IOB CYBERNOVA HACKATHON 2025

VEINPAY: CARDLESS CASH WITHDRAWAL IN ATMs

Problem Statement Title- Vein Authentication System

Theme- Innovation with Authentication

PS Category- Software integrated with Hardware

Team ID- 02

Team Name (Registered on portal): AuthGuardians

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Proposed Solution

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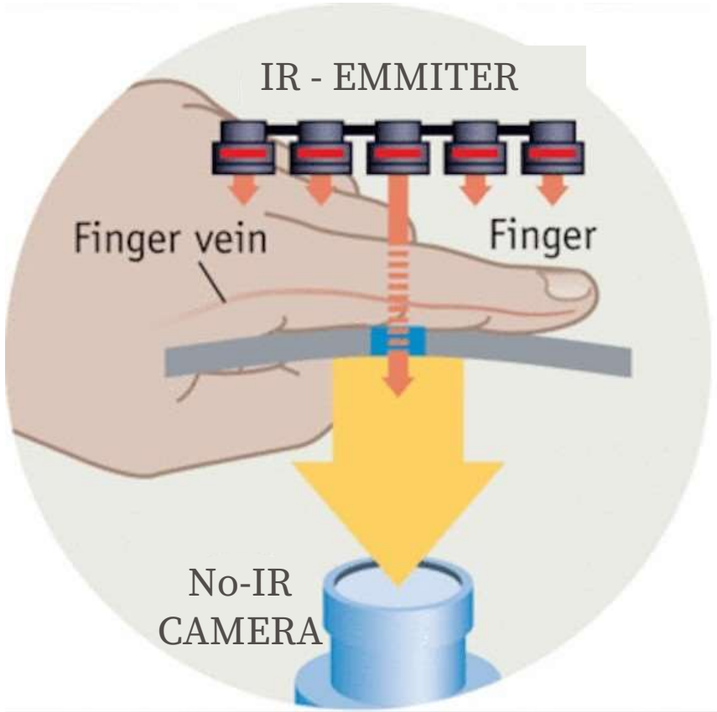
What We're Bringing

•A secure, contactless biometric system using **infrared-based finger vein patterns.**

•Powered by **Raspberry Pi** +Smart Image Processing (**Pre-processing + HOG**)

•**AES** -encrypted biometric templates – protected at every stage.



Why It Beats Other Biometrics

•**Veins are internal** → Can't be copied like fingerprints or faces

• **Requires live blood flow** → Spoof-proof by design

•**Hygienic & contactless** → Ideal post-pandemic and for luxury use

•**Even twins don't match** → Truly individual authentication

Use Case

ROLE	APPLICATION	WHY IT'S UNIQUE
•👨‍💼Bank Staff	•Cash replenishment at ATM	•Live detection + Authentication
•🧍 Customer	•Cardless withdrawals at ATM	•No card. No PIN. No spoofing.
•👑 HNI	•High-value online transaction authentication	•Remote, encrypted, unbreakable

FEASIBILITY AND VIABILITY

Feasibility Highlights	Key Challenges	Mitigation Strategies
• Uses affordable hardware setup.	• Low contrast in different lighting conditions affects image clarity.	• Use of controlled IR lighting improves image consistency.
• Leverages open-source image processing algorithms → cost-effective.	• Accurate vein pattern extraction is difficult in non-uniform conditions.	• Advanced preprocessing enhances vein visibility.
• Compact design supports scalability and portability.	• Real-time processing is limited by Raspberry Pi's computational power.	• Apply HOG to extract key features efficiently.

TECHNICAL APPROACH

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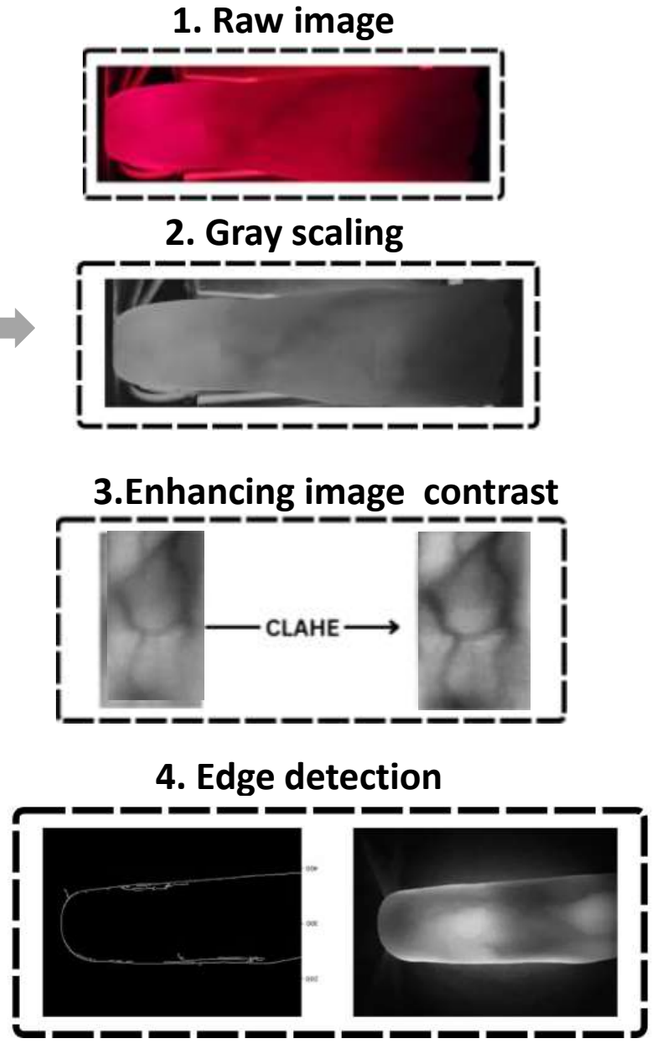
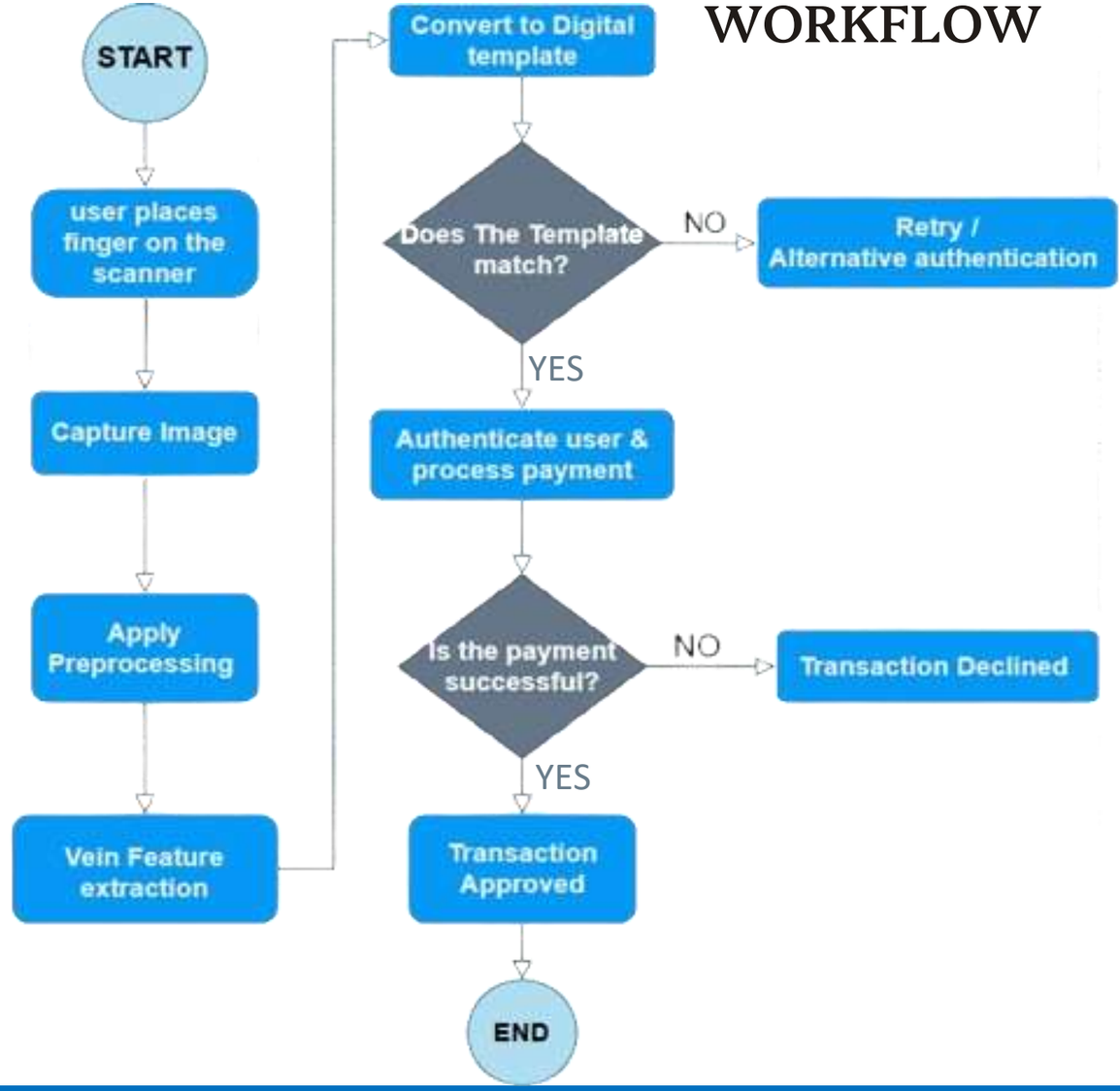
Software Pipeline

- **Python and OpenCV** for image processing
- Image Extraction
- **HOG** for efficient feature dimensionality reduction.
- **AES** encryption securing vein pattern templates
- **SVM(SVC - RBF Kernel)** is used for model training.



WORKFLOW



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IMPACT AND BENEFITS

Targeted Sectors

- Banks and ATM networks (Primary)
- High-net-worth individuals (HNIs) and corporate clients (Secondary)

“Finger vein systems have won wide acceptance in banking, especially in Japan.”
-Hitachi

Social & Economic Benefits

- Enables secure, inclusive identification
- Significantly reduces identity theft risks
- Cost-effective alternative to expensive biometric devices
- Prevents fraud like card cloning, PIN skimming, and unauthorized access.

SUSTAINABLE DEVELOPMENT GOALS

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
Biometric vein recognition drives innovation in secure financial infrastructure.

11 SUSTAINABLE CITIES AND COMMUNITIES
Secure biometric vein recognition ATMs enhance accessible financial services for urban and rural communities.

12 RESPONSIBLE CONSUMPTION AND PRODUCTION
Biometric ATMs reduce plastic and paper waste, promoting sustainable consumption and digital banking practices.

RESEARCH AND REFERENCES

The National Cyber Security Centre (GOV.UK)

- Vein pattern recognition - NCSC.GOV.UK

National Library of Medicine (An official US website of the United States government)

- Imaging of the Finger Vein and Blood Flow for Anti-Spoofing Authentication Using a Laser and a MEMS Scanner – PMC
- A Simple and Efficient Method for Finger Vein Recognition – PMC
- Feature Extraction for Finger-Vein-Based Identity Recognition - PMC

Hitachi Review Vol. 62 (2013), No. 8

- Use of Finger Vein Authentication for Population-based Surveys in Developing Countries

International Journal Of Engineering Research and Technology (IJERT) IFET-2014 Conference Proceedings

- FINGER VEIN AUTHENTICATION

US FBI

- **https://www.fbi.gov : file repository -Vascular Pattern Recognition**

For further exploration and implementation support, references include peer-reviewed papers, open-source libraries, and hardware manuals to guide developers and investors on the technical fundamentals and best practices.