

# Authentication by hand geometry

Presented by **Group 19**

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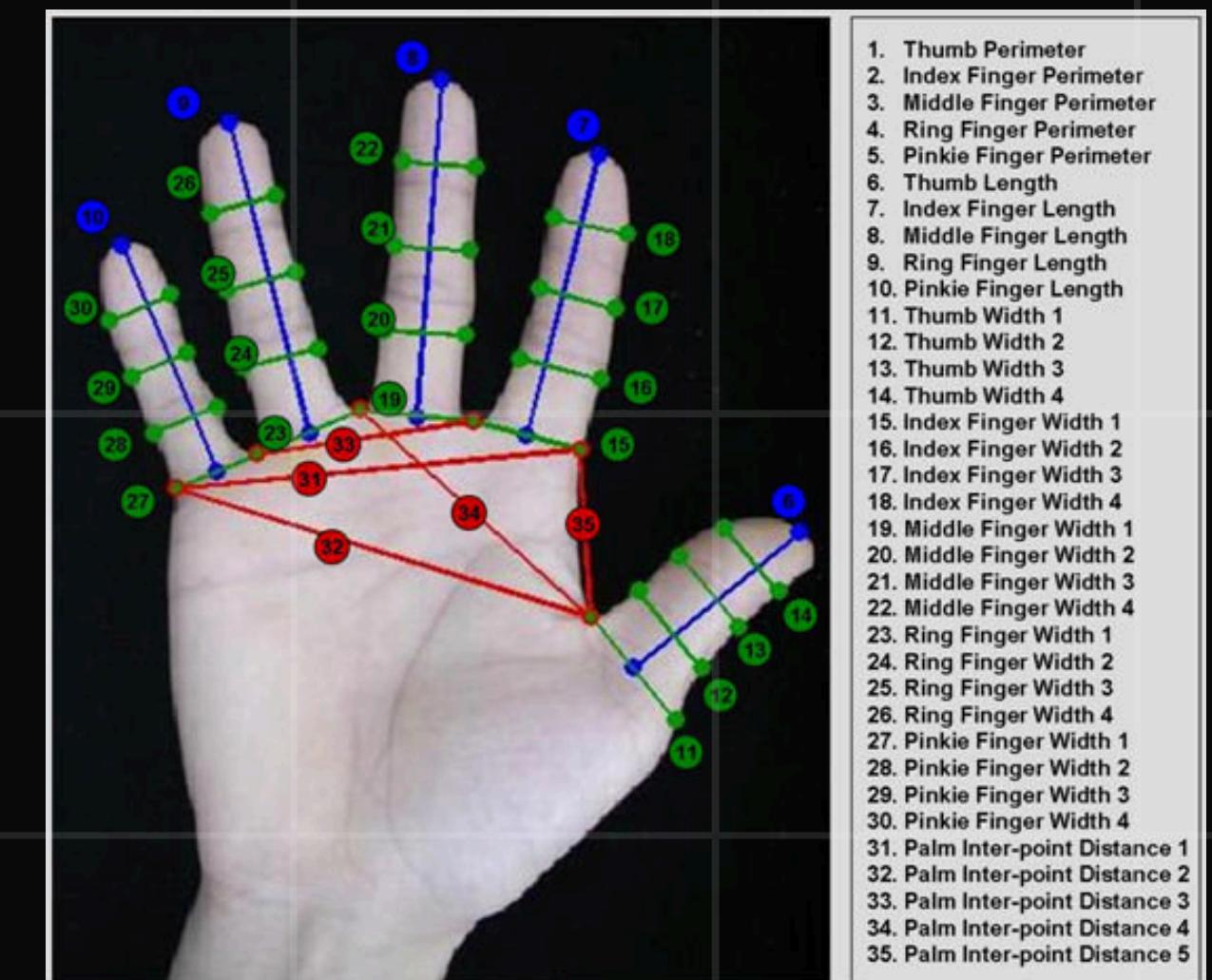


What is

# Authentication by hand geometry

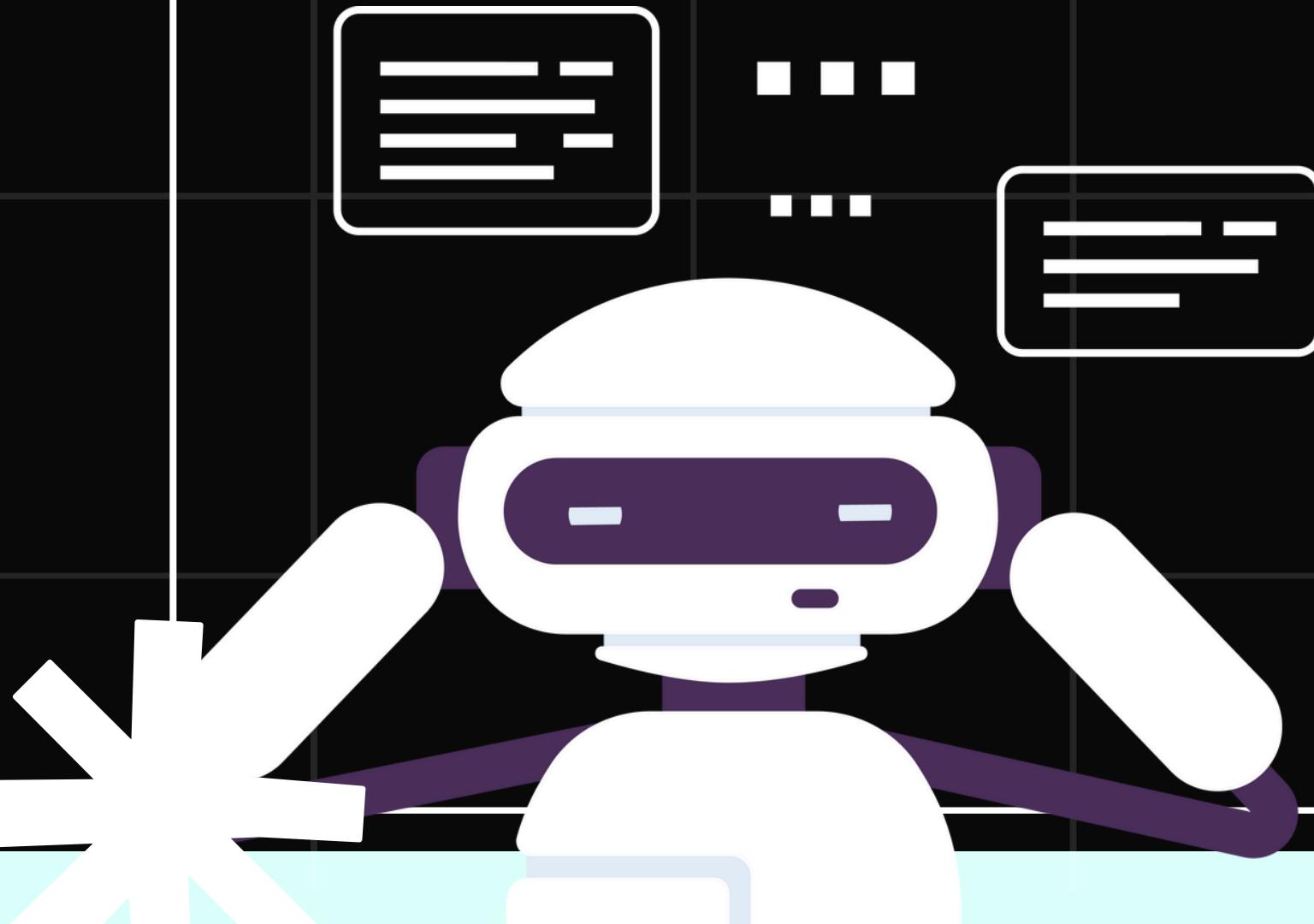
Authentication by hand geometry is a biometric technique used for verifying a person's identity based on the shape and dimensions of their hand.

The system analyzes structural characteristics such as finger length, knuckle position, hand width, and overall contour geometry.



Source: [A single sensor hand biometric multimodal system](#)

# Technology used



## Programming Language

### Python (Version 3.90)

Core language for both the back-end processing and front-end web app

## Image Processing & Feature Extraction

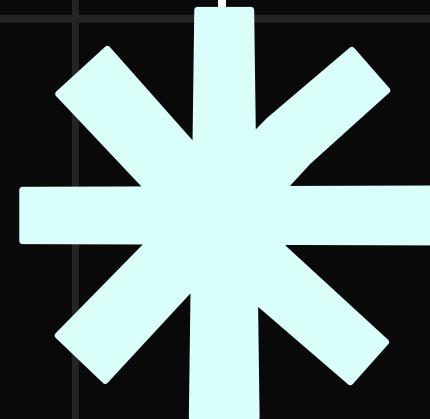
**OpenCV:** A library used for real-time computer vision tasks

**MediaPipe:** A framework by Google for building pipelines to process media

**NumPy & Pandas:** A library used for numerical data analysis

## Web Framework

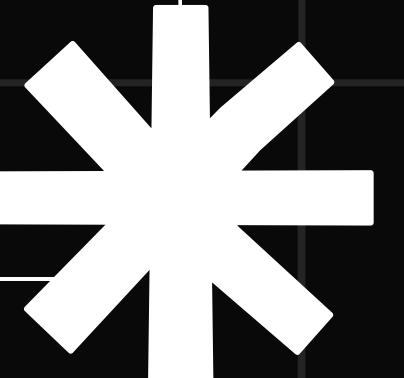
**Streamlit:** an open-source Python library that create web apps



# Details of our Design

## FEATURES

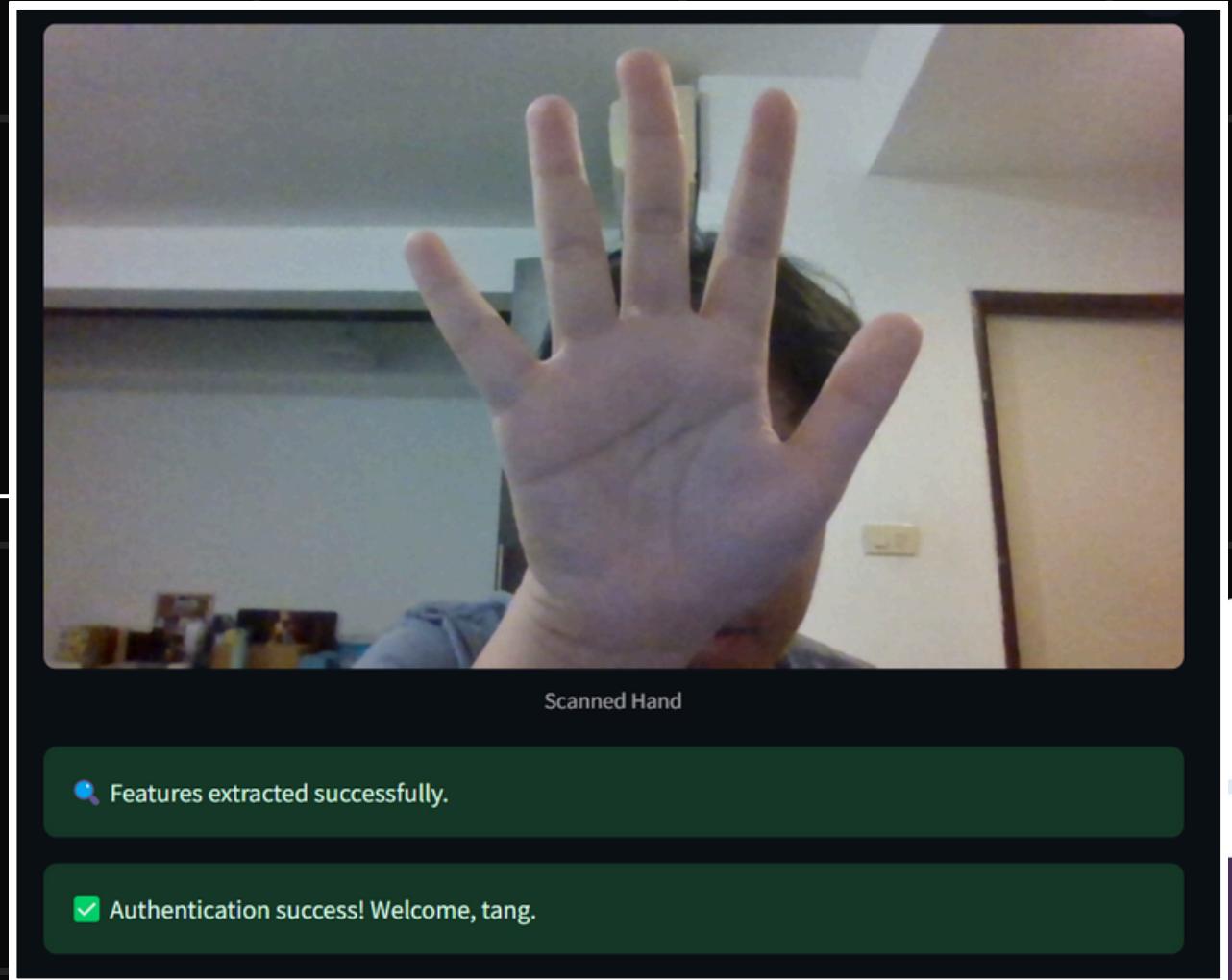
- Register
  - Captures an image using the webcam (`st.camera_input`)
  - Extracts features using `extract_features()`
  - Stores the feature vector along with a username in a CSV (`data/features.csv`)
- Authenticate
  - Captures a new hand image.
  - Extracts features and compares them against registered users using `match_hand()`.
  - Displays success if a match is found, or an error otherwise.



# Details of our Design

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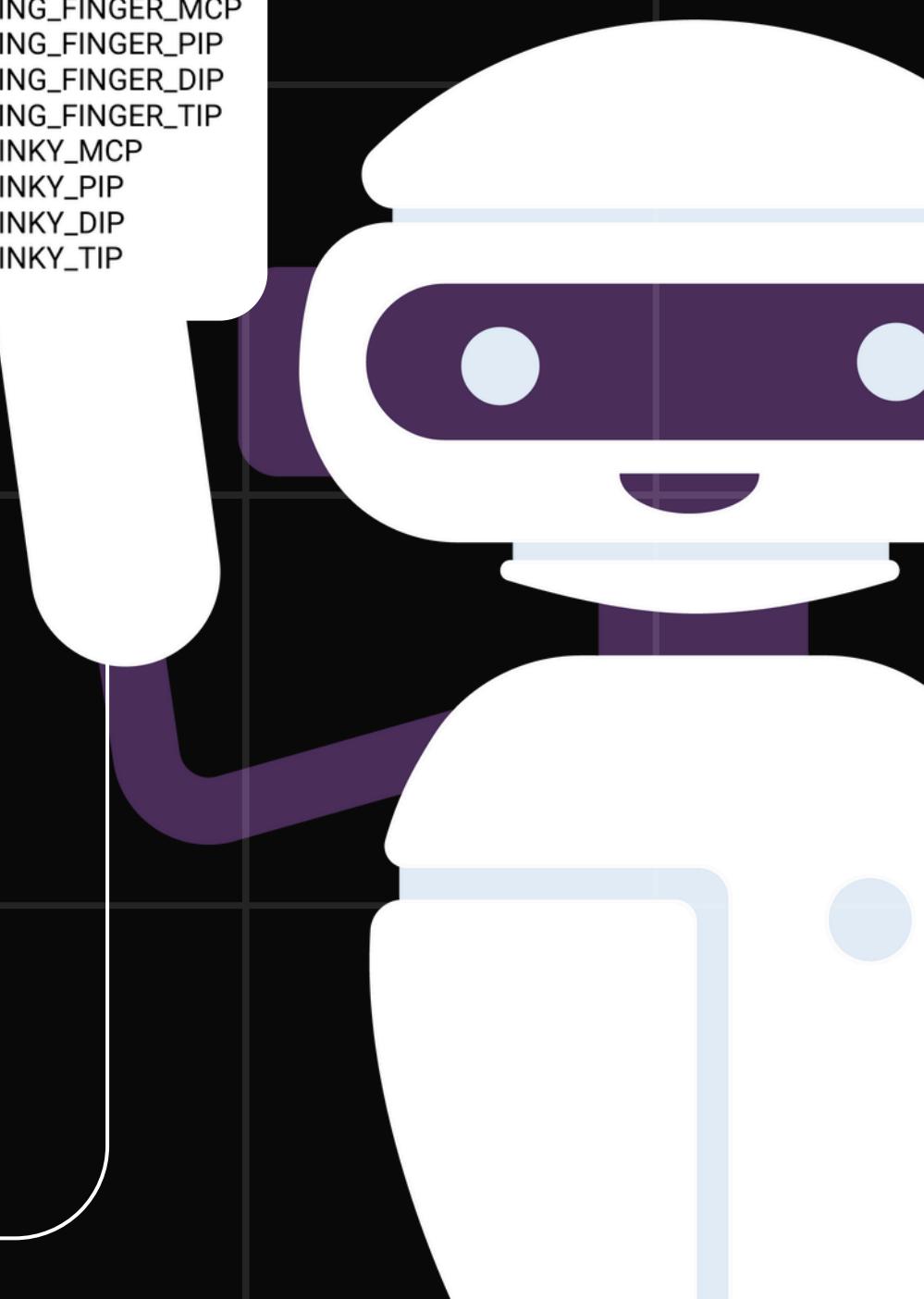


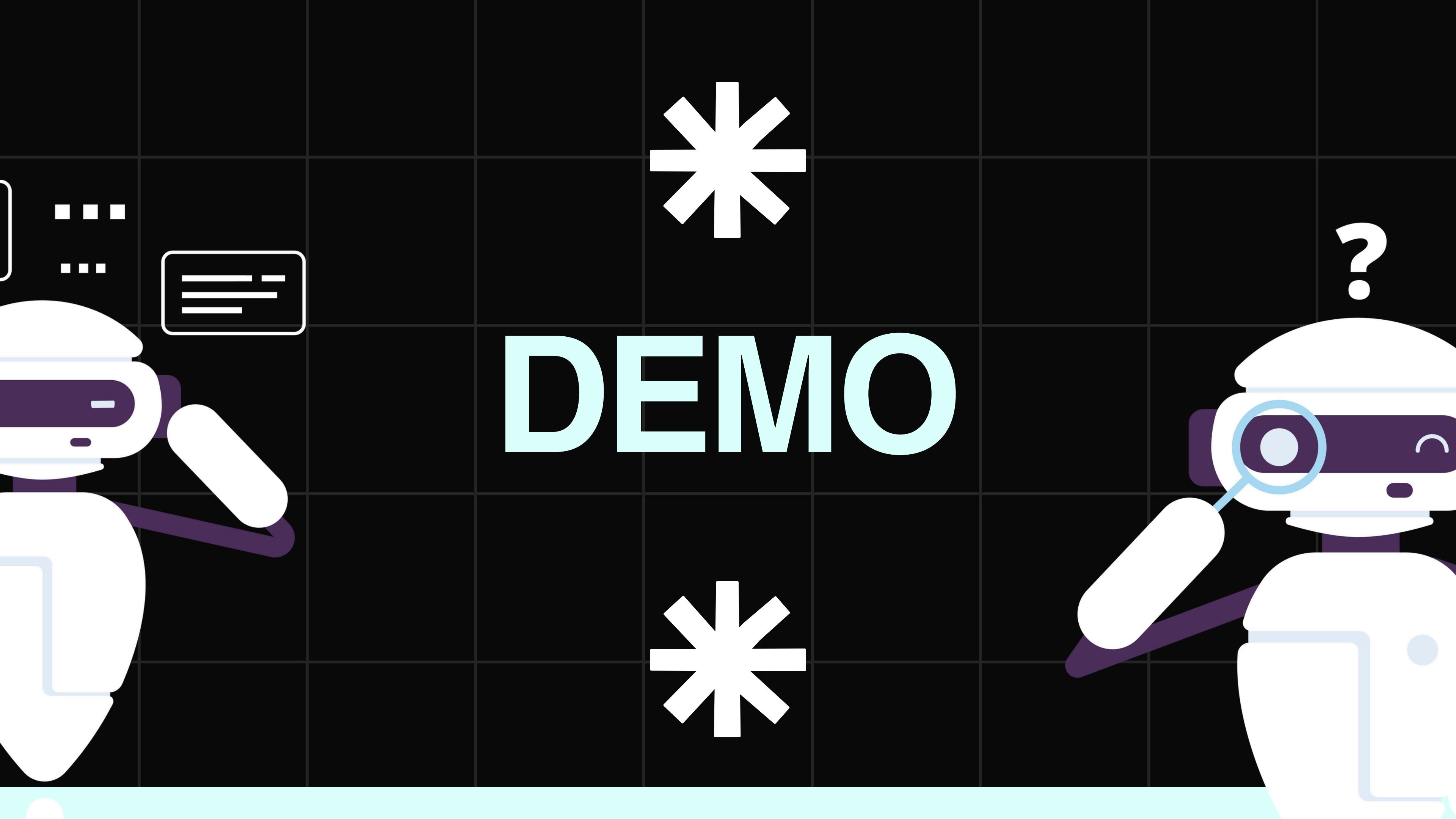
# Details of our Design

## Core Component

### Feature Extraction Module (hand\_utils.py)

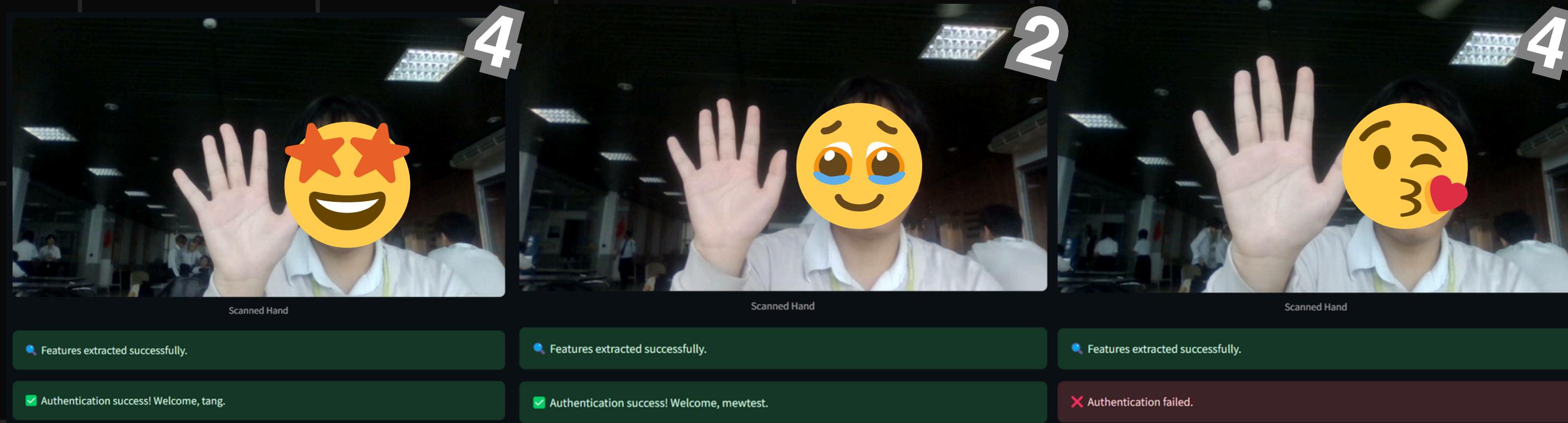
- Finds Key Points on Your Hand
  - Using a smart tool called **MediaPipe**, the system detects 21 key landmarks on your hand
- Measures Finger Bends
  - It calculates the angles between your **finger joints** (**how curved your fingers are**)
- Calculates Hand Span
  - The distance between your thumb tip and pinky tip (**hand's wingspan**)
- Gets the Hand's Shape
  - It checks how wide and tall your hand is, and calculates the **aspect ratio** (**width ÷ height**), giving a sense of its overall shape.





# DEMO

# EVALUATION

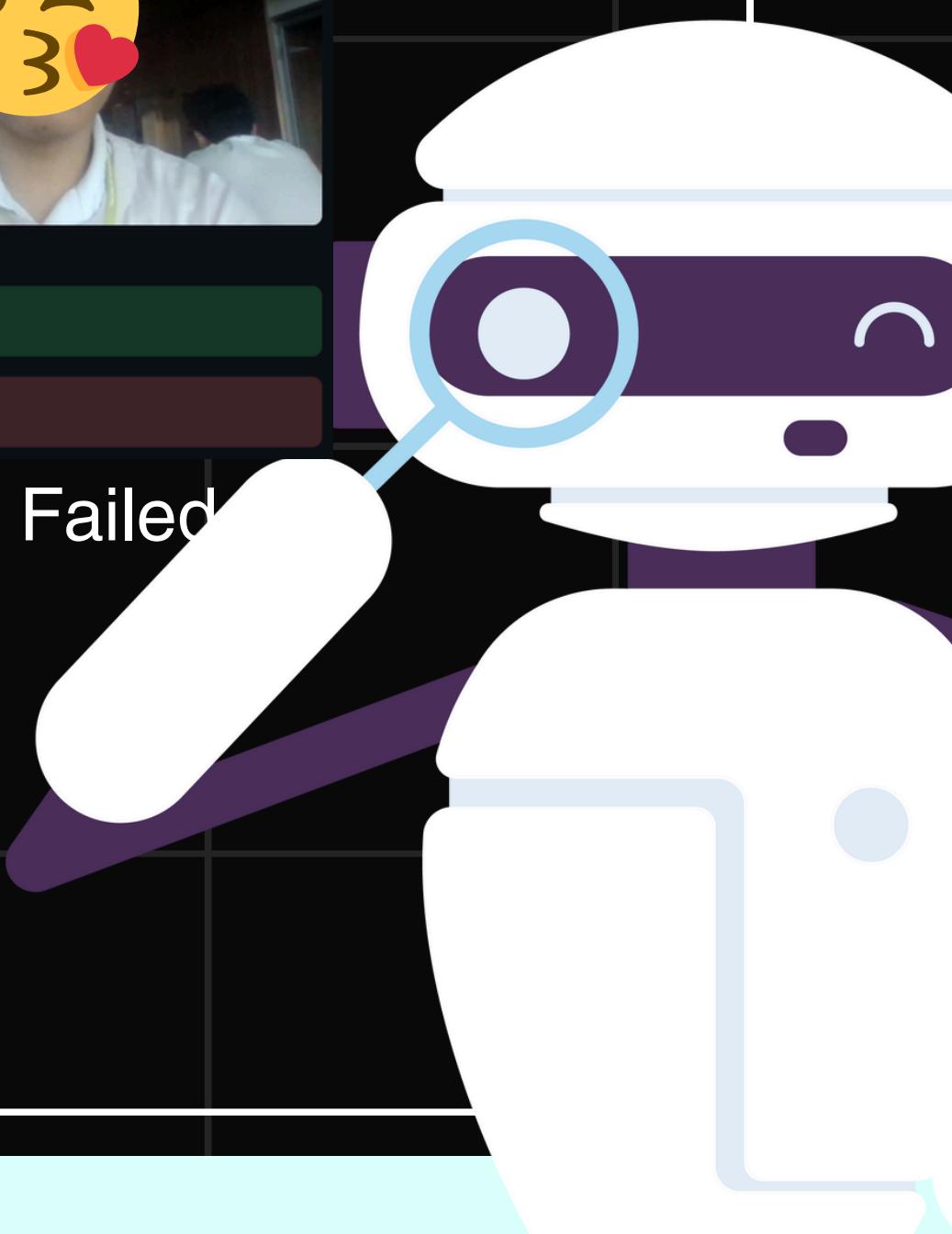


Authentication  
Successed

Wrong  
Authentication  
Successed

Authentication Failed

$$\text{SENSITIVITY} = \frac{\text{TP}}{\text{TP} + \text{FP}} = 4/6 = 0.66$$



# CONCLUSION

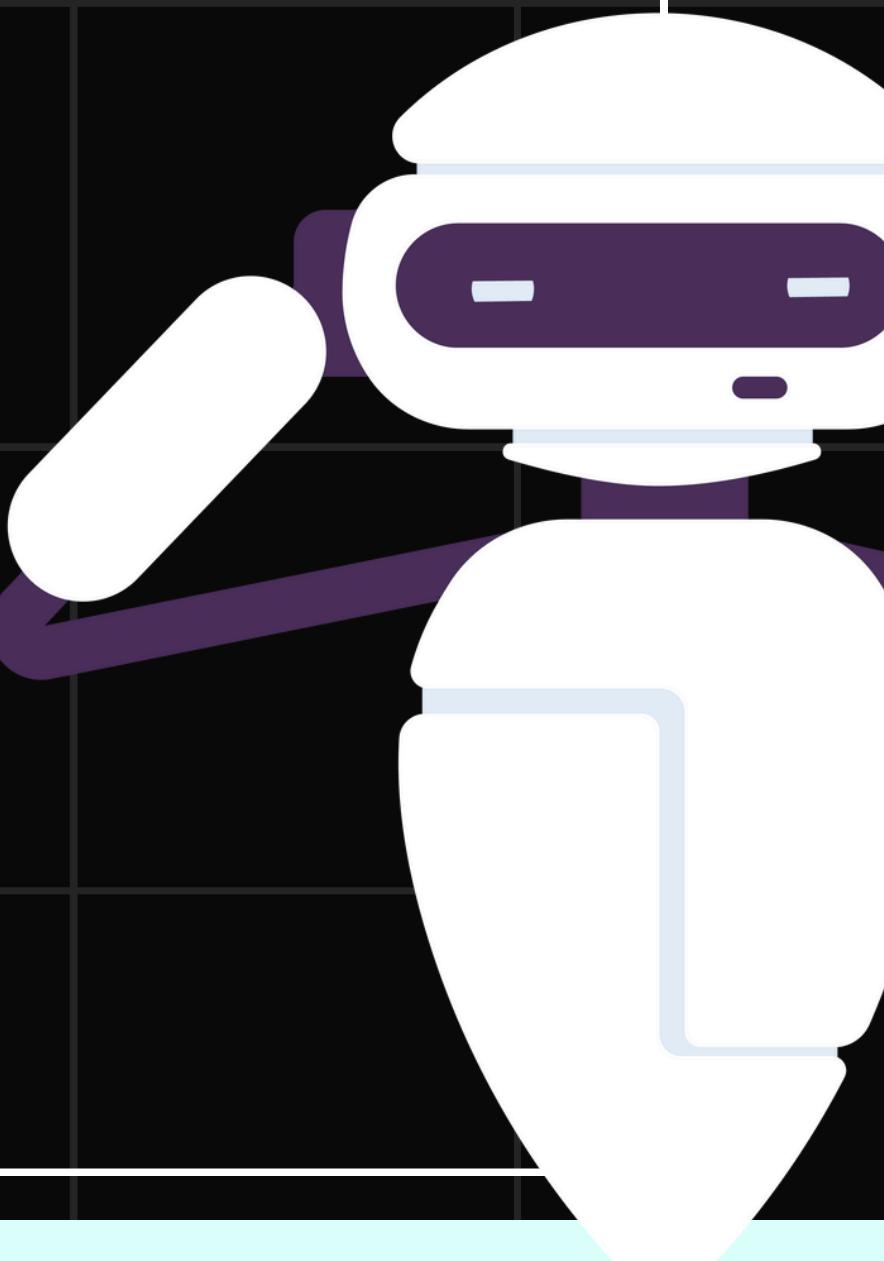
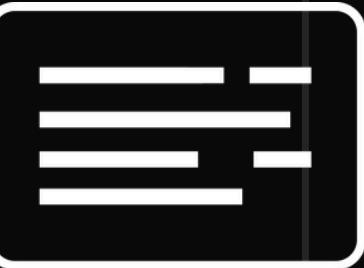
## KEY TAKEAWAYS



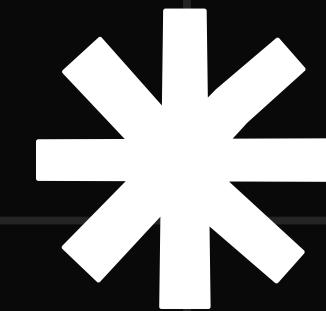
Type 1 Authentication  
Knowledge



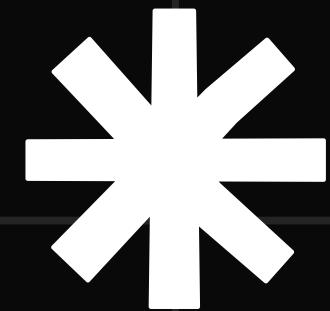
Type 2 Authentication  
Possession



## Multifactor Authentication



# Reference



<https://github.com/gautamits/hand-geometry>

## **(PDF) A single sensor hand biometric multimodal system**

PDF | Nowadays the question of identifying a person assumes a major role in many applications. To circumvent the limita-tio...

researchgate.net

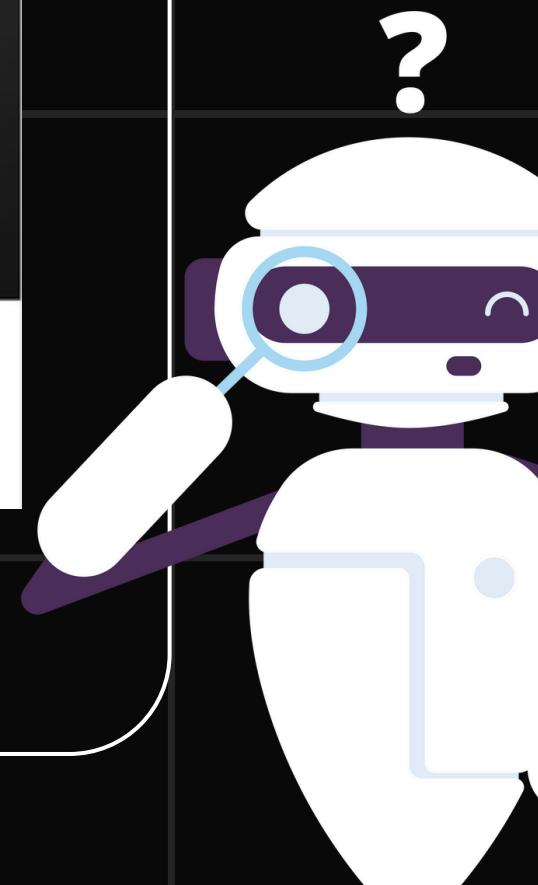
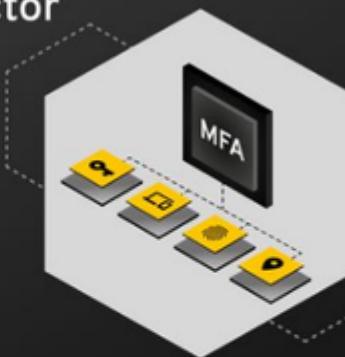
## The Types of Multi-Factor Authentication (MFA)



### Types of Multi-Factor Authentication (MFA)

MFA options have different strengths and weaknesses. Understand your MFA options and how to choose the best one for your unique situation.

● Keeper Security Blog / Jun 27, 2023



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# Thank You

Group 19

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# Q&A

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