Fr. Conceicao Rodrigues College of Engineering, Bandra (W)

Department of Computer Engineering

Mini-Project Proposal

TE Computer - (SEM V)

1. **Name of the student(s) with Roll Number and Division:**

   - Joshua D'mello Div A, Roll No : 9886
   - Aryan Daripkar Div A, Roll No : 9882
   - Sanyo Fonseca Div A, Roll No : 9896
   - Vatsal Chudasama Div A, Roll No : 10399

2. **Problem Statement :**

   Slums, characterized by inadequate sanitation, water supply, housing, and living space, pose significant developmental challenges. Governments have attempted solutions like slum upgrading, involving improving infrastructure and legalizing land rights. Despite these efforts, poverty, lack of affordable urban land, and insufficient data contribute to the rise of slums. To create a healthy, inclusive, and prosperous country, technology can address data gaps, monitor and control epidemics, and regularize slum settlements. We propose an innovative technical solution to redevelop slum areas, curbing future growth and ensuring sustainable development.

3. **Project Area:** [Tick whichever is applicable]

Project Area	**Put Y/N**	**Category**	**Put Y/N**
IOT		Societal	Y
ML / AI	Y	Environmental	Y
Blockchain	Y	Health care	Y
Robotics		Hardware	
VLSI		Research	
ChatGPT		Application	Y
Cryptography and Network security		Startup Idea	
Others (Please Specify)	Generative AI,XAI	Others (Please Specify)	

4. Project Abstract:

Slums face significant development challenges due to inadequate infrastructure and services. This project introduces a digital solution for slum redevelopment, featuring a community app that provides a live map, government policies, grievance reporting with geotagging, and a reward system to boost resident engagement. A government web portal supports grievance management with AI-driven departmental routing, automated email drafting, and predictive models for slum growth. Additionally, a blockchain system secures land ownership and resident data, reducing disputes and enhancing transparency. This integrated approach aims to improve slum conditions, streamline government processes, and foster community involvement. The project strives to improve living conditions. Ultimately, it aims to create healthier, more inclusive communities across the nation.

5. Project Overview [Short description of the Project]:

This project aims to address the complex challenges of slum redevelopment through an integrated digital solution. The approach involves developing a community app for slum residents and a web portal for government officials, leveraging modern technologies to enhance efficiency, transparency, and community engagement.

The community app provides residents with a live-location-based slum map, access to government policies, and a grievance reporting system with geotagged photos and a reward mechanism to encourage active participation. The app's interface is user-friendly, especially for individuals with limited digital literacy. It displays grievances within a specified radius, fostering communal awareness and problem-solving. It promotes local businesses of community members. Additionally, the app incorporates Allan AI for language support and accessibility, ensuring that it can be used by all residents regardless of language or literacy barriers.The transparency of government implemented policies and solved grievances bring to the light the present state of living to the entire community.

For government officials, the web portal streamlines grievance management with AI-driven departmental routing, automated email drafting using the Gemini API, and predictive models for forecasting slum growth. Additionally, an AI-generated report system offers insights based on sentiment analysis.

A blockchain-based system secures land ownership and resident data, reducing disputes and facilitating transparent relocation processes. This comprehensive digital solution aims to improve slum conditions, optimize government processes, and promote a healthier and more inclusive urban environment.

6. Motivation:

1. **Resident Participation and Empowerment:** We want to create a platform where residents can actively participate in improving their communities. The mobile app will enable them to report issues, access information about government initiatives, and voice their concerns. This empowers residents to take ownership of their communities and have a say in the redevelopment process.
2. **Improved Data Collection and Monitoring:** Currently, there is a lack of accurate and up-to- date data on slum conditions. Our project will address this by using geotag based data collection to map slum areas, track their growth, and identify critical infrastructure needs. This data will lead to more informed decision-making for redevelopment efforts.
3. **Enhanced Transparency and Efficiency:** By integrating data collection, resident participation, and potentially blockchain technology we aim to increase transparency and efficiency in slum redevelopment projects. This can help reduce land disputes, improve communication between residents and authorities, and ensure resources are allocated effectively.

7. Challenges:

1. **Sustainability:** The project's long-term sustainability requires collaboration with government agencies and NGOs to ensure continued support and integration with existing programs.
2. **Community Engagement:** Building trust with residents and encouraging their participation in the project is crucial. We need to develop effective communication strategies to ensure the project is perceived as beneficial to the community.
3. **Data Security and Privacy:** It's essential to implement robust security measures to protect resident data and ensure its privacy. We need to be transparent about data collection and usage practices.

8. Project Implementation details [Explain the methodology/technology used in implementation with proper justification)

Methodology:

The digital solution for solving the challenges of slums consists of three-pronged operations: 1) a community-centric mobile application, 2) a web portal targeted towards the government, and 3) a blockchain-based smart property contracts.

The methodology adopted would encapsulate all the steps from research to evaluation. In particular, the five phases of the proposal are: Research, Design, Development, Implementation, and Evaluation.

Phase 1: **Research and Analysis Literature Review**: A detailed study of existing research related to slum redevelopment, urban planning, and technology applications in urban development, with relevant policy frameworks. In-depth interviews and surveys of government officials, slum dwellers, NGOs, and domain experts to understand needs and expectations. All relevant data on the demographics of slums, infrastructure,property rights and socio-economic conditions have to be collected to develop analysis and modeling.

Phase 2: System Design and Development Requirements Analysis: Based on the research, specify the functional and non-functional requirements for the mobile app, web portal, and blockchain system. Overall system architecture shall be designed with respect of components, data flow and integrations.

Mobile App Development: The mobile application will be developed having user-centric design with features like live location mapping of grievances, grievance registration, policy information, community interaction and AI assistance.The app will be developed to have a separate section to show government policies,local businesses,

Web Portal Development: A web portal focusing on efficient functioning in the area of grievance management, AI-driven automation, and data analytics will be developed.A dataset is to be obtained on specific parameters so as to train one ML Model to predict the government department based on grievance content. An ML Model is also trained to generate a sentiment analysis based report for the Government in addition to the usage of Explainable AI(XAI).

Blockchain Implementation: Development of blockchain system will concentrate on secure land record management and integrity of the data with regard to interoperability of other constituents of the system. A secure contract is to be built for slum dwellers moving into flats with Solidity and Euthereum and serves as a legal tool to use in court.

Phase 3: **Implementation and Testing Pilot Testing:** The developed systems will be piloted in some selected slum area, after which feedback from users can be obtained

regarding its applicability and areas of improvement. System Integration: Integration of the mobile app, web portal, and blockchain system for smooth data exchange and functionality. User Testing: Extensive testing will be done to assess the usability, performance, and security of the developed systems.

Phase 4: Deployment and Evaluation System Deployment: The developed and tested systems will be deployed in the target slum areas. Continuous Improvement: A reward system is to be implemented to encourage slum dwellers to bring to light the problems to be addressed to the government inorder to empower and improve their conditions of living. Ethical Considerations Data privacy will be observed at all times during the project. Digital divide: There will be measures to address any digital literacy challenges that might be faced in the slums. Community engagement:The solution will seek constant engagement with the slum community to guarantee that it is tailor-made to suit the needs of the community.

Tech Stack

a. Mobile Application

- **React Native**
  - **Justification:** React Native allows for cross-platform mobile app development using a single codebase, reducing development time and costs while ensuring consistent performance across both iOS and Android platforms.
  - **Function:** Develops the mobile version of the community app, providing residents with access to slum maps, grievance reporting, and local business promotion on their smartphones.

b. MongoDB

- **Justification:** MongoDB is a NoSQL database known for its scalability and flexibility. It handles large volumes of unstructured data well, making it suitable for storing sensor data and logs.
- **Function:** MongoDB will be used to store and manage data from the community app and government web portal, including grievance records, user information, and local business details. Its flexible schema allows for easy updates and integration with various data types.

c. Web Application

- **Frontend**
  - **React.js**

- **Justification**: React.js is chosen for its component-based architecture, enabling reusable UI components and efficient rendering
- **Function**: Develops the user interface of the web application, providing a responsive and interactive experience for government officials.

- **Backend**
  - **Node.js**
    - **Justification**: Node.js is a lightweight, efficient runtime environment for executing JavaScript code server-side. It integrates seamlessly with JavaScript libraries used in the frontend, facilitating full-stack development with a unified language.
    - **Function**: Manages server-side logic, API endpoints, and data processing. It handles communication between the frontend, database, and external services.
  - **ExpressJS**
    - Minimalist framework for building Node.js web applications.

- **ML Model :**
  - **Python:** The primary language for data science and machine learning.
  - **Pandas, NumPy:** For data manipulation and numerical computations.
  - **Scikit-learn:** For machine learning algorithms (classification, regression, clustering).
  - **NLTK or spaCy:** For natural language processing tasks (sentiment analysis, text preprocessing).
  - **TensorFlow or PyTorch:** Deep learning frameworks for complex models.
  - **Grievance Categorization:** A classification model (e.g., Naive Bayes, Random Forest, Support Vector Machine) can be used to assign grievances to appropriate departments based on text content.
  - **Predictive Modeling:** Time series analysis, regression models(e.g., Random Forest, Gradient Boosting) to forecast slum growth.

- **Blockchain based Smart Contracts :**
  - **Ethereum: Decentralized platform for creating and running smart contracts.**
  - **Solidity: Programming language for writing smart contracts on Ethereum.**
  - **Truffle: Development framework for building Ethereum applications.**

9. What is the Novelty / Innovative aspects of the proposed project? :

Community-centric application: The development of a dedicated mobile application focused exclusively on the needs and concerns of slum dwellers represents a novel approach to community engagement and problem-solving.

Geospatial integration of grievances: The incorporation of geotagged grievance reporting is a unique feature that enables precise visualization and prioritization of issues within slum communities.

AI-driven grievance management: The application of artificial intelligence to automate grievance assignment and response is a groundbreaking approach to enhancing government efficiency and responsiveness.

Blockchain for secure land records: The utilization of blockchain technology to establish secure and transparent land ownership records within slum areas is a pioneering initiative with the potential to resolve longstanding land disputes.

10. SDGs:

• **SDG 3: Good Health and Well-being** by facilitating infrastructure upgrades that lead to improved sanitation and public health outcomes in slum communities.

• **SDG 10: Reduced Inequalities** by empowering residents and fostering more equitable access to basic services.

• **SDG 11: Sustainable Cities and Communities** by promoting inclusive, safe, resilient, and sustainable urban development.

• **SDG 16: Peace, Justice and Strong Institutions** by promoting community participation and accountable governance.

11. Reference Papers [Published in Last 3 years] (At least 15 references):

1.Title of the paper:

Authors:

Link:

Published in: