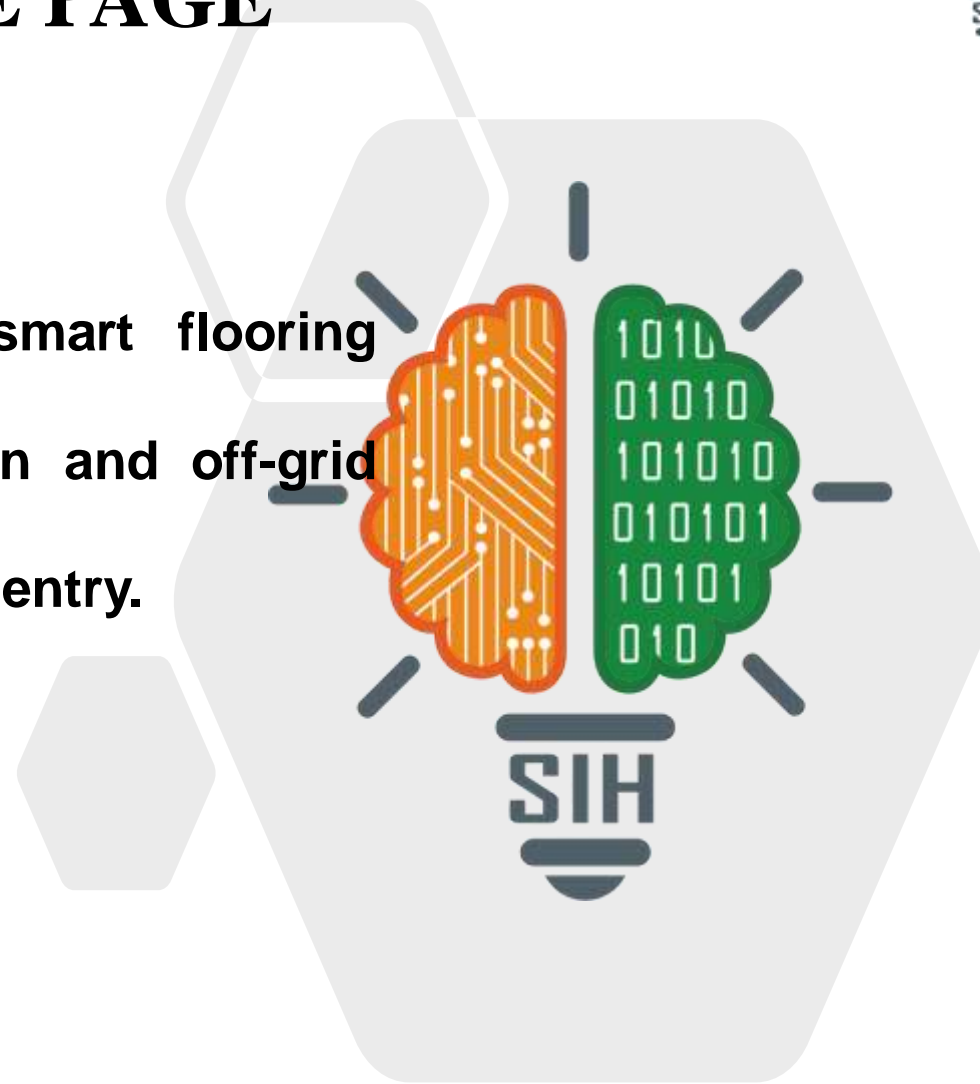


TITLE PAGE

- Problem Statement ID- SIH25118
- Problem Statement Title- Develop a smart flooring system that powers homes, rural, urban and off-grid spaces while also detecting unauthorized entry.
- Theme-Smart automation
- PS Category- Hardware
- Team ID- 53998
- Team Name (Registered on portal): Volt Secure



Volt Secure



- **Detailed explanation of the proposed solution**
 - Piezoelectric mats generate electricity from footsteps/vehicle movement and store it for powering lights, sensors, or cameras.
 - Integrated IoT sensors track movement for security monitoring.
 - Real-world use case examples (airports, railway stations, rural homes, office buildings).
- **How it addresses the problem**
 - Produces clean, renewable energy in high-footfall areas.
 - Enhances security by detecting unusual/unauthorized movement.
 - Reduces electricity costs and supports smart city initiatives.
- **Innovation and uniqueness of the solution**
 - Dual purpose: **energy harvesting + security monitoring**.
 - “Real-time monitoring via mobile dashboard” and analytics.
 - Self-sustaining, scalability (small homes → large cities)., and eco-friendly solution.

- Technologies to be used:
- “AI/ML algorithms for anomaly detection and predictive analytics”.

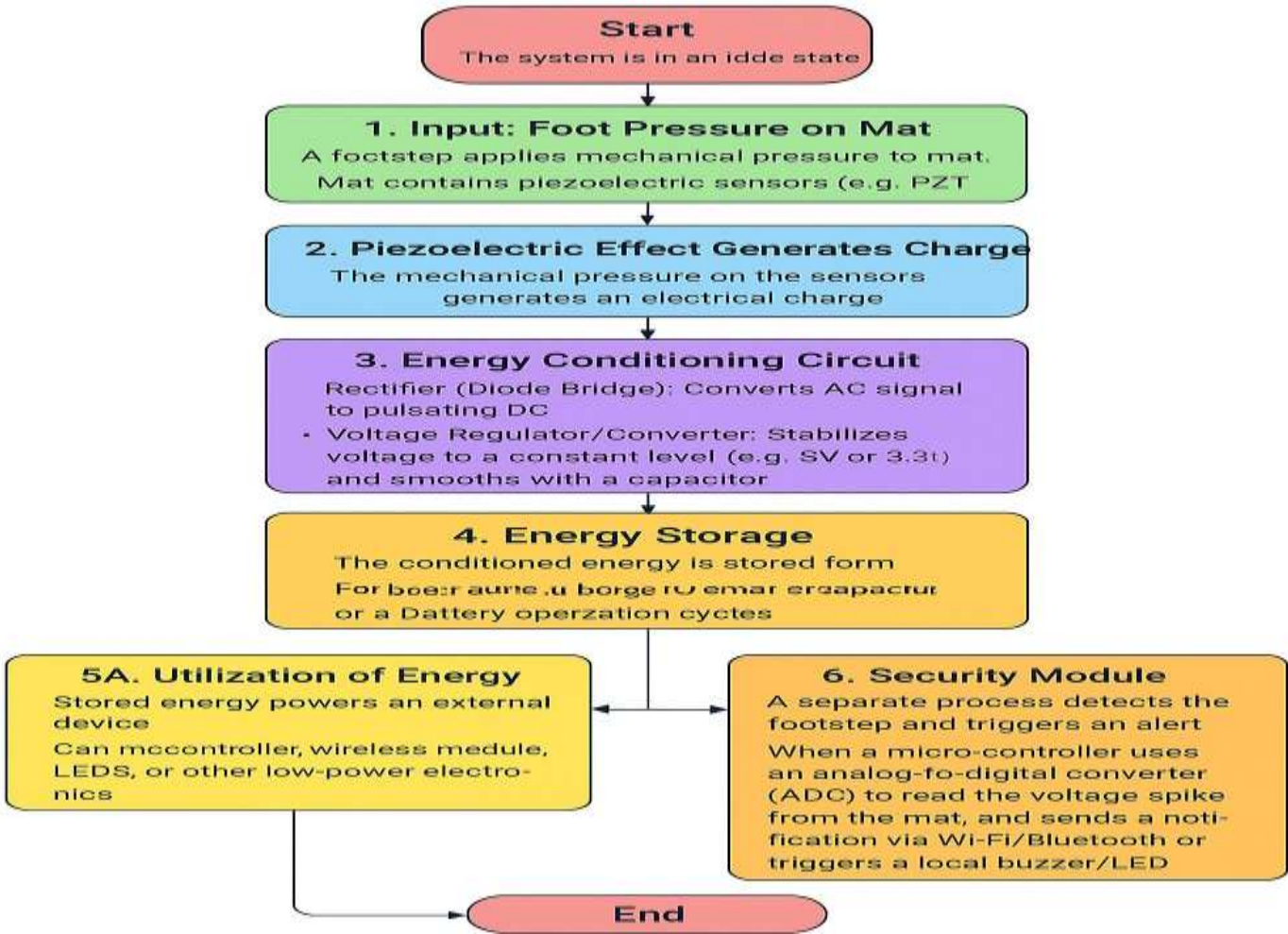
Hardware:

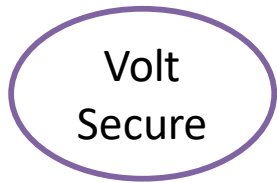
- Piezoelectric sensors/mats
- Microcontroller (Arduino/Raspberry Pi)
- Energy storage (batteries, supercapacitors)
- IoT modules (ESP32/Node MCU, Wi-Fi, GSM)
- Security sensors & CCTV integration

Software/Programming:

- Programming: Python, C/C++ (Arduino IDE)
- IoT Platforms: Blynk, Things Board, or custom dashboards
- Data Processing & Analytics: Python with MQTT/REST APIs
- Visualization: Web/Mobile app for energy + security monitoring

- Methodology and process for implementation :





FEASIBILITY AND VIABILITY



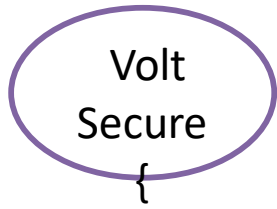
Feasibility (How practical)	Challenges (problems and risks)	Strategies (practical solutions)
Practical with existing piezoelectric and IoT technologies	Durability of piezo mats under heavy loads and long-term	Develop modular prototypes for easy testing and upgrades
Cost-effective compared to traditional surveillance	Balancing power efficiency with installation cost	Use energy-efficient hardware and cost-optimized materials
User-friendly and scalable design	Network reliability in rural and low-connectivity areas	Implement strong encryption and cloud security protocols
Supports both on-grid and off-grid deployment (urban + rural adaptability)	Data privacy and cyber security concerns	Hybrid connectivity (Wi-Fi + GSM) for reliable rural performance

IMPACT AND BENEFITS



- **Potential Impact on Target Audience**
 - Makes processes easier, faster, and more reliable
 - Improves accessibility and user experience
 - Builds trust and encourages technology adoption

- **Benefits of the Solution**
 - **Social**
 - Safer rural households via intruder detection
 - Improved public safety in smart cities
 - **Economic**
 - Cuts electricity bills by 20–30% in high-footfall areas
 - Creates jobs in IoT installation & maintenance
 - **Environmental**
 - Each mat offsets ~15–20 kg CO₂/year (hypothetical)
 - Promotes clean, renewable energy adoption



RESEARCH AND REFERENCES



- https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.researchgate.net/publication/393048278_Piezoelectric_Floor_Mat_Systems_for_Sustainable_Energy_Harvesting&ved=2ahUKEwj538rZrcuPAxXa2TgGHUwyH0EQFnoECFAQAQ&usg=AOvVaw0goqYoDd7thaWE1EQpDJNL
- https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://piezo.com/pages/our-piezo-advantage%23:~:text=3DPiezoelectrics%2520have%2520many%2520benefits%2520and,such%2520as%2520providing%2520haptic%2520feedback.&ved=2ahUKEwjVgdaPrsuPAxUizjgGHWpQDysQFnoECAQQBQ&usg=AOvVaw1Cc1PuO1rMbO_beg2hRDLx
- <https://chatgpt.com/c/68ceb871-0dd4-8323-a760-2f36204a9f5d>