REVOLUTIONING HOME DESIGN:AI-POWERED HOUSE PLANNING AND VISUALIZATION

A Project Report

submitted to

the APJ Abdul Kalam Technological University

in partial fulfillment of the requirements for the degree of

Bachelor of Technology

by

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DECLARATION

We hereby declare that the project report **REVOLUTIONING HOME DESIGN:AI-POWERED HOUSE PLANNING AND VISUALIZATION**, submitted for partial fulfillment of the requirements for the award of degree of Bachelor of Technology of the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by under supervision of **Ms. Aiswarya M R** .

This submission represents our ideas in our own words and where ideas or words of others have been included, we have adequately and accurately cited and referenced the original sources.

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Abstract

Our proposed system is an innovative AI-powered app that helps users design their dream homes effortlessly, tailored to their budget, family needs, and style preferences. By leveraging AI, the app generates affordable, functional, and aesthetically pleasing house designs while providing smart construction insights, cost-effective material suggestions, and guidance on government housing subsidies. The system allows users to input preferences such as budget, plot size and dimensions, requirements such as bedrooms, kitchens, workspaces etc. to generate the basic floor plan which paves the foundation for their homes. Users can save these designs for future reference or download it. Users will be provided with a feature for material estimate. Users can easily get information regarding government subsidies. The system also connects users with verified architects, thus allowing them to view their designs and previous works. The system would be ideal for first-time homeowners, low/middle-income families, architects and contractors looking for AI assisted design tools.

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Chapter 1

Introduction

1.1 General Background

In recent years, the integration of Artificial Intelligence (AI) into the construction and architecture industries has significantly transformed the way homes are designed and planned. Traditional house design processes often require extensive manual work, consultation with architects, and high costs, making them inaccessible for many families—especially first-time homeowners and those with limited budgets. With rapid technological advancements, AI-based systems now enable automated, efficient, and user-friendly design solutions that cater to personalized needs, budgets, and lifestyle preferences. The proposed AI-powered house design application aims to bridge the gap between professional architectural design and affordability. The system enables users to generate customized and visually appealing floor plans based on inputs such as budget, plot size, number of rooms, and family requirements. Beyond layout creation, the system provides valuable features such as material cost estimation, sustainable design recommendations, and guidance on government housing schemes and subsidies. This empowers users to make informed and cost-effective decisions during the planning and construction phases. Furthermore, the platform facilitates collaboration by connecting users with verified architects, contractors, and suppliers, ensuring the quality and feasibility of the proposed designs. Through this digital approach, home design becomes more accessible, transparent, and efficient. The system particularly benefits first-time homeowners, low- and middle-income families, and professionals seeking AI-assisted tools for rapid and reliable planning.

1.2 Problem Defintion

The project aims to develop an AI-based platform that offers affordable and accessible house design solutions by generating personalized floor plans a based on user needs, budgets, and lifestyles, while also providing intelligent suggestions for suitable materials, cost estimation, guidance on government housing schemes, and connections with verified architects, workers, and suppliers to ensure reliability and quality.

1.3 Scope of the system

The proposed AI-powered house design system focuses on making home planning and construction more accessible, affordable, and intelligent. The system allows users to generate customized floor plans and visualizations by entering key preferences such as budget, plot size, number of rooms, and family requirements. In addition to design generation, the system provides smart suggestions for suitable building materials, cost estimation, and energy-efficient design alternatives. It also assists users by offering detailed information on government housing schemes and subsidies, helping them plan economically viable housing projects. The platform further enhances collaboration by connecting users with verified architects, contractors, and material suppliers, enabling professional validation and smoother construction processes. Designed for both individuals and professionals, the system caters to first-time homeowners, low- and middle-income families, architects, and small-scale builders seeking AI-assisted tools for efficient design and planning. Overall, the system aims to revolutionize the traditional home design process by integrating automation, cost-effectiveness, and sustainability into a single, user-friendly digital platform.

1.4 Objective

The main objective of the proposed system is to develop an AI-powered application that simplifies and automates the process of home design and planning. It aims to provide affordable and accessible house design solutions by generating personalized floor plans based on user preferences such as budget, plot size, and family needs. The system assists users in construction planning by offering intelligent suggestions for suitable building materials, accurate cost estimation, and energy-efficient design ideas. It also supports informed decision-making by providing guidance on government housing schemes and subsidies, making home ownership more economical. Furthermore, the system enables collaboration by connecting users with verified architects, contractors, and suppliers for reliable and professional assistance, while promoting sustainable and resource-efficient housing practices.

Chapter 2

Literature Survey

2.1 Semi-Automatic Building Layout Generation for Virtual Environments

The paper "Semi-Automatic Building Layout Generation for Virtual Environments" by Sepúlveda et al. (2024) presents a novel approach to efficiently create building layouts for virtual environments. The main objective of the study is to reduce the time, effort, and complexity involved in manual building design while maintaining functional and visually coherent layouts. The system combines computational algorithms with user input to produce complete building designs, making it particularly useful in applications such as virtual reality simulations, architectural visualization, gaming, and urban planning. The paper highlights how semi-automatic methods can streamline the design process, allowing designers and users to focus more on creativity and overall planning rather than manual drafting of every detail.

2.1.1 Methedology

The methodology of the paper uses a semi-automatic, hybrid approach. Initially, the user provides essential inputs like room dimensions, plot boundaries, connectivity rules between spaces, and overall building constraints. The system then uses procedural generation algorithms and optimization strategies to automatically generate complete building layouts that are functional, aesthetically consistent, and adaptable to different scenarios. This approach ensures that the generated layouts follow design rules while still allowing flexibility and creativity. By combining algorithmic efficiency with human guidance, the methodology significantly reduces the effort required for layout planning while producing practical and visually appealing designs.

2.1.2 Relevance

This study is highly relevant to our AI-powered home design system, which aims to help users create personalized home layouts based on their budget, plot size, and room requirements. Similar to the semi-automatic approach in the paper, our app allows users to enter their preferences, and the AI generates optimized floor plans automatically. By leveraging such algorithmic techniques, our system can provide functional, cost-effective, and aesthetically pleasing designs while also offering additional features like material estimation, construction insights, and guidance on government housing subsidies. The approach ensures that even first-time homeowners, low- and middle-income families, and architects can access smart, efficient, and user-friendly tools for home planning. Incorporating these insights from the paper can improve workflow, reduce manual effort, and enhance the overall user experience by combining automation with user customization.

2.2 Transparent and reliable construction cost prediction using advanced machine learning and explainable AI

The paper “Transparent and Reliable Construction Cost Prediction Using Advanced Machine Learning and Explainable AI” by Chen et al. (2025) presents a modern approach for accurately predicting construction costs using advanced machine learning

(ML) techniques combined with explainable AI (XAI). The study emphasizes not only the precision of cost prediction but also the transparency of the results, allowing stakeholders to understand how predictions are made. This is crucial in construction and housing projects, where budgeting errors can cause delays, overspending, and resource mismanagement. The paper demonstrates that combining ML with XAI improves reliability, interpretability, and trust in automated cost estimation systems.

2.2.1 Methedology

The methodology involves collecting historical construction project data, including material costs, labor, project scale, and other influencing factors. Advanced machine learning models, such as ensemble learning and deep learning algorithms, are applied to predict the total construction cost based on these inputs. To ensure transparency and interpretability, explainable AI techniques like SHAP (SHapley Additive exPlanations) are used to show which factors contribute most to the predicted costs. This combination allows both accurate prediction and clear insights for users, enabling better decision-making during planning and execution.

2.2.2 Relevance

This paper is highly relevant to our AI-powered home design system because cost prediction is a critical feature for users planning their dream homes. By integrating ML and XAI techniques similar to those in the study, our system can provide reliable construction cost estimates based on user inputs like plot size, number of rooms, materials, and design preferences. The explainable AI component ensures that users understand how costs are calculated and which factors influence them, increasing trust and usability. Incorporating these methods in our app allows users to make informed budgeting decisions, compare cost-effective alternatives, and plan construction efficiently, aligning perfectly with our goal of providing affordable, functional, and AI-assisted home designs.

2.3 AI-driven design optimization for sustainable buildings: A systematic review

The paper “AI-Driven Design Optimization for Sustainable Buildings: A Systematic Review” by Manmatharasan et al. (2025) provides a comprehensive overview of how artificial intelligence can be applied to optimize building designs for sustainability. The study reviews various AI techniques used in architecture and construction to enhance energy efficiency, reduce material waste, and improve overall environmental performance. It highlights the potential of AI in creating buildings that are both cost-effective and environmentally friendly while maintaining functionality and comfort for occupants.

2.3.1 Methedology

The methodology of the paper is based on a systematic literature review of existing research on AI-driven sustainable building design. The authors analyze studies that use machine learning, optimization algorithms, and AI-based simulation tools to optimize building parameters such as energy consumption, material usage, ventilation, lighting, and overall environmental impact. By comparing different AI techniques, the paper identifies key trends, advantages, and limitations in current approaches, providing insights into effective strategies for sustainable building design.

2.3.2 Relevance

This paper is highly relevant to our AI-powered home design system because it emphasizes the importance of integrating sustainability and efficiency in building design. By incorporating AI-driven optimization techniques, our system can suggest energy-efficient layouts, cost-effective materials, and environmentally responsible design choices while generating floor plans. The insights from the paper can help our app provide smarter, sustainable, and user-friendly home design solutions, ensuring that users not only get functional and aesthetically pleasing homes but also reduce long-term energy costs and environmental impact. It also supports the goal of offering AI-assisted guidance to first-time homeowners and families on designing homes that are efficient, practical, and sustainable.

2.4 Generative artificial intelligence in construction: A Delphi approach, framework, and case study

The paper "Generative Artificial Intelligence in Construction: A Delphi Approach, Framework, and Case Study" by Taiwo et al. (2025) explores the application of generative AI techniques in the construction industry. It presents a framework for using AI to automate design generation, optimize construction processes, and improve decision-making. The study emphasizes the potential of generative AI to transform traditional construction workflows by increasing efficiency, reducing errors, and enabling more creative and adaptive design solutions.

2.4.1 Methedology

The methodology in this paper combines a Delphi study, framework development, and practical case study analysis. Experts in construction and AI were consulted to identify key challenges, opportunities, and best practices for implementing generative AI. The proposed framework integrates AI-driven design generation with process optimization, allowing for automated creation of building layouts, estimation of resources, and planning of construction sequences. The case study demonstrates how the framework can be applied in real-world scenarios to produce efficient and feasible building designs.

2.4.2 Relevance

This paper is directly relevant to our AI-powered home design system because it highlights how generative AI can automate and optimize building design processes.

By adopting similar AI techniques, our app can generate personalized home layouts quickly and efficiently based on user inputs like plot size, room requirements, and budget. The framework also supports integrating additional features, such as material estimation, cost analysis, and design feasibility checks, which are important for first-time homeowners, families, and architects. Leveraging insights from this study can help our system provide creative, adaptive, and AI-assisted home designs, improving both usability and reliability for end users.

2.5 AI in Civil Engineering

The paper "AI in Civil Engineering" by X. Zhao (2022) provides an overview of how artificial intelligence (AI) is being applied in civil engineering to improve design, construction, and maintenance processes. It highlights the potential of AI technologies, including machine learning, computer vision, and optimization algorithms, to enhance efficiency, accuracy, and decision-making in civil engineering projects. The study emphasizes that AI can support various tasks such as structural design, project planning, cost estimation, and predictive maintenance.

2.5.1 Methedology

The methodology is primarily a comprehensive review and analysis of existing AI applications in civil engineering. The paper examines case studies, algorithms, and AI-driven tools used across different phases of construction projects, from initial design to construction management. Zhao categorizes the AI applications into predictive modeling, optimization, automation, and monitoring, highlighting their benefits and limitations in real-world scenarios.

2.5.2 Relevance

This paper is relevant to our AI-powered home design system as it provides a broad understanding of AI applications in civil engineering, which can be adapted for home design and construction planning. Insights from this study can help our system incorporate AI techniques for accurate floor plan generation, construction cost prediction, material estimation, and project optimization. By leveraging AI, our app can assist first-time homeowners, architects, and contractors in making informed design and construction decisions, improving efficiency, reducing errors, and ensuring functional and aesthetically pleasing home designs.

2.6 Generative AI in the Construction Industry: Opportunities and Challenges

The paper "Opportunities and Challenges of Generative AI in Construction Industry: Focusing on Adoption of Text-Based Models" by Ghimire et al. (2024) explores how generative AI, particularly text-based models, can be applied in the construction industry. The study discusses the potential of AI to automate design generation, improve project planning, and enhance communication between stakeholders. It also highlights the challenges in adoption, including data quality, integration with existing workflows, and trust in AI-generated designs.

2.6.1 Methedology

The methodology involves a review and analysis of recent research and industry practices regarding generative AI in construction. The authors examine case studies where text-based AI models are used for conceptual design, documentation, and decision support. They identify opportunities for improving efficiency, reducing errors, and facilitating creative solutions while also discussing barriers to adoption, such as technical limitations, regulatory compliance, and stakeholder acceptance.

2.6.2 Relevance

This paper is relevant to our AI-powered home design system as it provides insights into using generative AI for automating and enhancing design processes. By understanding the opportunities and challenges outlined, our system can adopt AI techniques to generate home layouts, suggest design alternatives, and assist users in planning their homes efficiently. Moreover, the study highlights the importance of integrating AI responsibly and transparently, which aligns with our goal of providing users with reliable, personalized, and explainable design recommendations. This ensures that first-time homeowners, architects, and contractors can confidently use the app for practical, cost-effective, and creative home planning solutions.

2.7 Transforming the civil engineering sector with generative artificial intelligence, such as ChatGPT or Bard

The paper "Transforming the Civil Engineering Sector with Generative Artificial Intelligence, such as ChatGPT or Bard" by Rane et al. (2024) discusses how generative AI tools can revolutionize civil engineering practices. It highlights the role of advanced AI models, including ChatGPT and Bard, in automating design tasks, generating construction documentation, providing expert guidance, and improving decision-making. The study emphasizes the transformative potential of AI in enhancing efficiency, reducing human error, and enabling creative and data-driven solutions in civil engineering projects.

2.7.1 Methedology

The methodology is based on a comprehensive review of recent applications and experiments involving generative AI in civil engineering. The authors analyze case studies, explore AI-assisted workflows, and evaluate the benefits and limitations of using language-based AI models for design support, documentation, and construction planning. The study also identifies best practices for adopting generative AI responsibly in real-world engineering scenarios.

2.7.2 Relevance

This paper is highly relevant to our AI-powered home design system, as it highlights the potential of generative AI to automate and enhance design workflows. By leveraging similar AI tools, our system can assist users in generating optimized floor plans, providing smart construction insights, and offering explanations for design and cost decisions. The study also reinforces the importance of transparency, usability, and reliability in AI-assisted systems, ensuring that homeowners, architects, and contractors can trust and effectively use AI-driven recommendations in home planning. Incorporating these insights can make our app more efficient, creative, and user-friendly, aligning perfectly with our goal of providing AI-assisted home design solutions.

2.8 AI in automated sustainable construction engineering management

The paper "AI in Automated Sustainable Construction Engineering Management" by Elmousalami et al. (2025) explores the application of artificial intelligence in automating construction engineering processes while emphasizing sustainability. The study focuses on how AI can optimize resource management, scheduling, cost estimation, and environmental impact assessment in construction projects. It highlights the potential of AI to improve efficiency, reduce waste, and support sustainable practices in building and infrastructure development.

2.8.1 Methedology

The methodology involves implementing AI-driven automation techniques in construction management processes. The authors analyze the use of machine learning, predictive analytics, and optimization algorithms to manage tasks such as material allocation, labor scheduling, and energy-efficient design. The study evaluates these approaches for their ability to enhance sustainability and operational efficiency while minimizing human errors and project delays.

2.8.2 Relevance

This paper is relevant to our AI-powered home design system because it provides insights into incorporating AI for automated and sustainable construction planning. By applying similar AI techniques, our system can offer users guidance on cost-effective material selection, energy-efficient design choices, and optimized scheduling for home construction. Integrating these approaches ensures that our app not only generates functional and aesthetically pleasing home layouts but also promotes sustainable and practical building practices. This aligns with our project's goal of providing AI-assisted solutions that are efficient, environmentally responsible, and user-friendly for homeowners, architects, and contractors.

2.9 Cost Estimation Model Based on Building Information Modeling and Virtual Reality for Customizing Presold Homes

The paper "Cost Estimation Model Based on Building Information Modeling and Virtual Reality for Customizing Presold Homes" by Wang and Tung (2023) presents a framework for accurately estimating construction costs for customizable homes using Building Information Modeling (BIM) combined with Virtual Reality (VR). The study emphasizes improving cost transparency and visualization for presold or client-specific homes, enabling better planning, budgeting, and client decision-making. By integrating VR, users can experience and assess design choices in an immersive environment before construction begins.

2.9.1 Methedology

The methodology involves creating a cost estimation model that uses BIM data to calculate quantities, materials, and labor costs. VR technology is integrated to allow clients and designers to visualize layouts, make modifications, and evaluate design impacts on cost in real-time. The approach combines data-driven estimation with interactive design visualization, enhancing accuracy, efficiency, and user engagement in home customization.

2.9.2 Relevance

This paper is highly relevant to our AI-powered home design system, as it demonstrates how BIM and VR can be combined with predictive models to provide accurate cost estimates and interactive design visualization. By incorporating similar techniques, our system can help users not only generate optimized floor plans but also understand the cost implications of their design choices. The VR-like visualization and real-time cost feedback enhance user experience, enabling homeowners, architects, and contractors to make informed decisions, plan efficiently, and design functional, affordable, and personalized homes.

2.10 Comprehensive and Dedicated Metrics for Evaluating AI-Generated Residential Floor Plans

The paper “Comprehensive and Dedicated Metrics for Evaluating AI-Generated Residential Floor Plans” by Zeng et al. (2025) focuses on establishing a framework to evaluate the quality, functionality, and usability of AI-generated residential floor plans. The study emphasizes that generating floor plans using AI is not enough; there must be clear, objective metrics to assess their practicality, design coherence, and user satisfaction. This research helps ensure that AI-generated designs are both efficient and suitable for real-world residential construction.

2.10.1 Methedology

The methodology involves defining and applying comprehensive evaluation metrics that assess multiple aspects of AI-generated floor plans, including spatial efficiency, room connectivity, accessibility, and adherence to design standards. The authors analyze a variety of AI-generated layouts and use these metrics to quantify their quality and usability. This structured evaluation allows designers and developers to improve AI models and ensure that generated layouts meet functional and aesthetic requirements.

2.10.2 Relevance

This paper is highly relevant to our AI-powered home design system because it provides guidelines for assessing the quality and effectiveness of AI-generated floor plans. By applying similar metrics, our system can ensure that the layouts it generates are functional, practical, and aesthetically appealing while meeting user requirements such as room connectivity, plot constraints, and usability. This allows homeowners, architects, and contractors to trust the AI-generated designs, make informed adjustments, and ultimately create homes that are both efficient and customized to the user's needs.

2.11 Quantity Surveying and its Association with Building Information Modeling (BIM) and Digital Twin (DT)

The paper "Quantity Surveying and its Association with Building Information Modeling (BIM) and Digital Twin (DT)" by Joel Ochieng' Wao (2024) explores how quantity surveying can be integrated with BIM and digital twin technologies to enhance construction project planning, cost estimation, and management. The study highlights the benefits of using digital tools to provide accurate material quantities, reduce errors, and improve decision-making throughout the construction lifecycle. It emphasizes the increasing role of digital technologies in modern civil engineering practices.

2.11.1 Methedology

The methodology involves analyzing the integration of quantity surveying practices with BIM and digital twin models. The study examines how these technologies enable automated extraction of material quantities, cost estimation, and real-time project monitoring. By using BIM and DT, construction professionals can simulate, visualize, and optimize building processes before actual construction, reducing errors and improving resource management.

2.11.2 Relevance

This paper is relevant to our AI-powered home design system because it provides insights into using BIM and digital twin concepts to enhance cost estimation, material planning, and project visualization. By incorporating similar techniques, our system can offer users accurate material estimates, cost predictions, and interactive floor plan previews. This supports homeowners, architects, and contractors in making informed decisions, planning efficiently, and ensuring that AI-generated home designs are practical, affordable, and feasible for real-world construction.

Chapter 3

Requirement Specifications

3.1 Functional Requirements

The user interface of the proposed AI-powered home design system is designed to be simple, intuitive, and user-friendly. It allows users to easily enter their preferences such as budget, plot size, number of rooms, and style choices through interactive forms and dropdown menus. The interface provides real-time visual feedback by displaying generated floor plans and material estimates in an organized layout. Clear navigation menus guide users to different features such as plan generation, cost estimation, material selection, and architect consultation. Both web and mobile versions of the interface ensure accessibility, while a chatbot feature assists users in clarifying doubts and receiving design suggestions. The overall interface design focuses on ease of use, responsiveness, and smooth interaction for all types of users, including those with minimal technical knowledge.

3.2 Non Functional Requirements

The non-functional requirements of the proposed system ensure that it performs efficiently, securely, and reliably under all conditions. The system is designed to provide fast response times when generating floor plans or estimating costs, ensuring smooth performance even with large datasets. It emphasizes data security by safely storing user information and preventing unauthorized access. The interface is responsive and compatible across multiple platforms, including web and mobile devices, allowing users to access the application anytime and anywhere. The system also focuses on scalability, enabling future upgrades and the addition of new features without major redesign. Moreover, it maintains high usability standards so that users of all backgrounds can navigate and operate the application easily.

3.3 Software Requirements

3.3.1 Programming – Python, Dart

Python is a versatile and powerful programming language widely used for artificial intelligence, machine learning, and backend development. It is known for its simple syntax, readability, and vast library support. In this system, Python is mainly used to implement the AI modules that generate house designs, perform material estimation, and process user data. Its frameworks and libraries make it suitable for developing scalable and efficient applications.

Dart is an object-oriented programming language developed by Google and is mainly used for building fast and interactive cross-platform mobile applications. In this system, Dart is used along with the Flutter framework to create smooth and responsive user interfaces for Android and iOS devices. It allows users to interact seamlessly with the system through an intuitive mobile interface.

3.3.2 Frameworks – NLTK, NLP

NLTK (Natural Language Toolkit) is a Python library used for working with human language data. It helps the system understand and process user inputs such as budget, plot size, and room requirements. NLP (Natural Language Processing) techniques enable the system to interpret user preferences and convert them into meaningful data for AI-based design generation. These frameworks enhance the system's intelligence and make interaction more natural and user-friendly.

3.3.3 Feature Extraction – Pandas, NumPy, NLTK

Pandas and NumPy are essential Python libraries used for data analysis and manipulation. Pandas is used to handle structured data such as user information, cost details, and material lists, while NumPy provides efficient mathematical and statistical operations that support AI model computations. Together with NLTK, these libraries help extract relevant features from input data, allowing the system to analyze and generate accurate results for floor plans and cost estimation.

3.3.4 Front End – HTML, CSS, Bootstrap, JavaScript, Flutter

HTML (HyperText Markup Language) is used to design the basic structure of web pages in the system. It defines the layout and elements of the interface, such as text boxes, buttons, and links, which allow users to input their preferences and navigate easily.

CSS (Cascading Style Sheets) is used to enhance the appearance of the web pages. It controls the color, font, layout, and overall visual design, making the application more appealing and user-friendly.

Bootstrap is a responsive front-end framework that provides ready-made design components such as navigation bars, modals, and grids. It ensures that the web interface looks consistent across all screen sizes and devices.

JavaScript is a scripting language that adds interactivity and dynamic behavior to the web application. It enables real-time updates such as displaying generated floor plans, showing cost estimations, and improving user experience.

Flutter is a UI development framework based on Dart. It is used to build cross-platform mobile applications for Android and iOS. In this system, Flutter allows users to access all the features of the home design application through a smooth and responsive mobile interface.

3.3.5 Back End – Python, MySQL, Dart

Python serves as the main backend language that manages AI algorithms, user requests, and system logic. It handles operations such as generating floor plans, estimating costs, and managing user data. Its simplicity and efficiency make it suitable for building reliable backend systems.

MySQL is an open-source relational database management system used to store and manage data efficiently. It maintains information such as user profiles, project details, material lists, and design data. MySQL ensures fast data retrieval and secure storage.

Dart is also used in the backend to manage communication between the Flutter-based front-end and the Python server. It ensures smooth data transfer and synchronization, providing users with real-time responses and updates during interaction.

3.3.6 Hugging face model

Hugging Face is a key player in the AI industry, known for its commitment to open-source AI. It provides a central platform where developers and researchers can collaboratively build, share, and deploy AI models. It hosts hundreds of thousands of free, open-source models and datasets.

Chapter 4

Propose System and Design

4.1 Proposed System

The proposed system employs advanced artificial intelligence techniques to generate personalized house floor plans based on user inputs such as budget, plot size, and family requirements. By analyzing the data provided by the user, the system automatically creates functional and aesthetically pleasing floor plans that meet the specified needs. User can also get recommendation from a pre-set collection of floor plans. Here the recommendation is done with the help of natural language processing (NLP). The user input is compared with the descriptions of available plans to find the similarity score of each plan with user input. Based on the similarity score, most matching plans are provided as output. In addition to design generation, the system provides intelligent suggestions for suitable building materials, cost estimation, and energy-efficient options to ensure affordability and sustainability. Users can also access information on relevant government housing subsidies and connect with verified architects or contractors for professional assistance. Overall, the system combines AI-driven automation with user-friendly interaction to make home planning smarter, faster, and more accessible to everyone.

4.2 Feasibility Study

4.2.1 Technical Feasibility

The proposed system is technically feasible as it utilizes widely available and reliable technologies for both development and deployment. The application can be efficiently built using programming languages such as Python, Dart, HTML, and JavaScript, along with frameworks like Flutter and Bootstrap, which support cross-platform compatibility. The backend infrastructure, powered by MySQL, ensures secure and efficient data handling. The AI components, developed using machine learning and natural language processing (NLP) libraries such as NumPy, Pandas, and NLTK, can be implemented on standard computing systems without the need for high-end hardware. Since all the required tools, libraries, and platforms are open-source and well-documented, the system can be easily developed, maintained, and upgraded, making it technically practical and achievable.

4.2.2 Operational Feasibility

The proposed system is operationally feasible as it is designed to be user-friendly, efficient, and easily accessible to all types of users, including those with minimal technical knowledge. The interactive interface allows users to input details such as budget, plot size, and design preferences with ease and receive instant AI-generated floor plans and cost estimates. The system's chatbot and clear navigation menus further simplify user interaction, ensuring a smooth experience. Since the application can be accessed through both web and mobile platforms, it provides flexibility for users to operate it anytime and anywhere. Additionally, the system's ability to connect users with architects, workers, and material suppliers enhances its practicality, making it a convenient and valuable tool for real-world home design and construction planning.

4.2.3 Economic Feasibility

The proposed system is economically feasible as it minimizes the overall cost of home design and construction planning for users. By integrating AI-based design generation, cost estimation, and material suggestions, the system reduces the need for expensive architectural consultations and manual planning. Most of the technologies and tools used, such as Python, MySQL, and Flutter, are open-source and free, which significantly lowers development expenses. The system also helps users save money by providing accurate budget planning, suggesting cost-effective materials, and guiding them on available government housing subsidies. Since the platform can be maintained and upgraded with minimal additional cost, it offers a long-term, affordable solution for both developers and users.

4.3 Design

4.3.1 Architecture Diagram

An architectural diagram is a visual representation that maps out the physical implementation for components of a software system. It is an important tool as it provides an overall view of the physical deployment of the software system and its evolution road map. It shows the general structure of the software system and the associations, limitations, and boundaries between each element.

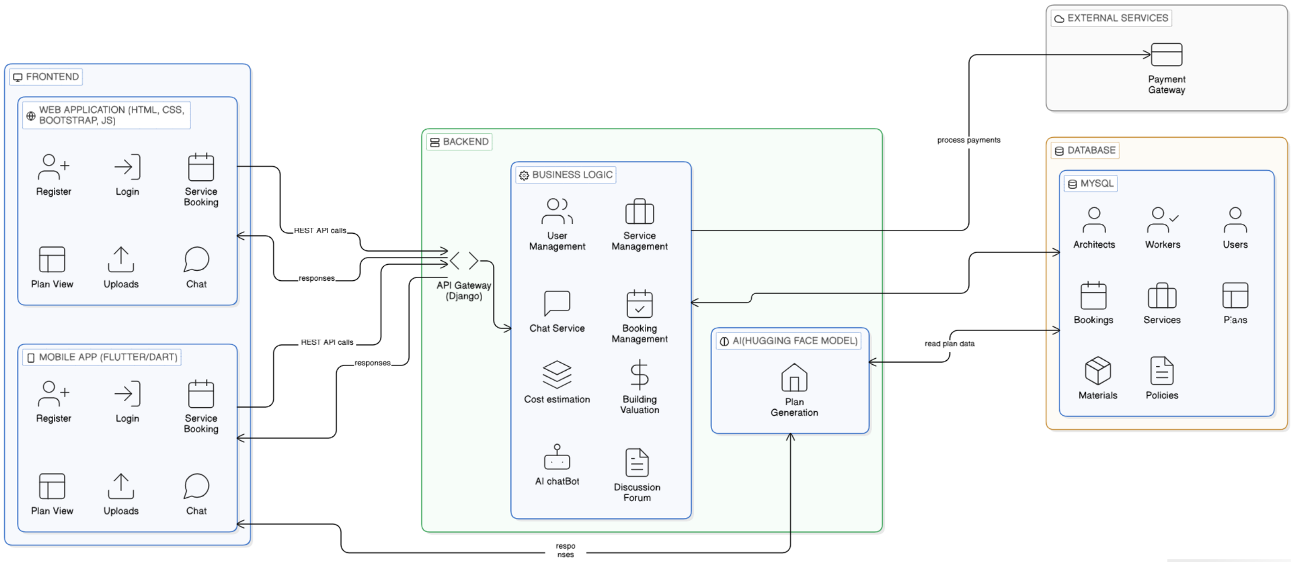

Figure 4.1: Architecture Diagram

4.3.2 Use case Diagram

This use case diagram illustrates the interactions between key users—Admin, Client, and Worker/Architect/Material Supplier—and the main modules of the construction management system. It covers core processes such as Login and Register for secure access, Service Management for connecting clients with service providers, and Booking for scheduling services or consultations. The Chat feature enables real-time communication, while the Plan Generation module allows professionals to share customized building designs with clients. Additionally, the Building Valuation use case offers accurate project cost estimations, helping clients make informed decisions. Overall, the diagram highlights an integrated system that ensures efficient coordination, transparency, and effective communication among all stakeholders in the construction process.

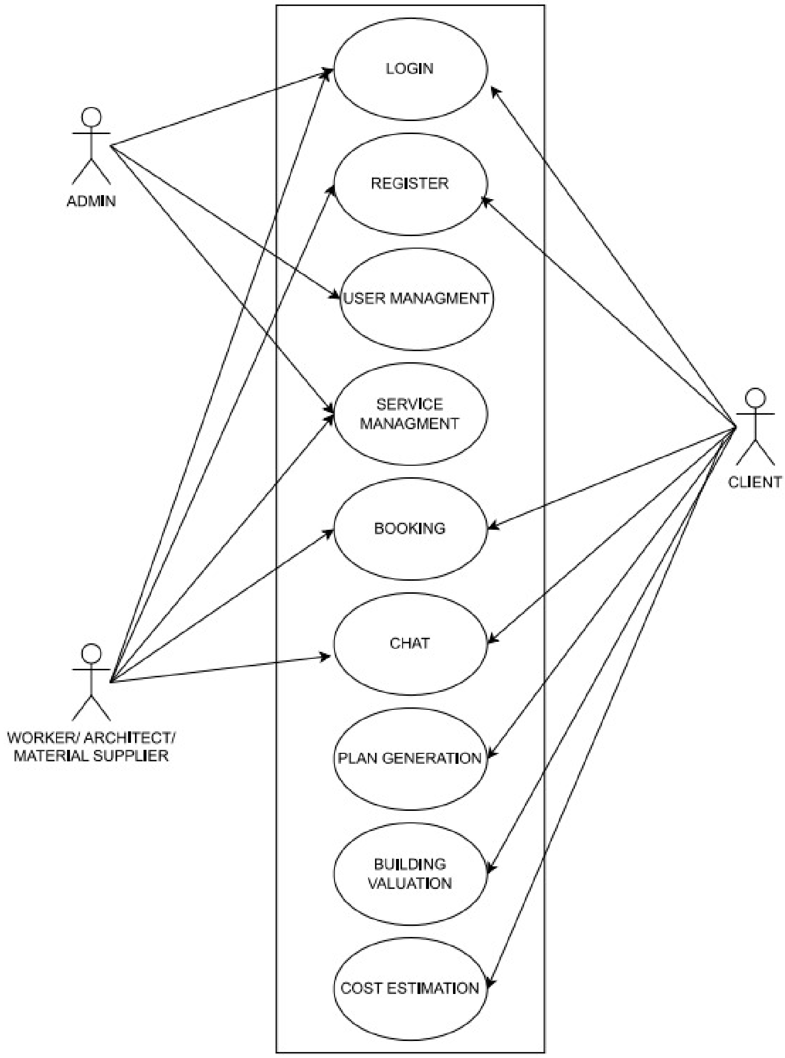

Figure 4.2: Use Case Diagram

4.3.3 Data Flow Diagram

A Data Flow Diagram (DFD) is a visual representation of the information flows within a system.It provides information about how data enters and exits the system, changes made on the system, and where the data is stored.

Level 0 : In Level 0, the entire system is shown as a single process where the user provides data for plan generation or building valuation. The system processes this input and interacts with the database to fetch or store information, then returns the result to the user.

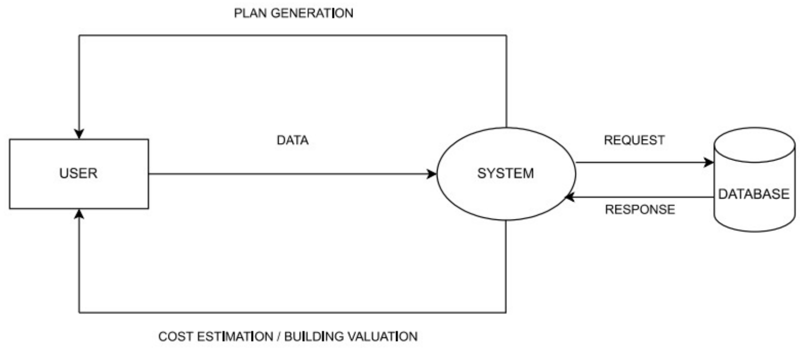

Figure 4.3: Level 0

Level 1 : In Level 1, the system is represented with its main components — admin, user, system, and database. The admin manages data, and the user provides inputs which are processed by the system. The system sends requests to the database and retrieves responses to generate results for the user.

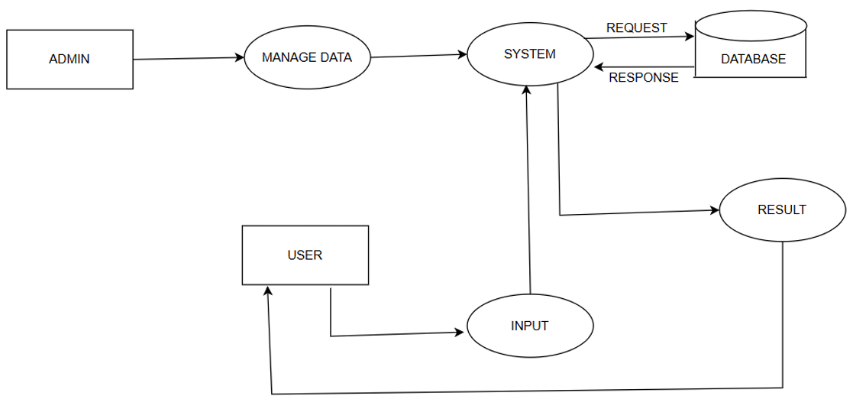

Figure 4.4: Level 1

Level 2 : At Level 2 of the Data Flow Diagram, the complete working of the system is illustrated in detail. The process begins with the admin managing and updating project-related data such as materials, costs, and design parameters, which are stored securely in the database. The user interacts with the system by entering project-specific inputs for plan generation or building valuation. The system then sends a request to

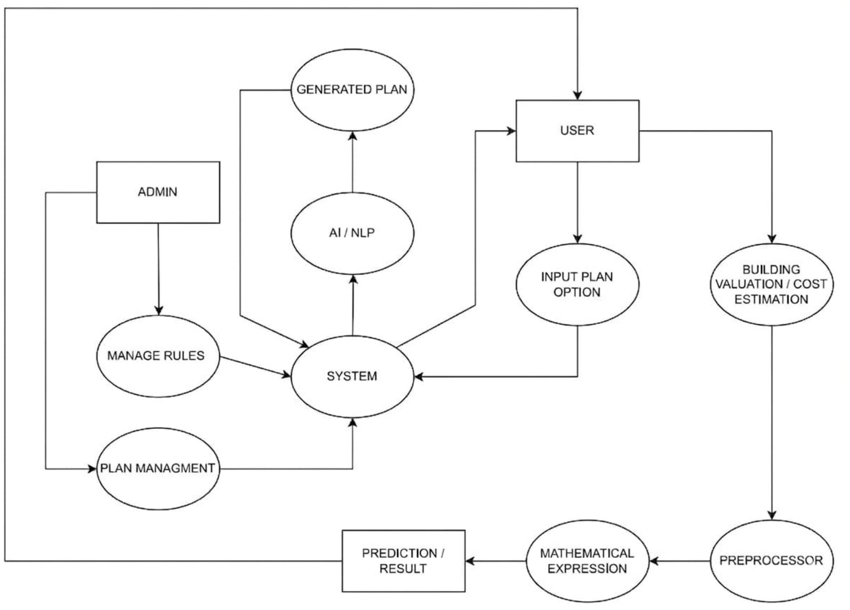

Figure 4.5: Level 2

the database, retrieves the necessary information, and performs computations or data analysis based on the user's requirements. The processed results, including building plans or valuation reports, are then displayed to the user in a structured format. This level provides a clear picture of how data flows between admin, user, system, and database, ensuring accurate plan generation and efficient decision-making within the construction management process.

4.3.4 ER Diagram

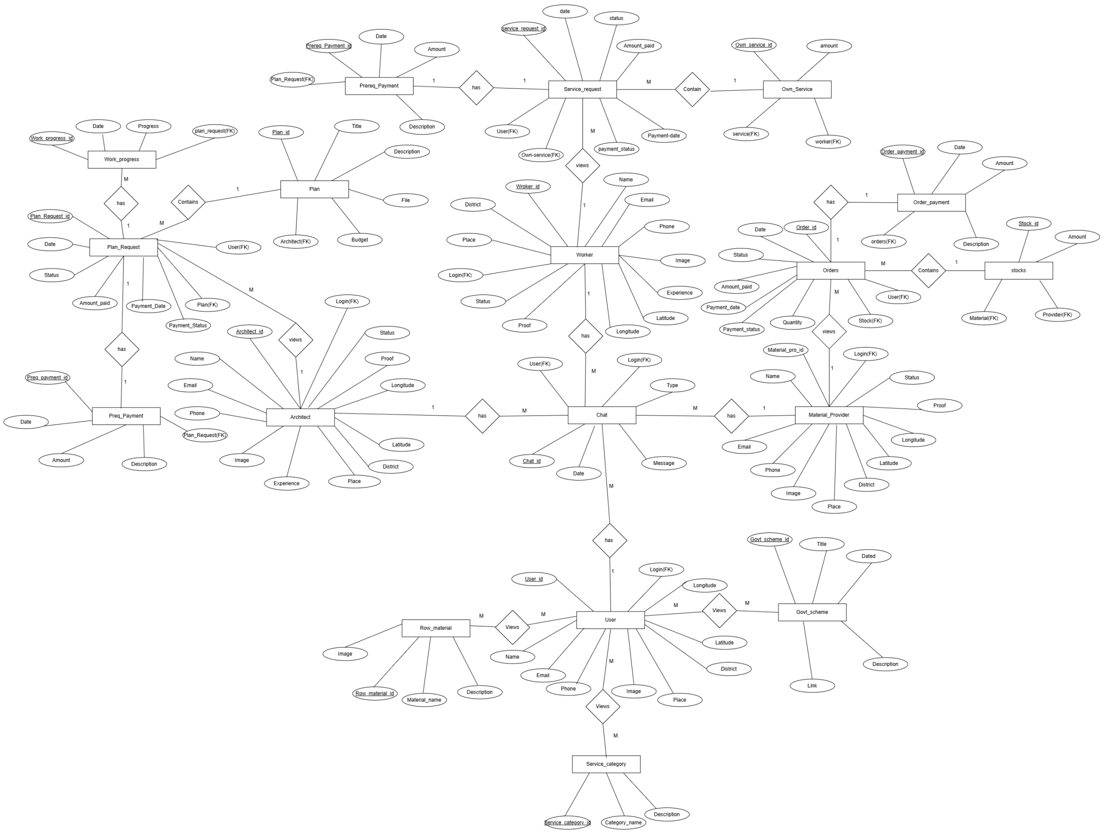

Figure 4.6: ER Diagram

4.4 Methods and Techniques

4.4.1 House Plan Generation

The house plan generation feature is the main part of the proposed system that creates personalized floor plans based on the user's needs and preferences. When users enter details such as plot size, dimensions, budget, and the number of rooms like bedrooms, kitchens, and workspaces, the system automatically generates a suitable and well-organized layout. It focuses on making the best use of space while keeping the design practical, comfortable, and attractive. This feature makes it easy for anyone to create a house plan quickly without needing expert design skills. The plan can either be generated by AI or collected from the database.

4.4.2 Building Valuation

The building valuation process utilizes a structured computational approach to estimate the present value of a property based on specific user-provided details. It begins by collecting essential information such as the type of roofing, construction materials, structural condition, and the age of the building. These inputs form the foundation for evaluating the overall quality and durability of the structure. The system then applies a predefined valuation formula that incorporates factors such as base construction cost, material specifications, and depreciation rate. Depreciation is calculated according to the building's age and current condition, ensuring that wear and tear are accurately reflected in the final estimate. The valuation process is designed to be straightforward and user-friendly, allowing individuals to obtain reliable cost estimates without requiring technical expertise.

4.4.3 Real Time Communication and Messaging System

The on-time messaging system is designed to facilitate seamless and real-time communication between users and various service providers, including architects, workers, and material suppliers. This feature enables users to directly interact with professionals to discuss project requirements, clarify design details, negotiate pricing, and seek expert guidance. The messaging system ensures timely exchange of information, reducing delays and misunderstandings during the planning and execution phases. It also maintains a record of conversations for future reference, promoting transparency and accountability. By enabling instant and structured communication within the platform, the system enhances collaboration, improves decision-making, and strengthens the overall efficiency of project coordination.

Chapter 5

Implementation

5.1 Module Split Up

5.1.1 Registration and Login Module

The login page provides access to both new and existing users of the system. New users, including architects, workers, and material or service providers, can register on the platform by completing the sign-up process. This enables them to create an account and access the services offered by the system. Existing users who have already registered can log in to their accounts by entering their registered email address and password. This ensures secure and authorized access to the platform.

5.1.2 Admin Module

Once a new architect, worker, or service provider has successfully registered in the system, their details are made available for administrative review. The administrator has the authority to view all registered users, including architects and workers, and evaluate their submitted profiles. Based on this evaluation, the administrator can either approve or reject the registrations, thereby ensuring the authenticity and quality of users within the platform.

5.1.3 Architects, Workers and Material Suppliers Module

In this module, different types of users are provided with functionalities to manage and showcase their respective services and offerings. Architects can upload details of their completed or ongoing projects, along with the corresponding service charges or payment details. Material providers are able to list the materials available in their stores, including descriptions and pricing information for each item. Similarly, workers can present their skills, previous work experiences, and specify their service charges or rates.

5.1.4 Plan Generation Module

The Plan Generation module is responsible for generating suitable design plans based on user requirements. Initially, the system collects the user's requirements, which are then analyzed using Natural Language Processing (NLP). Based on this analysis, the system generates a customized plan using a Hugging Face model. In addition to AI-based plan generation, the system also incorporates an alternative approach using a repository of pre-existing plans stored in an Excel database. When a user provides their requirements, the system compares these inputs with the stored plans and evaluates the level of similarity. A matching score is then calculated for each plan, and the most relevant plans are suggested to the user based on the highest scores.

5.1.5 Building Valuation Module

The Building Valuation module is designed to estimate the current value of a building based on various user-provided parameters. The system collects essential features such as the type of roofing (e.g., reinforced concrete roof, tiled roof, or other materials), as well as the overall condition and depreciation of the building. Using these inputs, the module applies a predefined valuation formula that considers factors such as material type, structural condition, and depreciation rate. Based on this calculation, the system determines the present cost or estimated value of the building. This module provides users with a systematic and reliable approach to assess the current worth of a property, supporting better decision-making in construction, renovation, and investment planning.

5.1.6 Service Provider Interaction and Communication Module

This module is designed to facilitate effective interaction between users and various service providers, including architects, workers, and material suppliers. It enables users to explore and evaluate the profiles of different professionals by viewing their previously completed works and project details. Based on this analysis, users can identify suitable architects or workers according to their requirements and preferences. The system allows users to send service requests to selected professionals for further collaboration. Additionally, a direct communication feature is provided, enabling users to interact with architects and other service providers through messaging. This helps users gain better insights into their expertise, discuss project requirements, and make informed decisions.

5.1.7 Cost Estimation Module

The Cost Estimation module helps users estimate the approximate quantity of construction materials and the overall cost required for building a house. This module collects important information about the structure in a step-by-step manner to ensure accurate estimation. Initially, the user provides basic details such as the number of rooms in the house. The system then guides the user to enter the dimensions of each room, including the length and width. In the following steps, the user is required to provide additional measurements such as the total wall length and wall height. The system also gathers information about the number and dimensions of doors and windows, including their width and height. By considering these structural details, the module calculates the approximate amount of construction materials such as bricks, cement, and sand required for the building. Based on the collected inputs, the system performs the necessary calculations and provides an estimated material requirement and cost.

5.2 Tools and Techniques

5.2.1 Flutter and Dart

Flutter is an open-source UI toolkit that allows us to create a visually appealing and responsive mobile app from a single codebase. Using Flutter, our system provides a smooth and interactive interface where users can design homes, save or download floor plans, and access additional features like material estimation and subsidy information. Dart is used to write the code for the mobile application. As the language behind Flutter, it enables the development of a fast, interactive, and cross-platform mobile app where users can input preferences, view AI-generated floor plans, and interact with architects.

5.2.2 HTML and CSS

In the proposed home design system, HTML is used as the backbone for creating and structuring the web pages of the application. It defines the layout of different sections such as user login, plan generation, cost estimation, and chatbot interface.HTML ensures that all content, including text, images, buttons, and forms, is properly organized and displayed, providing a clean and accessible structure for users to interact with. CSS is used to style the web pages of the system, ensuring that the interface is visually appealing and consistent. It controls the layout, colors, fonts, and spacing to make the platform attractive and easy to navigate. By separating design from structure, CSS helps maintain a neat and professional look across all pages of the app.

5.2.3 Javascript

JavaScript adds interactivity and dynamic behavior to the system. It allows users to perform actions like generating house plans based on their inputs, viewing cost estimations instantly, and interacting with the chatbot for assistance. JavaScript also helps in validating user inputs and updating page content without reloading, making the app more responsive and user-friendly.

5.2.4 Bootstrap

Bootstrap is used in the project to create a responsive and mobile-friendly interface quickly and efficiently. It provides ready-made design components like navigation bars, buttons, and forms, which make the system look modern and uniform across different devices. With Bootstrap, the application maintains a smooth layout whether accessed from a desktop, tablet, or smartphone.

5.2.5 MySQL

MySQL is an open-source relational database management system used to store and manage data efficiently within the proposed system. In this project, it serves as the central data repository for maintaining user profiles, including architects, workers, material providers, and clients. It also stores project details, uploaded works, pricing information, material lists with rates, building valuation parameters, and generated or recommended plans. The database structure is designed using relational tables to ensure proper organization and easy retrieval of interconnected data. MySQL supports secure authentication mechanisms, role-based access control, and efficient query processing, which help in maintaining data integrity and confidentiality.

5.2.6 Hugging Face Model

Hugging Face is a key player in the AI industry, known for its commitment to open-source AI. It provides a central platform where developers and researchers can collaboratively build, share, and deploy AI models. It hosts hundreds of thousands of free, open-source models and datasets.

Chapter 6

Result and Discussion

6.1 Home page

The home page serves as the central interface of the app, providing users with easy access to all major features of the platform. The interface is designed with a simple and user-friendly layout, allowing users to navigate different functionalities efficiently through a side navigation menu. The menu includes several options such as Home, Profile, AI Chatbot, Government Schemes, Plan Generator, AI Plan Generator, Valuation, Architects, Plan Requests, Workers, Service Requests, Materials, Orders, and Change Password. Each section is designed to provide specific services to the users. The Profile section allows users to manage their personal information, while the Plan Generator and AI Plan Generator enable users to create house plans based on their requirements. The Valuation feature helps users estimate the value of a building by considering different structural parameters. Additionally, the platform allows users to connect with architects, workers, and service providers through dedicated sections. Users can also view available materials and place orders for construction materials through the Materials and Orders modules. The Government Schemes section provides information about housing-related schemes and subsidies that may benefit users.

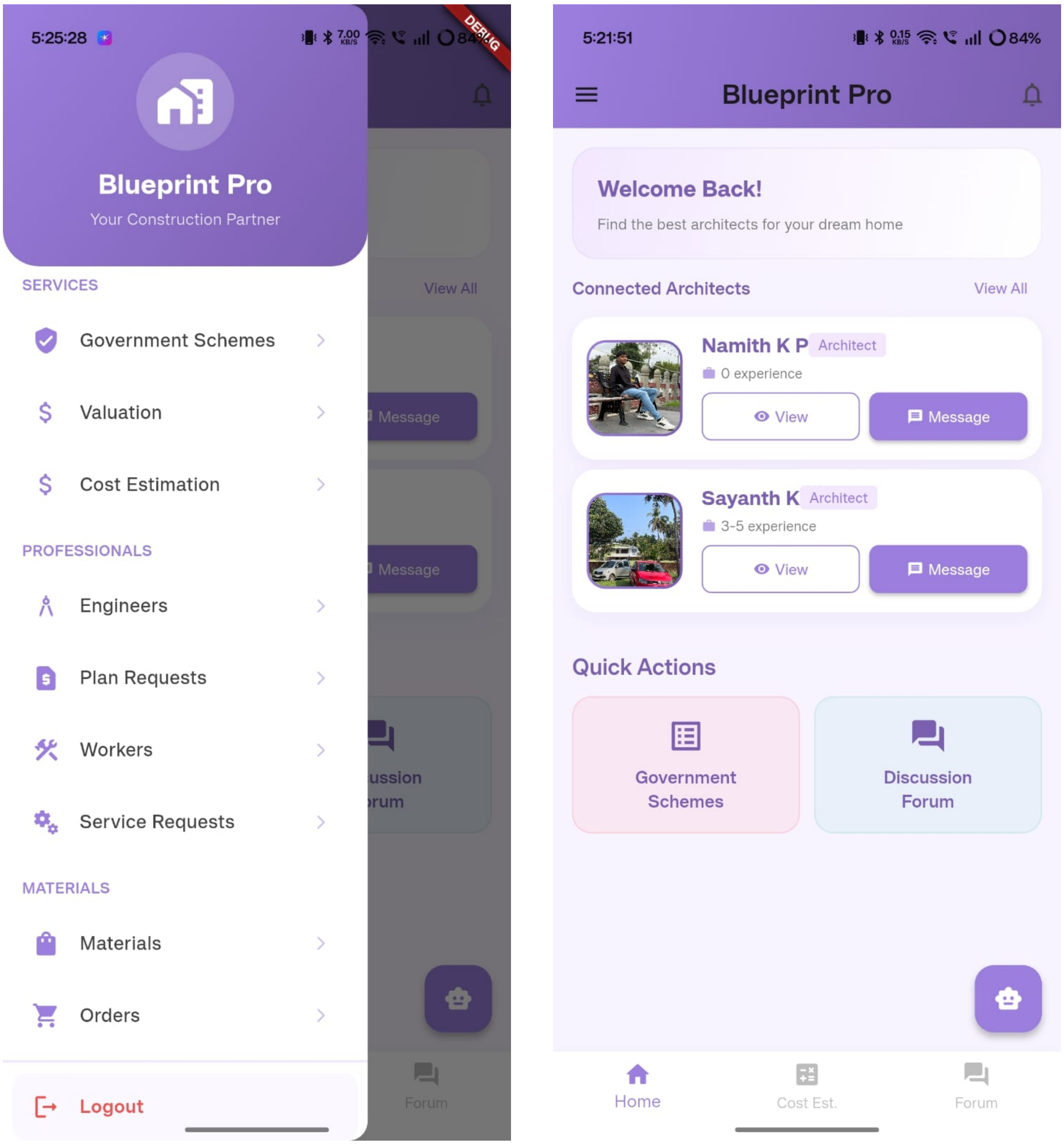

Figure 6.1: Homepage

6.2 User Profile

This section allows users to view and manage their personal information within the system. The profile page displays essential user details such as the user's name, phone number, email address, place, and district. It serves as a centralized location where users can verify their registered information and ensure that their contact details are accurate and up to date. The profile interface is designed to be simple and user-friendly, enabling users to easily access their account information whenever required. Maintaining accurate profile information helps improve communication within the platform and ensures that architects, workers, and service providers can effectively connect with users during project planning and service requests.

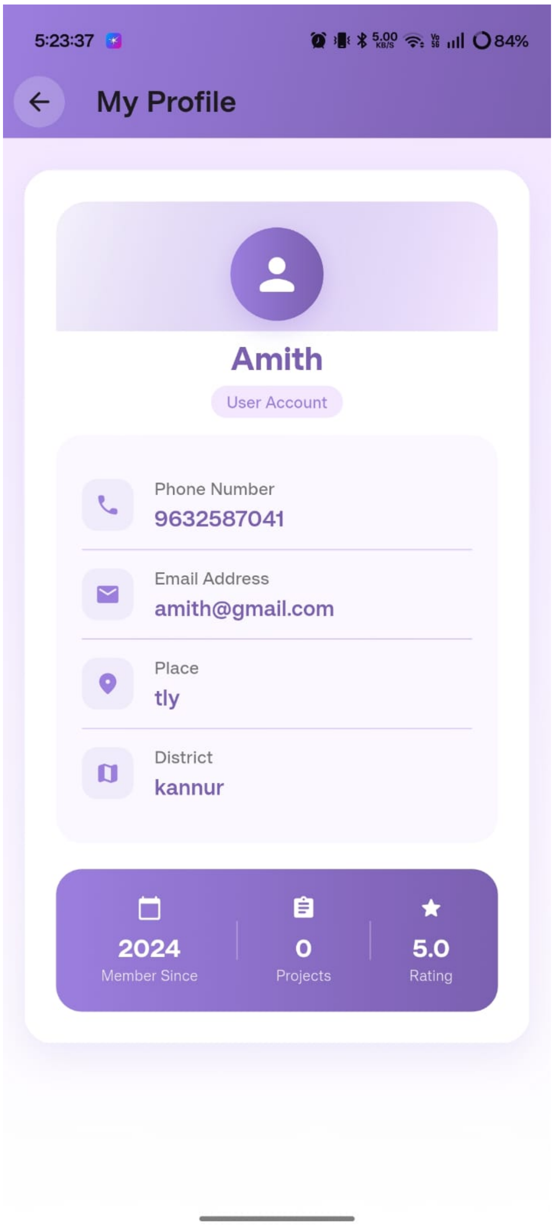

Figure 6.2: User Profile

6.3 Service Providers Interface

This page allows users to view the profiles of registered professionals available on the platform, including engineers (architects), workers, and material suppliers. The interface presents important details of each service provider such as their name, role, contact information, and work experience. This helps users easily evaluate and identify suitable professionals for their construction projects. Each profile provides an option to directly send a message, enabling users to communicate with the selected professional to discuss project requirements, clarify service details, or request assistance.

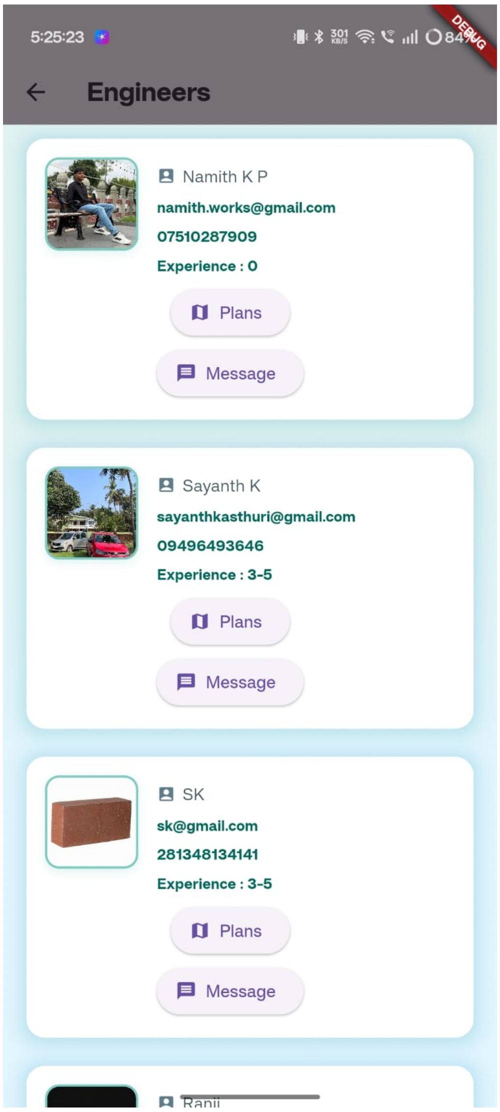

Figure 6.3: Engineer Interface

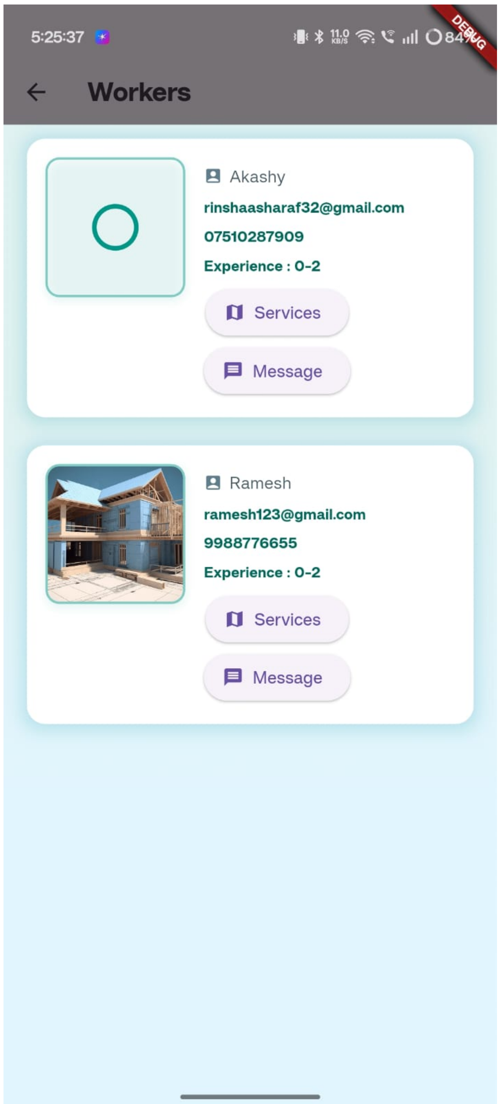

Figure 6.4: Worker Interface

6.4 Plan Generation Interface

This page allows users to generate suitable house plans based on their specific requirements. Users can enter a description of the type of house they need, including details such as the number of floors, bedrooms, kitchen, balcony, or other preferences. The system then analyzes the given description and searches for similar plans. Based on the similarity between the user's input and the available plans, the system displays a list of matching files along with their similarity scores. The results are ranked according to how closely they match the user's requirements, helping users easily identify the most relevant design options. This feature simplifies the process of finding appropriate house plans and assists users in selecting designs that best suit their needs.

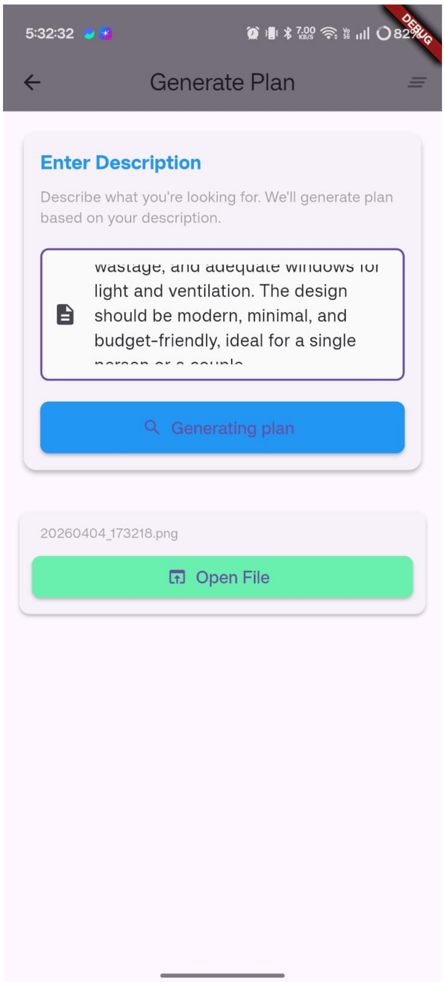

Figure 6.5: Plan Generation

6.5 Building Valuation Interface

The Building Valuation page helps users estimate the current cost or value of a building by considering various structural and condition-related factors. On this page, users can enter important details such as the total area of the building in square meters, the age of the building, the construction rate, and the cost index. These inputs provide the basic information required to evaluate the building. Users can also specify additional details that may influence the building's value, such as the type of roof used (for example, RCC roof), whether there are any leakage issues, the availability of local wood, and whether red oxide treatment has been applied. These factors help the system better understand the condition and materials of the building. Once all the required information is entered, the user can click the "Calculate Final Amount" button. The system then processes the given details and calculates the estimated value of the building. This feature allows users to quickly obtain an approximate valuation, which can be useful for property evaluation, renovation planning, or construction-related financial decisions.

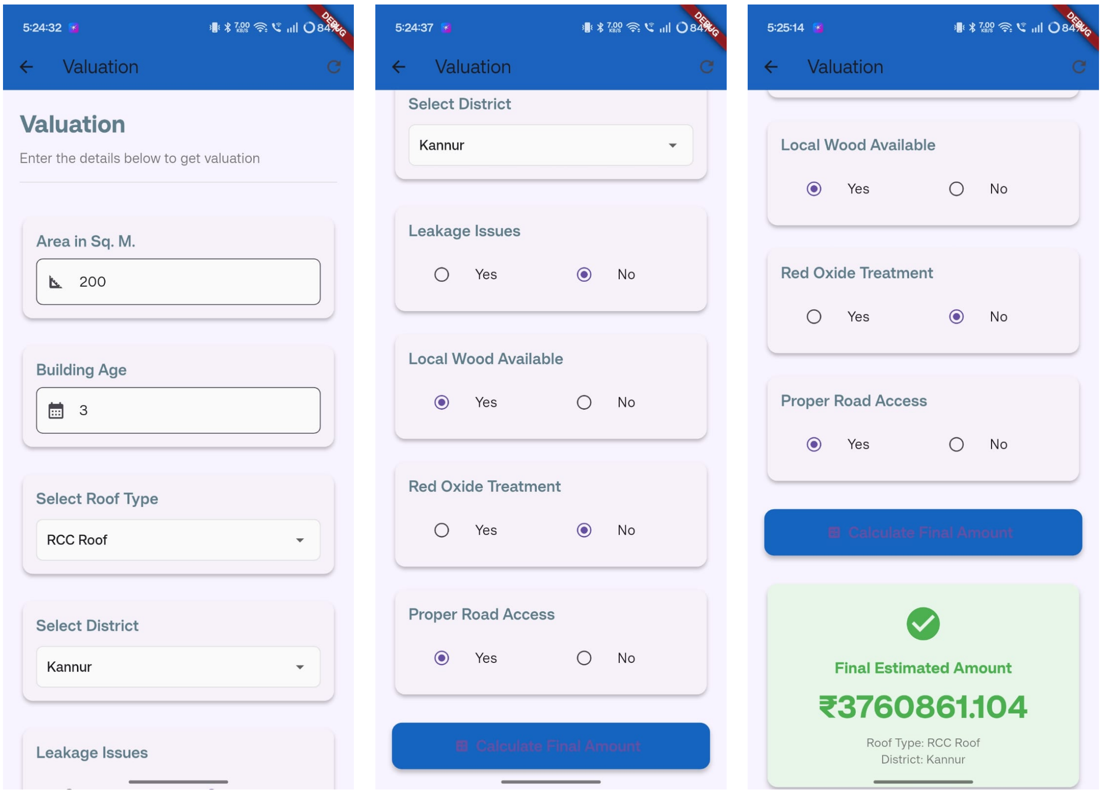

Figure 6.6: Building Valuation Interface

6.6 Cost Estimation

The House Cost Estimation page is designed to help users estimate the materials required for constructing a house by collecting important structural details in a step-by-step manner. Initially, the user enters the total number of rooms in the house, after which the system guides the user through multiple stages to gather necessary measurements. In the following steps, the user provides the length and width of each room, followed by the total wall length and wall height of the building. The system also collects details about doors and windows, including their number and dimensions such as width and height. By obtaining these measurements, the system can accurately calculate the approximate quantities of construction materials such as bricks, cement, and sand required for the building. This feature helps users gain a better understanding of the material requirements and estimated construction cost, thereby supporting effective planning and budgeting for their house construction project.

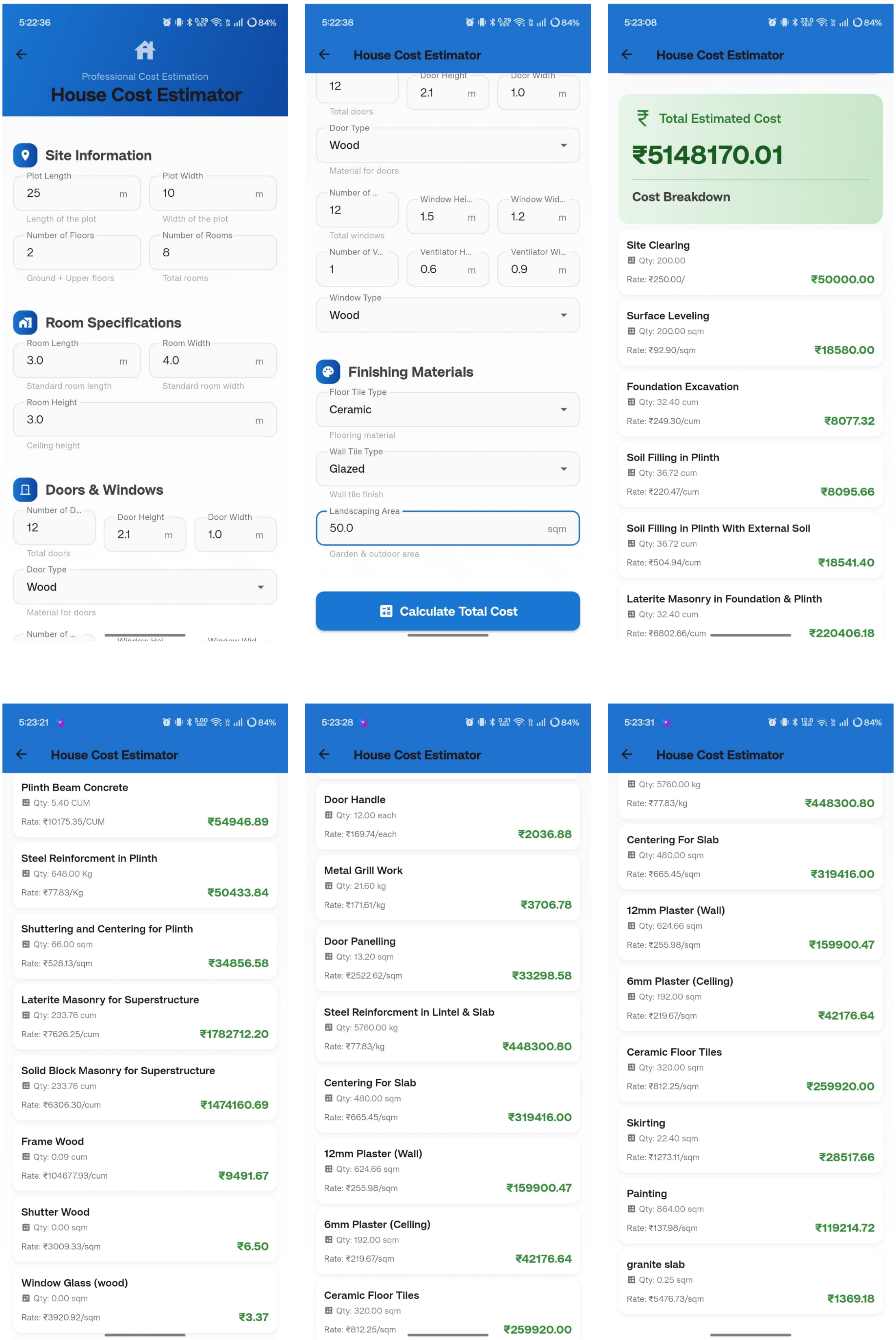

Figure 6.7: Cost Estimation Interface

6.7 Government Schemes

The Government Schemes page provides users with easy access to important housing-related schemes offered by the government. This interface presents detailed information about various schemes such as their name, launch date, purpose, eligibility criteria, and key benefits. It helps users understand the financial support and housing opportunities available to them, especially for those belonging to low and middle income groups.

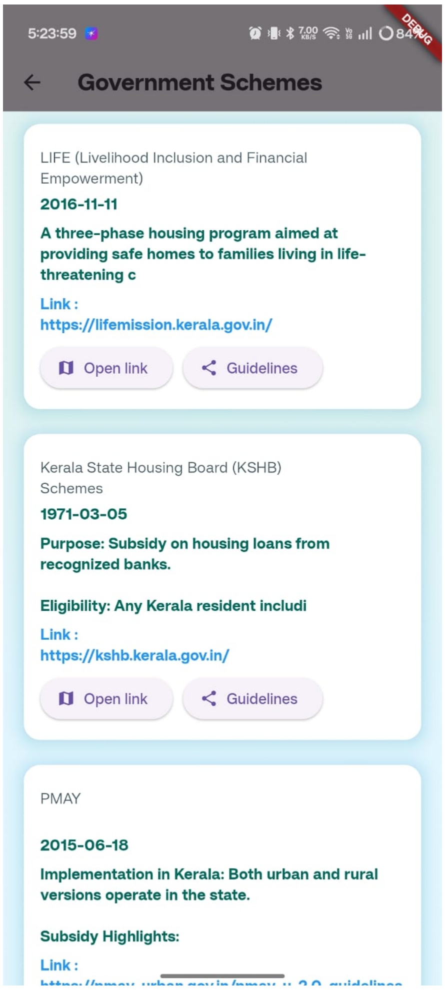

Figure 6.8: Government Schemes

6.8 Discussion Forum

The Discussion Forum page provides an interactive space where users can ask questions, share ideas, and engage in conversations related to house planning, construction, and available services. This feature allows users to post their queries, which can then be viewed and answered by other users or professionals on the platform. Each discussion includes details such as the user's name, date, and the content of the query, making it easy to follow and participate in conversations.

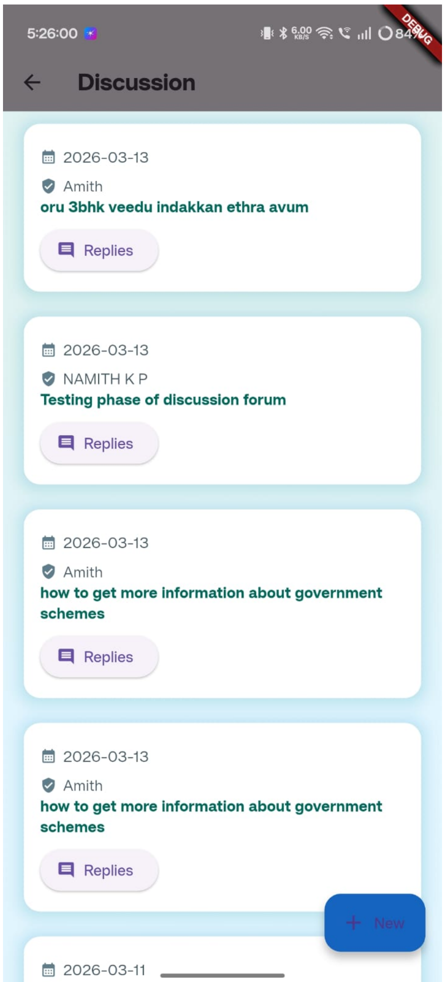

Figure 6.9: Discussion Forum

6.9 AI Chatbot

The AI Chatbot interface offers users an easy and interactive way to get instant help related to house planning and construction. Users can simply ask questions in a conversational manner such as about building rules, housing schemes, or construction methods and receive quick and relevant responses. The chatbot presents information in a clear and understandable way, allowing users to find what they need. This feature improves the overall user experience by providing real time support and saving time. It helps users clarify doubts, gain useful insights, and make better decisions during their planning process. By offering continuous guidance, the chatbot functions as a virtual assistant that supports users at every stage of their journey.

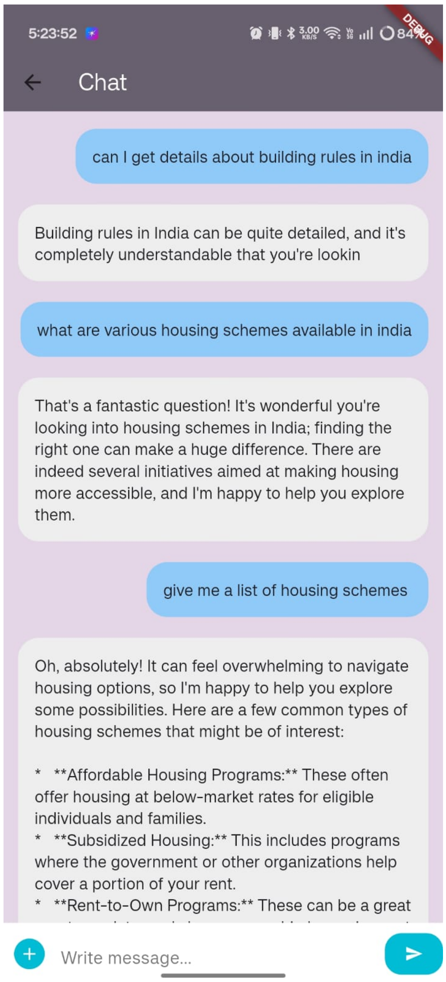

Figure 6.10: AI Chatbot

6.10 Chat Section

The chat interface provides a seamless communication platform that connects users with professionals such as architects and workers in real time. Through the mobile application, users can easily initiate conversations, share their requirements, ask queries, and discuss project details in a convenient and interactive manner. On the other side, architects and workers can access these messages through the web interface, enabling them to respond promptly, provide guidance, and clarify any doubts. This two-way communication system enhances collaboration, reduces misunderstandings, and ensures that users receive timely support throughout their construction process.

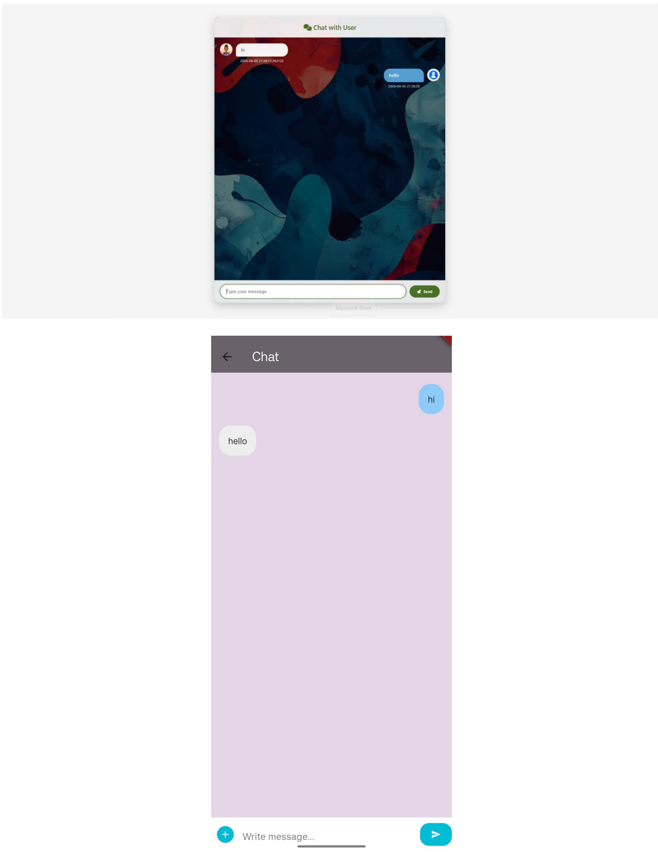

Figure 6.11: Chat Interface

6.11 Website Interface

The website interfaces are designed to provide a well-structured and professional platform for architects, construction workers, and other service providers to manage their business activities efficiently. The login page offers a simple and secure entry point, allowing registered users to access their accounts. The registration page enables new users to create an account by providing their personal and professional details, ensuring that only verified and relevant professionals join the platform. Once logged in, users are directed to their dedicated dashboard, where architects and workers can manage their profiles, view client requests, update their services, and interact with users. This structured interface helps professionals organize their work, showcase their expertise, and connect with potential clients in a streamlined manner. Overall, the website enhances business management by offering a centralized system that improves accessibility, communication, and service delivery.

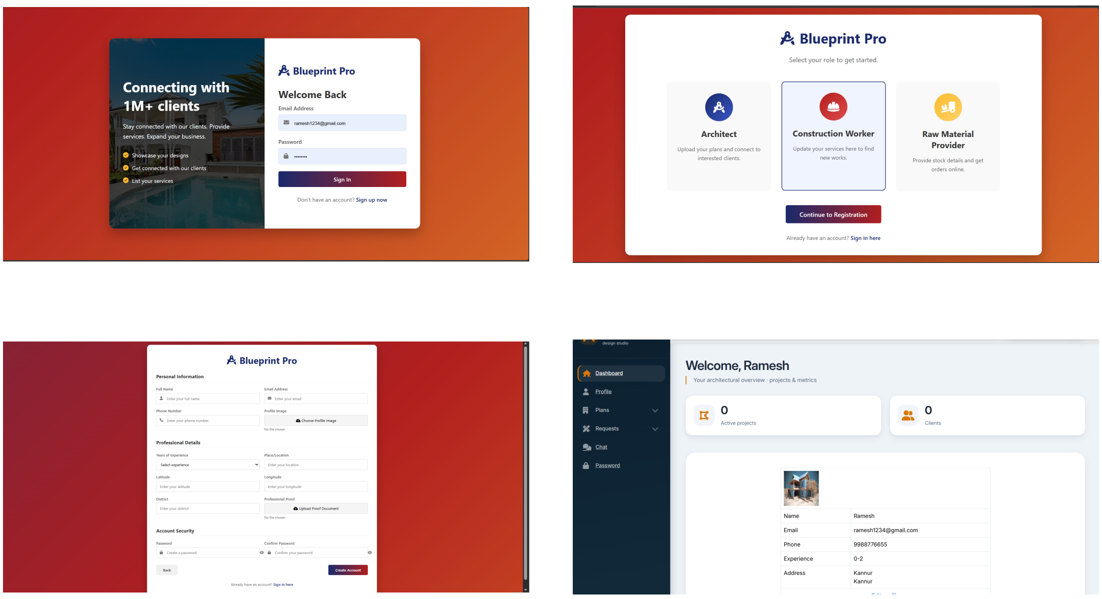

Figure 6.12: Website Interface

Chapter 7

Conclusion

The proposed house design system successfully demonstrates how advanced technologies can transform traditional home planning and construction into a more efficient, accessible, and intelligent process. By allowing users to input key preferences such as budget, plot size, and family needs, the system generates personalized and aesthetically pleasing floor plans that suit individual requirements. Additionally, the system offers valuable guidance on government housing schemes and subsidies, making home ownership more attainable for low- and middle-income families. The inclusion of features that connect users with verified architects, contractors, and suppliers ensures professional validation and reliable implementation of designs. Overall, the project achieves its goal of integrating automation, cost-effectiveness, and smart design within a single platform. It not only simplifies the home design process but also empowers users with informed decision-making and sustainable planning capabilities. This project represents a significant step toward modernizing the housing sector, paving the way for future advancements in intelligent architecture and construction technologies.

Chapter 8

Future Works

Although the proposed house design system successfully integrates plan generation, building valuation, professional connectivity, and communication features within a single platform, there is significant scope for further enhancement. In the future, the system can be extended to incorporate advanced 3D visualization and virtual walk-through capabilities, enabling users to experience generated designs more interactively before construction. Integration with real-time construction cost databases and market price updates can further improve the accuracy of cost estimation and material recommendations. The platform can also be enhanced by introducing predictive analytics for budget optimization and sustainability analysis, including energy consumption estimation and eco-friendly material suggestions. Future development may also focus on integrating government approval processes, automated compliance checking with building regulations, and location-based design customization. These advancements would transform the system into a comprehensive digital ecosystem for intelligent housing design and construction management.

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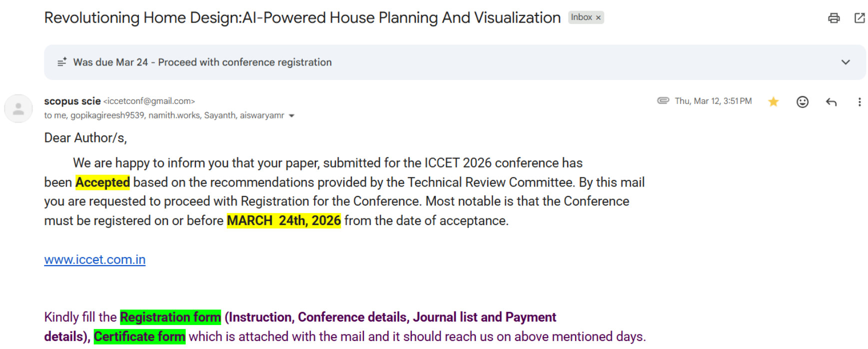
Appendix A

Conference Details

A.1 Conference Details



Revolutioning Home Design:AI-Powered House Planning And Visualization Inbox ×

Was due Mar 24 - Proceed with conference registration

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to me, gopikagireesh9539, namith.works, Sayanth, aiswaryamr

Thu, Mar 12, 3:51 PM

Dear Author/s,

We are happy to inform you that your paper, submitted for the ICCET 2026 conference has been **Accepted** based on the recommendations provided by the Technical Review Committee. By this mail you are requested to proceed with Registration for the Conference. Most notable is that the Conference must be registered on or before **MARCH 24th, 2026** from the date of acceptance.

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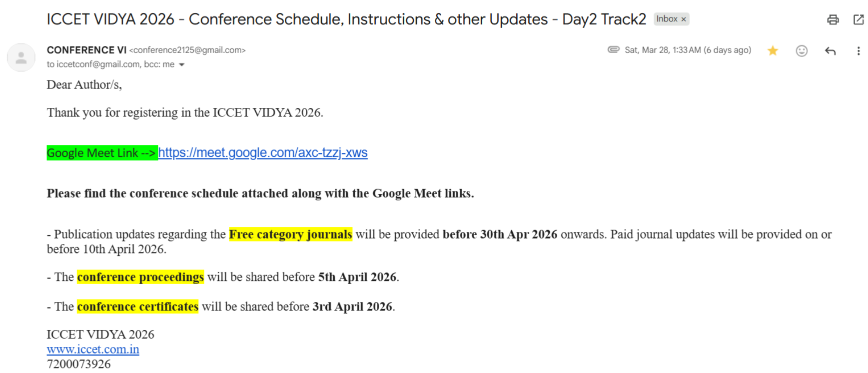
Kindly fill the **Registration form (Instruction, Conference details, Journal list and Payment details), Certificate form** which is attached with the mail and it should reach us on above mentioned days.

Figure A.1: Acceptance Mail



ICCET VIDYA 2026 - Conference Schedule, Instructions & other Updates - Day2 Track2 Inbox ×

CONFERENCE VI <conference2125@gmail.com>
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Thank you for registering in the ICCET VIDYA 2026.

Google Meet Link --> https://meet.google.com/axc-tzzj-xws

Please find the conference schedule attached along with the Google Meet links.

- Publication updates regarding the **Free category journals** will be provided **before 30th Apr 2026** onwards. Paid journal updates will be provided on or before 10th April 2026.

- The **conference proceedings** will be shared before **5th April 2026**.

- The **conference certificates** will be shared before **3rd April 2026**.

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Figure A.2: Registration Response Mail

A.2 Certificates

INTERNATIONAL CONFERENCE ON COGNITIVE INFORMATICS ENGINEERING AND TECHNOLOGY- 2026

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VIDYAA VIKAS COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

TIRUCHENGODE, TAMILNADU, INDIA.

In collaboration with

OSIET , Chennai , India .

SAMARKAND STATE UNIVERSITY, SAMARKAND , UZBEKISTAN .

Certificate of Presentation

This is to Certify that the paper entitled

Revolutioning Home Design: AI-Powered House Planning And Visualization

Authored by

Gopika Gireesh N G

Vimal Jyothi Engineering College, Kannur

has been presented at

International Conference on Cognitive Informatics Engineering and Technology- 2026 held on 28th & 29th March 2026 at Vidyaa Vikas College of Engineering And Technology, (Autonomous) Tiruchengode , Tamilnadu , India.

Dr.K.Pooranapriya
Principal & Conference Chair

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Samarkand State University, Uzbekistan

Dr.Akhatov Akmal Rustamovich
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Samarkand State University, Uzbekistan

Figure A.3: Certificate 1

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Figure A.4: Certificate 2


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Figure A.5: Certificate 3

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Figure A.6: Certificate 4

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Figure A.7: Certificate 5