# Indian Overseas Bank

## Cybernova Hackathon 2025

### 1. Overview of the Problem Statement

The financial ecosystem is increasingly challenged by rising cases of digital fraud, identity theft, and hygiene concerns in user authentication. Traditional mechanisms such as PINs, passwords, and cards are prone to phishing, skimming, cloning, and brute-force attacks. Moreover, advanced biometric devices often involve high costs, limiting their scalability across diverse banking infrastructures.

The hackathon problem statement therefore focused on developing a secure, scalable, and contactless authentication solution that could address fraud prevention, customer trust, and inclusivity while being feasible for wide-scale deployment.

### 2. The Solution: VeinPay

The team developed VeinPay, a cardless biometric authentication system leveraging the recognition of vein patterns in the fingers. Unlike external biometrics such as fingerprints or facial recognition, finger vein patterns are internal, unique to each individual, and impossible to replicate without live blood flow. This makes VeinPay inherently spoof-proof, and highly secure.

**Key Features:**

- Infrared Imaging & NoIR Camera: Captures unique subcutaneous finger vein patterns.
- AES Encryption: Biometric templates secured end-to-end, preventing misuse.
- Spoof-Proof Design: Requires live blood flow; twins or duplicates cannot bypass it.
- Low-Cost Hardware: Uses Raspberry Pi and open-source libraries, enabling scalability.
- Speed & Accuracy: Achieves authentication in less than a second.
- Future-Ready: Validated by prior adoption in global banking (e.g., Japan).

**Workflow:**

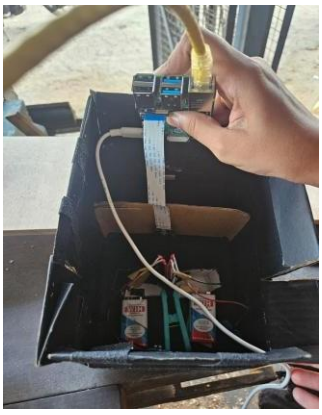
1. Image Capture: Finger vein scanned using IR emitter and NoIR camera.
2. Preprocessing: Grayscale conversion, noise reduction, and contrast enhancement.
3. Feature Extraction: Histogram of Oriented Gradients (HOG) for efficient representation.
4. Encryption: AES ensures security of biometric templates.
5. Classification: Support Vector Machine (SVM, RBF kernel) matches live image with stored templates.
6. Authentication: Access granted only if similarity threshold is satisfied.

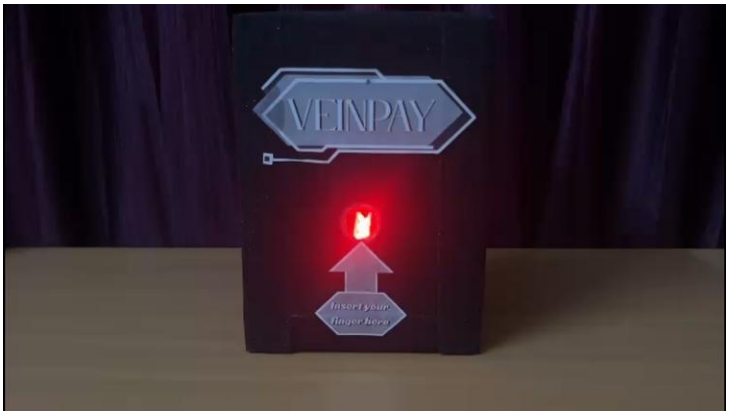
## 3. Team's Journey Through the Hackathon

The AuthGuardians team embarked on their hackathon journey with a shared passion for cybersecurity and digital banking transformation. After brainstorming on critical issues in financial security, the team identified ATM fraud and identity theft as a pressing challenge with real-world impact.

Stages of Development:

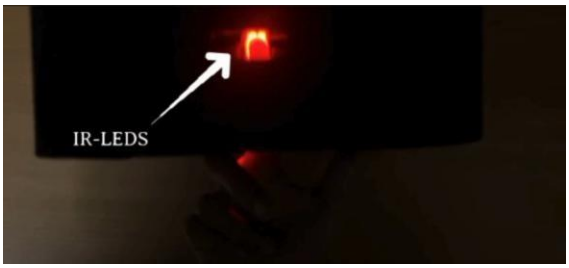
**Ideation Phase:** Narrowed down on finger vein authentication as a novel yet feasible approach.
**Prototyping Phase:** Built a working hardware-software pipeline using Raspberry Pi, NoIR camera, and IR lighting.






**Algorithm Development**: Designed an image processing pipeline with

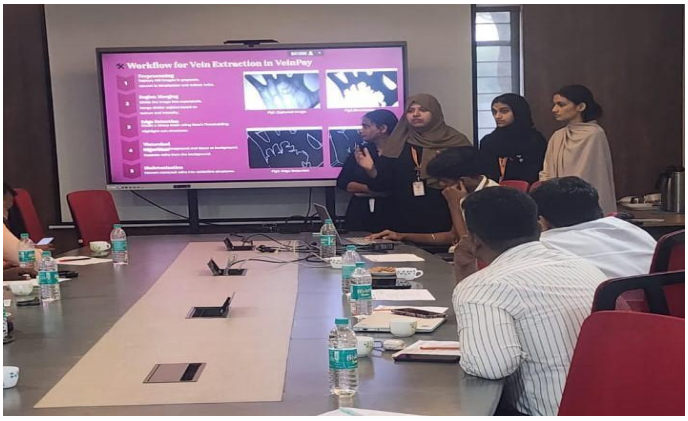
preprocessing, feature extraction (HOG), and AES encryption




**Model Training:** Implemented SVM (RBF kernel) for classification, balancing accuracy and efficiency.
**Presentation & Selection:** Showcased the solution at IOB Cybernova Hackathon 2025, where it received recognition for innovation and practicality.

### Team Members:

1. Sujatha G
2. Salha Afreen Sahani H
3. Sana Taquim
4. Farhat Nausheen




### 4. Role of the Bank in Mentoring & Support

Indian Overseas Bank (IOB), through the Cybernova Hackathon, played a pivotal role in fostering innovation. The bank provided:

- A real-world challenge statement, aligned with pressing security issues in ATMs.
- Mentorship and domain insights, enabling the team to align technical feasibility with banking needs.
- Got the opportunity to interact with bank's IT/security experts and

understand current cyber security practices in the financial sector

- Platform for visibility, allowing the team to present their solution in a professional setting.
- Encouraged innovation and creative thinking to build solutions for evolving cyber threats..
- Winners and participants gained recognition, boosting their confidence and motivation to pursue excellence in this field.

## 5. Outcomes, Learnings & Future Plan

**Key Outcomes:**

- A working prototype of a finger vein recognition-based ATM authentication system.
- Demonstrated feasibility of low-cost, scalable biometric authentication for financial services.
- Can be combined with existing ATM infrastructure and multi-factor authentication for stronger security.

**Learnings:**

- Importance of balancing technical innovation with banking sector practicality.
- Insights into the need for robust preprocessing and liveness detection in biometrics.
- Experience in cross-functional teamwork, combining computer science, cybersecurity, and banking perspectives.

**Future Plan:**

- Refining hardware design for enhanced image clarity and portability.
- Exploring cloud integration for secure, centralized storage of biometric templates.
- Pilot deployment in ATMs to validate performance in real-world banking environments.
- Expansion across domains like corporate access systems and critical applications

### Conclusion

VeinPay highlights how innovation nurtured through hackathons can directly contribute to financial inclusion, digital trust, and secure banking transformation. With its combination of security, convenience, and scalability, VeinPay has the potential to become a next- generation authentication standard in India's banking ecosystem.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