

Voting System with AI and Blockchain

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Outline

- Objectives
- Methodology
- Results
- Analysis/ Discussion of Results
- Project Status
- References

Objectives

- Voting web application that incorporates blockchain for system security.
- Face recognition system for identity authentication.

Methodology

- UI for voter to login is created
- Voter's ID is matched with database
- Second phase of authentication is via face recognition
- The authentic voters will have coin
- Voters having coin can cast the vote
- Block created for each voter
- Block are chained with headers (hash, address, etc.)

Block Diagram

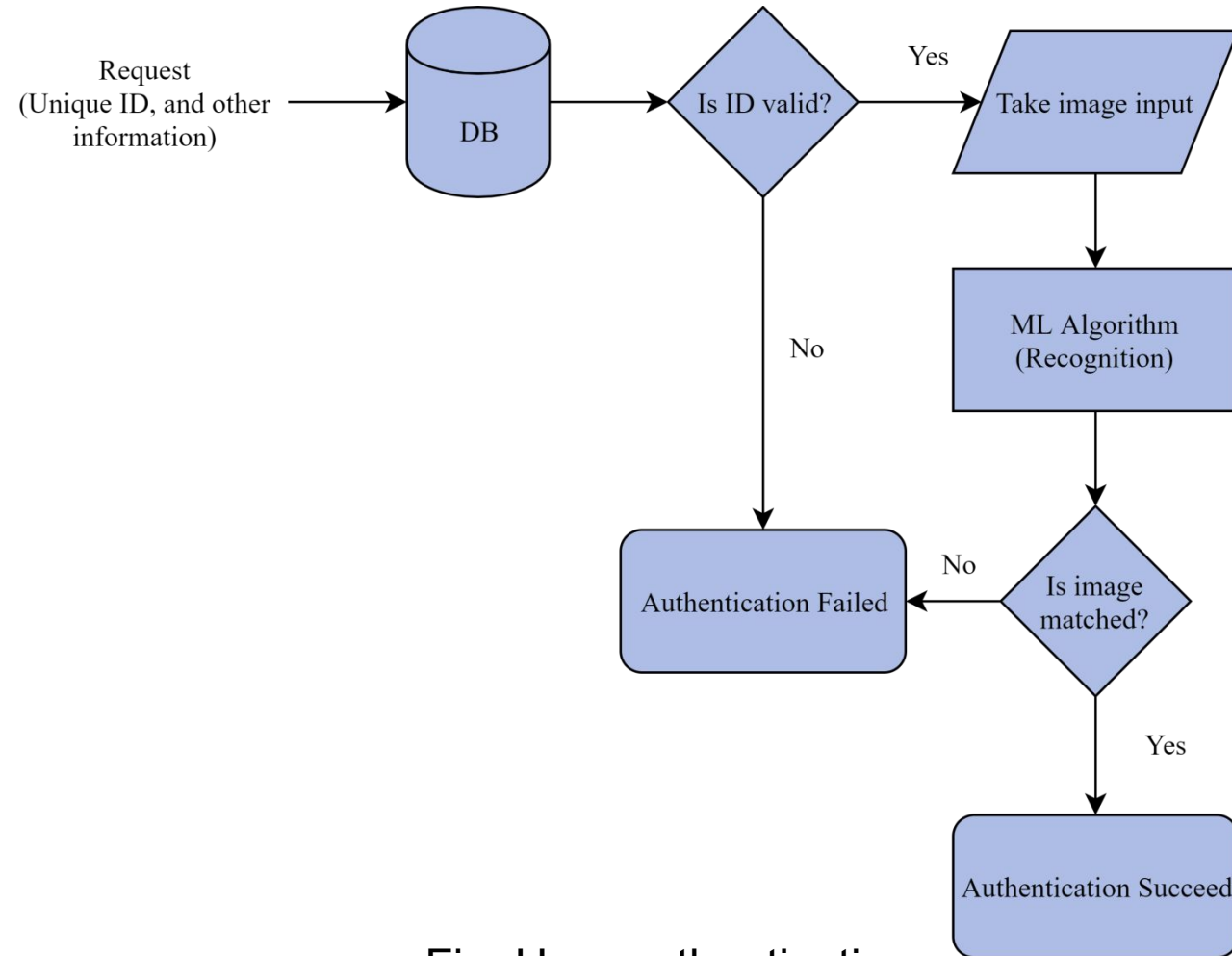


Fig: User authentication

Block Diagram (CONTD...)

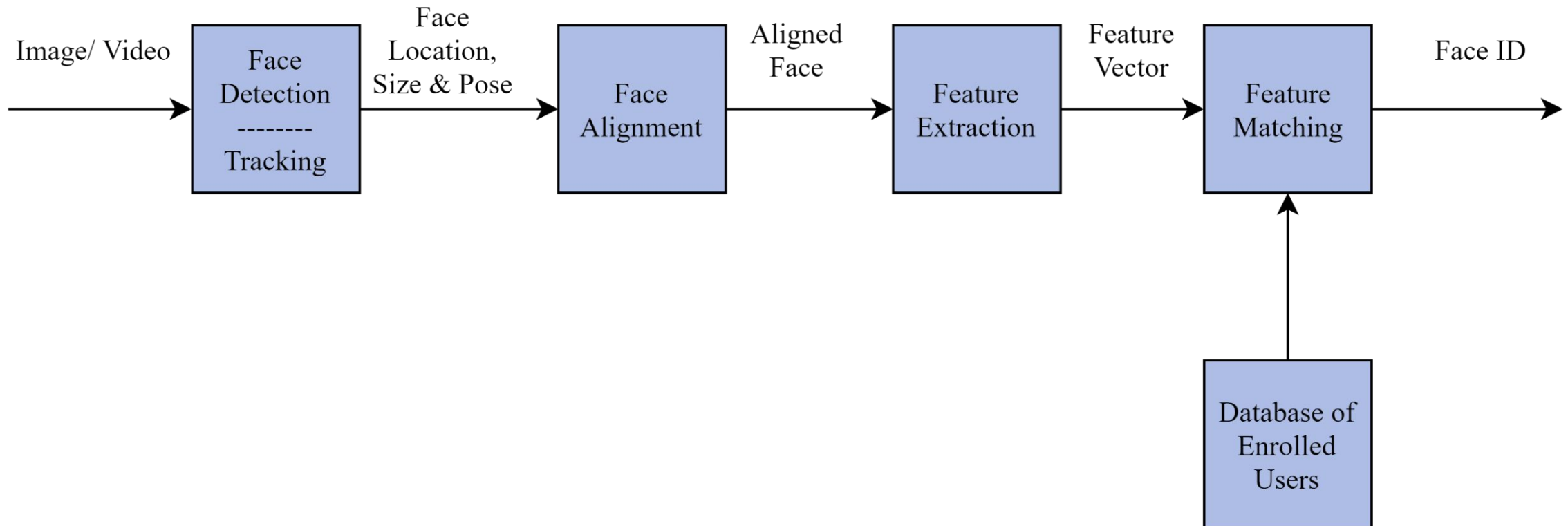
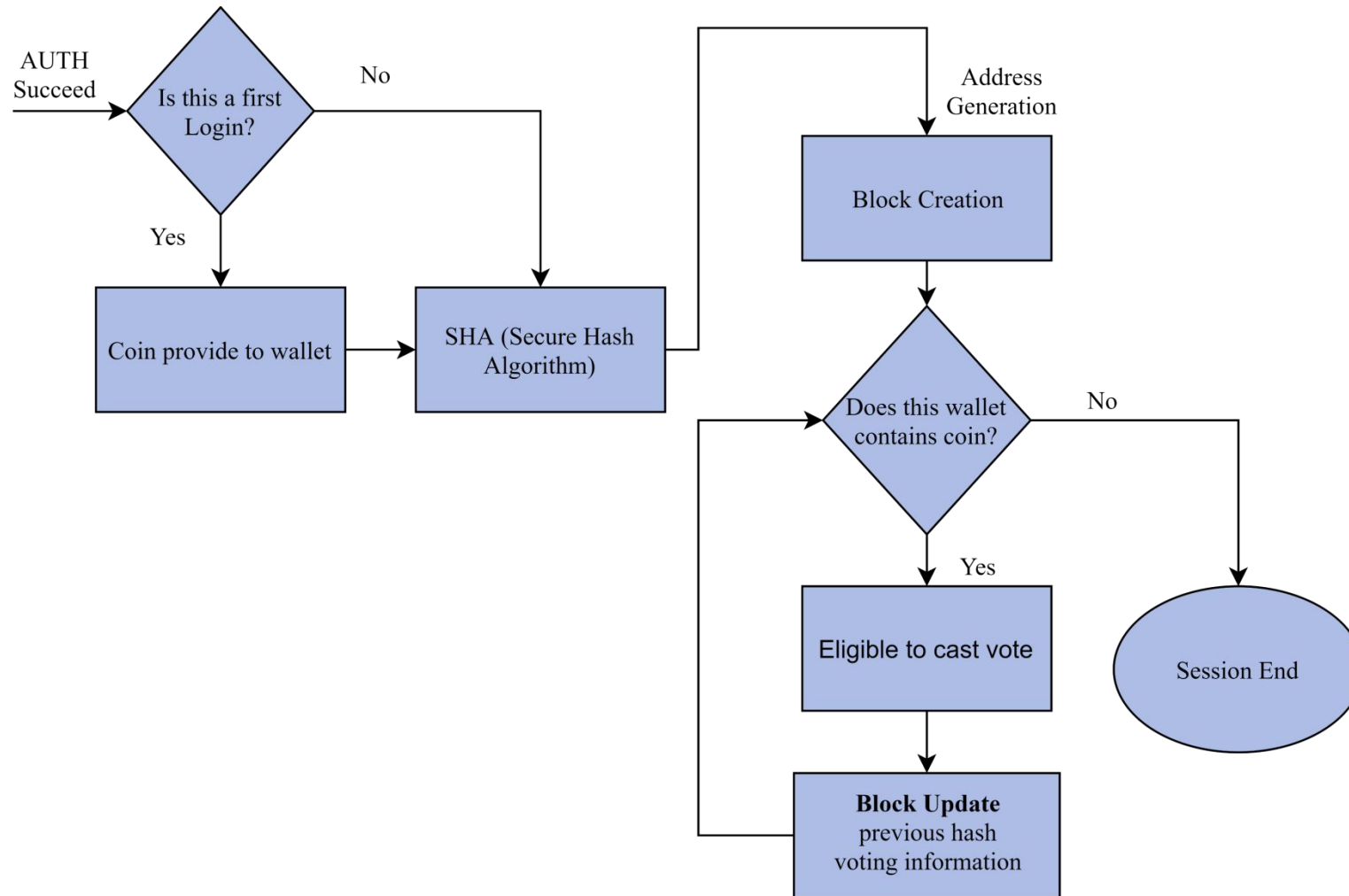


Fig: Face recognition

Block Diagram (CONTD...)



Face Recognition

- Face recognition
 - Face verification: one-to-one mapping to identify faces against a known identity
 - Face identification: one-to-many mapping for a given face against a database of known faces
- Facenet developed at Google in June 2015

Facenet



Fig: Facenet model structure

- Learn similarity function
- $d(img_1, img_2)$ = degree of difference between images
 - If $d(img_1, img_2) \leq \tau$: “Same images”
 - If $d(img_1, img_2) > \tau$: “Different images”
- τ is threshold value

Facenet (CONTD...)

- Based on Deep Neural Network (Inception Network)
- Encodes face data to 128 bytes
- If x is the image, $f(x)$ is the encoded image data
- Goal of learning:
 - If x^i, x^j are the same person, $\|f(x^i) - f(x^j)\|^2$ is small
 - If x^i, x^j are the different person, $\|f(x^i) - f(x^j)\|^2$ is large

Facenet (CONTD...)



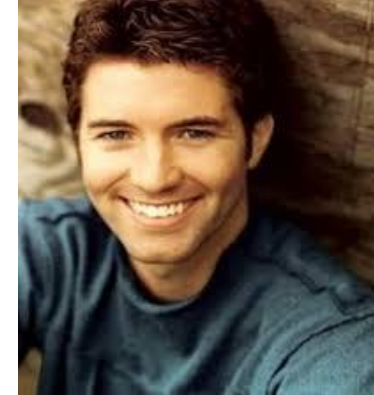
Actor(A)



Positive(p)



Actor(A)



Negative(N)

- Want: $\|f(A) - f(P)\|^2 + \alpha \leq \|f(A) - f(N)\|^2$
- $\|f(A) - f(P)\|^2 - \|f(A) - f(N)\|^2 + \alpha \leq 0$
 $d(A, P) + \alpha \leq d(A, N)$
- α is margin

Facenet (CONTD...)

- Loss function

$$L(A, P, N) = \max(\|f(A) - f(P)\|^2 - \|f(A) - f(N)\|^2 + \alpha, 0)$$

- Choosing A, P, N:

- Choose triplets that're "hard" to train on

$$d(A, P) \approx d(A, N)$$

- Because algorithm model will cover more features

Facenet (CONTD...)

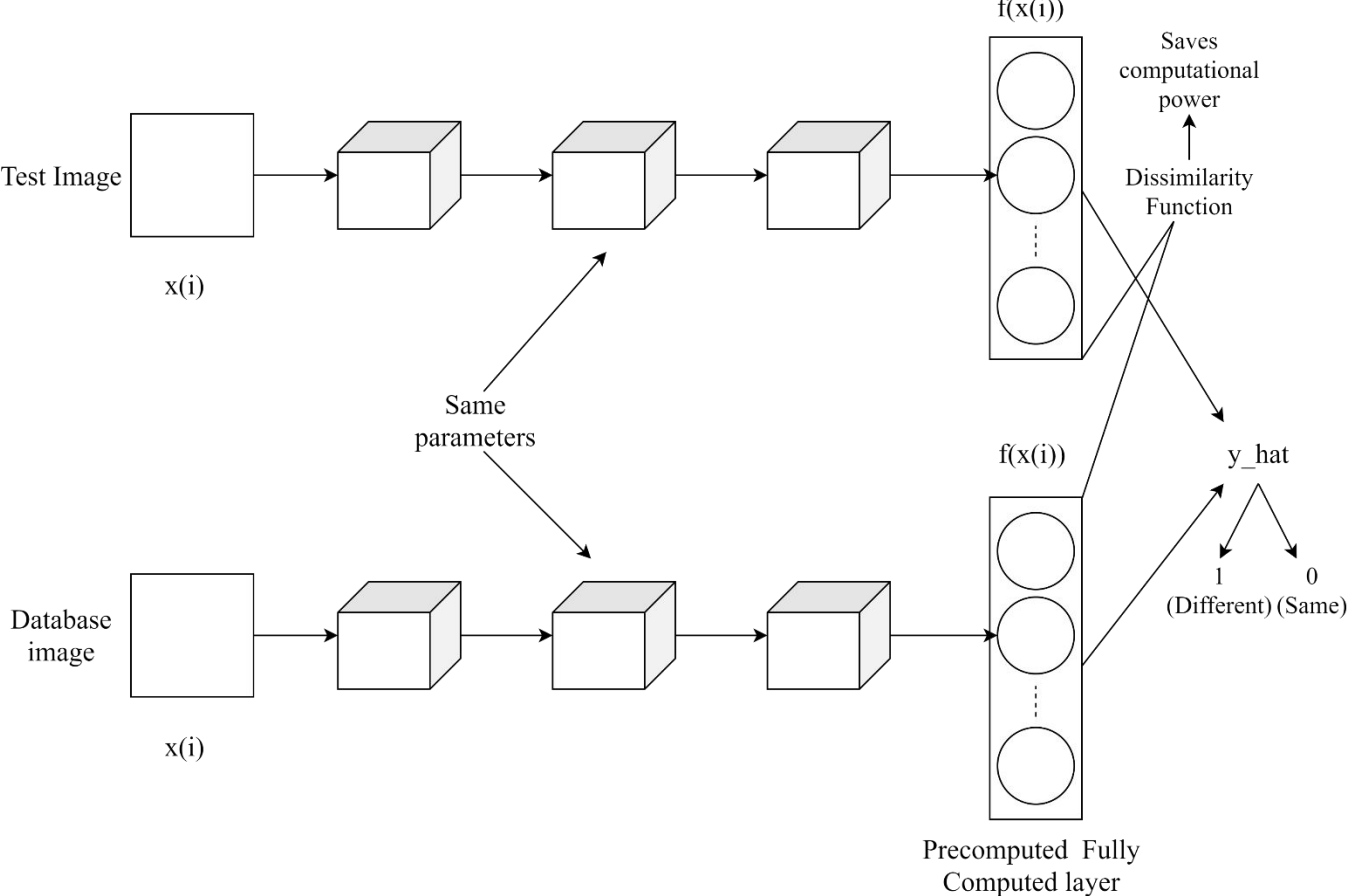


Fig: Face verification

Working Principle

- Combination of AI and Blockchain
- Database for User information
- Face recognition for user authentication
- Blockchain for data security

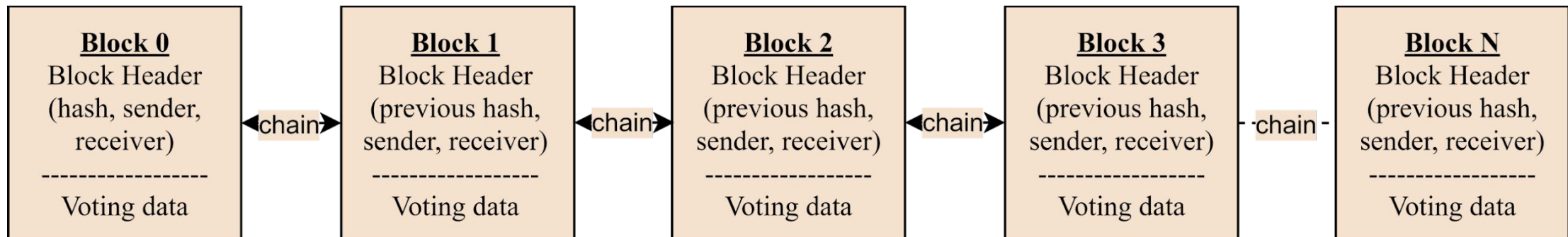


Fig: Blockchain

Output

election

Home About [Registration](#) [Login](#)

Vote your candidates

Democracy is about voting and it's about a majority vote. And it's time that we started exercising the Democratic process.
- Debbie Stabenow
Let's vote!



Secure your spot

Your each one vote counts, Let's take a step signing up and logging!

[Register](#) [Login](#)

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Output (CONTD...)

Demographic Details

First Name	<input type="text" value="First Name"/>	Middle Name	<input type="text" value="Middle Name"/>
Last Name:	<input type="text" value="Last Name"/>	Mother's Name:	<input type="text" value="Mother's Name"/>
Father's Name:	<input type="text" value="Father's Name"/>	Gender	<input type="text" value="Select Gender"/>
Date of birth	<input type="text" value="mm/dd/yyyy"/>	Education	<input type="text" value="Education"/>
Occupation	<input type="text" value="Occupation"/>	Post	<input type="text" value="Post"/>
Citizenship No.	<input type="text" value="Citizenship Number"/>	Citizenship issued District	<input type="text" value="Select District"/>
Passport No.	<input type="text" value="Passport Number"/>	Blood Group	<input type="text" value="Blood Group"/>

Address Details

Present Address

State	<input type="text" value="State"/>	Zone	<input type="text" value="Select Zone"/>
District	<input type="text" value="Select District"/>	Rural Municipality/ Municipality	<input type="text" value="Rural Municipality/ Municipality"/>
Ward No.	<input type="text" value="Ward Number"/>	Tole	<input type="text" value="Tole"/>
Block No.	<input type="text" value="Block Number"/>	Contact No.	<input type="text" value="Contact Number"/>

Permanent Address

State	<input type="text" value="State"/>	Zone	<input type="text" value="Select Zone"/>
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Output (CONTD...)

election

[Home](#) [About](#) [Registration](#) [Login](#)

Login

Citizenship Number

Password

Login

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Output (CONTD...)

Demographic Details

First Name	<input type="text" value="First Name"/>	Middle Name	<input type="text" value="Middle Name"/>
Last Name:	<input type="text" value="Last Name"/>	Mother's Name:	<input type="text" value="Mother's Name"/>
Father's Name:	<input type="text" value="Father's Name"/>	Gender	<input type="text" value="Select Gender"/>
Date of birth	<input type="text" value="mm/dd/yyyy"/>	Education	<input type="text" value="Education"/>
Occupation	<input type="text" value="Occupation"/>	Post	<input type="text" value="Post"/>
Citizenship No.	<input type="text" value="Citizenship Number"/>	Citizenship issued District	<input type="text" value="Select District"/>
Passport No.	<input type="text" value="Passport Number"/>	Blood Group	<input type="text" value="Blood Group"/>

Address Details

Present Address

State	<input type="text" value="State"/>	Zone	<input type="text" value="Select Zone"/>
District	<input type="text" value="Select District"/>	Rural Municipality/ Municipality	<input type="text" value="Rural Municipality/ Municipality"/>
Ward No.	<input type="text" value="Ward Number"/>	Tole	<input type="text" value="Tole"/>
Block No.	<input type="text" value="Block Number"/>	Contact No.	<input type="text" value="Contact Number"/>

Permanent Address

State	<input type="text" value="State"/>	Zone	<input type="text" value="Select Zone"/>
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Output (CONTD...)

Election WELCOME, 1 VIEW SITE / CHANGE PASSWORD / LOG OUT

Home > User > Users >

Change user HISTORY

Demographic Details

First name:

Middle name:


Last name:

Password: **algorithm: pbkdf2_sha256 iterations: 180000 salt: rJQNYk***** hash: 1p7Ydp*******

Mother's Name:

Father's Name:

Gender:

Date of birth: Today 
Note: You are 5.75 hours ahead of server time.

Education:

Occupation:

Post:

Citizenship Number:

Citizenship issued district:

Passport Number:

Blood group:

Address Details

Present Address

Output (CONTD...)

The screenshot shows the pgAdmin interface with a query editor and a data output table. The query executed is `SELECT * FROM public.user_user`. The data output table has the following columns: `id` (integer), `password` (character varying), `last_login` (timestamp with time zone), `first_name` (character varying), `middle_name` (character varying), `last_name` (character varying), `mothers_name` (character varying), `fathers_name` (character varying), and `gender` (character varying). The first row of data shows `id=1`, `password=pbkdf2_sha256$180000$RjQ...`, and `last_login=2020-02-04 22:38:17.669045+05:...`.

id	password	last_login	first_name	middle_name	last_name	mothers_name	fathers_name	gender
1	pbkdf2_sha256\$180000\$RjQ...	2020-02-04 22:38:17.669045+05:...						

Analysis/ Discussion of Result

- Analysis of result



Fig: database image



Fig: testing image(0.33040315)



Fig: testing image (0.56747013)

- Face is verified with distance 0.33040315 (for recent images)
- Face is verified with distance 0.56747013 (for 4 years gap images)
- Image is verified but distance is slightly larger
- Threshold value is 0.6

Analysis/ Discussion of Result (Contd...)

- The distance is larger for slightly different images
- The second image is from 5 years back
- The model is quite accurate as it recognizes old image too
- The distance will be very large for completely different images (images of different person)

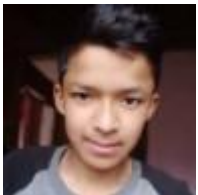


Fig: testing different image (0.635434)

- This is True Negative case and truly classified with distance 0.635434

Tasks Status

- List of completed tasks
 - Design
 - Frontend development
 - Backend development
 - Face verification/ recognition implementation
- List of remaining tasks
 - Facenet API
 - Blockchain integration

References

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Thank you