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Face AI Products

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Status : API Ready

Face Recognition

Description

User's face image is registered into a database (**FaceGalleries**), contains users data from the same group/organization/etc. The system will be able to recognize the user faces after the registration process is completed.

Use Case:

Facial Based Attendance System

Seamless

- Without stopping / queuing
- Using HD CCTV camera
- Multiple person recognition
- 1 - 2.8 seconds processing time per person

Non-Seamless

- Standing still in front of camera
- Using HD camera
- Single person recognition

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Demo

Face Recognition Engine/Algorithm

Localize

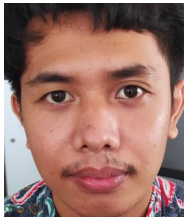
Image from
ATM Machine

The model will search the reference face with the same matrix value as the image captured from the ATM camera

Database


User ID 1


User ID 2


User ID 3


User ID 4


User ID 5


User ID 6

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Seamless Attendance System - Performance Highlight

Face Capacity

Our Seamless Face Identification system can perform well for recognizing **500** people and detecting up to **200** unknown people.

Constraints

There are several constraints set in order to obtain an optimal performance:

- The camera is placed in a hallway with minimum length of 3 meters
- Users are not allowed to wear face attributes other than eyeglasses
- Users' face needs to be evenly illuminated
- Users need to walk in average walking pace

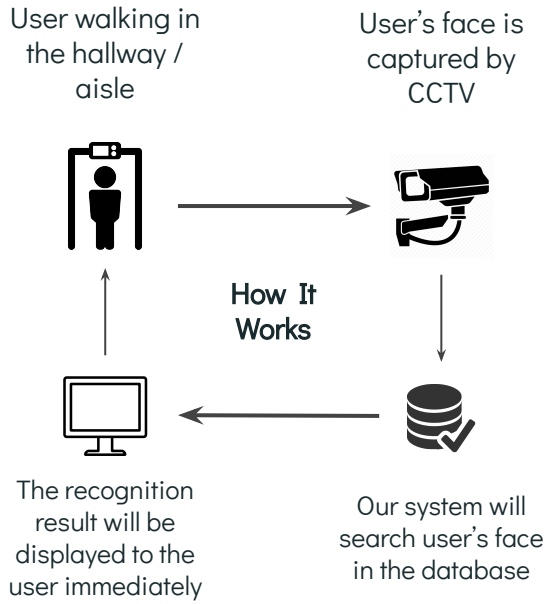
Recognition Accuracy

Tested with the set constraints, the recognition accuracy ranges from **93.6%** to **96.6%**.

Unknown Person Detection Accuracy

Not only recognizing registered users, our system performs well for detecting unknown person. The success rate ranges from **90% up to 99%**.

Seamless face identification is highly dependable on camera angles, illumination, and walking behavior of the users. It is recommended for the users to be aware of the camera therefore the system will work optimally.



Non-Seamless Attendance System - Performance Highlight

Face Capacity

Our Non-Seamless Face Identification system can perform well for recognizing **3500** people and detecting up to **570** unknown people.

Constraints

Although we test the system with high variety of data, there are several constraints in order to the system work at optimal performance:

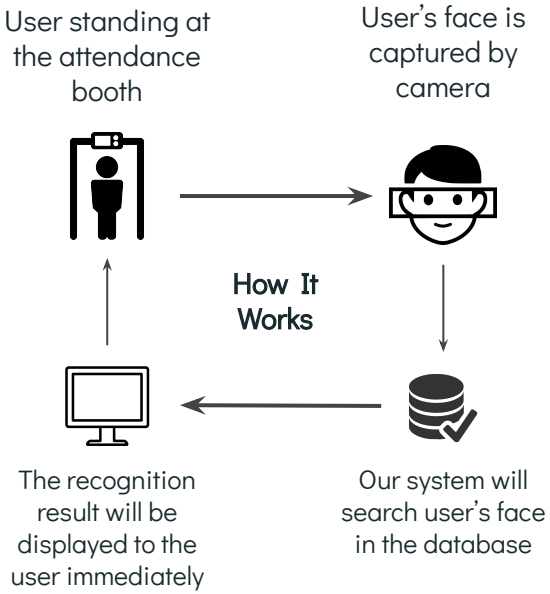
- Users need to look straight to the camera
- Users are not allowed to wear face attributes other than eyeglasses
- Users' face needs to be evenly illuminated

Recognition Accuracy

Tested with the set constraints, the recognition accuracy ranges from **90% to 95%**.

Unknown Person Detection Accuracy

Not only recognizing registered users, our system performs well for detecting unknown person. The success rate ranges from **90.1% up to 99.94%**.



The Non-Seamless system is highly influenced by lighting, face attributes, and image resolution. because this system is widely used on tablets and smartphones, the selection of camera devices becomes crucial to get an optimal performance.

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Status : API Ready

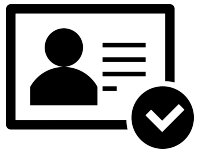
Face Verification

Description

User registers by taking a frontal picture of their face and adding a unique identifier such as citizen ID or employee ID to the system. After the registration is completed, the system can verify whether the ID belongs to the correct user.

Use Case:

Door Lock / Security Access



- Using specialized identifier such as employee ID, citizen ID, etc
- Standing in front of camera / queuing
- Using HD camera
- Single person recognition

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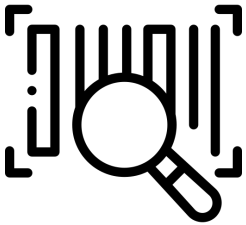
Face Verification Engine/Algorithm

Request Image

Reference Image



MATCH

User ID 2

User ID 2

Recognition Success

Face Verification - Performance Highlight

Constraints

There are several constraints in order to the system work at optimal performance:

- Users need to look straight to the camera
- Users are not allowed to wear face attributes other than eyeglasses
- Users' face needs to be evenly illuminated

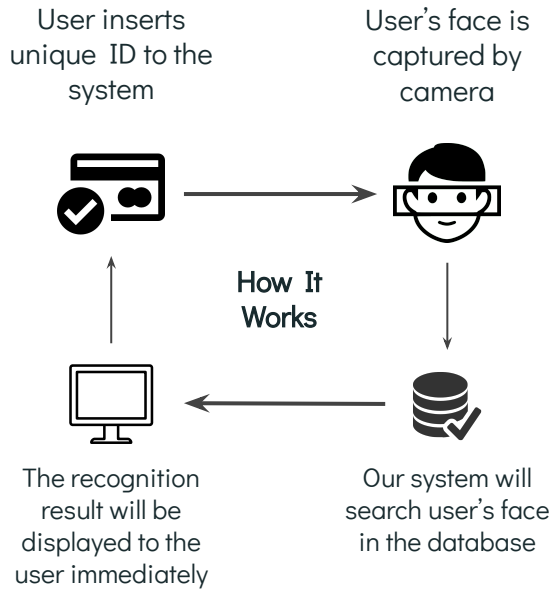
False Rejection Rate (FRR)

FRR is a likelihood that the system rejects an authorized person. The system has FRR ranges from **1.9%** to **18%**

False Acceptance Rate (FAR)

FAR is a likelihood that the system approves an unauthorized person. The system has FAR ranges from **1.4% up to 14%**.

For the verification system, the key parameter that needs to be evaluated is Authentication Threshold. This threshold will help reduce/increase FAR and/or FRR in order to get more secured authentication system.



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Status : API Ready

Face & Mask Identification System

Description

User registers to the system by taking a picture without wearing mask. After the registration process is completed, user can be identified by the system with or without any masks on.

Use Case:

Face-Mask Attendance System

- Standing in front of camera / queuing
- Using HD camera
- Single person recognition

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FaceMask Attendance System - Performance Highlight

Constraints

There are several constraints in order to the system work at optimal performance:

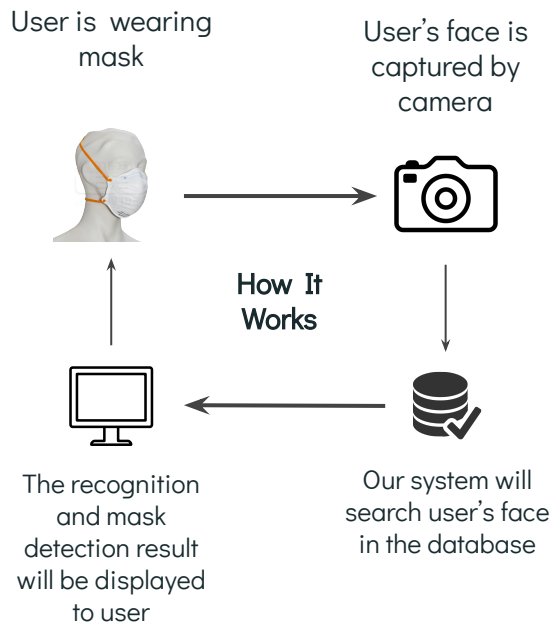
- Users need to look straight to the camera
- Users are allowed to wear eyeglasses
- Masks that covering all face features including eyes and forehead are not allowed

Mask Accuracy

Tested with the set constraints, the mask detected accuracy ranges from **96-%99.92 %**

Recognition Accuracy

Tested with the set constraints, the recognition accuracy ranges from **85%-90%**



The Face-Mask Identification system is highly influenced by lighting, mask position, and image resolution. Because the system is commonly used on smart devices, the selection of camera devices becomes crucial to get an optimal performance.

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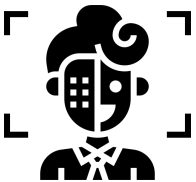
Liveness Detection

Description

Users record a video of them moving heads up, right, left, or down or blinking their eyes or opening their mouth for several seconds. The system will check if the user is a real person or fake.

Use Case:

e-KYC, Fraud



- 4-6 seconds video recorded using smartphone camera
- Combining face verification and anti spoofing detection

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Liveness Detection - Features

Active Liveness

Eye Blink

Mouth Movement

Head Movement

Passive Liveness

Print/Replay Detection

Anti Spoofing Detection - Use Case

Anti Spoofing Detection

- **Input**
  - Recorded user video
- **User movement in the video**
  - Eye blinking
  - Head movement (up/down/left/right)
  - Mouth movement (open/close)
- **Process**
  - Detect whether the movement is correct
  - Detect whether the person in the video is real or fake (e.g. pre-recorded video from another smartphone)
- **Output**
  - Real or fake predictions with confidence in scale 0 to 1

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Details

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API Documentation

- API - FV General Docs - Client Distribution

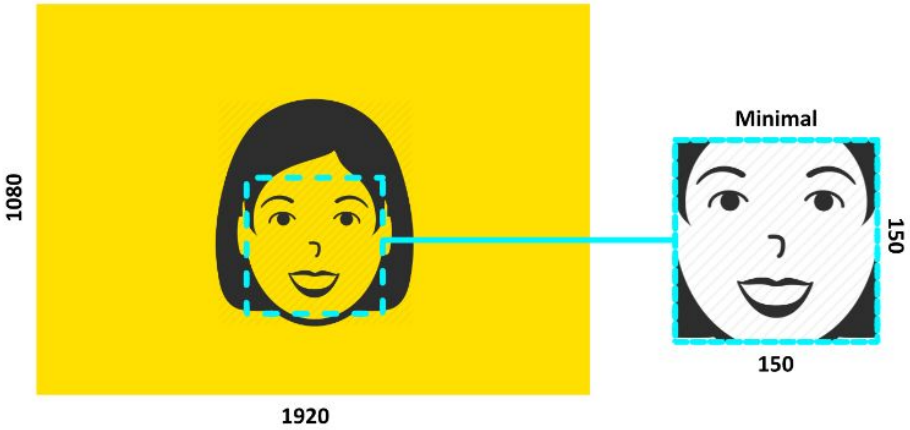
  https://bit.ly/FaceRisetaiFV

- API - FR General Docs - Client Distribution

  https://bit.ly/FaceRisetaiFR

CP: Thariq Ramadhan (081281008062)

Image Recommendations | Resolution



- Image size for face should be above 150x150 pixels for optimal process.
- Any smaller than this, the system will have a hard time detecting and localizing the person's face from the capture image.
- The closer the face is to the camera, the larger the size of captured face, the higher probability of detecting and recognizing face accurately.

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Camera and Image

Reference
Android Camera

Good Lighting

(CRM HYOSUNG 8600 GRAHA)

100% match

Smudge
Mask
Bad Lighting

(CRM HYOSUNG 8600 PJP)

89.8% match

Mask
Glasses
Extreme backlight

(CRM IBM Graha)

Failed

Camera Setup & Specs Recommendations

Ring Light for illumination/lighting in poorly lit environments

Logitech C920
for USB Camera Setup

1080p or 2 MP

or

Vivotek IB8382-T
for IP Camera Setup

1920p / 5mp

The Face Recognition system is highly influenced by illumination/lighting, mask position, and image resolution.

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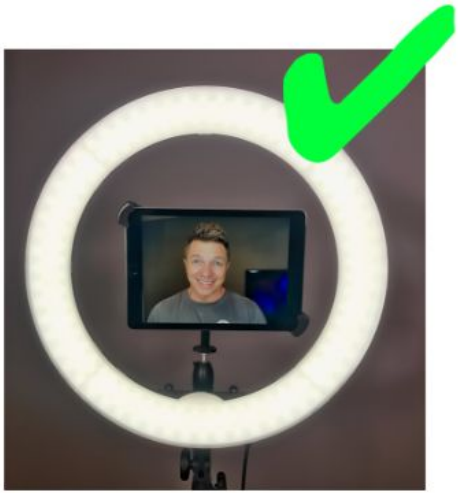
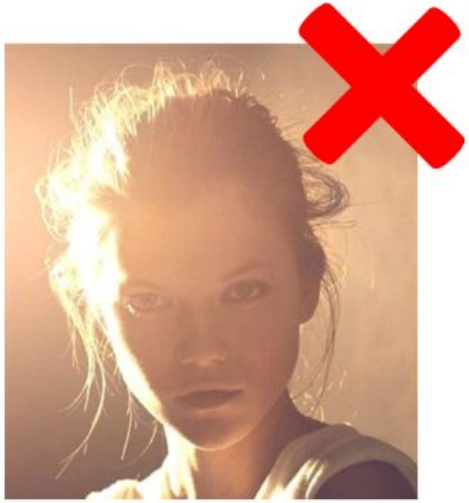
Image Recommendations | Lighting





Consider adding additional illumination for the person's face, eg. with ring light or proper room lighting

Image Recommendations | Lighting

(CRM HYOSUNG 8600 GRAHA
before preprocessing)

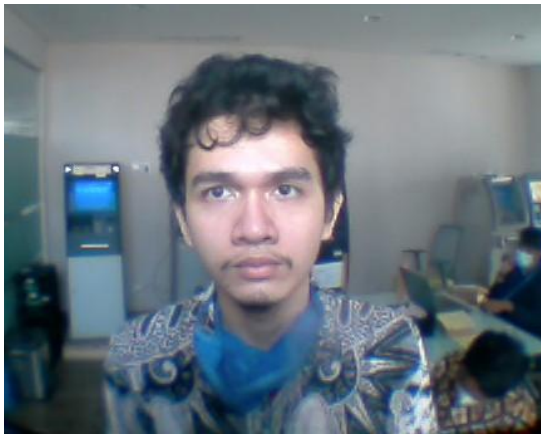
(CRM HYOSUNG 8600 GRAHA
after preprocessing)

Resolution : 320x240
Size : 8.64 KB

Recommendation:

- Add a good lighting
- Even if there is backlight, it must be compensated by light facing the face, so that the face can be more detailed and natural (used white light)

Image Recommendations | Lighting



Good Lighting

100% match

Backlight

5.6% match

Image Recommendations | Position

Bad Camera Position
(73.9%)

Good Camera Position
(100%)

The closer the face is to the camera

↓

The larger the size of captured face

↓

The higher probability of detecting and recognizing face accurately

Note:

- This position still can be used, but the user experience (UX) will be involved.
- Low accuracy.

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Resolution: 320x280
- Smudge
- Bad lighting
- Hat

Machine: Wincor P280 Graha

Failed

Bad Resolution, Image, Position and Lighting

Even with the bare eyes, it's hard to see the proper face.

Resolution : 640x480
Size : 39.1 KB

Recommended Resolution, Position and Lighting

Image Recommendations | Compression

In case of smaller bandwidth network, it might be preferred to compress image capture by the camera, eg. with 90% JPG compression, which in average comes at 250KB per image. Assuming a network bandwidth of 2Mbps, that means an average transfer speed of 250KBps (2Mbps/8), thus a speed of 1 image/second. Image compression may further be fine-tuned depending on available network bandwidth, target transaction time, camera specs, face distance to camera, and illumination

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Server System Requirements | On Premise Specifications

Specifications	
GPU	RTX 2070(8 GB RAM)
CPU	i7 8770
Motherboard	-
RAM	8GB 24000mHz (or higher)
Power Supply	DA 750 Watt (or higher)
Storage	2TB (archive data)
SSD	1TB (or higher)
UPS	1200VA / 840 Watt
Bandwidth	>= 2 Mbps

- **GPU,** For higher processing speed we recommend higher GPU specs (2080 Ti, Titan etc.)
- **Memory**. Minimum 8 GB. Higher GPU memory requires higher memory.
- **Storage**, Minimum 1TB (SSD) for runtime/operational database, and extra HDD for archive data.
- **Power Supply**, Minimum 750 Watt, Higher GPU Memory requires a higher power supply rating I For applications in the cloud
- **Bandwidth** seeds to be fast enough to accommodate real case.

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Latency Test | Results

No	CPU Model	Core / Thread #	RAM	GPU Model	GPU #	VRAM Total	DL Models	Endpoint	Throughput Max	90% Throughput Latency	Min Throughput Latency
1	AMD EPYC 7702	64 Cores 128 Threads	128GB	-	-	-	FaceAlignment, FaceDetector, FaceMask, FaceEmbedding	FR /recognize	20 TPS	0.827s	0.344s
2	i7-8700	6 Cores 12 Threads	32GB	RTX 2070	1	8GB	FaceAlignment, FaceDetector, FaceMask, FaceEmbedding	FR /recognize	10 TPS	0.712s	0.376s
3	i7-3770	4 Cores 8 Threads	8GB	GTX 1050	1	2GB	FaceAlignment, FaceDetector, FaceMask, FaceEmbedding	FR /recognize	4 TPS	0.926s	0.451s
4	i7-3770	4 Cores 8 Threads	8GB	-	-	-	FaceAlignment, FaceDetector, FaceMask, FaceEmbedding	FR /recognize	2 TPS	0.982s	0.799s