

AANGANCONNECT: A SMART COMMUNITY PLATFORM

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Abstract - Modern residential communities frequently grapple with the complexities of efficient management and fostering meaningful resident engagement. A significant hurdle for residents lies in effectively managing maintenance requests, participating in community events, addressing security concerns, and facilitating seamless neighbour communications. These tasks often demand considerable time and effort, leading to decreased satisfaction and participation. Our research proposes a novel solution: a Smart Community Platform. This platform is meticulously designed to streamline community living by delivering a personalized residential experience. It achieves this by employing advanced analytical capabilities to understand individual user preferences and needs. By processing this data, the system can generate customized solutions and recommendations, ranging from tailored event notifications to proactive maintenance reminders. This personalized approach is anticipated to significantly enhance community interaction and overall resident satisfaction, thereby addressing the core challenges faced by contemporary residential communities [1]. This intelligent system aims to transform the residential landscape by making community management intuitive and resident engagement effortless.

Key Words: Community Management Optimization, Personalized Resident Experience, Community Assistant, Neural Networks, Computer Vision, Smart Communities.

1. INTRODUCTION

Community residents frequently struggle with effective engagement due to overwhelming management tasks and the absence of personalized solutions. Traditional community management approaches remain rigid, time-consuming, and often fail to accommodate individual preferences and interests. Our research seeks to simplify

community living while enhancing user experience by tailoring interactions to individual requirements [1]. By examining user preferences such as maintenance priorities, event interests, and communication styles, our system generates personalized community experiences that improve upon existing solutions. Our analysis of current community management applications has identified several key challenges, including inaccurate service response estimations, limited customization options, and user interface difficulties. Our study explores how advanced computational models can optimize community engagement, increase resident satisfaction, and foster sustainable community living [2].

2. LITERATURE SURVEY

We conducted a comprehensive survey of existing Community Management applications available on Google Play. Table 1 presents key features and issues observed in these applications based on user reviews, maintaining specification integrity and user-centric evaluation. The findings revealed recurring challenges faced by residents and administrators, including limited engagement options, inaccurate service times, unintuitive interfaces, network issues, and insufficient community planning. These limitations often lead to reduced user satisfaction and hinder smooth coordination. To address these challenges, our proposed application features a streamlined and user-friendly interface to improve accessibility and usability. The system ensures faster processing and responsive performance for real-time interactions. With a modular community management structure, it facilitates efficient communication, scheduling, and issue tracking. The design supports scalability, allowing easy integration of future enhancements and third-party services. Security and data privacy have also been prioritized to build trust among users. By integrating analytics, location services, and smart notifications, our solution not only resolves current issues but also anticipates future needs, fostering an efficient and inclusive digital community experience.

TABLE I. COMMUNITY MANAGEMENT APPS WITH THEIR FEATURES AND ISSUES.

App Name	Features	Issues
Community.com	Event notifications, discounts, easy navigation	Poor support, slow interface
SmartHomes.ai	Quick schedule creation	No location tracking, limited providers
ResidenceConnect	User-friendly, note feature, quick issue fixing	Buggy buttons, manual input, weak network
MyResidence	Expense tracking, calendar, checklist	Date bug, no sync, limited device support
CommunityLog	Maintenance, reservations, bill split, budgeting	No priority setting, can't delete account
ResidenceView	Community plans, share & rate tips	Limited services
SmartView	Assistant, activity planning, route suggestions	Distant services shown, hard to use
CommunityLife	Maintenance, expenses, to-do, document attach	Inaccurate service time, uneditable tasks
CommunitySteps	Media sharing, tips, internal transport suggestions	No Google Maps, unclear service sections
ResidenceMapper	Notes, budget, offline access	Info erasure bug, limited options

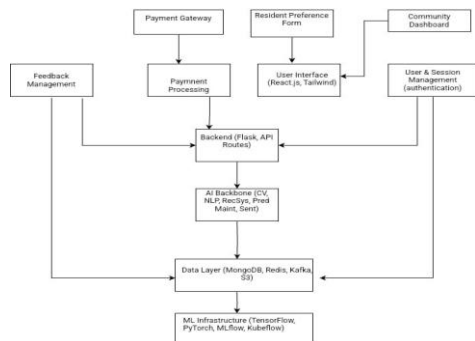
3. SYSTEM ARCHITECTURE AND METHODOLOGY

The system architecture of our smart community service outlines the key components and their functionalities. Security is ensured through advanced encryption and blockchain technology to protect user data. The user interface consists of six main pages: the landing page, login/sign-up page, resident preference form, community dashboard, feedback page, and payment gateway interface. The backend incorporates authentication services for secure login, user and session management for handling credentials, feedback management for collecting user input, and a payment processing service for transactions.

The AI backbone of the system includes:

- Computer Vision System:** Uses YOLOv5 model to process security camera feeds for automated threat detection, vehicle recognition, and occupancy monitoring of community spaces.
- Natural Language Processing:** Implements GPT-4 for resident request processing, understanding complex maintenance descriptions, and generating appropriate service tickets automatically.
- Recommendation System:** Utilizes collaborative filtering with matrix factorization and deep neural networks to suggest community events, services, and amenities based on resident preferences and historical usage patterns.
- Predictive Maintenance:** Employs Random Forest and LSTM models to predict equipment failures in community infrastructure before they occur, allowing proactive maintenance scheduling.
- Sentiment Analysis:** Implements BERT-based models to analyze resident feedback and community discussion forums, providing insights To management on community Staisifaction Level.

This structured approach ensures a seamless, secure, and efficient user experience.[4]



System Architecture Diagram: AanganConnect AI-Powered Smart Community Platform The architecture demonstrates how AanganConnect integrates multiple technologies to create a seamless experience, from user interaction through AI processing to data storage, with each layer serving a specific purpose while communicating effectively with adjacent layers.

TABLE II. TECHNOLOGIES USED TO DEVELOP A SYSTEM UNITS

Component	Description
Backend	<ul style="list-style-type: none"> • Flask Framework: Developed using Flask, a lightweight Python web framework offering routing, request handling, and template rendering. • API Routes: Multiple routes using <code>@app.route</code> handle client requests. Integrates OpenAI API, Claude API for NLP, and Razorpay API for payments. • AI Model Serving: Uses TensorFlow Serving and PyTorch for real-time inference on resident data.
Frontend	<ul style="list-style-type: none"> • React.js for dynamic UI components • TailwindCSS for responsive design • Redux for state management • WebSocket for real-time notifications

Machine Learning Infrastructure	<ul style="list-style-type: none"> • TensorFlow and PyTorch for model development • MLflow for experiment tracking • Kubeflow for ML pipeline orchestration • NVIDIA CUDA for GPU acceleration
Data Infrastructure	<ul style="list-style-type: none"> • MongoDB for user data and preferences • Redis for caching and real-time features • Apache Kafka for event streaming • Amazon S3 for media storage

TABLE III. PAGES IN THE APPLICATION

Page	Description
Homepage	Landing page with AI-powered community highlights and personalized recommendations.
About Page	Describes the mission, features, and AI technology stack of the platform.
Signup Page	Form for new users with biometric authentication options.
Login Page	Secure login with multi-factor authentication for existing users.
Resident Preference Form	AI-assisted form to gather data on preferences and community interests.
Community Dashboard	Displays personalized community info, alerts, and events. Free and premium versions (₹500 subscription).
Smart Assistant Page	AI conversational interface for community queries, requests, and bookings.
Payment Display Page	Subscription fee payment options with AI-powered fraud detection.
Feedback Page	Collects and analyzes

	resident feedback using sentiment analysis.
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4. CHALLENGES AND SOLUTIONS

The survey findings revealed several common issues faced by users in community management applications, including limited options for resident engagement, inaccurate service response times, user-friendliness concerns, network connectivity problems, and a lack of detailed community planning. To address these challenges, our application offers an intuitive and AI-powered user interface, improved performance with faster processing through edge computing, and a well-structured community management system that ensures comprehensive resident satisfaction. By enhancing these key aspects, our solution aims to provide a seamless and efficient community living experience for users. [5]

Our platform addresses several key challenges:

- Data Privacy Concerns:** Implemented federated learning approach where AI models are trained locally on devices before being aggregated, ensuring resident data stays on their devices.
- Integration with Legacy Systems:** Created custom API adapters using transformer models to interpret and standardize data from various existing community management systems.
- Real-time Response Requirements:** Implemented edge computing architecture with TinyML models deployed on local gateways to provide immediate responses for critical features.
- Inclusivity and Accessibility:** Utilized transfer learning to develop voice-controlled interfaces that work in multiple languages and dialects common in the target communities.
- Scalability Across Different Community Sizes:** Developed a microservices architecture with Kubernetes orchestration that dynamically scales based on community size and activity levels.

5. DISCUSSIONS

The development of the smart community platform involved a comprehensive approach integrating frontend and backend development, database management, API integration, styling, payment gateway implementation, user feedback mechanisms, testing, deployment, and ongoing maintenance. The backend was built using the Flask framework, ensuring efficient request handling and service integration, while the frontend utilized React.js, TailwindCSS, and WebSocket for a seamless user experience. Rigorous testing methodologies, including unit testing, integration testing, and user acceptance testing, were applied to enhance security and functionality. [6]

6. RESULT



Figure 1: Dashboard

The page you sent displays an "EMERGENCY CONTACTS" page, likely part of a community or residential management system. It shows profile cards for various essential services: Admin, Ambulance, Plumber, and Pharmacy. Each card includes a picture, the service name, and potentially contact information or a status like "Not Added By Admin." Based on the additional text you provided, this "EMERGENCY CONTACTS" page is just one component of a larger platform designed to enhance community living through AI-powered features. Scrolling through the platform would reveal functionalities such as a personalized homepage with community highlights and recommendations, an "About" page detailing the platform's mission and technology, signup and login pages with advanced security features, a resident preference form to gather data for personalization, a community dashboard displaying relevant information and events (with a premium subscription option), an AI-powered smart assistant for queries and bookings, a payment page with fraud detection, and a feedback page

that uses sentiment analysis. This comprehensive system aims to create a more connected, efficient, and responsive community environment.

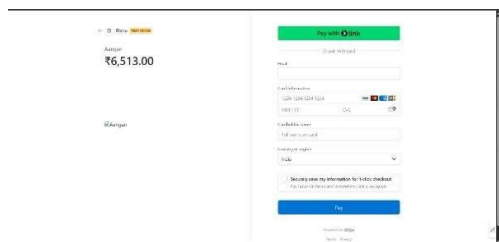


Figure 3 :-Stripe Payment Gateway Integration for AanganConnect – Test Mode Checkout Interface

Figure I above shows a test payment checkout page for the Aangan project, integrated with Stripe, a widely used online payment gateway. It is currently in test mode, indicating that no real money is being used; this is for testing or demo purposes. The checkout amount is 6,513.00 for a service titled "Aangan." Users can either pay using Stripe Link (I-click method) or by filling in their card details such as email, card number, expiry, and name. A country selector is provided, with India selected by default. There is also a checkbox to save information for faster future payments.

7. CONCLUSION

The study meticulously explored the intricate nuances of personalized community management and its profound impact on enhancing residential experiences. By thoroughly examining resident preferences, our research unveiled significant opportunities for advancing existing community technologies. A central finding underscores the critical importance of a user-centered design approach in developing community management systems. Such systems are engineered to tailor resident experiences based on individual needs, encompassing preferred communication methods, diverse event interests, and prioritized service requirements. A pivotal aspect of these advanced systems lies in their leveraging of transformer-based machine learning algorithms. These algorithms are instrumental in analyzing vast datasets of community information, thereby enabling the generation of highly personalized recommendations and fundamentally revolutionizing traditional community management methodologies [8]. Beyond this core, the proposed "AanganConnect" platform further integrates cutting-edge technologies. It incorporates computer vision for enhanced security, utilizes natural language processing for seamless communication, and employs predictive analytics for proactive maintenance. This

synergistic integration creates a truly intelligent and adaptive community ecosystem, capable of evolving to meet the unique and dynamic needs of each residential community, fostering a more harmonious and efficient living environment.

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