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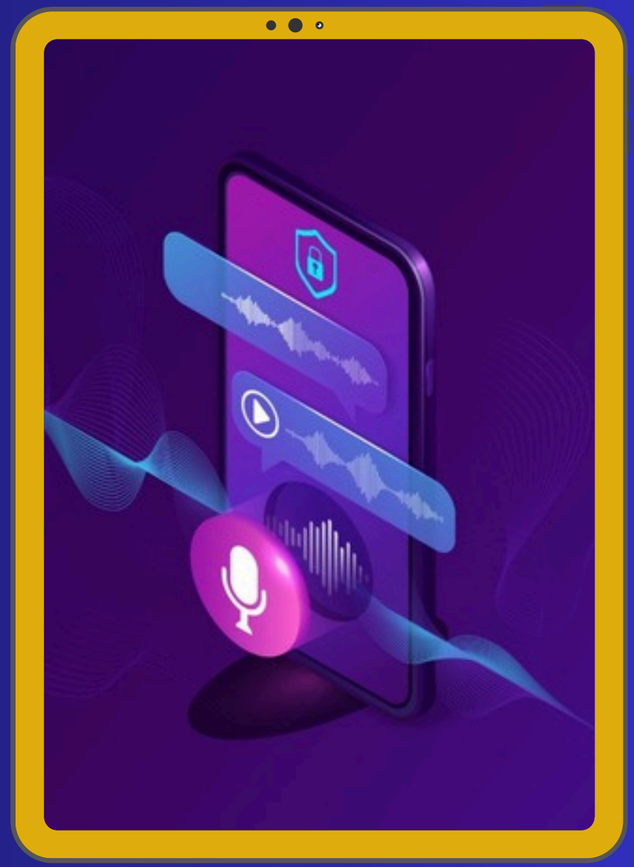
DUAL-LAYER AUTHENTICATION VOICE AND SPEECH INTEGRATION

20CYS443 Biometrics and Security

Get started with Voice Biometrics

Each time we speak, our voice reveals unique characteristics, similar to fingerprints. Voice biometrics software can capture these characteristics to create a voiceprint for identifying individuals. Our project enhances this by also checking the specific words spoken. This dual-layer authentication improves security, ensuring that both the voice and the speech content are verified.



Need for the project

Demand for Security

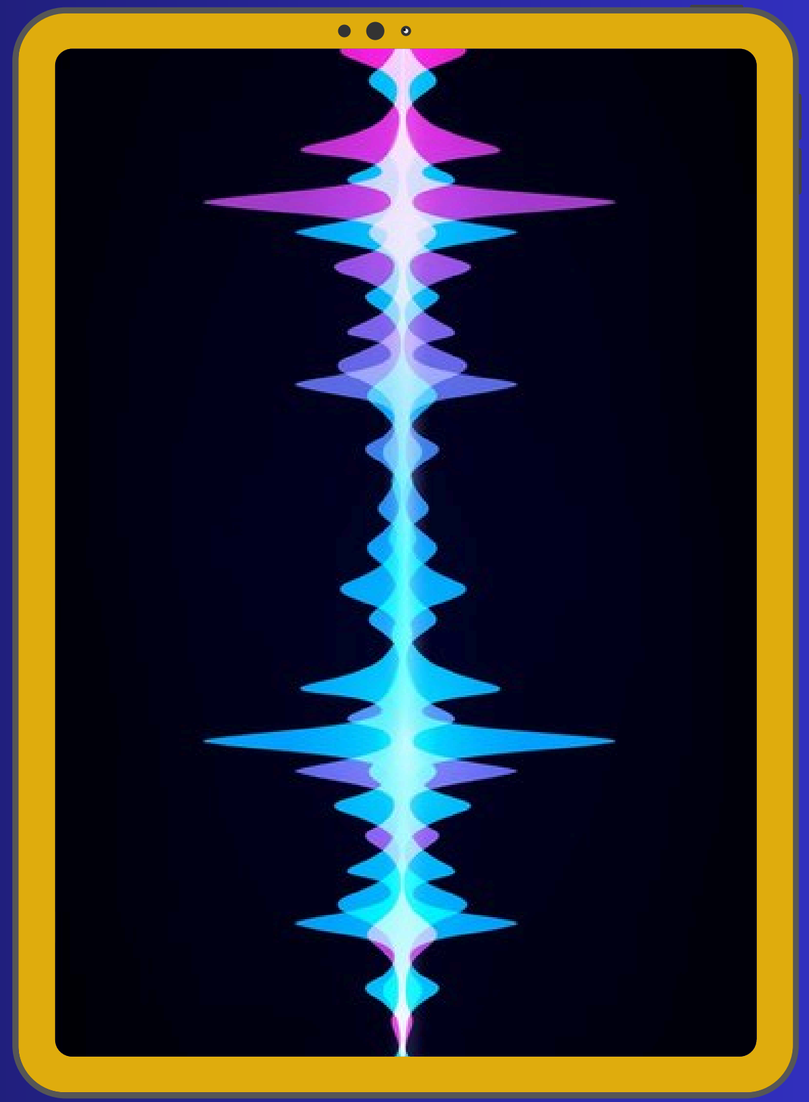
Increase in demand for secure and personalized media consumption.

Access Control

To prevent unauthorized users accessing our personal media.

Prevent Morphing

Using only voice can be vulnerable to morphing attacks, so integrating voice and speech makes it harder for third parties to replicate.



Literature Survey

Authors	Title	What does it have	Year
Soumya Priyadarsini Panda	Intelligent Voice-based Authentication System	This paper introduces a voice-based authentication system for IoT devices that improves performance by addressing voice variability under different conditions	2022
Rohan Kumar Das, Sarfaraz Jelil & S. R. Mahadeva Prasanna	Development of Multi-Level Speech based Person Authentication System	The work develops a multi-level speech-based authentication system for attendance using combined voice-password, text-dependent, and text-independent modules.	2022
Singh Nilu; Agrawal Alka; Khan R. A.	Voice Biometric: A Technology for Voice Based Authentication	It reviews Automatic Speaker Recognition (ASR) for identifying individuals through voice, comparing it with other biometric methods.	2021

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Marian Ceapar , Stefan Adrian Toma , Svetlana Segarceanu , George Suciu1 and Inge Gavat	Multifactor Voice-Based Authentication System	This paper presents a voice-based biometric authentication system for smartphones, combining Speaker Verification and Automatic Speech Recognition.	2020
R. Nagakrishnan, A. Revathi	Novel secured speech communication for person authentication	This paper presents a speech-based authentication system with encrypted features using MFCC and RNN operations for enhanced security.	2020

MOTIVATION & KEY CHALLENGES

Increased Security

Strengthen authentication processes by combining voice and speech, making it more secure than traditional methods.

Accuracy

Ensuring both voice and speech recognition are highly accurate to prevent false positives or negatives.

Voice Variability

Ensuring accuracy despite variations in voice due to factors like illness, age, or emotional state.

Speech Variability

Ensuring that the system accurately verifies specific spoken words or phrases despite natural variations in speech patterns.

Gaps Identified

Adaptation to Voice Changes:

Existing systems may struggle with adapting to vocal changes from aging, illness, or emotions, necessitating continuous updates and adjustments to voiceprints

Background Noise Interference:

Many systems struggle with authentication in noisy environments, requiring enhanced noise-cancellation and signal processing techniques to improve accuracy.

Resistance to Sophisticated Spoofing

Current voice biometrics may alter against advanced spoofing techniques like deepfake audio, necessitating improved liveness detection and anti-spoofing measures.

Voice Playback

Using recordings of the legitimate user's voice to gain unauthorized access.

PROPOSED METHODOLOGY

Voice

Preprocessing

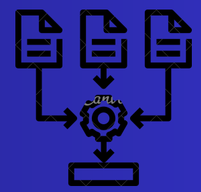
Feature Extraction
LPC, MFCC

Feature vector creation

Create a voice template from the sample

Templates

Identification
SVM, DTW



Acoustic Modelling and Threshold

Decision

Anomaly detection
FA, FR (False acceptance and reject)

Acceptance

DUAL-LAYER AUTHENTICATION

Unlike traditional voice authentication, which can be spoofed, our system adds an extra layer by requiring both the unique voiceprint and specific spoken words or phrases, enhancing security.

ENHANCED FRAUD PREVENTION

By requiring both voice and specific spoken phrases, the system makes it much harder for unauthorized users to gain access.

ADAPTIVE VOICEPRINT MODEL

Develop a voiceprint aging model that continuously adapts to natural changes in the user's voice over time, ensuring consistent accuracy and security despite vocal variations due to aging or health conditions.

INNOVATION ASPECT

Integrate dynamic voiceprint adaptation and multi-layered authentication combining voice with speech biometrics to enhance security and user adaptability

References

- Development of Multi-Level Speech based Person Authentication System: https://tinyurl.com/DMLSPAS
- Voice Biometric: A Technology for Voice Based Authentication : https://tinyurl.com/VBATVBA
- Multifactor Voice-Based Authentication System : https://tinyurl.com/MBVAS
- Novel secured speech communication for person authentication : https://tinyurl.com/NSSCPA
- Intelligent Voice-based Authentication System : https://tinyurl.com/IVBAS

THANK YOU!

Method	Coded Pattern	Misidentification rate	Security	Applications
Iris Recognition	Iris pattern	1/1,200,000	High	High-security facilities
Fingerprinting	Fingerprints	1/1,000	Medium	Universal
Hand Shape	Size, length and thickness of hands	1/700	Low	Low-security facilities
Facial Recognition	Outline, shape and distribution of eyes and nose	1/100	Low	Low-security facilities
Signature	Shape of letters, writing order, pen pressure	1/100	Low	Low-security facilities
Voice printing	Voice characteristics	1/30	Low	Telephone service