CERTIFICATE AUTHENTICATION SYSTEM

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project/internship title "Certificate Authentication System" , submitted by Md. Shoriful Hasan Sakib, ID No: 181-15-11245, Shakhawat Hossain, ID No. 183-15-2325 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 14th September 2022..

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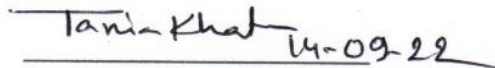Jahangirnagar University

DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Dr. S.M. Aminul Haque,** Associate Professor, Department of CSE Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ABSTRACT

The purpose of our creation of this online certificate verification system is that it can be used by a student or an institution's authority from home or anywhere. If certificate verification is required for university admissions, and job recruitment, then using our site can verify the certificate within a short period. It is very easy to understand whether the certificate is original or not. Doing this certificate verification is a waste of time and many times there are chances of various frauds. To be subjected to more such harassment. Considering more such aspects and inspired by it, we thought of creating this site. A student and an institution can benefit by using this site. The student can verify his/her certificate to see if there is any factual error in the certificate. A university can use this site to verify the validity of a student's previous certificates while admitting them. Again if a student wants to go abroad for higher education and requires previous certificate verification, then the site can be used. A company can use this site to verify the validity of its certificates while hiring someone. To build this site we used Python code that we did in Visual Studio Code. We have used different types of libraries to perform different types of tasks, e.g. we have used OS libraries to trace files and modify files. Used Pytesseract library to convert images to data. Used OCR, a numerical library, to process the converted data. Used it to perform various mathematical operations. Used which is commonly used to capture videos and photos. To use this site the user needs to login to this site first, then the user will take a photo of the certificate and upload it to the site and search. Our site will then extract the data from the user's uploaded images and match them with the database on the website. If the data matches then it will give a message saying valid, and if it does not match then it will give a message saying it is not valid.

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CHAPTER 1
Introduction

1.1 Introduction

This project is all about online certificate verification. This is a web-based digital certificate verification system. This system is designed to verify certificates for users. Those who verify certificates will benefit from using this application. The user-friendly interface and functionality help users and admins manage the application easily.

We have created a certificate verification website. Anyone can open an account and do certificate verification through this website by accessing this website. The specialty of our developed site is that any user can check the validity of their required certificate by entering this site. This includes editing, deleting, and uploading to our system. A search system collects information from user-uploaded certificates and checks against the database, verifying that the certificate is valid. We used Visual Studio Code to build this system.

Html, CSS, Python, etc. have been used and it is a dynamic website that will run on any system through webpack when opened on mobile the site will be optimized on the mobile screen as well.

1.2 Project Motivation

A certificate verification site, which a user can enjoy directly from home. Here the user can also be an institution, such as a university. If a student needs a certificate from his/her previous educational institution for university admission, the university authorities can use our system and verify the validity of the student's certificate through our system. In this case, both the university and students can benefit from using our site. It has been observed that many organizations look for such a website where they can verify the validity of a certificate very easily and in a very short time.

Not only in educational institutions but also in various workplaces when a student starts his/her career, the organization can use our system to check the validity of the student's certificates for free. In this case, we have to enter more data into our database.

1.3 Objective

- To prevent creating fake college certificate.
- To prevent creating important documents using fake certificate.
- The university authority can easily verify the certificate when students are admitted to the university.
- The site will help to verify the certificate in case of hiring any organization.

1.4 Expected outcome

We hope, our certificate verify system will be very useful for the present time. By using this site the user will be benefited from the verifying the certificate. There are many other sites for certificate verification, but the user can easily understand how to do the certificate verification by entering our site. W have created the site keeping in mind that the user can understand it easily.

1.5 Benefits of the Project

Online certificate verification system makes certificate verification easier. It has various advantages like-

- This site is lite weight, as a result it works flawlessly.
- Data show and compare with database quickly.
- Save time.
- Data can be saved and retrieved easily.
- This site is available 24*7.
- If someone gives wrong data it can be identified easily and in less time.

1.6 Methodology

This certificate authentication system project is carried out through the following phases-

- Analysis of procedures in online certificate verification system.

- Identifications of problems and limitations.

- Requirement analysis of the new system.

- Design a database schema to represent the entities and relationships.

1.7 Summary

In this chapter, our objectives have come very clear. We have discussed the system development life cycle and we followed that. Here we have discussed how the whole system works and how we have developed the whole system.

CHAPTER 2
Background

2.1 Introduction

In this online certificate verification system, we used PyCharm and created the backend by coding raw python. We used CV2, NumPy, Pytesseract, and OS library. We also used this Django framework for the backend. So that the backend of our project can run smoothly. It is one of the popular frameworks for building online service systems these days. That's why we used this framework for the backend of our project. We have used a theme for our system so that the site is easy for our system user to use and the user can understand everything easily. Because if a user does not understand the system well after entering the system then he will not be able to use the system properly and will not be able to benefit from the system. But it is not a good experience. And user experience is the most important factor for any online service site to grow. We have tried to implement our online certificate verification system keeping those things in mind.

2.2 Related Works

Certificate verification has become very important in today's era. Because, nowadays many people apply for jobs in various organizations and to enjoy various government facilities using wrong certificates. If want to verify the certificate then contact the education board. Or can use some verifications sites online. But you have to pay to use those sites, due to which not everyone can use these sites. Again, there are many sites that have a very complex user interface, which makes it difficult for the user understand. Users don't understand how to works so they can't use it. First of all, our site is completely free for users, no need to pay, then the user interface of our site is very simple. Users can do everything easily when they enter our site. We have taken ideas to build this project from "certificateverify.online, pharma-research.in, isaca.org, aacn.org, elearning.heart.org, etc. Also we have got idea from many websites to design our project.

2.3.1 Introduction to the Development platform

We have used the raw Python, CV2, NumPy, Pytesseract, and OS library, OCR. Python is a safe and more secure dynamic, single-threaded language that admits developers to make the spread secure and sturdy apps that run on Code Python.

Python's popularity has been increasing day by day over the past few years. The programming language has surpassed Java in popularity. But to many, this is no surprise. Python is being used in machine learning, data analysis, and web application development. And many developers are using Python for its power, rich libraries, easy-to-learn syntax, and portability. The Python library offers a wide range of tools and packages that allow you to access pre-written code, streamlining your application development time.

- CV2 library: CV2 is a library function. To use this module, it must first be imported. It is commonly used to capture photos. First, it reads this image, then displays this image, then saves this image. CV2 is a class that usually provides Python's OpenCV library.

- NumPy library: NumPy is an open-source numerical library for Python. It contains a multidimensional array and matrix data structures. It is used to perform various mathematical operations. This library requires less memory, has very low time complexity, and is very convenient to use.

- Pytesseract library: Pytesseract is a Python package that helps extract data from images.

- OCR: Pytesseract uses the data obtained from the image by OCR processing.

- OS library: OS libraries are used to trace files and modify files. It also performs tasks like opening and closing live files.

2.3.2 Scope

Different areas where we may use this website-

- Certificates may be used to verify the validity of a student's admission to the University.

- His certificate can be used for verification while hiring someone in the workplace.

- In going out for higher education, his previous certificates can be used to verify validity.

2.3.3 Study of feasibility

A feasibility study is a rating and analytical visualization of anticipated planned projects that are covered and supported by investigations and urges the decision makers to exercise full discretion. This system provides all the information about the certificate. Certificate operations are recorded, stored on the computer, and retrieved. It ensures security as there is a login option for the user.

Responsibilities typically lead to feasibility analysis, technical development, and project implementation.

CHAPTER 3

Requirement of Specification

3.1 Requirement of Hardware

To build this system we have used the following hardware system. There is no fancy hardware requirements. We can build this on every pc.

TABLE 3.1: REQUIRED HARDWARE FOR OUR SYSTEM.

Configuration	Limitation
Processor	No limitation
Ram	At least 500 mb ram for smooth experience
Motherboard	No limitation
Graphics card	Not necessary
Hard disk	No limitation
Monitor	Any type of monitor
Webcam and sound system	Not necessary

3.2 Requirement of Software

As for software requirement, we have used a specific code editor PyCharm as it is easy to locate issues in code, and coding friendly environment. And for operating system we used Windows 10.

TABLE 3.2: REQUIRED SOFTWARE FOR OUR SYSTEM.

Software	Usage
PyCharm	Code Editor
Operating System	Windows 10

3.3 Backend Requirement

3.3.1 Python

We have used python for creating this system. As python is a high-level programming language and it has some useful libraries. As a result, we executed our task very easily.
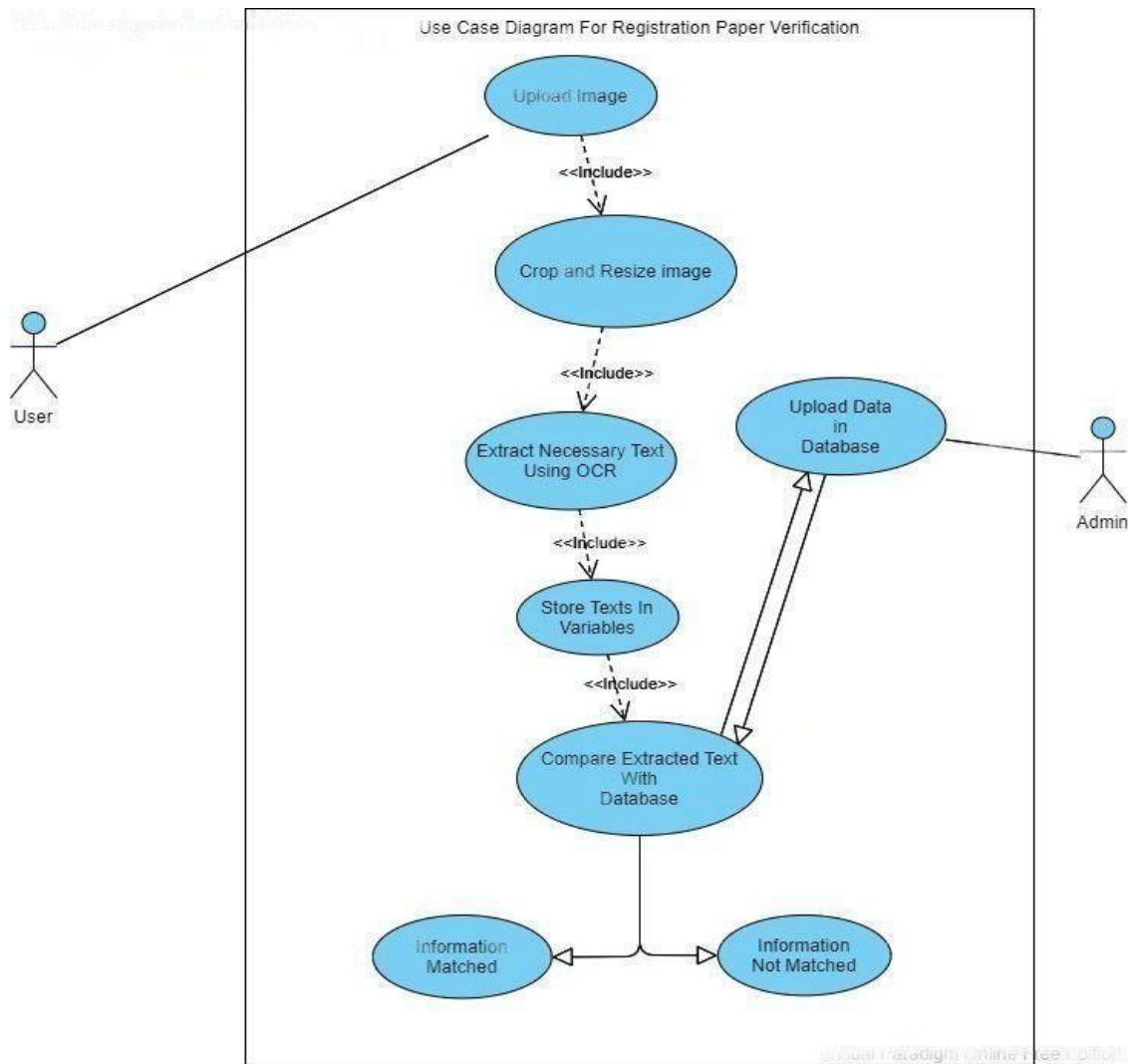
3.4 Use Case Diagram

Figure 3.1: Use Case Diagram

In figure 3.1, we have created a diagram where we show the working process of our app. So foremost, we need to upload an image to our web app. And it will be our targeted image.

Secondly, we will crop and resize our image by following an idle image. Then we will extract the necessary feature from the cropped image. We will save those extracted data in a variable. Next, we will compare those variable data with a database where all verified data will be stored. We will use the registration number as the primary key to search data in our database. Then we will decide that is it authentic or not.
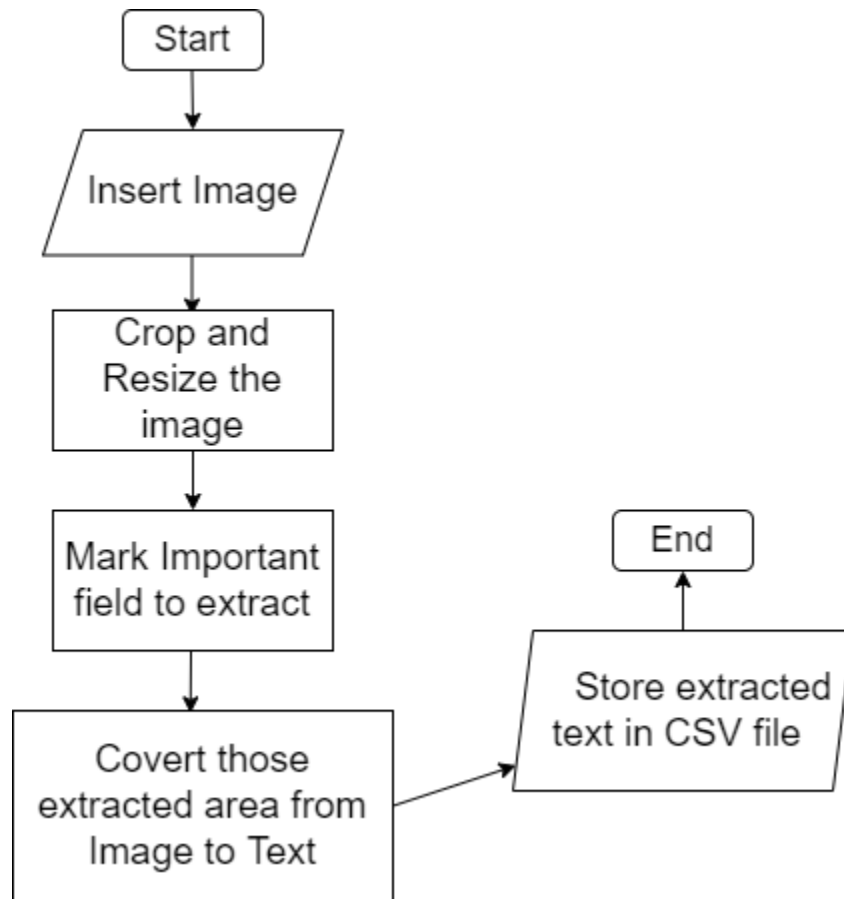
3.5 Flow Chart

Figure 3.2: Flow Chart Diagram

In the following chart, we can see the working procedures. After starting the process we have inserted our test image then cropped and resized our test image. Then we extract the important area. Afterward we have converted those important images into text. Finally stored extracted text in a CSV file. And that is the end of the process.

CHAPTER 4

Design Specification

4.1 Backend Design

4.1.1 Read an Image

```python
#-------store user image-------
path = 'image'

#-------list of images-------
myPicList = os.listdir(path)
print(myPicList)

for j, y in enumerate(myPicList):
    img = cv2.imread(path + "/" + y) #read user image
    imgScan = processImage.cropImage(img)

    myData = []

    imgShow = imgScan.copy()
    imgMask = np.zeros_like(imgShow)
```

Figure 4.1: Read Image

In figure 4.1 to read an image we have used the following code in figure 4.1. Here we have specified a folder where the user image will be stored. Then we ran a loop to find out all the stored images in it.

Original Image

Figure 4.2: User uploaded Image

4.1.2 Crop and Resize Image

```python
import os.path
import cv2
import numpy as np
import utlis


###########################################################
# webCamFeed = True
def cropImage(image):
    img = image

    imgQ = cv2.imread('temp\\query.jpg')
    heightImg, widthImg, c = imgQ.shape
    ###########################################################

    while True:
        img = cv2.resize(img, (widthImg, heightImg)) # RESIZ
        imgBlank = np.zeros((heightImg,widthImg, 3), np.uint
        imgGray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY) # CO
        imgBlur = cv2.GaussianBlur(imgGray, (5, 5), 1)
        thres = utlis.valTrackbars()
        imgThreshold = cv2.Canny(imgBlur,thres[0],thres[1])
        kernel = np.ones((5, 5))
        imgDial = cv2.dilate(imgThreshold, kernel, iteration
```

```python
        imgDial = cv2.dilate(imgThreshold, kernel, iterations=2)
        imgThreshold = cv2.erode(imgDial, kernel, iterations=1)

        ## FIND ALL COUNTOURS
        imgContours = img.copy() # COPY IMAGE FOR DISPLAY PURPOS
        imgBigContour = img.copy() # COPY IMAGE FOR DISPLAY PURP
        contours, hierarchy = cv2.findContours(imgThreshold, cv2
        cv2.drawContours(imgContours, contours, -1, (0, 255, 0),


        # FIND THE BIGGEST COUNTOUR
        biggest, maxArea = utlis.biggestContour(contours) # FIND
        if biggest.size != 0:
            biggest=utlis.reorder(biggest)
            cv2.drawContours(imgBigContour, biggest, -1, (0, 255
            imgBigContour = utlis.drawRectangle(imgBigContour,bi
            pts1 = np.float32(biggest) # PREPARE POINTS FOR WARP
            pts2 = np.float32([[0, 0],[widthImg, 0], [0, heightI
            matrix = cv2.getPerspectiveTransform(pts1, pts2)
            imgWarpColored = cv2.warpPerspective(img, matrix, (w

            #REMOVE 20 PIXELS FORM EACH SIDE
            imgWarpColored=imgWarpColored[20:imgWarpColored.shap
            imgWarpColored = cv2.resize(imgWarpColored,(widthImg
```

```python
            imgWarpColored=imgWarpColored[20:imgWarpCo
            imgWarpColored = cv2.resize(imgWarpColored

            # APPLY ADAPTIVE THRESHOLD
            imgWarpGray = cv2.cvtColor(imgWarpColored,
            imgAdaptiveThre= cv2.adaptiveThreshold(img
            imgAdaptiveThre = cv2.bitwise_not(imgAdapt
            imgAdaptiveThre=cv2.medianBlur(imgAdaptive

            # Image Array for Display
            imageArray = ([img,imgGray,imgThreshold,im
                          [imgBigContour,imgWarpColore

        else:
            imageArray = ([img,imgGray,imgThreshold,im
                          [imgBlank, imgBlank, imgBlan

        # LABELS FOR DISPLAY
        lables = [["Original","Gray","Threshold","Cont
                  ["Biggest Contour","Warp Prespective

        stackedImage = utlis.stackImages(imageArray,0.
```

```python
# SAVE IMAGE WHEN 's' key is pressed

if os.path.exists("Scanned/myImage.jpg"):
    os.remove("Scanned/myImage.jpg")
cv2.imwrite("Scanned/myImage.jpg",imgWarpColored)
cv2.rectangle(stackedImage, ((int(stackedImage.shape[1] / 2) - 230),
cv2.putText(stackedImage, "Scan Saved", (int(stackedImage.shape[1] /
cv2.waitKey(0)
return imgWarpColored
```

Figure 4.3: Code to Crop and Resize the original Image

After reading he stored image in 'image' folder, we need to crop and resize uploaded image. So we have used figure 4.3 script to do the job. Then we modified the user image using idle image resolution. And we can see the changes in figure 4.4.
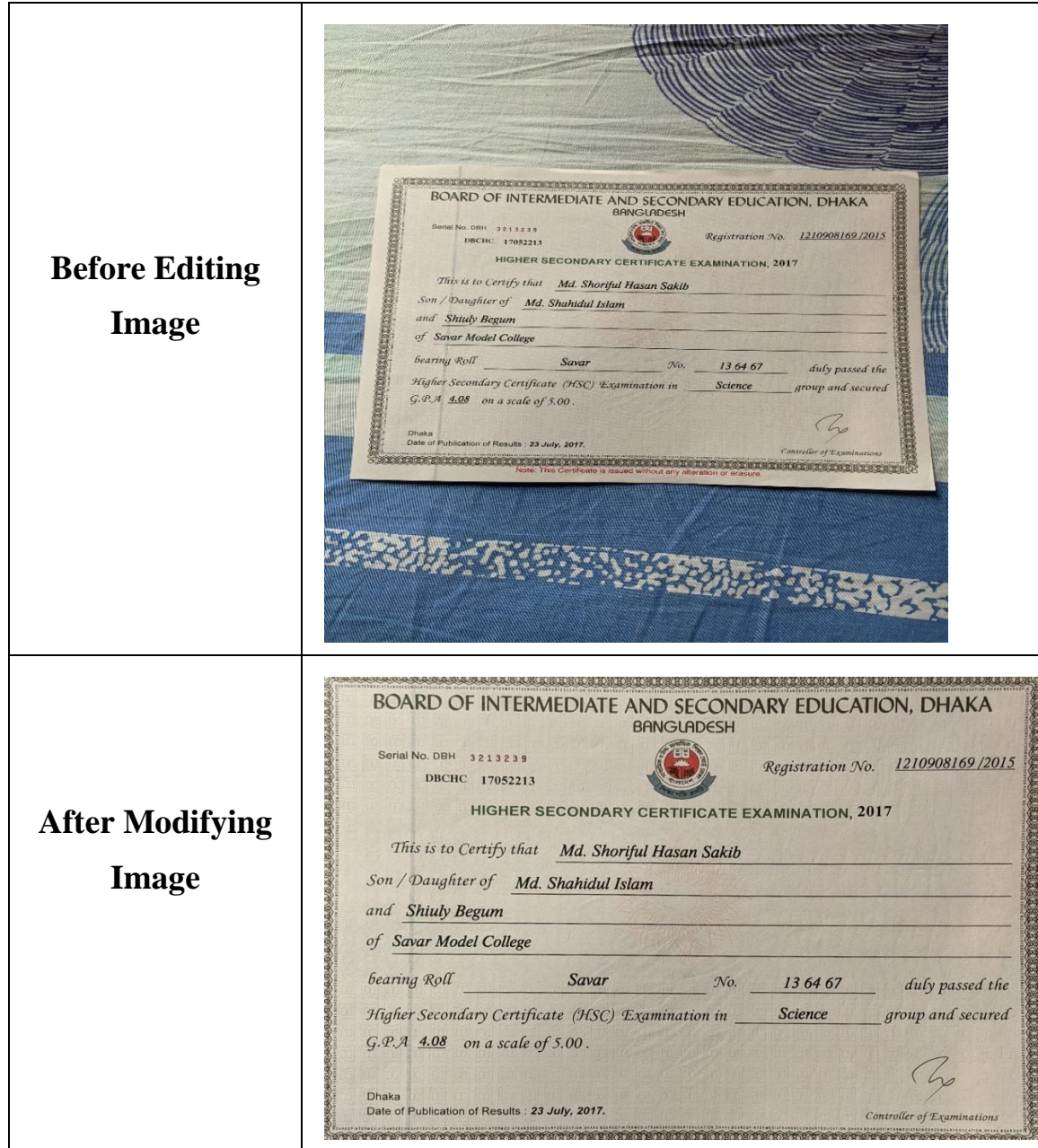
Result

Before Editing Image	
After Modifying Image	

Figure 4.4: Before and after editing Original photo

4.1.3 Marking important feature for extract

```
#-------field to crop-------
roi = [[(1706, 272), (2090, 332), 'text', 'Reg No.'],
        [(684, 588), (2080, 672), 'text', 'Name'],
        [(542, 708), (2082, 792), 'text', 'Father Name'],
        [(224, 814), (2082, 900), 'text', 'Mother Name'],
        [(190, 928), (2082, 1016), 'text', 'College Name'],
        [(420, 1058), (1152, 1148), 'text', 'Area'],
        [(1282, 1062), (1672, 1150), 'text', 'Roll No.'],
        [(1228, 1174), (1672, 1260), 'text', 'Group'],
        [(276, 1298), (382, 1350), 'text', 'GPA']]
```

Figure 4.5: Code to mark the area to extract

After modifying a user uploaded image, we need to select an important feature to extract. As we can see in figure 4.5, we have selected important to extract from the modified image. And for selecting important areas, we had used a query image as a template.
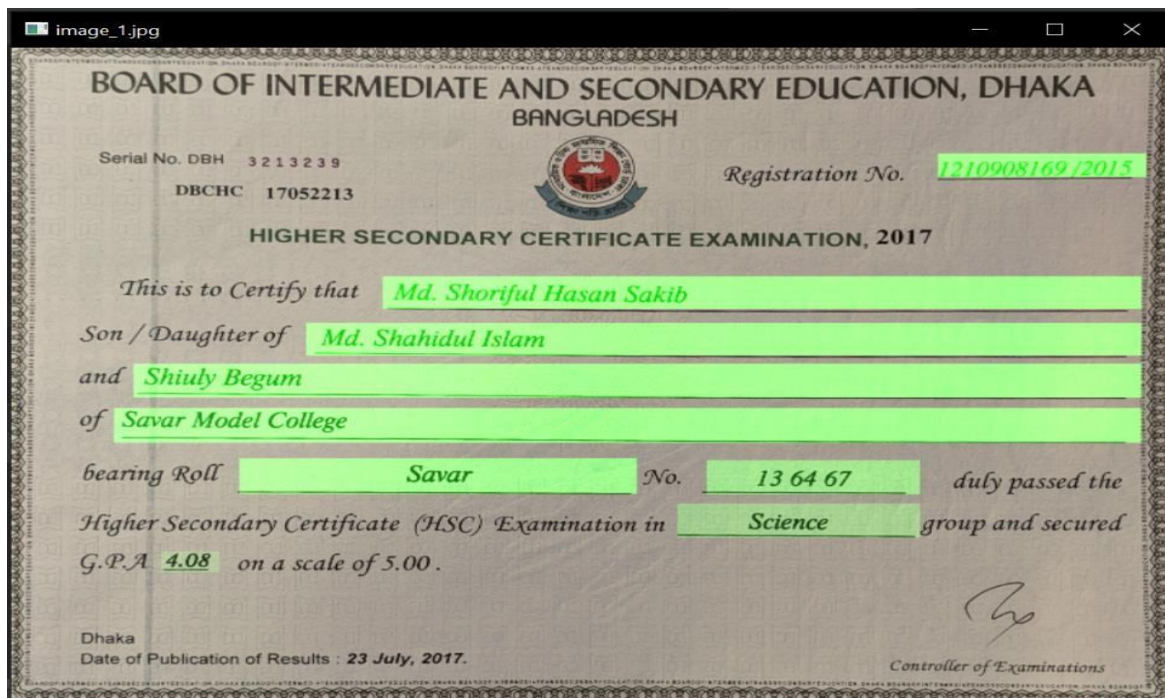
Result

Figure 4.6: Marked Area for Extraction

Then we will convert those marked area into text. So we can see in figure 4.7 we have used pytesseract to convert those marked area images into string. And we can see our output in figure 4.8.

4.1.4 Crop Mark Area and Convert Image to Text

```
#-------crop info-------
    imgCrop = imgScan[r[0][1]:r[1][1], r[0][0]:r[1][0]]

#-------extract data from crop image-------

    #change mad to md
    data = pytesseract.image_to_string(imgCrop)
    data = str(data)
    data = data.replace('Mad', 'Md')
    print(f'{r[3]} : {data}')
    myData.append(data)
```

Figure 4.7: Crop Marked Area and Convert it to Text

Result

```
['image_1(old).jpg']
1259
Reg No. : 1210908169 /2015
Name : Md. Shoriful Hasan Sakib
Father Name : Md. Shahidul Islam
Mother Name : Shiuly Begum
College Name : Savar Model College
Area : Savar
Roll No. : 13 64 67
Group : Science
GPA : 4.08
```

4.1.5 Store Output in a CSV file

```
#-------create and write data in csv file-------
    with open('DataOutput.csv', 'a+') as f:
        for data in myData:
            data = str(data)
            data = data.replace('Mad', 'Md')
            f.write((data+', '))
        f.write('\n')


    imgShow = cv2.resize(imgShow, (w // 3, h // 3))
    cv2.imshow(y, imgShow)
    cv2.waitKey(0)
    print(myData)
```

Figure 4.9: Storing Output in a CSV file

After converting image to string, in one place 'Md' turn into 'Mad'. So in figure 4.9 we have changed 'Mad' to 'Md'. As OCR is not perfect yet, there are some errors. After doing so, we have stored our results in a CSV file. Then we can see the CSV file output in figure 4.10.

Result

	A	B	C	D	E	F	G	H	I
1	1210908169 /2015	Md. Shoriful Hasan Sakib	Md. Shahidul Islam	Shiuly Begum	Savar Model College	Savar	13 64 67	Science	4.08
2									

Figure 4.10: Outputs in CSV file

4.2 Front-End Design

The front-end is very important for a certificate verification site. Because if a site does not have a front-end or user interface, the user will not understand how to work on the site after entering the site. We have tried to make the entire project responsive so that our project can be used on any device. We used the Django framework to create the front-end. Since we coded in Python on the backend, we used the Django framework for the front-end. It's a very popular front-end framework used to create modern websites and web applications. It's a free front-end framework with the purpose to make web development faster and easier.

4.2.1 Home Page
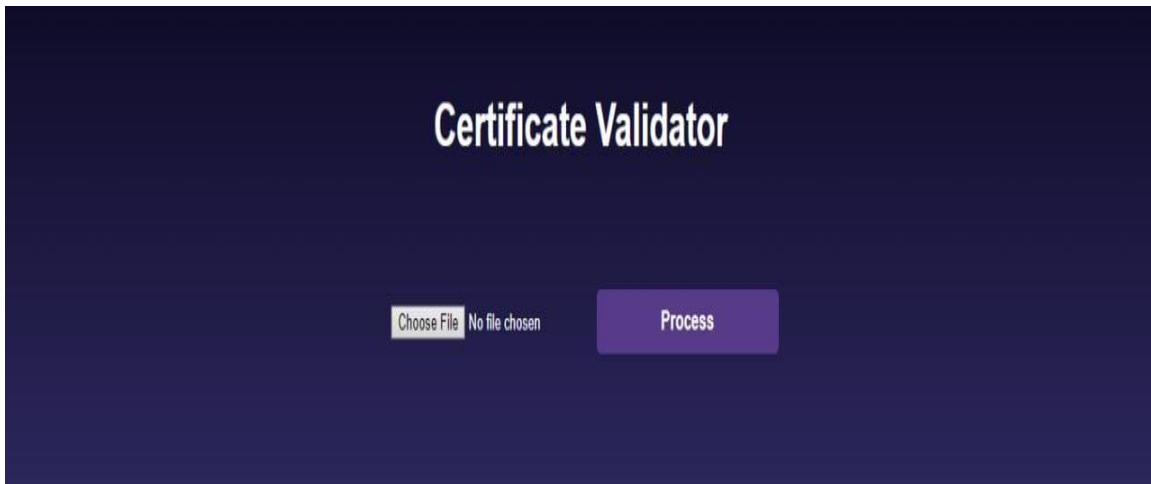
Figure 4.11: Home Page

A simple home page, where we can choose our image and start the process to extract our needed information.

4.2.2 Information Extract

4.2.2.1 Certificate Matched
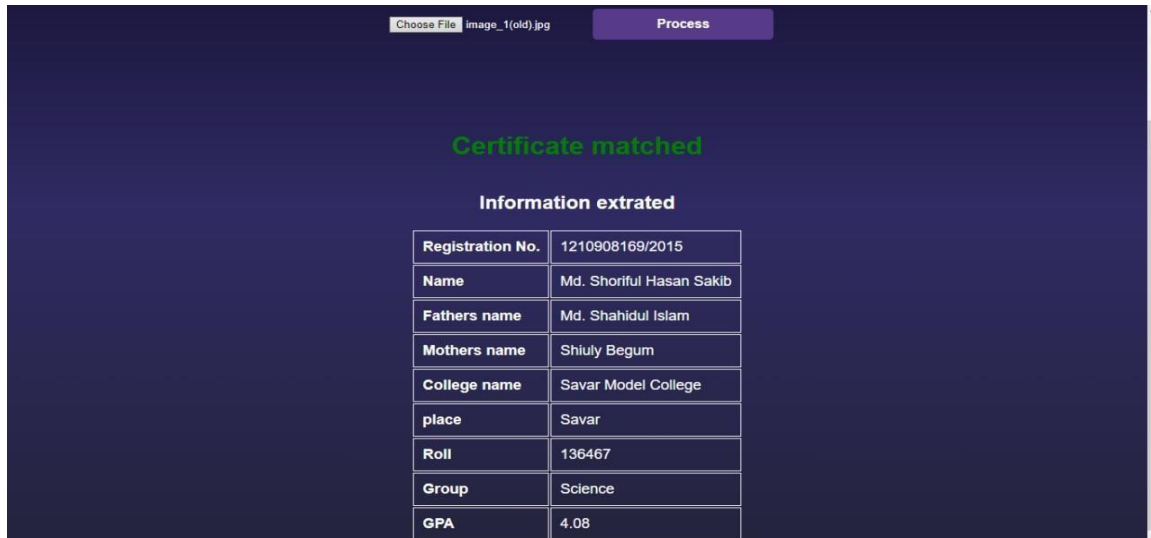
Figure 4.12: Certificate Matched

After extracting important feature from image, we compare extracted data with an existing verified information. As user's uploaded image's information matched with our database, that's why it's showing Certificate matched.
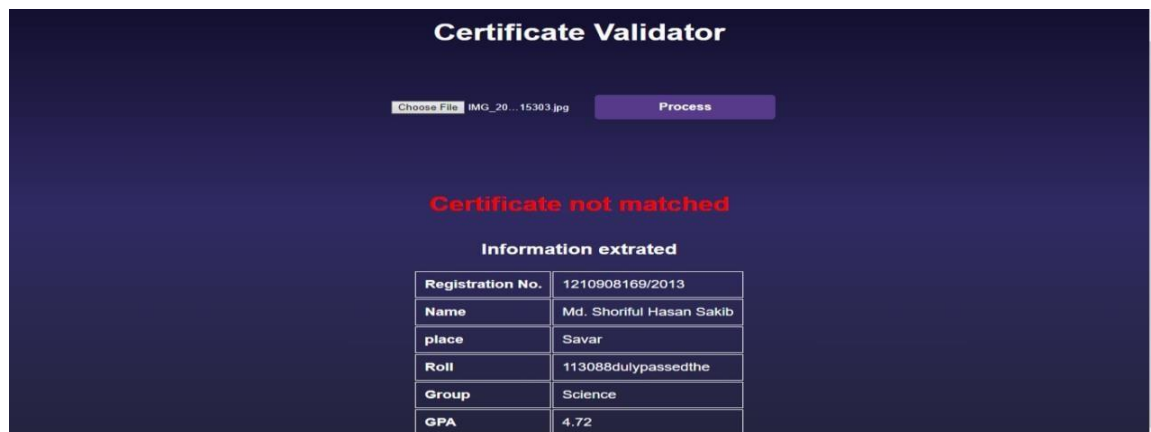
4.2.2.2 Certificate Not Matched

Figure 4.13: Certificate Not Matched

The second uploaded data did not matched with the existed information, that's why it's showing Certificate not matched.

4.3 Database

The most important information of a website is saved in the database. Only admin can control the data in that database. Due to which the platform on which the database will be created should be created keeping in mind how much secure and privacy it can maintain. We used SQLite to create the database. SQLite is a self-contained, serverless, zero configuration database engine. It has a public domain. Because of which we can use it completely free.

4.3.1 Admin Panel
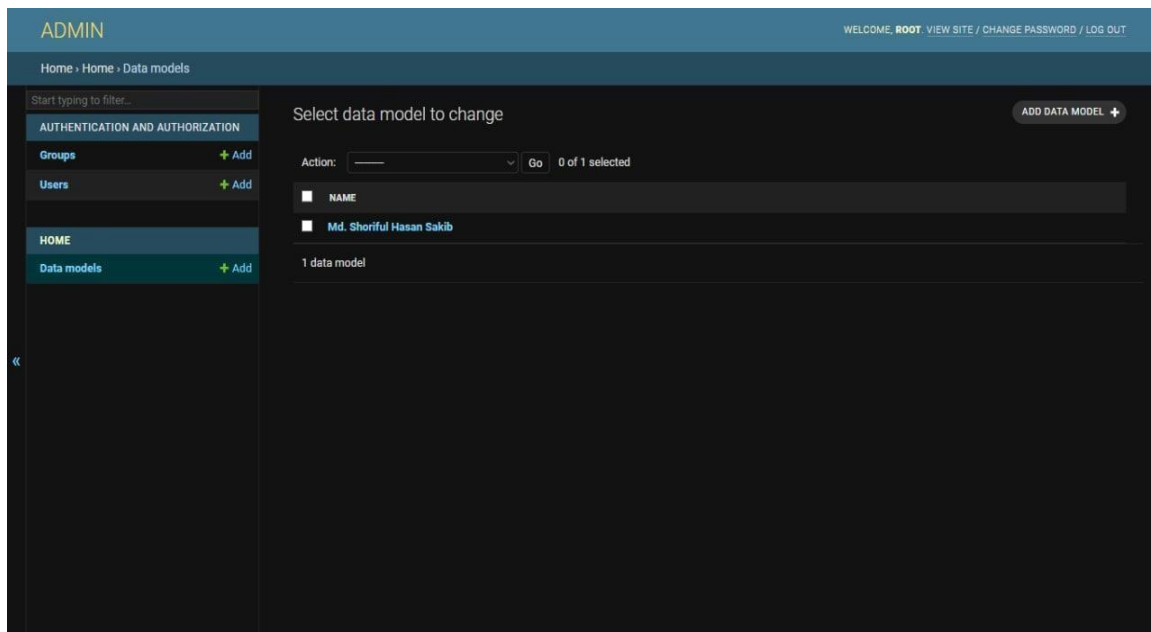
Figure 4.14: Admin Panel

Here is the admin panel, where we can add, modify or delete all verified data. Only admin can access this section. After extracting data from an image, system will compare those extracted data with existing data in this database.
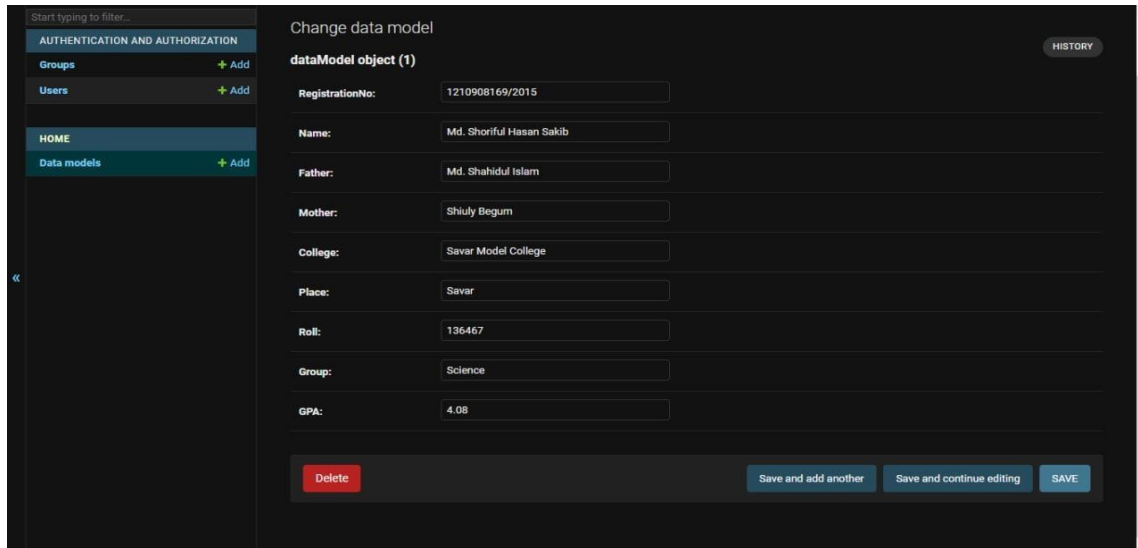
4.3.2 Change Student Information

Figure 4.15: Change Student Information

Here is an existing information. We can change it as per we want. We can also delete it from here.
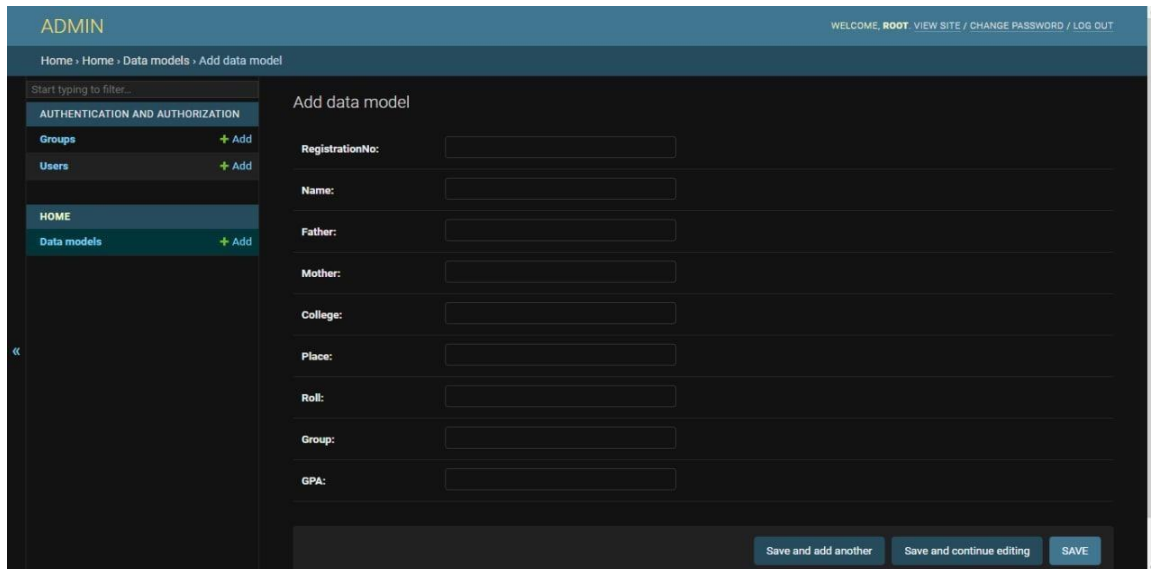
4.3.3 Add New Information

Figure 4.16: Add New Information

Here is the "Add Information Field" where we can add new information.

CHAPTER 5

Conclusion and Future Scope

5.1 Conclusion

This Application will provide extra security to authorities in terms of receiving one's HSC level certificate. As a result, the intention of creating a fake certificate will reduce. But nothing is perfect, so there are some issues. Sometimes image to text conversion is not accurate. So we will need a support system to maintain this service. And also we need to train our system to make fewer mistakes.

5.2 Future Scope

Nowadays, people are always busy. And we also consider that time is money. So we don't want to waste our valuable time by doing silly stuff. But today, if we need to do any important work where our authentic papers are important, we need to wait in line to approve our papers to complete our job. Where this process is not secure at all.

In those situations, we can implement our system and we can do the authentication job without waiting in line.

For example, when we go to create our passport, we need to wait in a big line just to check out whether the birth certificate and other stuff are authentic or not. This just give peoples extra hassle. So we can use our system to check whether the birth certificate is authentic or not.

Reference:

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