

## **THEME: SOCIAL IMPACT**

### **Problem Statement 1:**

Build a solution that uses AI + behavioral analytics to detect fraudulent education loan applications (fake documents, identity theft, multiple loan applications) in real time, while maintaining a smooth student experience.

Create social impact by: Protecting students from identity theft, Building trust in digital financial platforms, Supporting financial inclusion. Reducing defaults, lowering interest rates, and contributing to **Digital India & Atmanirbhar Bharat**.

### **Motivation:**

The loan industry today faces **growing fraud through fake or synthetic applicants** — using forged documents, stolen student identities, or automated bots. These not only cause **financial losses** but also **erode trust** in digital lending. At the same time, genuine students applying for loans often struggle with **tedious verification processes**. If systems become too strict, they risk alienating those who truly need support.

### **Exact deliverables:**

1. **Behavioral Analytics Module-** Capture signals like typing speed, error patterns, hesitation, mouse/scroll actions, IP/device consistency. Normalize and process behavioral data for analysis.
2. **AI/ML Fraud Detection Model-** Baseline models (logistic regression, random forest), Advanced models (deep learning, anomaly detection, ensembles), Fraud risk scoring system for applicants.
3. **Explainability & Ethical Layer (XAI)-** module that provides reasons for fraud flags (e.g., device mismatch, abnormal typing behavior), Ensures transparency, fairness, and accountability.
4. **Student-Facing Loan Application Portal**
5. **Loan Officer Dashboard**

### **Milestones:**

1. **Data Engineering**
2. **AI Model Development-** Train baseline ML models. Experiment with advanced models (deep neural nets, anomaly detection). Build fraud risk scoring system.
3. **Behavioral Analytics Integration-** Implement keystroke dynamics, device fingerprinting, hesitation time analysis. Fuse behavioral + document/KYC features into the model.
4. **UX Layer Development-** Build student-friendly loan application interface (web/mobile). Develop loan officer dashboard with fraud insights.
5. **Testing & Evaluation**

## **Problem Statement 2:**

Eco-Friendly Waste Management, Smart bins with sensors for waste segregation, AI-enabled recycling assistants.

## **Related SDG: SDG 12 (Responsible Consumption and Production)**

### **Motivation:**

Rapid urbanization and rising population density have created a **waste management crisis** in cities worldwide. Traditional collection systems often rely on **manual segregation**, leading to inefficiency, contamination of recyclable waste, and excessive landfill use. At the same time, communities and institutions struggle with **low awareness about correct waste disposal**, while recycling plants receive **mixed or poorly sorted waste**, reducing the effectiveness of sustainability initiatives.

### **Milestone:**

1. Problem Understanding & Ideation
2. Sensor & IoT Prototype
3. **AI & Analytics Layer-** Develop AI model or rule-based logic to classify waste, Train a small prototype for waste detection using sample dataset, Generate waste category prediction + recycling suggestions.
4. User Interaction & AI Assistant
5. Dashboard & Monitoring
6. Integration & Final Demo

### **Deliverables:**

1. Prototype Smart Bin
2. AI-enabled Recycling Assistant
3. Waste Management Dashboard
4. Gamified Citizen Engagement Module

### **Problem statement 3:**

**Flash flood- monitoring and control in Urban areas-** Traditional flood warning systems are either **reactive, slow, or not localized enough** to address sudden surges in water levels across different parts of a city. There is a need for a **smart, real-time monitoring and control system** that can:

- Continuously monitor rainfall, drainage water levels, and flow patterns.
- Provide **early warnings** to citizens and city authorities.
- Suggest **control strategies** such as smart diversion, pumping, or traffic rerouting.

**Related SDG: SDG 6 (Clean Water and Sanitation), UN SDG 11 (Sustainable Cities & Communities)**

### **Motivation:**

**Urban Vulnerability, Human Safety, Economic Protection, Technology Opportunity** – IoT sensors, AI/ML prediction, and GIS mapping can provide real-time insights and proactive interventions. **Social Impact** as it protects vulnerable communities, strengthens public trust in smart city solutions, and contributes to climate adaptation strategies.

### **Deliverables:**

1. **IoT-based Sensor Network**
2. **AI/ML Flood Prediction Engine-** prediction of flash floods based on rainfall intensity + drainage data, risk scoring
3. **Urban Flood Dashboard-** GIS-based visualization of waterlogged areas, Alerts for city authorities with suggested actions.
4. **Citizen Mobile App / Alert System** - Push notifications/SMS for real-time flood warnings, Safety tips, safe routes, and nearest shelters.
5. **Control Strategies Module-** Suggestions for pumping, diversion channels, traffic rerouting, Integration with smart city infrastructure (traffic lights, drainage control).
6. **Final Demo & Presentation**

### **Milestones**

1. Problem Framing & Architecture
2. Data Collection & Simulation
3. IoT & Monitoring Layer
4. AI/Prediction Module

5. Dashboard & Visualization (Hours 23–28)
6. Citizen mobile app
7. Integration & Final Demo

## **THEME: FINTECH, BLOCKCHAIN AND CYBER SECURITY**

### **Problem Statement 1: Cryptographic Key Lifecycle Management**

Design and implement a mini Key Management System that can securely handle the lifecycle of cryptographic keys, including their generation, secure storage, controlled usage, scheduled/manual rotation, revocation, and logging. The system should enforce cryptographic best practices and demonstrate how keys can be managed in a secure and compliant manner, even in a simplified environment.

#### **Exact Deliverables**

- Supports at least two key types.
- Key rotation and revocation workflow.
- Simple workflow showing: generate → use (encrypt) → rotate → revoke → verify logs.

#### **Relevance**

With India's expanding digital infrastructure (UPI, Aadhaar, digital banking), secure cryptographic key management is a priority. Compromised keys can lead to catastrophic breaches - financial frauds, loss of national data sovereignty, or cyber warfare risks.

#### **Milestones**

1. Define key lifecycle workflow + initial architecture.
2. Implement key generation, storage, and rotation features.
3. Add audit logging
4. Full demonstration with secure workflows + documentation.

#### **Additional Information**

- Students may explore open-source KMS frameworks (e.g., HashiCorp Vault, AWS KMS simulators) for rapid prototyping.

## **Problem Statement 2: Voice Based Financial Scam Detector**

Design and implement a voice analysis tool capable of monitoring phone calls in real time to identify potential fraudulent financial scams. The system should combine linguistic patterns (keywords, urgency cues) and contextual indicators to distinguish between legitimate and malicious calls. Upon detecting suspicious behaviour, the tool must generate instant alerts to protect users from disclosing sensitive information or making fraudulent transactions.

### **Exact Deliverables**

- Real time voice processing prototype (mobile/desktop/web).
- ML model that classifies scam vs legitimate financial conversations.
- Dashboard/logging for alerts and case analysis.
- Short demo with simulated scam call scenarios.

### **Relevance**

Financial voice scams are one of the fastest growing cybercrime methods in India, targeting vulnerable groups such as the elderly, new digital banking users, and less tech savvy citizens. Losses from phone based scams have grown into hundreds of crores annually, undermining trust in digital financial ecosystems.

### **Milestones**

1. Define scam indicators (keywords, linguistic markers etc).
2. Build initial classifier using open datasets.
3. Integrate real time voice processing and alerting mechanism.

### **Additional Information**

- Encourage lightweight ML models that can run on low resource devices.
- Students may use open source datasets such as Mozilla Common Voice, VoxCeleb

### **Problem Statement 3: Phishing Email Detection System**

Design and implement an AI powered phishing detection system that goes beyond traditional keyword filtering to identify malicious emails. The solution should leverage advanced NLP techniques to analyse email content, metadata, and embedded links, while providing explainable alerts.

#### **Exact Deliverables**

- Prototype email client plugin/tool.
- Trained phishing detection model.
- Dashboard/logging for flagged emails.
- Short demo with phishing vs legitimate emails.

#### **Relevance**

Phishing is the #1 attack vector in India's financial, government, and corporate ecosystems. As India pushes for digital adoption across sectors, preventing phishing ensures resilience of digital trust infrastructures (UPI, GST, DigiLocker).

#### **Milestones**

1. Define phishing indicators (URLs, sender spoofing, metadata anomalies).
2. Train and test a baseline NLP model on open datasets.
3. Integrate the model with real time flagging.
4. Demonstrate explainability (highlight phishing cues).

#### **Additional Information**

- Public datasets: PhishTank, SpamAssassin, Enron Email Dataset.
- Encourage use of transformer based NLP models

## **THEME: SMART AND SUSTAINABLE LIVING**

### **Problem Statement 1:**

Develop IoT-based systems to monitor and reduce household/campus energy consumption using AI models.

**Related SDG: SDG 7 (Affordable and Clean Energy), SDG 13 (Climate Action)**

### **Motivation:**

Traditional energy meters only provide aggregate usage data, offering no insights into which devices are consuming more energy, when, and how to optimize usage. With IoT sensors and smart plugs, it is now possible to capture real-time appliance-level energy data. By applying AI/ML models, we can analyze consumption patterns, predict peak loads, and recommend personalized actions to reduce waste.

### **Deliverables:**

1. IoT Monitoring Prototype
2. AI/ML Analytics Module- Forecasting, anomaly detection, and optimization recommendations.
3. User Dashboard/App
4. Alert/Automation System
5. Final Demo & Presentation

### **Milestones:**

1. Problem Definition & System Architecture
2. **IoT Data Collection Setup** - simulate and track energy consumption, Enable real-time data streaming to cloud/local server.
3. **Data Preprocessing & Storage**- timestamped data with device ID, consumption level, **Storage in database**
4. **AI/ML Model Development** - Detect abnormal usage, Classify “essential vs. non-essential” energy use, recommendation system
5. User Dashboard/AppDevelop interface showing
6. **Alerts & Optimization Layer**- push notification, SMS, or email, suggestions
7. Integration & Demo

## **Problem Statement 2:**

Design intelligent carpooling application for Real-time traffic reduction systems to lower emissions.

## **Related SDG: SDG 11 (Sustainable Cities and Communities)**

### **Motivation:**

A large number of vehicles on roads often have low occupancy, creating inefficiency and environmental stress. An intelligent carpooling solution powered by AI can:

- Encourage shared mobility to reduce vehicle count on roads.
- Optimize routes using real-time traffic data to minimize delays.
- Lower carbon emissions and fuel consumption, contributing to climate goals.
- Promote affordable and eco-friendly travel for commuters.

### **Deliverables:**

1. Mobile/Web App Prototype
2. **Real-Time Route Optimization System** integrating traffic data and AI-driven suggestions.
3. Ride-Matching Algorithm
4. **Emission & Impact Dashboard** showing estimated CO<sub>2</sub> reduction and traffic alleviation.
5. Incentive/Reward System Mockup
6. **Pilot Demo** showing effectiveness under real-world-like traffic conditions.

### **Milestones:**

1. System & Algorithm Design
2. **Prototype Development**- Build user registration, profile, and ride creation/joining features, Implement AI-based route optimization.
3. **Testing & Simulation** for multiple users, analysis of traffic, emission efficiency
4. **Dashboard** with Integrated gamification
5. Integration & Demo

### **Problem Statement 3:**

In emergencies (medical, natural disasters, women's safety), help is often delayed due to lack of coordination.

Build a digital platform where individuals can raise verified SOS alerts that are instantly mapped and routed to nearby volunteers, NGOs, or services.

### **Deliverables:**

A live demo app showing SOS request creation and real-time geo-mapping.

Role-based access for responders (volunteers, doctors, NGOs, police).

A quick "trust/verification" mechanism to avoid spam.

### **Milestones:**

- 1. Problem understanding & Research**
- 2. System Architecture & Design**
- 3. UI/UX mockups** for mobile/web app (emergency button, alert feed, map view).
- 4. SOS Functionality** for quick alerts (with GPS coordinates), **verification layer** (AI-based anomaly detection, duplicate filtering, or trusted ID check).
- 5. Real-time Mapping & Routing**
- 6. Volunteer & NGO dashboard**
- 7. Analytics dashboard** (heatmaps of alerts, response time reports), Add fake/false alert filtering mechanisms, Ensure encryption & privacy protection of user data.
- 8. Demo**