IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 3, March 2026

DOI: 10.17148/IJARCCE.2026.15378

An AI-Powered Interior, Exterior Designer & Layout Planner

HOD R. Y. Thombare[1], Mr. S. V. Waghmare[2], Sarthak Deshpande[3], Atharva Ahire[4], Aditya Awasarkar[5], Mitesh Pawar[6]

HOD of AIML, K K Wagh Polytechnic, Nashik[1]

Lecturer in AIML, K K Wagh Polytechnic, Nashik[2]

Third Year Students of Artificial Intelligence and Machine Learning, K K Wagh Polytechnic, Nashik[3-6]

Abstract: Interior and exterior design planning plays an important role in residential and commercial construction, but traditional methods require significant time, cost, and professional expertise. To address these challenges, this project proposes an AI-powered Interior, Exterior, and Layout Planner
Designing Website that helps users create smart, aesthetic, and optimized design solutions.

The system uses Artificial Intelligence and Machine Learning techniques to generate interior layouts, exterior designs, and space planning recommendations based on user inputs such as room size, building type, style preferences, furniture needs, and budget. It provides multiple design suggestions and an interactive platform to visualize layouts, furniture placement, and color combinations.

This solution reduces manual effort, improves personalization, and offers a cost-effective and userfriendly approach to modern architectural design, with future scope for 3D visualization and AR/VR integration.

Keywords: Artificial Intelligence, Interior Design, Exterior Design, Layout Planning, Machine Learning, Smart Architecture, Web Application.

I. INTRODUCTION

Interior and exterior design planning plays a significant role in modern residential and commercial construction, as it directly affects functionality, comfort, space utilization, and overall aesthetic appeal. A well-planned layout ensures efficient use of available space, proper furniture arrangement, suitable color combinations, and visually attractive exterior elevations. However, traditional design methods depend largely on professional designers, manual drawings, and continuous revisions, which make the process time-consuming, expensive, and less accessible to many individuals.

Conventional interior and exterior designing require expert knowledge to create optimized layouts and balanced design themes. For people without architectural or technical background, visualizing complete room arrangements or building exteriors becomes difficult. Moreover, making changes according to evolving requirements often increases cost and effort, especially in small-scale or budget-sensitive projects.

With the rapid growth of Artificial Intelligence (AI) and Machine Learning technologies, intelligent automation has opened new possibilities in the field of architectural design. AI-powered systems can analyse user inputs such as room dimensions, building type, design preferences, furniture requirements, and budget constraints to generate personalized layout suggestions. These systems reduce manual effort, improve accuracy, and provide multiple design alternatives within a short time.

This project proposes the development of an AI-powered Interior, Exterior, and Layout Planner Designing Website that offers a user-friendly and interactive platform for creating smart and optimized design solutions. The system enables users to explore various layout options, themes, and design concepts without requiring professional expertise. By automating the planning process, the platform aims to save time, reduce cost, and make quality design solutions more accessible. Future enhancements may include 3D visualization, augmented reality (AR) previews, and real-time customization features to further improve user experience and practical applicability.

International Journal of Advanced Research in Computer and Communication Engineering
Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 3, March 2026
DOI: 10.17148/IJARCCE.2026.15378

II. LITERATURE REVIEW

Interior and exterior design planning has evolved significantly with the advancement of digital technologies. Traditional architectural design methods primarily relied on manual drafting, expert consultation, and 2D visualization tools. While these approaches ensured professional quality, they required substantial time, cost, and technical expertise. Several researchers have explored the integration of computer-aided design (CAD) tools to simplify the planning process. CAD systems improved accuracy and efficiency but still depended heavily on human decision-making and expertise.

With the emergence of Artificial Intelligence (AI) and Machine Learning (ML), automated design generation has gained considerable attention. Studies show that AI-based generative design systems can analyze spatial constraints, user preferences, and environmental factors to produce optimized layout alternatives. Generative Adversarial Networks (GANs) and Convolutional Neural Networks (CNNs) have been used for image-based interior design suggestions, furniture arrangement prediction, and style classification.

Recent research also highlights the role of recommendation systems in personalized interior planning. These systems analyse user inputs such as room dimensions, style preferences, and budget constraints to suggest suitable layouts and design themes. Machine learning algorithms improve over time by learning from user interactions and feedback, making the design process more adaptive and intelligent.

Furthermore, the integration of 3D visualization and Augmented Reality (AR) technologies has enhanced user experience in design planning. AR-based applications allow users to virtually preview furniture placement and exterior structures before actual implementation. This reduces design errors and improves decision-making.

Despite these advancements, many existing systems focus only on either interior or exterior design separately and often lack full automation and personalization. Therefore, there is a need for an integrated AI-powered platform that combines interior, exterior, and layout planning into a single intelligent system.

The proposed project aims to bridge this gap by developing a web-based AI-powered Interior, Exterior, and Layout Planner that provides automated, personalized, and interactive design solutions, making smart architectural planning accessible and efficient for all users.

III. SYSTEM ARCHITECTURE

The given system architecture represents the working flow of the AI-powered Interior and Exterior Layout Planner. The process begins with the Input Layer, where the user provides essential details such as room image, room size, design style, and color preferences. These inputs help the system understand the user's requirements, spatial dimensions, and aesthetic choices.

After collecting inputs, the system moves to the Preprocessing Stage. In this phase, data cleaning is performed to remove incorrect or missing values and to ensure that the uploaded images and numerical inputs are valid. Following this, feature extraction is carried out, where important details such as room structure, available space, objects, and design-related attributes are identified and converted into a structured format. This step prepares the data for accurate analysis by the AI model.

Next comes the Model Pipeline, which is the core of the system. Here, the machine learning model is trained using relevant datasets to understand patterns in interior and exterior design. After training, the model undergoes validation to evaluate its performance and accuracy. Based on validation results, the best-performing model is selected to generate optimized layout and design suggestions.

Finally, the system enters the Deployment Phase. The selected model is deployed and integrated with the user interface, allowing users to interact with the system through a web platform. The system may also connect with external tools and cloud storage to manage data efficiently. Once processed, the final output is presented as interior design visualization, enabling users to view layout arrangements, design themes, and planning recommendations in an interactive manner.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 3, March 2026

DOI: 10.17148/IJARCCE.2026.15378

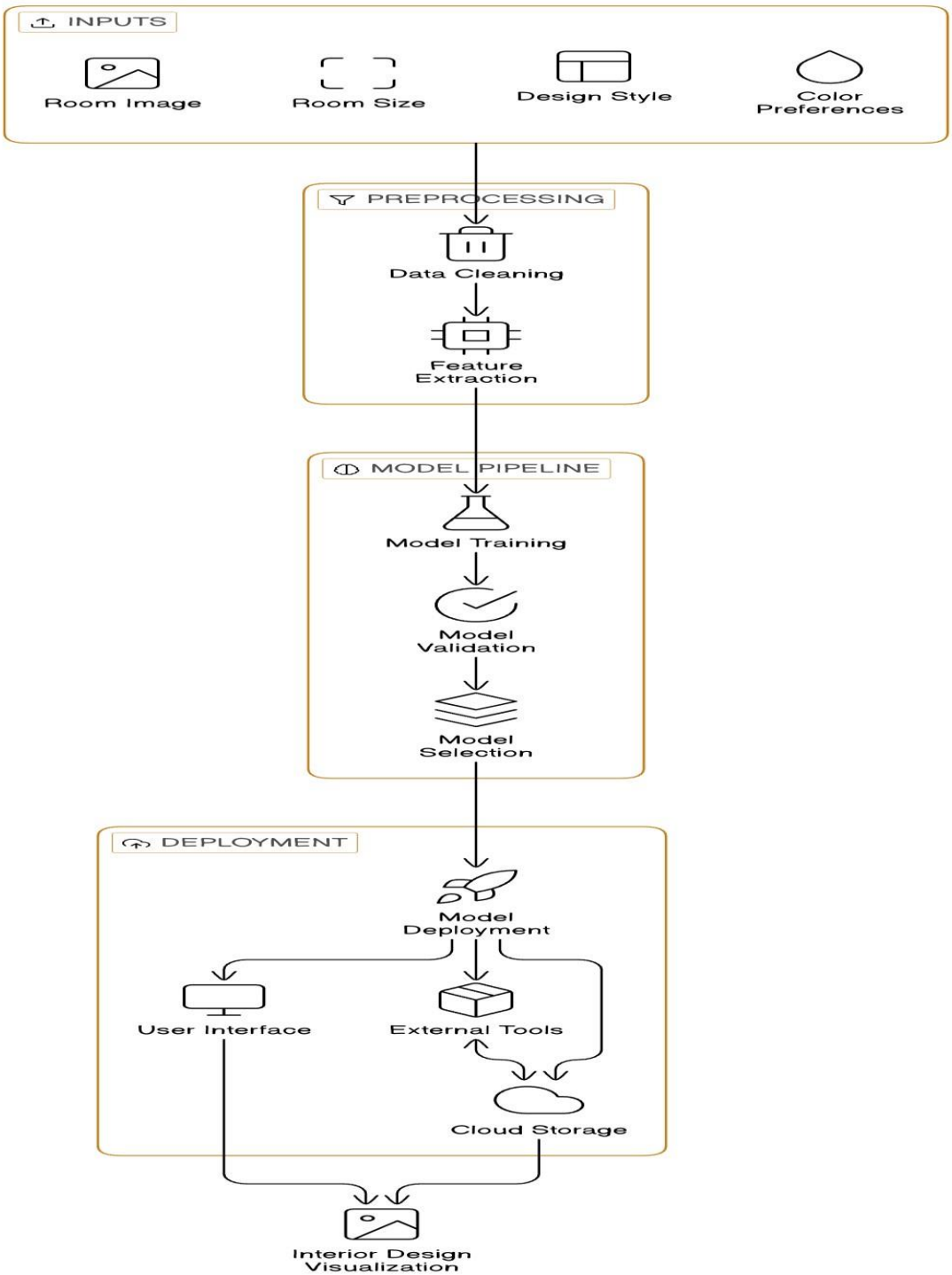

fig. 1 system architecture

IV. METHODOLOGY

1. Overview

The proposed AI-Powered Interior, Exterior, and Layout Planner Designing Website follows a structured methodology that integrates data processing, machine learning models, and web deployment to generate intelligent design solutions. The process begins with **data collection and dataset preparation**. Relevant interior and exterior design images, layout samples, furniture placement examples, and style-based themes are collected from publicly available datasets and design

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 3, March 2026

DOI: 10.17148/IJARCCE.2026.15378

resources. The dataset is then organized according to categories such as room type, design style, color themes, and spatial arrangements. This structured dataset forms the foundation for training the AI model.

In the next stage, **data preprocessing** is performed. Uploaded room images and user inputs such as room dimensions, building type, style preferences, and budget constraints are cleaned and standardized. Image resizing, normalization, and feature extraction techniques are applied to prepare the data for model training. Important features such as wall boundaries, floor space, furniture positions, and layout patterns are identified using image processing and deep learning techniques.

After preprocessing, the system moves to the **model development phase**. Convolutional Neural Networks (CNN) are used for image-based feature extraction and design classification. Machine Learning algorithms analyze user preferences and spatial parameters to generate optimized layout suggestions. The model is trained and validated using the prepared dataset to ensure accuracy and reliability. Performance evaluation metrics such as accuracy and loss are used to select the best performing model.

Once the model achieves satisfactory performance, it is integrated into a **web-based application**. The backend processes user inputs and sends them to the trained AI model, which generates multiple interior layouts, exterior concepts, and space planning recommendations. The frontend interface allows users to visualize and compare different design options interactively.

Finally, the system is deployed using cloud or local server infrastructure to ensure accessibility and scalability. The overall methodology ensures efficient automation of design planning while maintaining personalization, accuracy, and user-friendliness.

2. Methodology Workflow

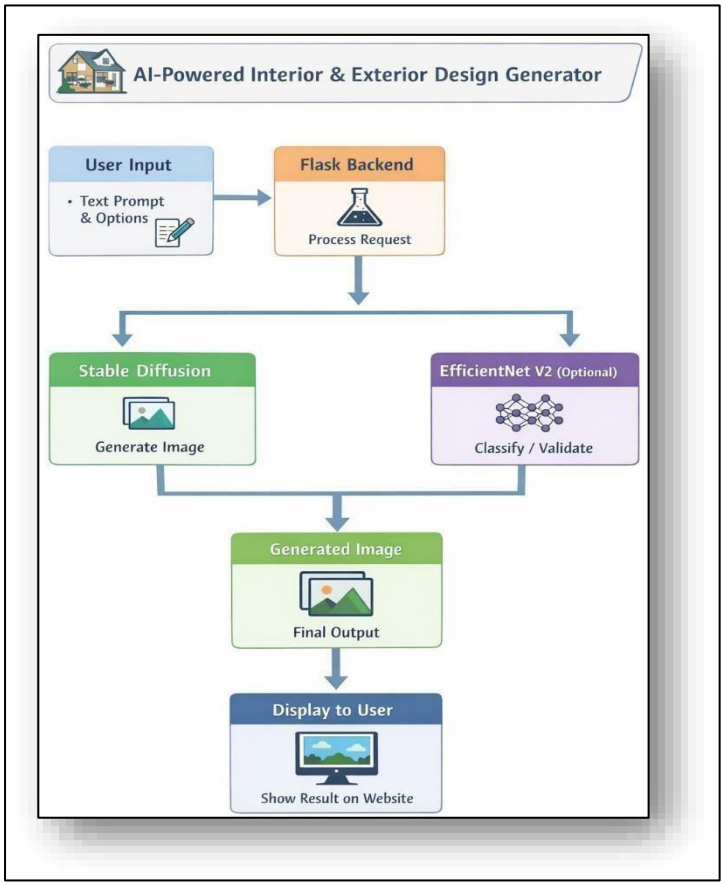

Fig. 2 Workflow

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 3, March 2026

DOI: 10.17148/IJARCCE.2026.15378

i. User Input Collection ii. API Request to Backend iii. Prompt Processing & Enhancement iv. Image Generation (Stable Diffusion)
v. Classification & Validation (Optional) vi. Result Processing vii. Response to Frontend viii. Deployment & Hosting

3. Dataset

fig. 3 Dataset

Various dataset of interior and exterior Design

i. Interior Design Dataset

a) **Name of dataset:** interior_design Dataset
b) **Source of dataset:** Public architectural datasets, Kaggle, and curated design image collections
c) **Type of dataset:** Text-to-image paired dataset (images with descriptive captions)
d) **Size of dataset:** Approx. 28,000 – 30,000 images

ii. Exterior Design Dataset

a) **Name of dataset:** exterior_design Dataset
b) **Source of dataset:** Public architectural datasets, Kaggle, and curated design image collections
c) **Type of dataset:** Semi-Supervised, Text-to-image paired dataset (images with descriptive captions)
d) **Size of dataset:** Approx. 34,000 – 38,000 images

iii. Layout Planner Dataset

a) **Name of dataset:** 2d_layout_planner Dataset
b) **Source of dataset:** Public architectural datasets, Kaggle, and curated design image collections
c) **Type of dataset:** Semi-Supervised, Text-to-image paired dataset (images with descriptive captions) **d) Size of dataset:** Approx. 50,000 images

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 3, March 2026

DOI: 10.17148/IJARCCE.2026.15378

V. RESULT AND DISCUSSION

1. Bedroom Design

Fig. 4 Bedroom Interior

This interior diagram represents an elegant and well-balanced bedroom design.
The design follows a strong concept of symmetry, where the bed is placed at the centre with matching bedside tables and lamps on both sides, creating a balanced and organized appearance. The tufted upholstered headboard adds a sense of luxury and comfort. The wall panelling and decorative molding enhance the classic and sophisticated look of the space.
The color palette consists of neutral tones such as cream, beige, white, and soft brown, which create a calm and relaxing atmosphere. The chandelier placed above the bed adds a modern yet graceful touch to the room. Soft lighting from table lamps and ceiling lights improves the warmth and ambiance.
Overall, the interior design reflects a combination of modern luxury and classic elegance, ensuring comfort, aesthetic appeal, and proper space utilization.

2. Livingroom Design

Fig. 5 Livingroom Interior

This image shows a modern luxury living room interior design.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 3, March 2026

DOI: 10.17148/IJARCCE.2026.15378

This image shows a modern luxury living room interior design. The room has large glass windows that allow plenty of natural light to enter and also provide a beautiful outside view of greenery. The use of neutral colors such as beige, brown, and wooden tones creates a calm, warm, and elegant atmosphere.

The wooden flooring and soft lighting on the ceiling further enhance the modern look of the space.

In the center of the room, there is a large wooden coffee table placed on a soft textured rug. Around the table, low and comfortable sofa seating is arranged, making the space perfect for relaxation and social gatherings. The room also features a modern fireplace and a built-in bookshelf, which add both functionality and style. Overall, the living room design focuses on comfort, natural lighting, and a luxurious modern aesthetic.

3. Kitchen Design

Fig. 6 Kitchen Interior

Modern white kitchen with elegant island seating and stylish lighting.

This image shows a **modern luxury kitchen interior design**. The kitchen has a bright and clean look with a **white color theme** that makes the space look spacious and elegant. Large windows allow natural light to enter, making the kitchen feel fresh and welcoming. The cabinets, walls, and countertops are designed in light colors, while wooden flooring adds warmth and balance to the overall design. In the center of the kitchen, there is a **large island counter** with four wooden bar stools, which can be used for dining or casual seating. Above the island, stylish **hanging pendant lights** provide both lighting and decoration. The kitchen also includes modern appliances like a refrigerator, oven, and built-in storage cabinets. The marble backsplash and golden fixtures add a luxurious touch, making the kitchen both functional and visually attractive.

The kitchen layout is designed to ensure **efficient workflow and maximum storage space**. The cabinets and drawers are well organized to store utensils, cookware, and ingredients neatly. The open and spacious design also allows easy movement while cooking and preparing food, making the kitchen both practical and comfortable for everyday use.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 3, March 2026

DOI: 10.17148/IJARCCE.2026.15378

4. Exterior Design

Fig. 7 Exterior

This exterior diagram represents a modern and contemporary two-story residential design.

The structure follows a clean, geometric layout with sharp lines and a flat roof, giving it a minimalist and sophisticated appearance. The combination of materials such as natural stone cladding, wooden vertical panels, large glass windows, and smooth white concrete surfaces creates a balanced and visually appealing façade.

The upper floor features wooden slatted panels that add texture and provide partial privacy while maintaining ventilation and natural light. Large glass windows enhance openness and allow ample daylight inside the house. The balcony area with glass railing adds a modern touch and improves the overall elegance of the structure.

The ground floor includes wide glass openings and a wooden main entrance door, creating a welcoming look. Exterior wall lights enhance the design during nighttime and highlight architectural details. The landscaped front yard with pathway tiles, greenery, and minimal outdoor lighting complements the modern aesthetic.

Overall, the exterior design reflects a blend of modern architecture, functionality, and natural elements, ensuring visual appeal, comfort, and efficient space utilization.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 3, March 2026

DOI: 10.17148/IJARCCE.2026.15378

5. Layout Plan

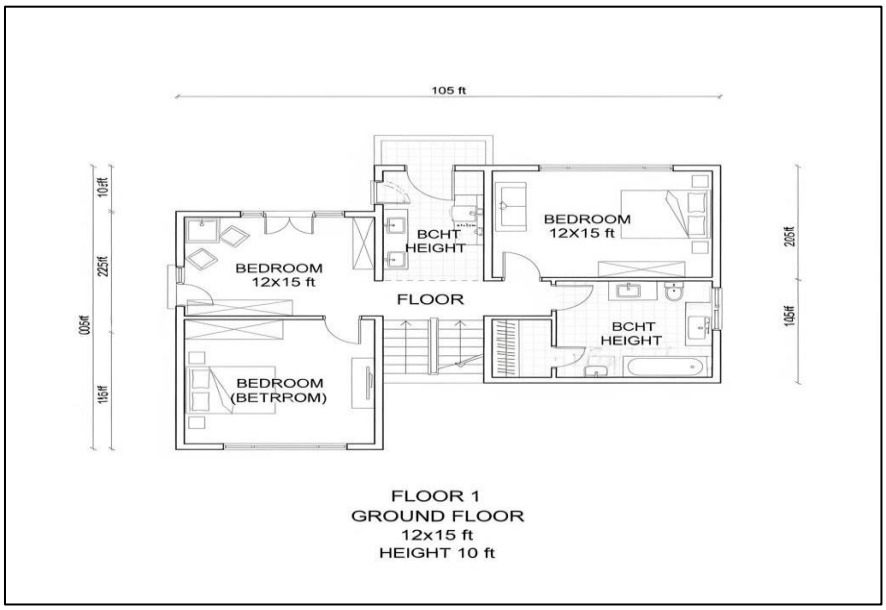

Fig. 8 Layout Plan

This layout plan diagram represents the ground floor plan of a residential building with a clear and functional space arrangement. The overall structure is designed with proper dimensions, ensuring comfortable room sizes and efficient circulation between spaces.

The plan includes three bedrooms, each approximately 12 × 15 feet in size, providing sufficient space for furniture placement and movement. The bedrooms are positioned to maintain privacy and easy accessibility. Attached bathrooms (bath height 10 ft) are provided near the bedrooms, ensuring convenience and proper utilization of space.

The central area connects all rooms and includes a staircase section, allowing vertical movement to the upper floor. Doors and windows are strategically placed to allow natural light and ventilation throughout the house. The layout also maintains proper wall alignment and passage space, ensuring smooth movement between rooms.

Overall, the floor plan demonstrates a well-organized residential layout with balanced room distribution, functional design, and optimal use of available space.

VI. CONCLUSION

The AI-Powered Interior, Exterior, and Layout Planner Designing Website demonstrates how Artificial Intelligence can simplify and enhance the building design process. The system generates intelligent interior layouts, exterior designs, and space planning suggestions based on user inputs such as room size, style preferences, and budget, reducing dependency on manual methods and professional consultations.

It provides a user-friendly web platform where users can easily explore and compare multiple design options, improving visualization, decision-making, and space utilization. The system saves time, reduces costs, and ensures personalized and consistent design outputs.

In conclusion, this AI-powered solution offers a smart, affordable, and accessible approach to modern design planning, with future scope for advanced features like 3D visualization and AR-based previews.

VII. ACKNOWLEDGMENT

With deep gratitude, we sincerely thank all those who guided and supported us throughout the selection, design, and development of our project.

International Journal of Advanced Research in Computer and Communication Engineering
Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 3, March 2026
DOI: 10.17148/IJARCCE.2026.15378

We express our heartfelt thanks to **Prof. P. T. Kadave, Principal, K. K. Wagh Polytechnic, Nashik**, for his permission and encouragement to complete this project. We are also thankful to **Prof. R. Y. Thombare, Head of the Artificial Intelligence & Machine Learning Department**, for his valuable guidance and timely suggestions.

We extend our sincere appreciation to **Mr. H. M. Gaikwad, Project Coordinator**, and our **Internal Guide Mr. S. V. Waghmare**, along with all staff members of the Artificial Intelligence & Machine Learning Department, for their continuous support and technical guidance.

Finally, we are grateful to our parents, friends, and classmates for their encouragement and support in successfully completing this project.

REFERENCES

[1]. Yash G. Patel, Riddhi Shah, Kruti Patel, "AI-Based Interior Design Recommendation System using Machine Learning," in International Journal of Computer Applications, Vol. 183, No. 21, 2021.
[2]. Chaillou, Stanislas, "ArchiGAN: Artificial Intelligence for Architectural Design," in Harvard Graduate School of Design, 2019.
[3]. Wei Liu, Xiaogang Wang, "Deep Learning for Image-Based Interior Layout Generation," in IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2020.
[4]. Ian Goodfellow, Jean Pouget-Abadie, Mehdi Mirza et al., "Generative Adversarial Nets," in Advances in Neural Information Processing Systems (NeurIPS), 2014.
[5]. Olga Russakovsky et al., "ImageNet Large Scale Visual Recognition Challenge," in International Journal of Computer Vision (IJCV), 2015.
[6]. Chuan Li, Michael Wand, "Precomputed Real-Time Texture Synthesis with Markovian Generative Adversarial Networks," in European Conference on Computer Vision (ECCV), 2016.
[7]. Abhishek Chaudhary, Shreya Kulkarni, "Smart Home Interior Planning System using Convolutional Neural Networks," in International Journal of Engineering Research & Technology (IJERT), 2022.
[8]. https://www.tensorflow.org/ (Accessed for Machine Learning Model Development)
[9]. https://threejs.org/ (Used for 3D Visualization in Web Applications)
[10]. https://react.dev/ (Frontend Web Application Development Framework)