of the project.

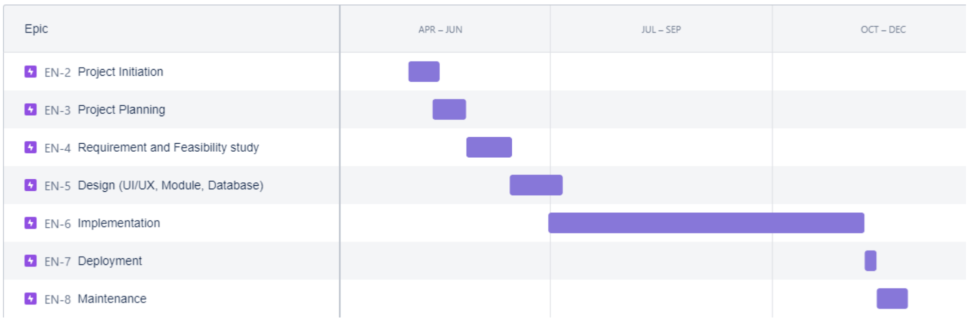


Figure 2: Gantt Chart

3.1.3 Analysis

Data modeling using EER Diagrams

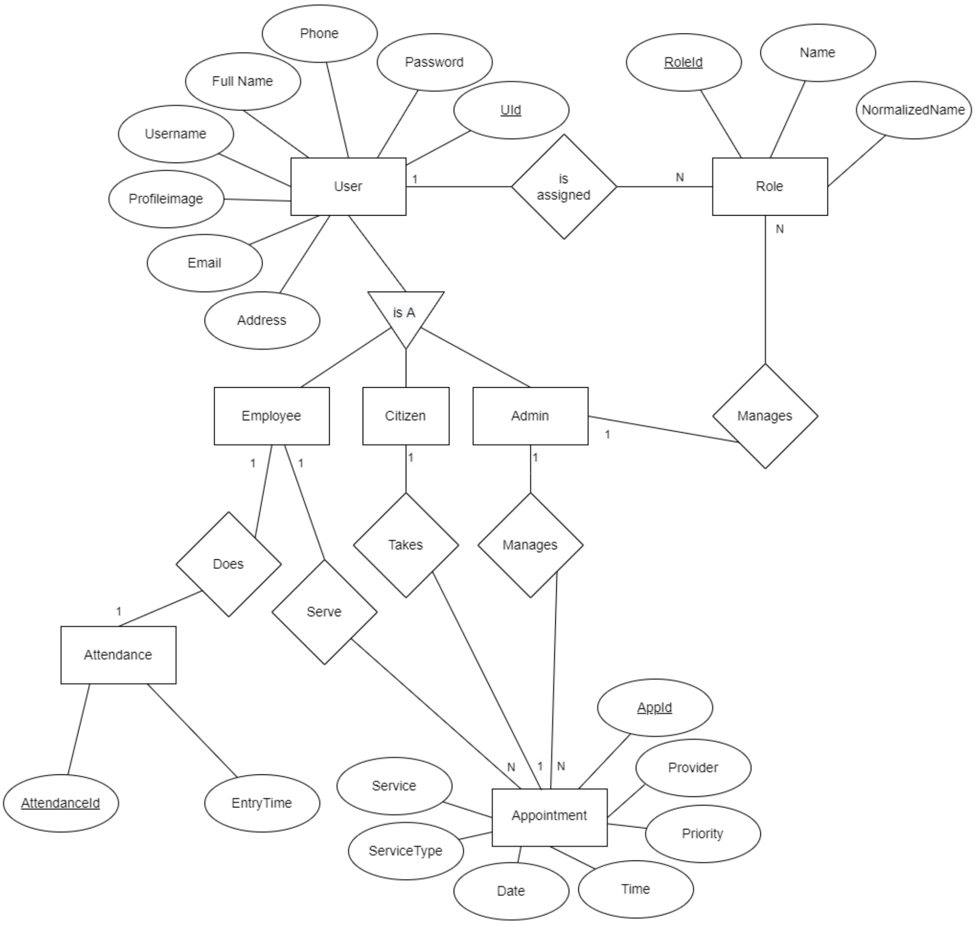


Figure 3: EER Diagram

Process modeling using DFD

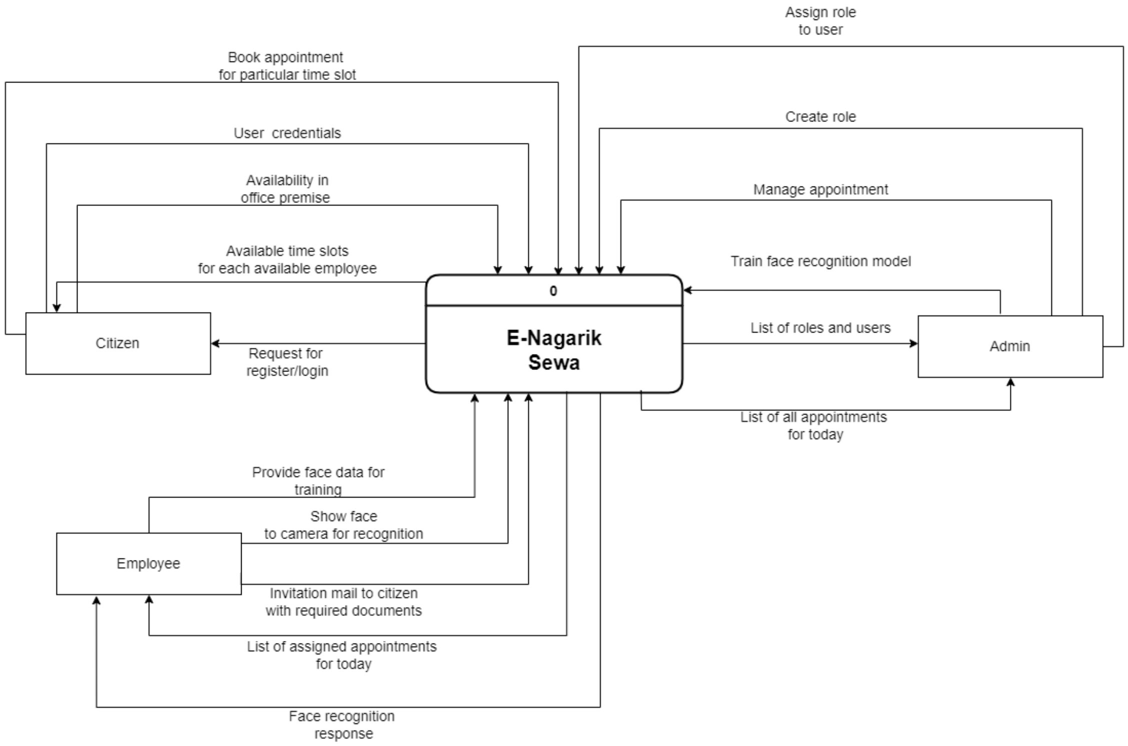

Assign role to user
Book appointment for particular time slot
Create role
User credentials
Manage appointment
Availability in office premise
Available time slots for each available employee
Train face recognition model
0
E-Nagarik Sewa
List of roles and users
Citizen
Request for register/login
Admin
List of all appointments for today
Provide face data for training
Show face to camera for recognition
Employee
Invitation mail to citizen with required documents
List of assigned appointments for today
Face recognition response

Figure 4: Context Diagram

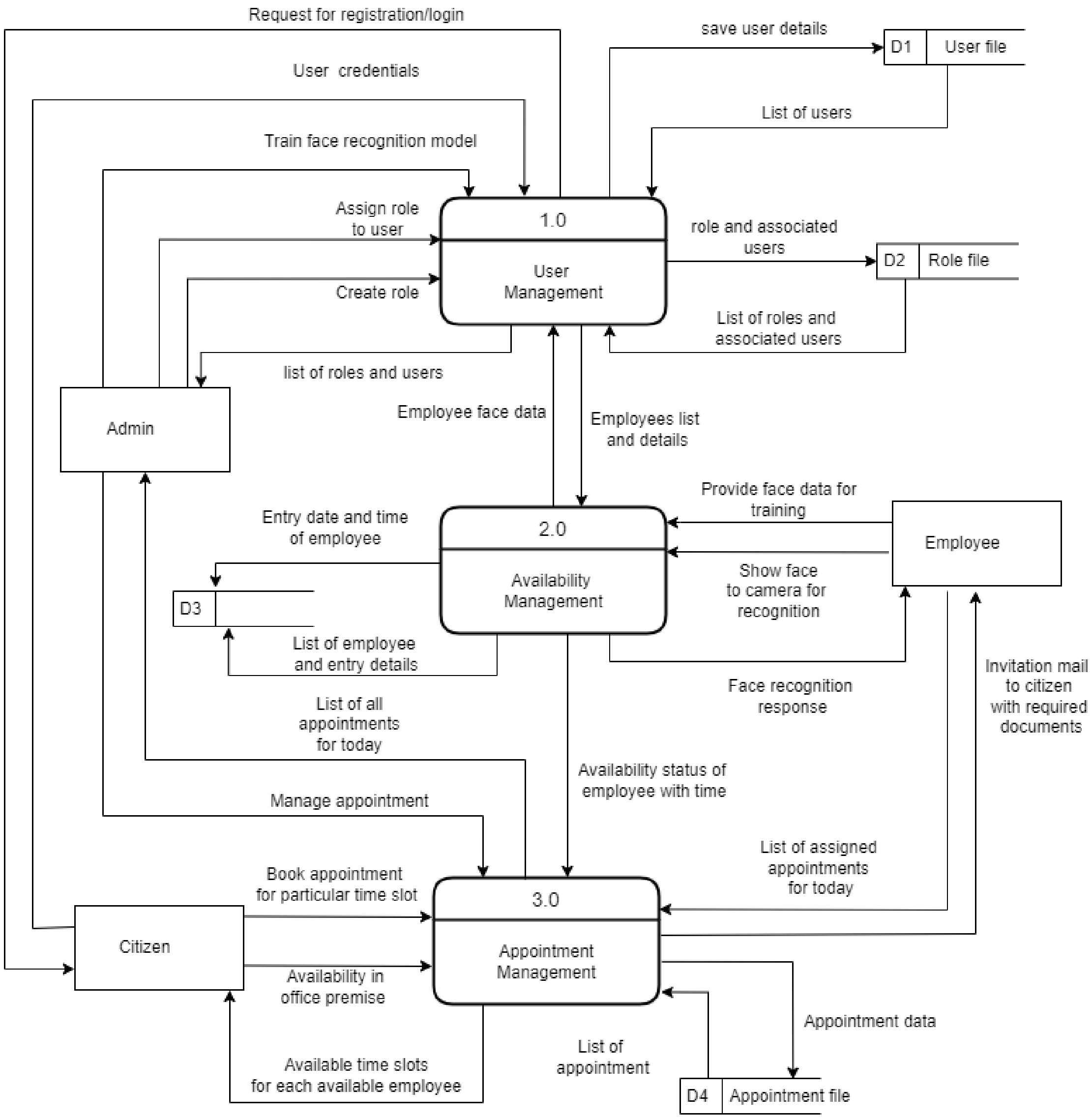

Request for registration/login
User credentials
Train face recognition model
Assign role to user
Create role
1.0
User Management
save user details
D1
User file
List of users
role and associated users
D2
Role file
List of roles and associated users
list of roles and users
Admin
Employee face data
Employees list and details
Provide face data for training
Employee
Entry date and time of employee
2.0
Availability Management
Show face to camera for recognition
D3
List of employee and entry details
Face recognition response
Invitation mail to citizen with required documents
List of all appointments for today
Availability status of employee with time
Manage appointment
List of assigned appointments for today
Book appointment for particular time slot
3.0
Appointment Management
Citizen
Availability in office premise
Appointment data
Available time slots for each available employee
List of appointment
D4
Appointment file

Figure 5: Level 0 DFD

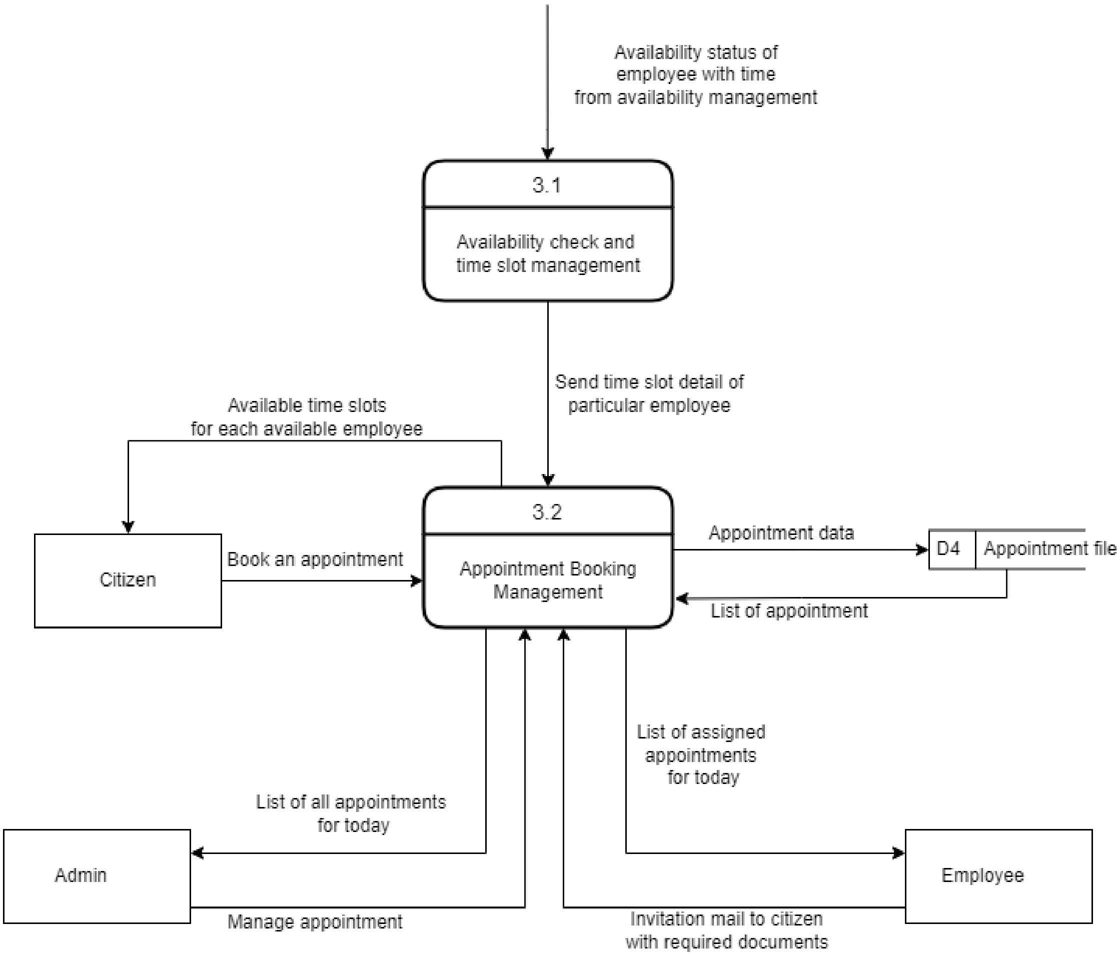

Availability status of employee with time from availability management
3.1
Availability check and time slot management
Send time slot detail of particular employee
Available time slots for each available employee
3.2
Appointment Booking Management
Citizen
Book an appointment
Appointment data
D4
Appointment file
List of appointment
List of assigned appointments for today
List of all appointments for today
Admin
Employee
Manage appointment
Invitation mail to citizen with required documents

Figure 6: Level 1 DFD for process 3.0

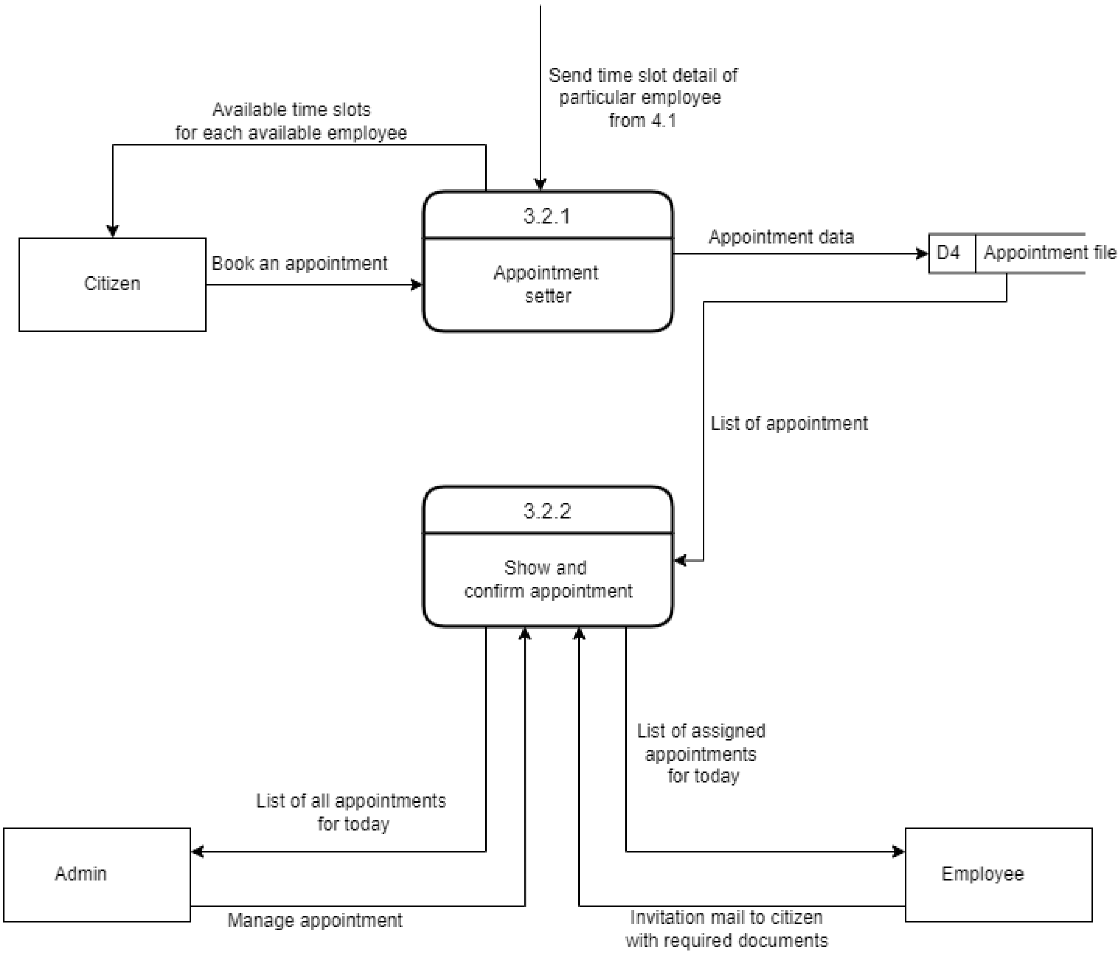


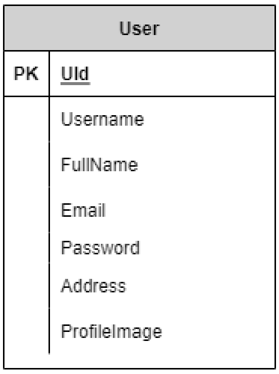
Figure 7: Level 2 DFD for process 3.2

Chapter 4: SYSTEM DESIGN

4.1. Design

4.1.1 Database Design

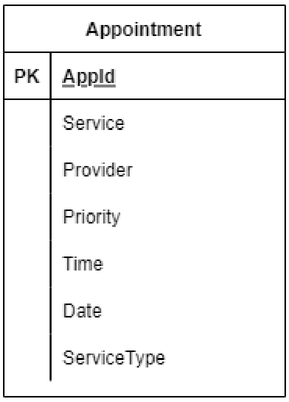
An Entity-Relationship(EER) Diagram is designed for the project as mentioned in section 3.1.3. The EER diagram is normalized and transformed into a relation as follows.



User	
PK	UId
	Username
	FullName
	Email
	Password
	Address
	ProfileImage

Figure 8: User Relation

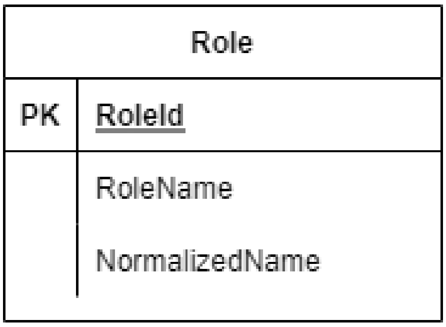
User table is used for storing user details having UId as the primary key. When the user gets registered, UId will be generated. This UId will make a unique identity key for each user. Similarly, We can store fullname, email, username,password (in hash), address and profile image.



Appointment	
PK	AppId
	Service
	Provider
	Priority
	Time
	Date
	ServiceType

Figure 9: Appointment Relation

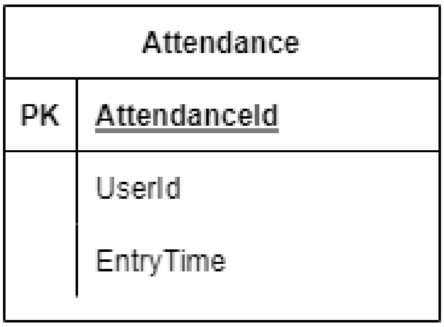
Appointment table is used for storing appointment details of both user and employee. Here, we have used AppId as the primary key which will be created when the user takes the appointment with the employees. Apart from Id, there are service, provider, priority, time, date , service type as the other entity.



Role	
PK	RoleId
	RoleName NormalizedName

Figure 10: Role Relation

Role table is used for storing user details such as role name and normalized name with RoleId as primary key. Role is defined by administration and services or function will be given accordingly.



Attendance	
PK	AttendanceId
	UserId EntryTime

Figure 11: Attendance Relation

Attendance table is used for storing the attendance of employees or service providers. Attendance will be done after the service provider's face is recognised within the criteria. Each attendance will have AttendanceId as the primary key. Only service providers will have attendance, not the user.

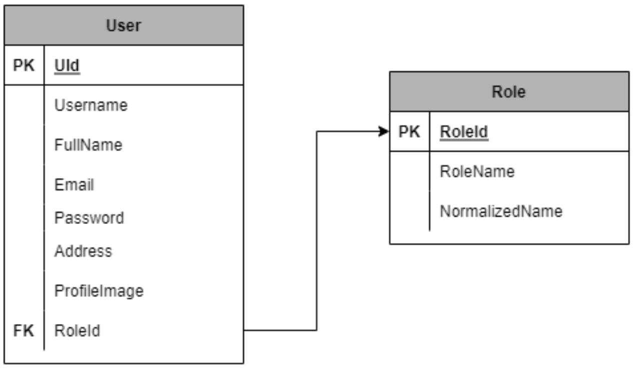


Figure 12: User and Role Relation

User and Role relation has been built through UserRole table which acts as intermediate table to join User table and Role table. The UserRole table has UId and RoleId both as primary and foreign keys.

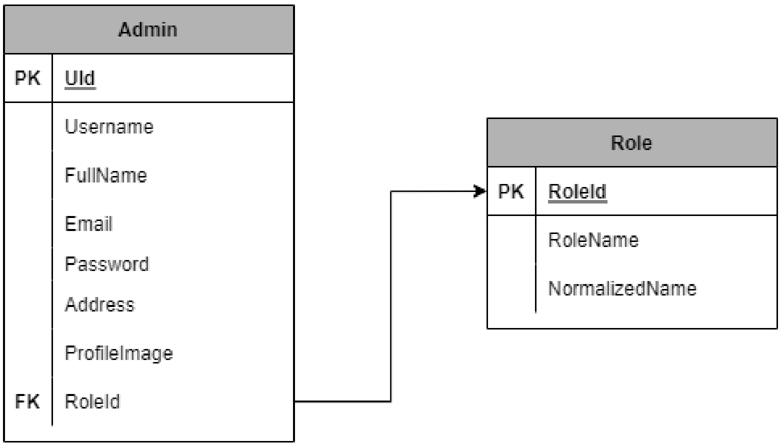


Figure 13: Admin and Role Relation

Admin table and Role table is used to create admin and role relations. Admin table has UId as primary key and RoleId as the foreign key in order to set the role of the users. Role table stores the defined role.

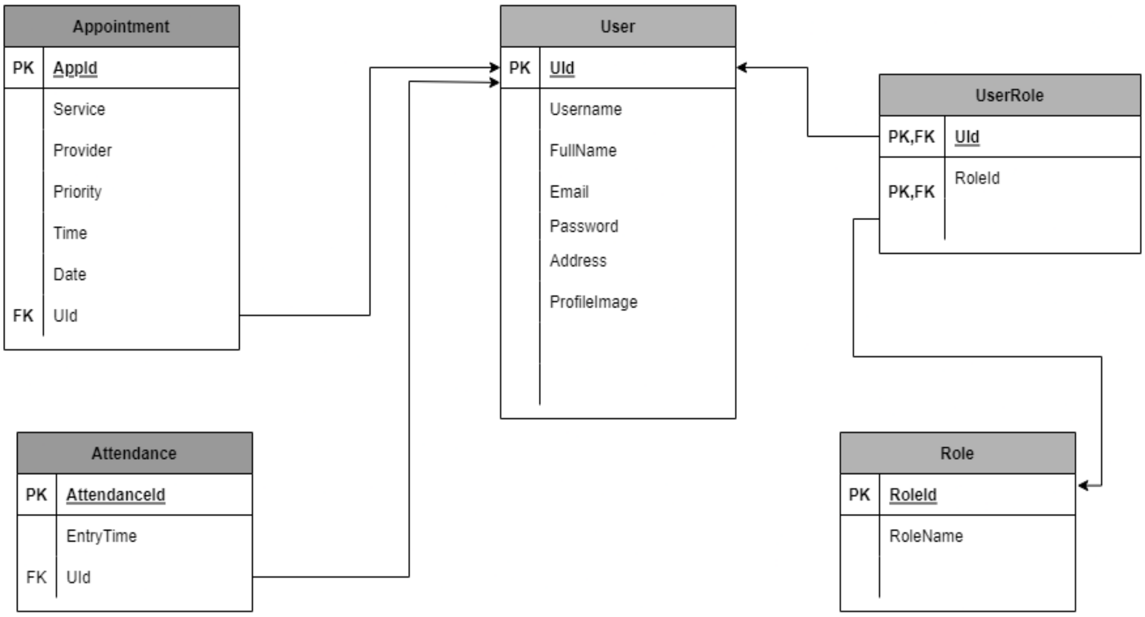


Figure 14: Relation Schema

Here, the Appointment table is used for storing appointments which have AppId as primary key and UId as foreign key from the User table. Similarly, There is an Attendance table with AttendanceId as primary key and UId as foreign key which is used for storing the attendance of employees as well as Role table is used for storing roles of the users which is set by the admin. UserRole table is used as the intermediate table to join Role and User tables having both UId and RoleId as primary and foreign keys to create a one-to-one relationship. User table is most important of all as it is used for storing user properties. When a user gets registered for the first time, its UId is created. Then the Role table is then used for storing a certain role which will define its function as whether they will be assigning appointments or only taking appointments.

4.1.2 Forms and Report Design

Forms allow us to enter data into the database, display it for review and also print it for distribution. E-Nagarik Sewa implements many forms for taking input from users. Following are the forms used in the project.

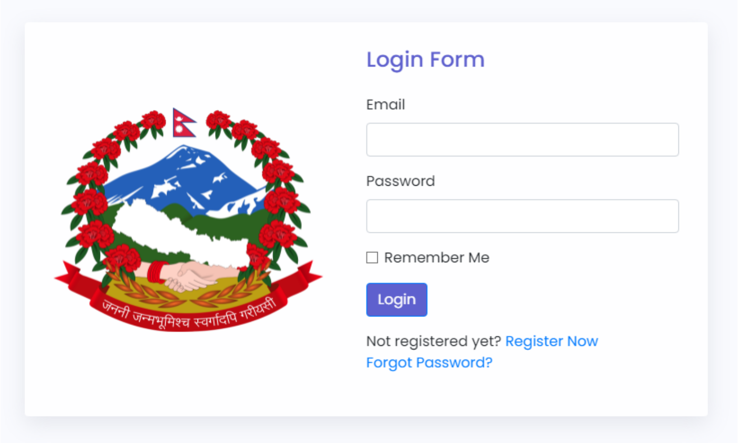

जननी जन्मभूमिश्च स्वर्गादपि गरीयसी
Login Form
Email
Password
□ Remember Me
Login
Not registered yet? Register Now
Forgot Password?

Figure 15: Login Form

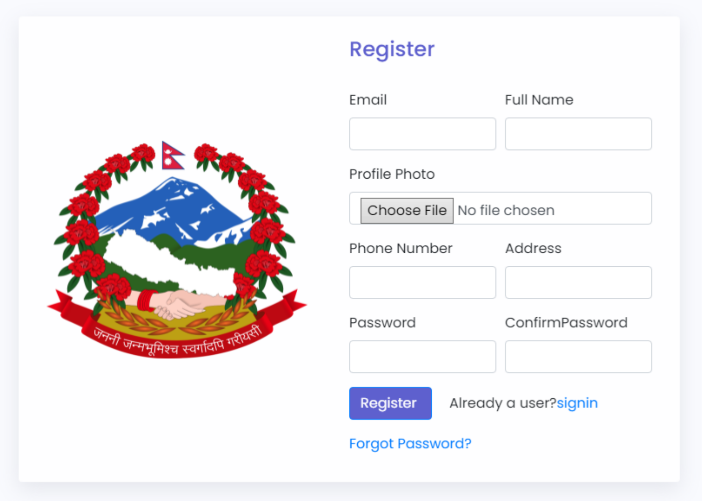
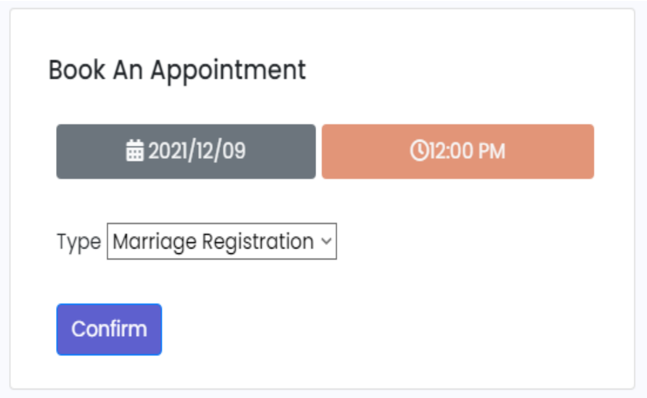


Figure 16: Registration form



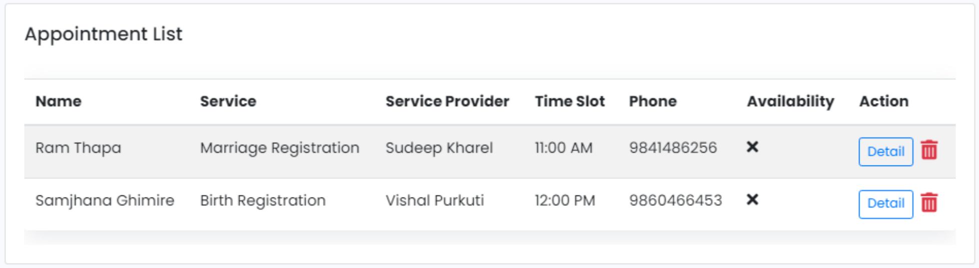
2021/12/09

12:00 PM

Type Marriage Registration

Figure 17: Appointment booking option

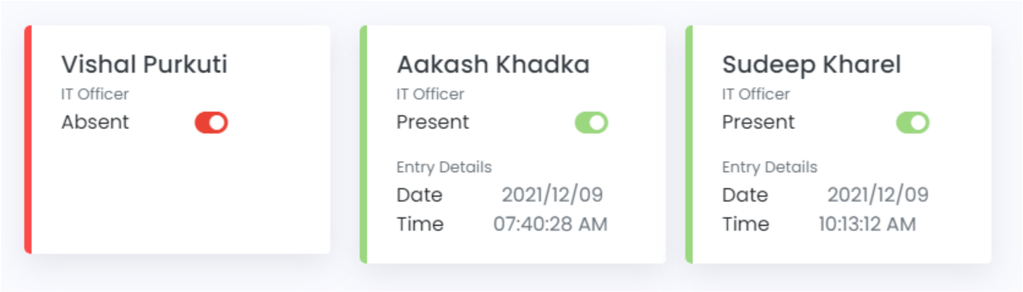
A report is the information that is organized and formatted to fit the required specification. It is a passive document that contains only predefined data and is used solely for viewing and reading. Following are the report designed in E-Nagarik Sewa:



Appointment List

Name	Service	Service Provider	Time Slot	Phone	Availability	Action
Ram Thapa	Marriage Registration	Sudeep Kharel	11:00 AM	9841486256	✕	Detail 🗑
Samjhana Ghimire	Birth Registration	Vishal Purkuti	12:00 PM	9860466453	✕	Detail 🗑

Figure 18: Appointment List



Vishal Purkuti
IT Officer
Absent

Aakash Khadka
IT Officer
Present
Entry Details
Date 2021/12/09
Time 07:40:28 AM

Sudeep Kharel
IT Officer
Present
Entry Details
Date 2021/12/09
Time 10:13:12 AM

Figure 19: Employee Attendance

Fig: 4.1.2.4 is an appointment list report which shows the list of appointments of the day and shown only to the respective employee, admin, and the citizen. Fig: 4.1.2.5 shows the attendance list and is publicly shown to citizens**.**

4.1.3 Interface and Dialogue Design

E-Nagarik Sewa is a web application that utilizes Graphical User Interface for interaction between the system and user. This appointment system is a user-friendly web application with modern UI elements like forms, buttons, navigation menu, reports, tables, lists, radio-button, checkboxes, text area, etc. Following are the major UI components used in the system.

Application Window: A web page is the application window of E-Nagarik Sewa since it is a web application.

Navigation Menu: Vertical and horizontal navigation menus are used in the web application. The navigation menu includes organized internal links to other web pages. This helps to navigate to pages like Appointment, Attendance, Roles, Profile, etc.

Buttons: Many buttons are used as a call to action to perform tasks like appointment booking, appointment canceling, updating information, etc.

Icons: Illustrative icons are used to convey the information without using textual content. The use of icons makes E-Nagarik Sewa more UI friendly and attractive.

Dialogue Box: Different alert, confirm, and prompt boxes are used as dialog boxes to interact with users. Moreover, custom dialog boxes are also used for some specific tasks like notification display.

Check-box: Checkboxes are provided to select different options as input. In E-Nagarik Sewa checkboxes are used for tasks like availability checks of citizens.

4.2 Algorithm Details

E-Nagarik Sewa implements different algorithms for face recognition and appointment management. Image processing algorithms like the Histogram Equalization algorithm are used for refining datasets in face recognition. Following are the major algorithms implemented in E-Nagarik Sewa:

4.2.1 Histogram Equalization

Histogram equalization is implemented to increase the global contrast of an image by spreading out the most frequent intensity levels[5]. Histogram equalization helps to adjust the contrast of an image by modifying the intensity distribution of the histogram.

The images as input from the camera were too dark or too light. So to provide consistent input we used the histogram equalization technique to balance the image intensity levels. The original RGB images were converted into grayscale images and then the histogram equalization was performed. This eventually helped to make a better face recognition model and achieve higher accuracy.

Histogram Equalization Algorithm

1. Convert the input image into a grayscale image
2. Find frequency of occurrence for each pixel value i.e. histogram of an image (values lie in the range [0, 255] for any grayscale image).
3. Calculate Cumulative frequency of all pixel values
4. Divide the cumulative frequencies by total number of pixels and multiply them by maximum graycount (pixel value) in the image.

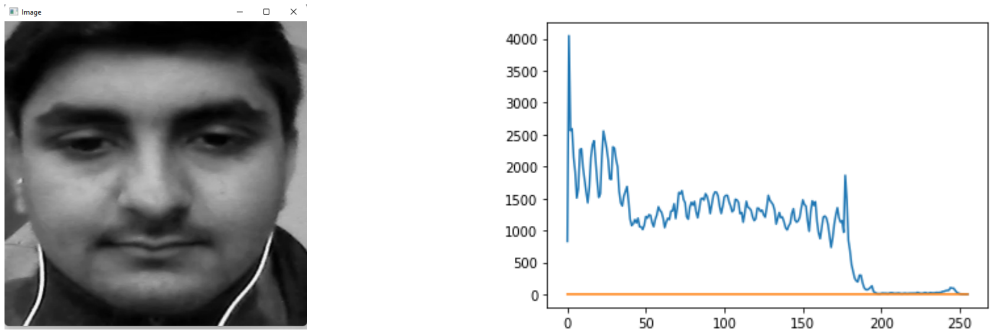


Figure 20: Original Image and Histogram

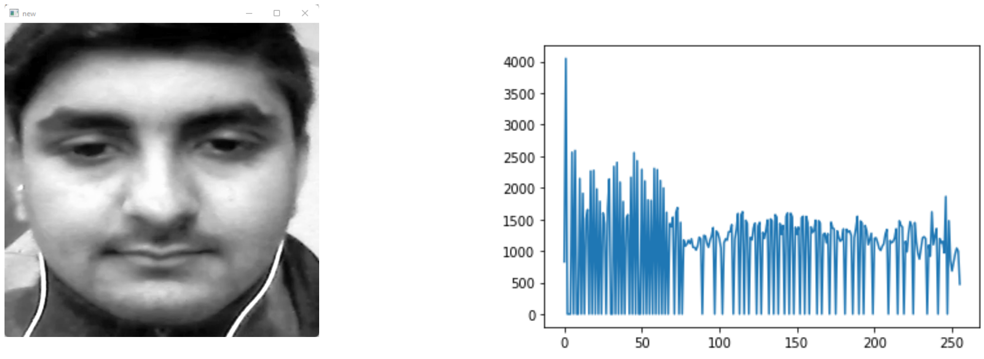


Figure 21: Enhanced Image and Histogram

4.2.2 Stochastic Gradient Descent

We implemented Convolution Neural Network (CNN) to develop a model for face recognition. A Convolutional Neural Network is a Deep Learning algorithm that can take in an input image, assign weights and biases to various aspects in the image, and be able to differentiate one from the other.

A dataset of 1000 images for each person was collected and preprocessed for training. For data preprocessing the RGB images were first converted into grayscale images then resized to 512x512 px and finally histogram equalized. We used Stochastic Gradient Descent (SGD) to optimize the weight and bias of CNN.

4.2.3 Face Validation Algorithm

```
Step 1: Initialize faceCounter of each employee as 0
Step 2: Take continuous input from camera.

Step 3: While(face is detected)
    {
       If (the detected face is of employee)
          {
             increment the faceCounter of  respective employee by 1
          }

       If (the faceCounter of any employee>8 in  a period of 10 seconds
          {
             mark the face as valid and update database.
          }
       Else
          {
          Make all other faceCounter of  invalid person as 0
          }
    }
```

Chapter 5:IMPLEMENTATION AND TESTING

5.1 Implementation

5.1.1 Tools Used

Following tools and technologies were used in E-Nagarik Sewa.

CASE Tools:

- Google Colab
- Diagram tools: Draw.io
- Project Management Tools: Jira, Github
- Design Tools: Adobe XD, Whimsical
- Sendgrid (Email service)

Programming languages:

- C#
- Python
- Javascript

Database Platforms:

- MSSQL

5.1.2 Implementation Details of Modules

Many modules are implemented in E-Nagarik Sewa. E-Nagarik is a web application where users can fix appointments with government employees. ASP. Net Core MVC is used for the development of E-Nagarik Sewa. This web application is an integration of many modules and components as follows.

Dataset Collection and Model training Module:

We developed a program that prepares datasets from videos of different persons. A video consisting of a face is uploaded to the google drive folder then images are extracted and stored in their respective folders of employees. The images are extracted using a python program that runs on google colab. 1000 images of size 512*512 from each video are extracted and further preprocessed for training.

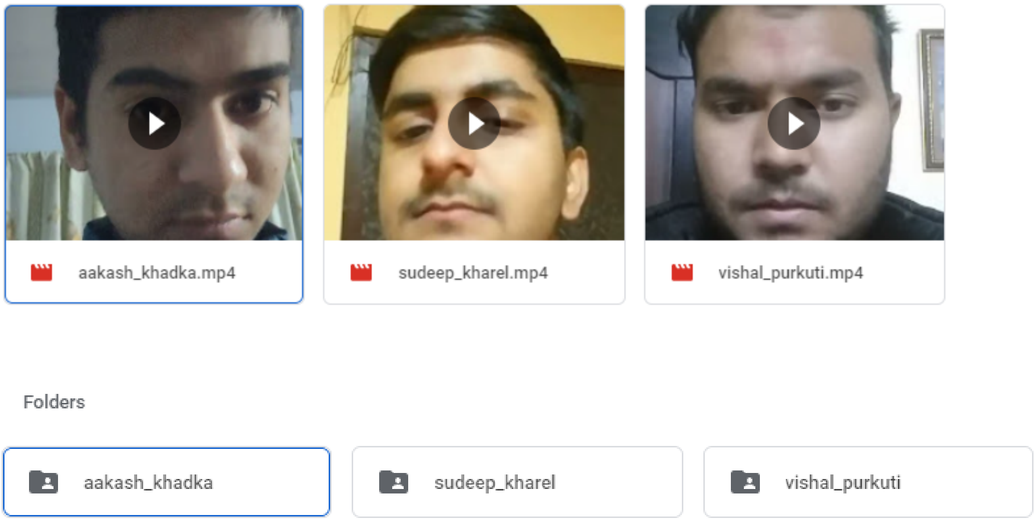


Figure 22: Google drive folder for storing training images

Details of datasets

The total dataset of 3 class is split into train and test datasets . Training dataset includes 750 images whereas train dataset includes 250 images for each class. Following table explains the details about the datasets.

Table 2: Details of datasets

Dataset	No. of images	Image size
Training Dataset	750	512*512
Test Dataset	250	512*512

Details of Face recognition Model

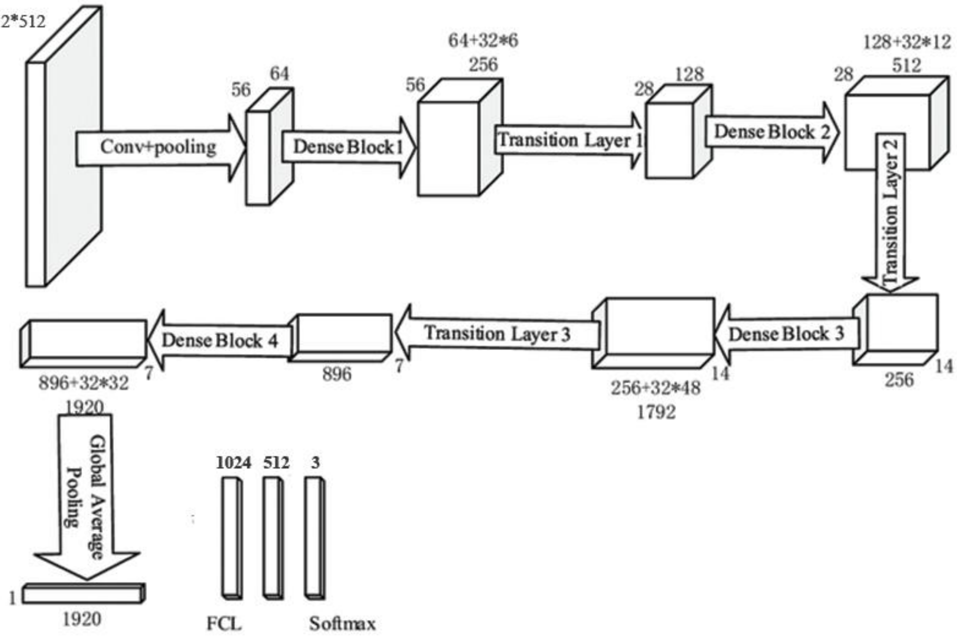


Figure 23:Modified Densenet 201

The model is constructed using a pretrained Densenet 201 model, which is modified by replacing the final layer with 3 fully connected layers with 1024, 512 and 3 nodes. The relu activation function is used in the first 2 layers with dropout of 0.4 and the softmax function is used in the final layer to predict 3 classes. The model is initialized with the imagenet weights freezing the pretrained layers. The optimization is performed for only the last 3 layers as we utilized the features learned from the pretrained model.

Table 3: Details of model

Number of Layers	(201-1)+3=203
Weights	Imagenet weight for pretrained 200 layers

Data Preprocessing

After preparing the datasets we performed the following operations for preprocessing:

- Grayscale conversion
- Resizing
- Rotation
- Cropping
- Augmentation
- Histogram equalization

After performing the above tasks we get preprocessed data and the preprocessed data is fed into the model.

Model Optimization

Stochastic Gradient Descent is used to optimize the weight and bias to find the minimum cost in many epochs of training. Then the test dataset is used to evaluate the performance of the model. All of these processes are performed using a python program that runs on google colab. The model is optimized using a learning rate of 0.01 and the model is trained for 20 epochs as the increase in number of epochs did not result in increase of accuracy.

Table 4: Model parameters

Learning Rate	0.01
Number of Epochs	20
Loss Function	Categorical CrossEntropy
Optimizer	Stochastic Gradient Descent
Momentum	0.7
Metrics	Accuracy

Face Recognition Module:

The Face Recognition Module uses a desktop application to run a python script that consists of a face recognition model which recognizes the employee and updates the entry and exit details. This module uses a camera and an active internet connection to record the employee details. The module needs 10 face entries within 5 seconds to confirm the presence of the employee. Also, it prevents the employee from making further entries within 2 hours after the previous entry.

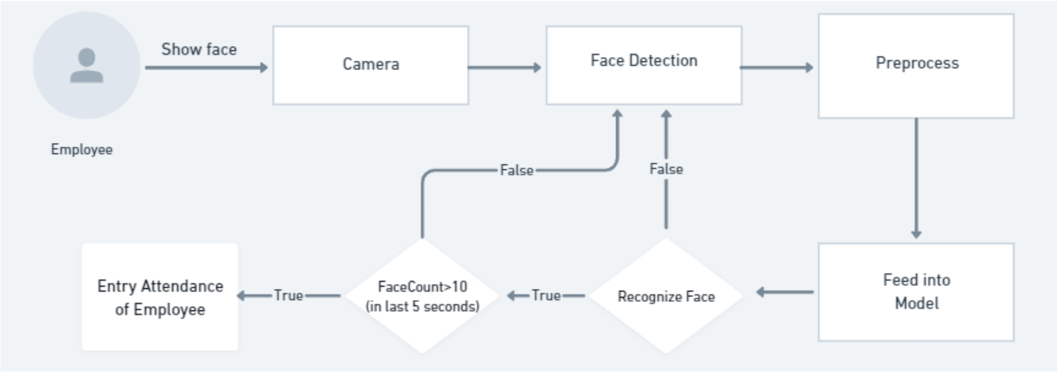


Figure 24: Working of face recognition system

User Management: The user Management module consists of user registration, user login and role management. This module is used to register new users and verify them using email verification. Then the verified users can log in to the system and can use the service or manage appointments according to their role. This module has features like forget password, profile update etc.

Home: This module contains the name and logo of E-Nagarik Sewa. There is also a simple navigation menu with elements like profile, notification, and appointment button.

Take Appointment: The appointment module allows users to fix an appointment with available government officers from many time slots. It also notifies the employee about the appointment assigned to them in a single day. A bell icon with a number of notifications is shown to individual employees and the admin.

Appointment: This module includes a list of appointments and its details. Admin can change the status of appointments and employees can send customized messages to the citizen. Citizens can confirm their availability in the office premises.

Attendance: This module shows the availability of government employees and authorities of the local governing body. Attendance of employees and authority is updated using a face recognition system.

5.2 Testing

Software testing is a process, to evaluate the functionality of a software application with an intent to find whether the developed software met the specified requirements or not and to identify the defects to ensure that the product is defect-free in order to produce a quality product. The E-Nagarik Sewa project is also tested using many test cases for unit testing and system testing as follows.

5.2.1 Test Cases for Unit Testing

Table 5: Unit testing for User Registration

Test case ID	Test Description	Test steps	Input test data	Expected result	Actual Result	Pass/ Fail
T-01	Signup with empty data	1. Click on register button 2.Leave input fields empty 3.Again click on register button	Email: Fullname: Address: Phone: Password: Confirm Password:	Error messages for all fields will be shown with an error summary.	Error messages for all fields was shown with an error summary	Pass
T-02	Signup with valid data	1. Click on register button 2.Enter valid	Email:aakash7khadka@gmail.com	New users will be created successfully	New user was created successfully and an	Pass

		data for all fields 3.Click on register button	Fullname: Aakash Khadka Address: Chabahil Phone: 9861098179 Password: Admin@123# Confirm Password: Admin@123#	and email verification messages will be shown .	email verification message was shown .	
T-03	Signup with invalid data	1. Click on register button 2.Enter invalid data for any field or all fields 3.Click on register button	Email:aakash7khadka@gmail.com Fullname: Aakash Khadka Address: Chabahil Phone: 9861098179 Password:1234 Confirm Password:1234	Error messages for all fields will be shown with an error summary.	Error messages for all fields were shown with an error summary.	Pass

Table 6: Unit testing for User Login

Test case ID	Test Description	Test steps	Input test data	Expected result	Actual Result	Pass/ Fail
T-11	Login with valid data	1.Enter the valid email and password 2.Click on login button	Email:aakash7khadka@gmail.com Password:Admin@123	The login page should redirect to homepage	The login page was redirected to homepage	Pass
T-12	Login with Invalid details	1.Enter incorrect email or password or both. 2.Click on login button	Email:aakash7khadka@gmail.com Password:123	The login page should not redirect to homepage with login error message	The login page was not redirected to homepage with login error message	Pass
T-13	Login empty fields	1.Leave the entry fields empty 2.Click on	Email: Password:	The login page should not redirect to homepage	The login page was not redirected to	Pass

		login button		with login error message	homepage with login error message	

Table 7: Unit testing for taking Appointment in appropriate time

Test case ID	Test Description	Test steps	Input test data	Expected result	Actual Result	Pass/Fail
T-21	Taking Appointment	1. Login with registered and verified account 2. Click on appointment button 3.Select appointment time slot from the available employee 4.Select the required service type and confirm	Time Slot: 11:00 AM Service type: Marriage Registration	Appointment should be created successfully	Appointment was created successfully	Pass

T-22	Taking Appointment with multiple accounts at same time	1. Login with registered and verified account in multiple devices 2. Click on appointment button 3.Select appointment time slot for same employee from all accounts 4.Select the required service type and confirm at the same time.	(Same input in all accounts) Time Slot: 11:00 AM Service type: Marriage Registration	Only one appointment will be successful with messages to both success and unsuccessful appointment	Only one appointment was successful with messages to both success and unsuccessful appointment	Pass

Table 8: Unit testing for role management

Test case	Test Description	Test steps	Input test data	Expected result	Actual Result	Pass/ Fail

ID						
T-31	Creating new roles by admin	1.Login with the admin account. 2. Click on roles and click on create roles. 3.Input the role name. 4.Click on ‘Create Role’ button	Role Name: Employee	A new role will be created	A new role was created	Pass

Table 9: Unit testing for Face recognition

Test case ID	Test Description	Test steps	Input test data	Expected result	Actual Result	Pass/ Fail
T-41	Face Recognition	1.Click on the desktop application. 2. Show the employee's face and it will collect data. 3. Then the employee’s face	Employee face images. Employee details.	The shown face of the employee should match the registered employee account.	The actual employee is selected.	Pass

		is registered. 4. After that, an employee account should be registered.				

5.2.2 Test Cases for System Testing

Table 10: System testing for user/admin

Test case ID	Test Description	Test steps	Input test data	Expected result	Actual Result	Pass/ Fail
T-51	Changing user role to admin	1.Users should register with the genuine email address and data. 2.Then,Login using a valid admin account. 3.Click on the "roles" button. 4.Look admin	Admin login: Username: harithapa@gmail.com Password: Nepal@123 Registration login: Full Name: Rojan Sharma Address:	Users should be updated to the admin role.	User is upgraded to the admin role.	Pass

		roles and click on the edit symbol action button.. 5.Again, click on “add or remove” users. 6.Add the user and click “update”.	Chabahil Email: rojansharma@gmail.com Phone no.: 498413616 Password: Abcd@123 Confirm Password: Abcd@123			
T-52	Changing the roles	1.Login with the admin account. 2.Click on the “roles” button. 3.Then click on the edit symbol of the admin panel. 4.Again, click on the “Add or remove user” button.	Admin Login: Username: harikarki@gmail.com Password: Nepal@123	Admin account should be changed to user account.	As expected.	Pass

Table 11: System testing for notification

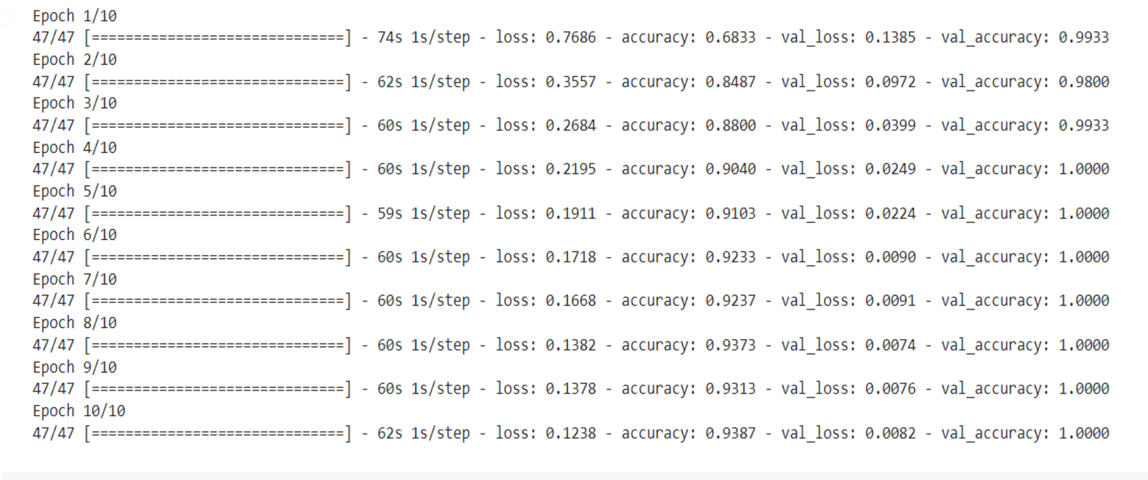
Test case ID	Test Description	Test steps	Input test data	Expected result	Actual Result	Pass /Fail
T-61	Updating Notification	1.Login with the registered user account. 2.Then,Click on the "take appointment" button. 3.Choose the available time slot. 4.Select category and click on "confirm" button	Username: rojansharma@gmail.com Password: Nepal@123	Employees should get the notification of the appointment..	Notification will pop up..	Pass
T-62	Notification of one another	1.Login with the registered user account. 2.Then,Click on the "take appointment" button. 3.Choose the available time slot. 4.Select	Username: rajansharma@gmail.com Password: Nepal@123	One Employee will not get the notification of another employee's appointment.	As expected.	Pass

		category and click on “confirm” button				

5.3. Result Analysis

We performed unit testing to properly analyze the functioning of individual modules and system testing to analyze the interoperability of the modules when integrated together. Different testing was done in order to verify if the functional and non-functional requirements are fulfilled or not.

The desired outcome of the face recognition system was to recognize employees with maximum accuracy avoiding misclassification of the face and preventing overfitting of the model. After training the model multiple times, we got training accuracy of 82% and a favorable testing accuracy of 99%. Although we got high accuracy, we had a few misclassifications. So, we developed a validation algorithm to prevent the invalid recognition of employees.



```
Epoch 1/10
47/47 [==============================] - 74s 1s/step - loss: 0.7686 - accuracy: 0.6833 - val_loss: 0.1385 - val_accuracy: 0.9933
Epoch 2/10
47/47 [==============================] - 62s 1s/step - loss: 0.3557 - accuracy: 0.8487 - val_loss: 0.0972 - val_accuracy: 0.9800
Epoch 3/10
47/47 [==============================] - 60s 1s/step - loss: 0.2684 - accuracy: 0.8800 - val_loss: 0.0399 - val_accuracy: 0.9933
Epoch 4/10
47/47 [==============================] - 60s 1s/step - loss: 0.2195 - accuracy: 0.9040 - val_loss: 0.0249 - val_accuracy: 1.0000
Epoch 5/10
47/47 [==============================] - 59s 1s/step - loss: 0.1911 - accuracy: 0.9103 - val_loss: 0.0224 - val_accuracy: 1.0000
Epoch 6/10
47/47 [==============================] - 60s 1s/step - loss: 0.1718 - accuracy: 0.9233 - val_loss: 0.0090 - val_accuracy: 1.0000
Epoch 7/10
47/47 [==============================] - 60s 1s/step - loss: 0.1668 - accuracy: 0.9237 - val_loss: 0.0091 - val_accuracy: 1.0000
Epoch 8/10
47/47 [==============================] - 60s 1s/step - loss: 0.1382 - accuracy: 0.9373 - val_loss: 0.0074 - val_accuracy: 1.0000
Epoch 9/10
47/47 [==============================] - 60s 1s/step - loss: 0.1378 - accuracy: 0.9313 - val_loss: 0.0076 - val_accuracy: 1.0000
Epoch 10/10
47/47 [==============================] - 62s 1s/step - loss: 0.1238 - accuracy: 0.9387 - val_loss: 0.0082 - val_accuracy: 1.0000
```

Figure 25: Face Recognition Model Accuracy

All modules passed testing with a satisfactory outcome. The face recognition module is successfully integrated with web application, as the employees are recognized availability status is updated in web app. Thus appointments can be taken from available employees only. The web application provides a user-friendly and simple user interface for taking appointments.

Chapter 6: CONCLUSION AND FUTURE RECOMMENDATIONS

6.1. Conclusion

A web application and an employee face recognition system were developed that allows citizens to book an appointment from the available employees. E-Nagarik Sewa successfully implemented a deep neural network for face recognition. An appointment system was developed with specific time slots where citizens can fix appointments from available service providers. Overall this system allows citizens to access government services efficiently without any hassle.

6.2. Recommendations

- New services other than vital registration such as social security, news and notice, tax e-payment, etc can be added.
- Option for Nepali, English, and other local languages can be added.
- Live chat features for employee-citizen interaction.

REFERENCES

[1]“Wikipedia”,Online]Available:https://en.wikipedia.org/wiki/Local_government_in_Nepal. [Accessed 22 June 2021].

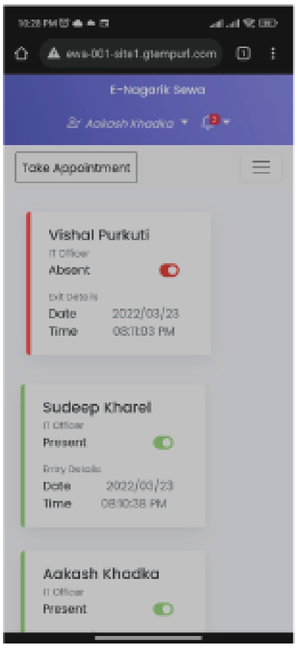
[2] "My Visit," [Online]. Available: https://evisitors.nic.in/NVIP/public/Home.aspx. [Accessed 20 June 2021].

[3] Y. Lecun, L. Bottou, Y. Bengio and P. Haffner, "Gradient-based learning applied to document recognition", in Proceedings of the IEEE, Vols. vol. 86, no. 11, Nov. 1998.

[4] “The evolution of image classification explained,” Stanford.edu, 2012. https://stanford.edu/~shervine/blog/evolution-image-classification-explained (accessed Apr. 08, 2022).

[5] “(PDF) Image enhancement by Histogram equalization,” ResearchGate. https://www.researchgate.net/publication/283727396_Image_enhancement_by_Histogram_equalization (accessed May 13, 2021).

APPENDIX



10:28 PM

ewa-001-site1.gtempurl.com

E-Nagarik Sewa

Aakash Khadka

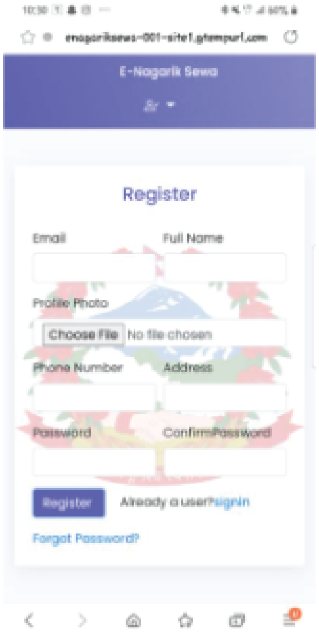
Take Appointment

Vishal Purkuti
IT Officer
Absent
Exit Details
Date 2022/03/23
Time 08:11:03 PM

Sudeep Kharel
IT Officer
Present
Entry Details
Date 2022/03/23
Time 08:10:38 PM

Aakash Khadka
IT Officer
Present

Login Page



10:30

enagariksewa-001-site1.gtempurl.com

E-Nagarik Sewa

Register

Email

Full Name

Profile Photo

Choose File No file chosen

Phone Number

Address

Password

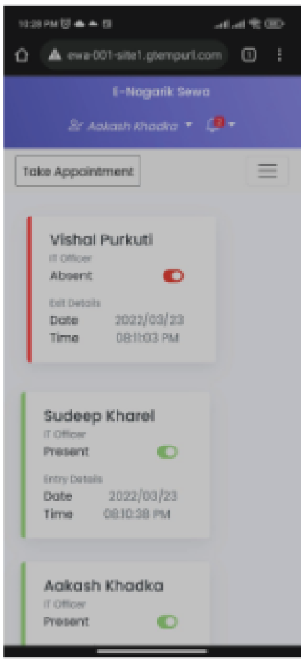
ConfirmPassword

Register

Already a user?signin

Forgot Password?

Registration Page



10:28 PM

ewa-001-site1.gtempurl.com

E-Nagarik Sewa

Aakash Khadka

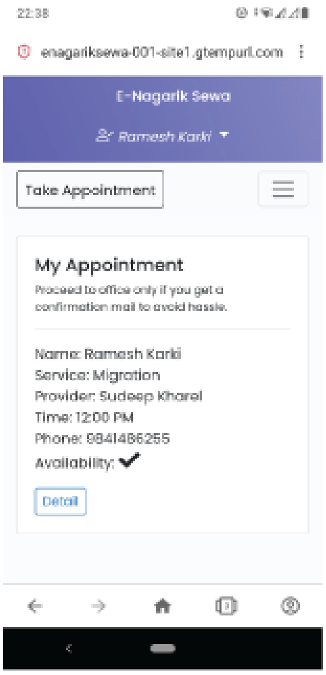
Take Appointment

Vishal Purkuti
IT Officer
Absent
Exit Details
Date 2022/03/23
Time 08:11:03 PM

Sudeep Kharel
IT Officer
Present
Entry Details
Date 2022/03/23
Time 08:10:38 PM

Aakash Khadka
IT Officer
Present

Attendance Page



22:38

enagariksewa-001-site1.gtempurl.com

E-Nagarik Sewa

Ramesh Karki

Take Appointment

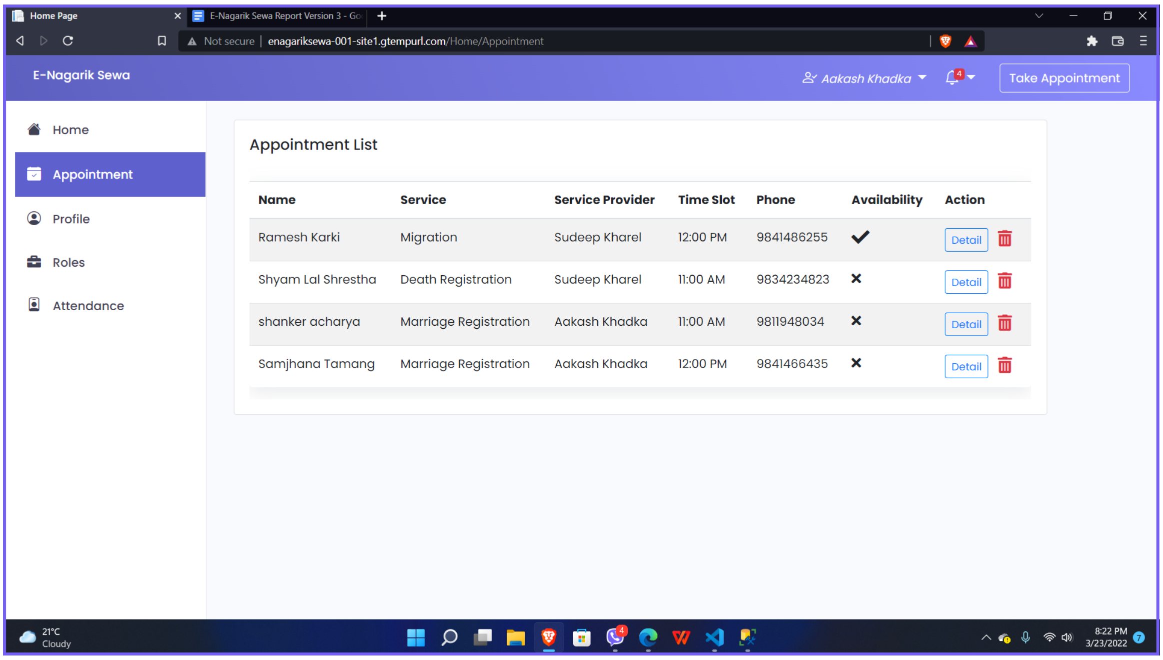
My Appointment

Proceed to office only if you get a confirmation mail to avoid hassle.

Name: Ramesh Karki
Service: Migration
Provider: Sudeep Kharel
Time: 12:00 PM
Phone: 9841486255
Availability: ✓

Detail

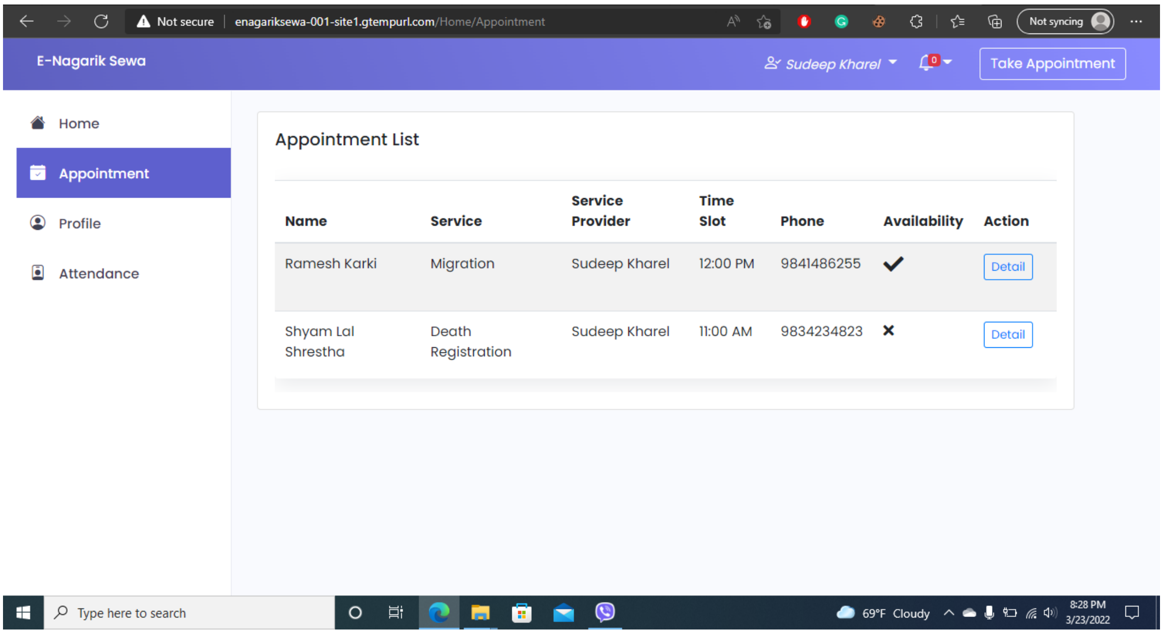
Appointment Page of Citizen



Appointment List

Name	Service	Service Provider	Time Slot	Phone	Availability	Action
Ramesh Karki	Migration	Sudeep Kharel	12:00 PM	9841486255	✓	Detail 🗑
Shyam Lal Shrestha	Death Registration	Sudeep Kharel	11:00 AM	9834234823	✗	Detail 🗑
shanker acharya	Marriage Registration	Aakash Khadka	11:00 AM	9811948034	✗	Detail 🗑
Samjhana Tamang	Marriage Registration	Aakash Khadka	12:00 PM	9841466435	✗	Detail 🗑

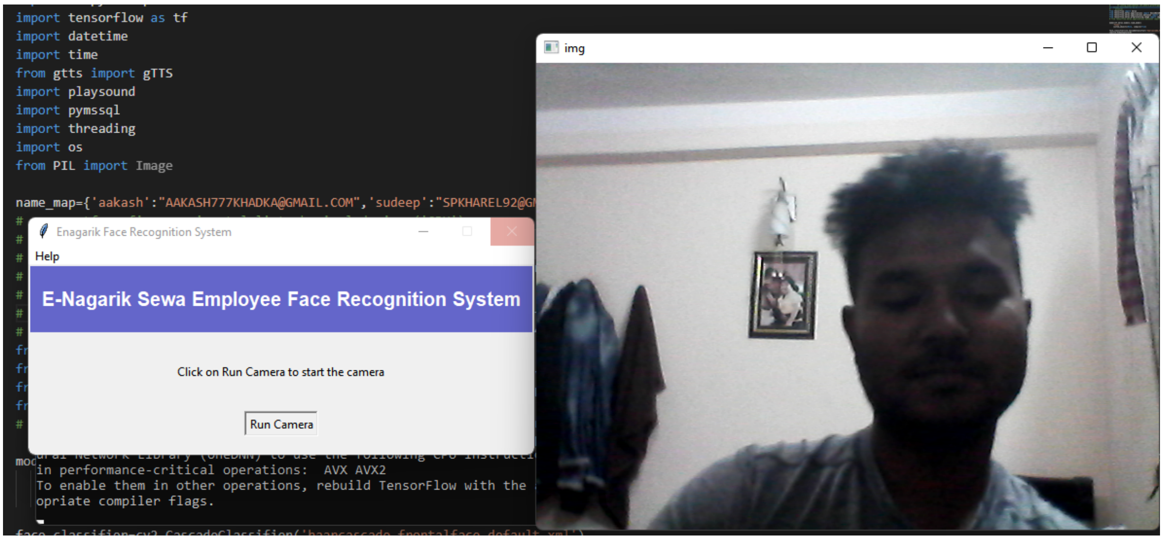
Appoint list view page of admin



Appointment List

Name	Service	Service Provider	Time Slot	Phone	Availability	Action
Ramesh Karki	Migration	Sudeep Kharel	12:00 PM	9841486255	✓	Detail
Shyam Lal Shrestha	Death Registration	Sudeep Kharel	11:00 AM	9834234823	✗	Detail

Appoint list view page of Employee



```
import tensorflow as tf
import datetime
import time
from gtts import gTTS
import playsound
import pymssql
import threading
import os
from PIL import Image

name_map={'aakash':"AAKASH777KHADKA@GMAIL.COM",'sudeep':"SPKHAREL92@G
```

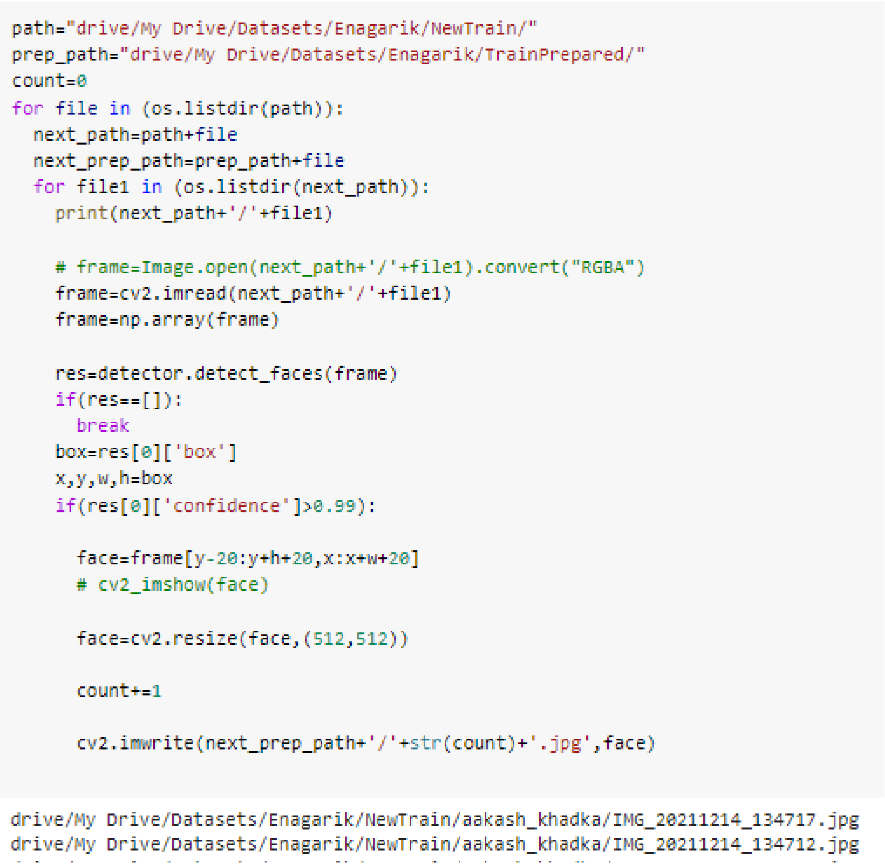
```
in performance-critical operations:  AVX AVX2
To enable them in other operations, rebuild TensorFlow with the
opriate compiler flags.
```

E-Nagarik Sewa Employee Face Recognition System

Click on Run Camera to start the camera

Face Recognition System using Desktop Application

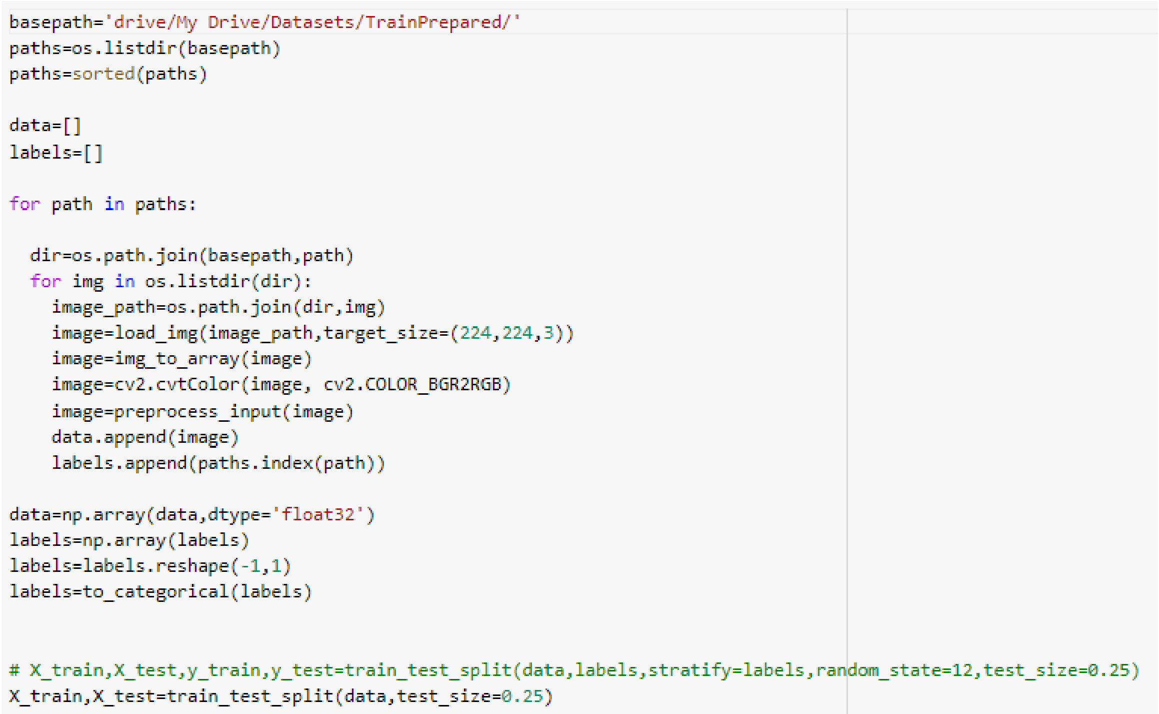
Code Screenshots



```
path="drive/My Drive/Datasets/Enagarik/NewTrain/"
prep_path="drive/My Drive/Datasets/Enagarik/TrainPrepared/"
count=0
for file in (os.listdir(path)):
  next_path=path+file
  next_prep_path=prep_path+file
  for file1 in (os.listdir(next_path)):
    print(next_path+'/'+file1)

    # frame=Image.open(next_path+'/'+file1).convert("RGBA")
    frame=cv2.imread(next_path+'/'+file1)
    frame=np.array(frame)

    res=detector.detect_faces(frame)
    if(res==[]):
      break
    box=res[0]['box']
    x,y,w,h=box
    if(res[0]['confidence']>0.99):

      face=frame[y-20:y+h+20,x:x+w+20]
      # cv2_imshow(face)

      face=cv2.resize(face,(512,512))

      count+=1

      cv2.imwrite(next_prep_path+'/'+str(count)+'.jpg',face)
```

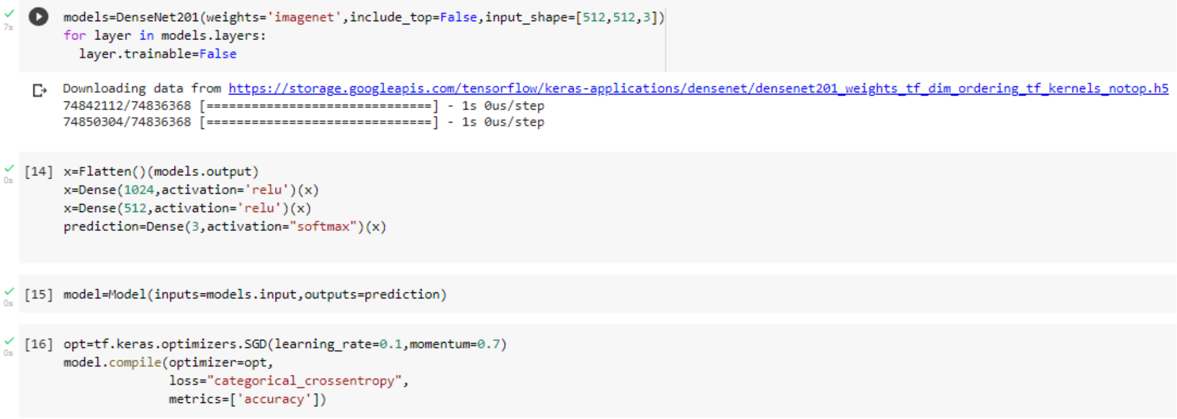
```
drive/My Drive/Datasets/Enagarik/NewTrain/aakash_khadka/IMG_20211214_134717.jpg
drive/My Drive/Datasets/Enagarik/NewTrain/aakash_khadka/IMG_20211214_134712.jpg
```

Data Collection from Video



```
basepath='drive/My Drive/Datasets/TrainPrepared/'
paths=os.listdir(basepath)
paths=sorted(paths)

data=[]
labels=[]

for path in paths:

  dir=os.path.join(basepath,path)
  for img in os.listdir(dir):
    image_path=os.path.join(dir,img)
    image=load_img(image_path,target_size=(224,224,3))
    image=img_to_array(image)
    image=cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
    image=preprocess_input(image)
    data.append(image)
    labels.append(paths.index(path))

data=np.array(data,dtype='float32')
labels=np.array(labels)
labels=labels.reshape(-1,1)
labels=to_categorical(labels)


# X_train,X_test,y_train,y_test=train_test_split(data,labels,stratify=labels,random_state=12,test_size=0.25)
X_train,X_test=train_test_split(data,test_size=0.25)
```

Getting data ready for training



```
models=DenseNet201(weights='imagenet',include_top=False,input_shape=[512,512,3])
for layer in models.layers:
  layer.trainable=False
```

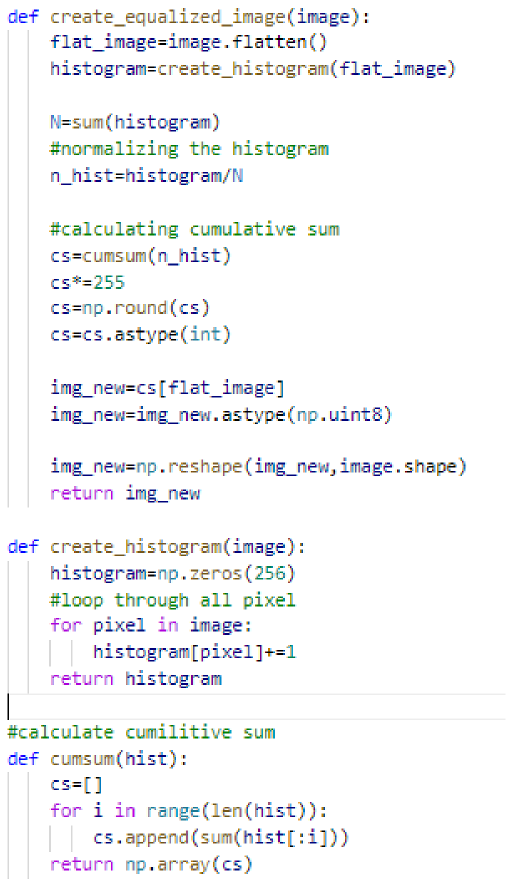
```
Downloading data from https://storage.googleapis.com/tensorflow/keras-applications/densenet/densenet201_weights_tf_dim_ordering_tf_kernels_notop.h5
74842112/74836368 [==============================] - 1s 0us/step
74850304/74836368 [==============================] - 1s 0us/step
```

```
[14] x=Flatten()(models.output)
     x=Dense(1024,activation='relu')(x)
     x=Dense(512,activation='relu')(x)
     prediction=Dense(3,activation="softmax")(x)
```

```
[15] model=Model(inputs=models.input,outputs=prediction)
```

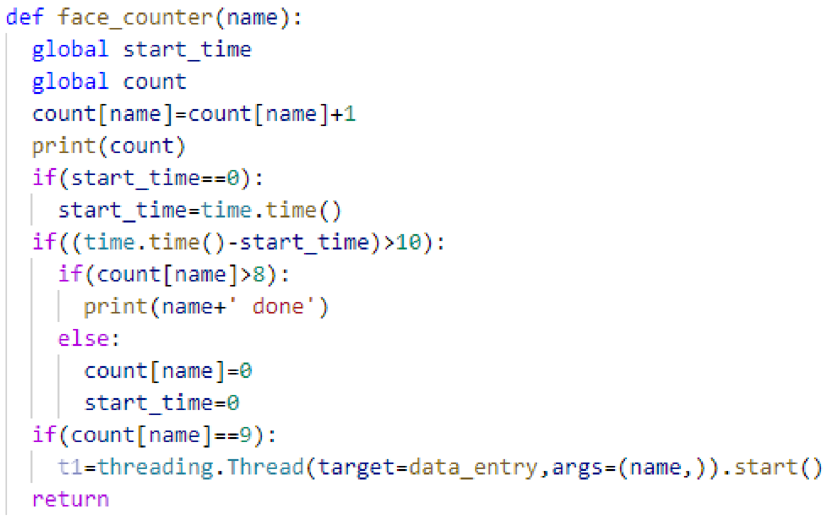
```
[16] opt=tf.keras.optimizers.SGD(learning_rate=0.1,momentum=0.7)
     model.compile(optimizer=opt,
                   loss="categorical_crossentropy",
                   metrics=['accuracy'])
```

Model Training



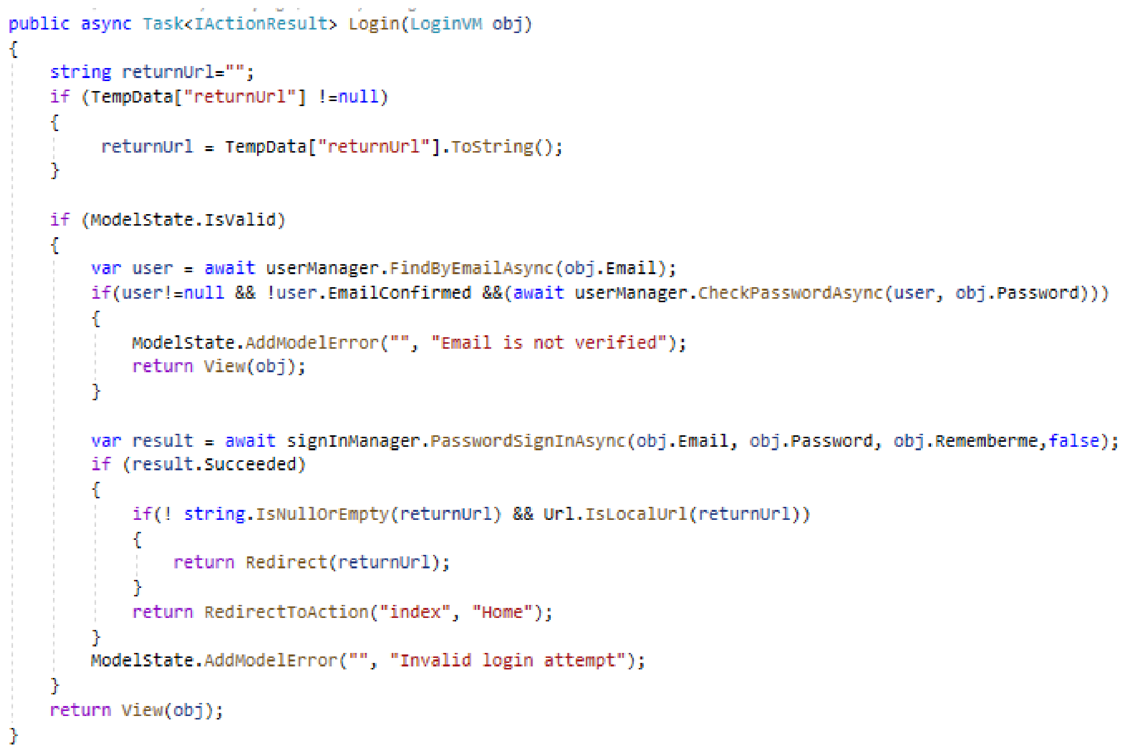
```
def create_equalized_image(image):
    flat_image=image.flatten()
    histogram=create_histogram(flat_image)

    N=sum(histogram)
    #normalizing the histogram
    n_hist=histogram/N

    #calculating cumulative sum
    cs=cumsum(n_hist)
    cs*=255
    cs=np.round(cs)
    cs=cs.astype(int)

    img_new=cs[flat_image]
    img_new=img_new.astype(np.uint8)

    img_new=np.reshape(img_new,image.shape)
    return img_new

def create_histogram(image):
    histogram=np.zeros(256)
    #loop through all pixel
    for pixel in image:
        histogram[pixel]+=1
    return histogram

#calculate cumilitive sum
def cumsum(hist):
    cs=[]
    for i in range(len(hist)):
        cs.append(sum(hist[:i]))
    return np.array(cs)
```

Histogram Equalization



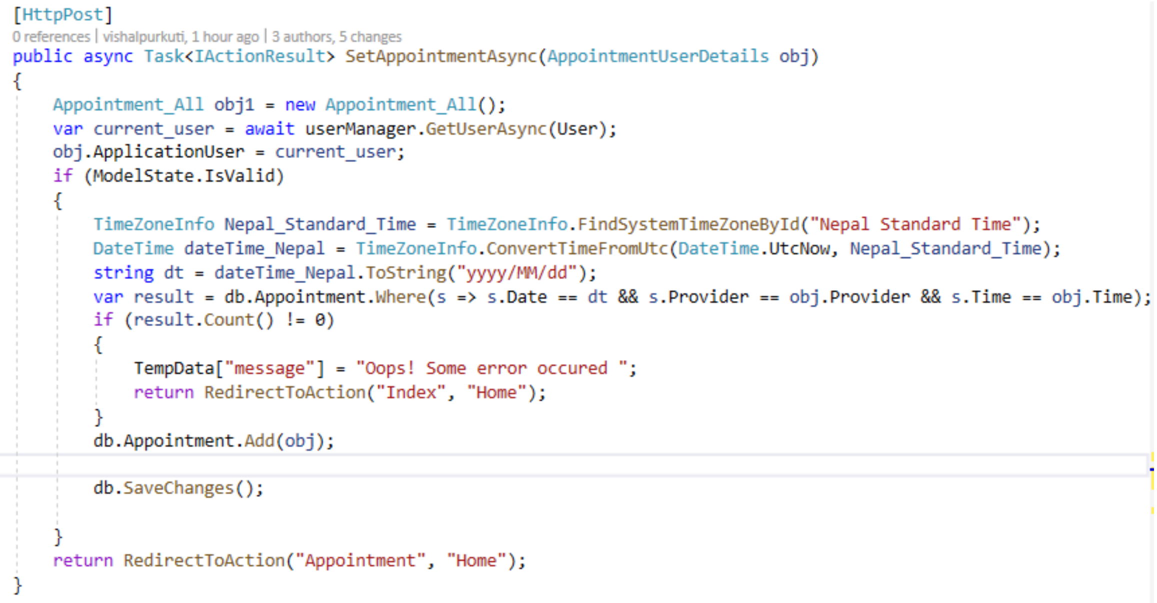
```
def face_counter(name):
    global start_time
    global count
    count[name]=count[name]+1
    print(count)
    if(start_time==0):
        start_time=time.time()
    if((time.time()-start_time)>10):
        if(count[name]>8):
            print(name+' done')
        else:
            count[name]=0
            start_time=0
    if(count[name]==9):
        t1=threading.Thread(target=data_entry,args=(name,)).start()
    return
```

Face Validation



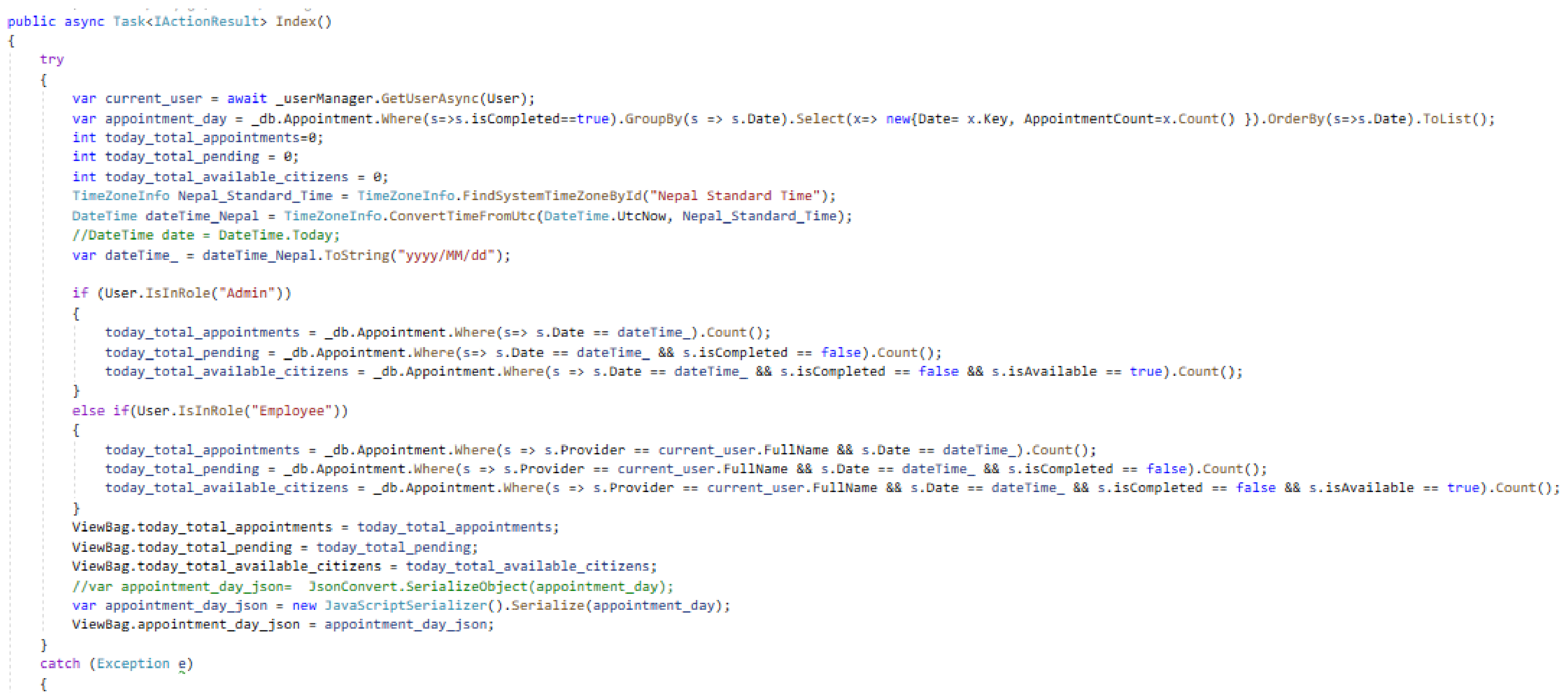
```
public async Task<IActionResult> Login(LoginVM obj)
{
    string returnUrl="";
    if (TempData["returnUrl"] !=null)
    {
         returnUrl = TempData["returnUrl"].ToString();
    }

    if (ModelState.IsValid)
    {
        var user = await userManager.FindByEmailAsync(obj.Email);
        if(user!=null && !user.EmailConfirmed &&(await userManager.CheckPasswordAsync(user, obj.Password)))
        {
            ModelState.AddModelError("", "Email is not verified");
            return View(obj);
        }

        var result = await signInManager.PasswordSignInAsync(obj.Email, obj.Password, obj.Rememberme,false);
        if (result.Succeeded)
        {
            if(! string.IsNullOrEmpty(returnUrl) && Url.IsLocalUrl(returnUrl))
            {
                return Redirect(returnUrl);
            }
            return RedirectToAction("index", "Home");
        }
        ModelState.AddModelError("", "Invalid login attempt");
    }
    return View(obj);
}
```

Login Post Action



```
[HttpPost]
0 references | vishalpurkuti, 1 hour ago | 3 authors, 5 changes
public async Task<IActionResult> SetAppointmentAsync(AppointmentUserDetails obj)
{
    Appointment_All obj1 = new Appointment_All();
    var current_user = await userManager.GetUserAsync(User);
    obj.ApplicationUser = current_user;
    if (ModelState.IsValid)
    {
        TimeZoneInfo Nepal_Standard_Time = TimeZoneInfo.FindSystemTimeZoneById("Nepal Standard Time");
        DateTime dateTime_Nepal = TimeZoneInfo.ConvertTimeFromUtc(DateTime.UtcNow, Nepal_Standard_Time);
        string dt = dateTime_Nepal.ToString("yyyy/MM/dd");
        var result = db.Appointment.Where(s => s.Date == dt && s.Provider == obj.Provider && s.Time == obj.Time);
        if (result.Count() != 0)
        {
            TempData["message"] = "Oops! Some error occured ";
            return RedirectToAction("Index", "Home");
        }
        db.Appointment.Add(obj);

        db.SaveChanges();

    }
    return RedirectToAction("Appointment", "Home");
}
```

Appointment Post Action



```
public async Task<IActionResult> Index()
{
    try
    {
        var current_user = await _userManager.GetUserAsync(User);
        var appointment_day = _db.Appointment.Where(s=>s.isCompleted==true).GroupBy(s => s.Date).Select(x=> new{Date= x.Key, AppointmentCount=x.Count() }).OrderBy(s=>s.Date).ToList();
        int today_total_appointments=0;
        int today_total_pending = 0;
        int today_total_available_citizens = 0;
        TimeZoneInfo Nepal_Standard_Time = TimeZoneInfo.FindSystemTimeZoneById("Nepal Standard Time");
        DateTime dateTime_Nepal = TimeZoneInfo.ConvertTimeFromUtc(DateTime.UtcNow, Nepal_Standard_Time);
        //DateTime date = DateTime.Today;
        var dateTime_ = dateTime_Nepal.ToString("yyyy/MM/dd");

        if (User.IsInRole("Admin"))
        {
            today_total_appointments = _db.Appointment.Where(s=> s.Date == dateTime_).Count();
            today_total_pending = _db.Appointment.Where(s=> s.Date == dateTime_ && s.isCompleted == false).Count();
            today_total_available_citizens = _db.Appointment.Where(s => s.Date == dateTime_ && s.isCompleted == false && s.isAvailable == true).Count();
        }
        else if(User.IsInRole("Employee"))
        {
            today_total_appointments = _db.Appointment.Where(s => s.Provider == current_user.FullName && s.Date == dateTime_).Count();
            today_total_pending = _db.Appointment.Where(s => s.Provider == current_user.FullName && s.Date == dateTime_ && s.isCompleted == false).Count();
            today_total_available_citizens = _db.Appointment.Where(s => s.Provider == current_user.FullName && s.Date == dateTime_ && s.isCompleted == false && s.isAvailable == true).Count();
        }
        ViewBag.today_total_appointments = today_total_appointments;
        ViewBag.today_total_pending = today_total_pending;
        ViewBag.today_total_available_citizens = today_total_available_citizens;
        //var appointment_day_json=  JsonConvert.SerializeObject(appointment_day);
        var appointment_day_json = new JavaScriptSerializer().Serialize(appointment_day);
        ViewBag.appointment_day_json = appointment_day_json;
    }
    catch (Exception e)
    {
```

Home Index action

Texas International College
Mitrapark, Chabahil, Kathmandu
Tel: +977 1 4479017
Department of Computer Science & IT

Students' record for project work activities

Course Name: Project Work
Program: BSc CSIT, Fourth Year/7thSemester

Team Name: 1) Aakash Khadka 2) Sudeep Kharel 3) Vishal Purkuti

SN	Name	Roll No	Date	Activities	Supervisor's Sign
	Aakash Khadka	15561	Ashar 1	Title Defense	
	Sudeep Kharel	15601	Ashar 3	Got review about changing the objectives, scope and limitation	
	Vishal Purkuti	15606	Ashar 15	Design plan and discussion	
	All		Ashar 25	Review of DFD and ER and recommend changes	
	All		Kartik 10	Had final design review	
	All		Mangsir 2	Implementation and testing plan discussion	
	All		Poush 5	Mid Defense of project	
	All		Falgun 17	Review of documentation and demonstration of project with comments on algorithm details	
	All		Chaitra 20	Discussion on final defense	

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Approved By
Head, CSIT