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AI Vastu Consultant

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Abstract - Vastu Shastra is an important part of architectural design, as it helps in orienting spaces and placing rooms in a way that maximizes harmony and wellness. The conventional Vastu analysis is highly dependent on human intelligence, and hence, it is prone to subjective interpretations, is a time-consuming process, and is not easily accessible to users. In this paper, an AI-based Vastu Consultant system is presented that uses computer vision and Large Language Models (LLMs) to process 2D floor plans and offer intelligent Vastu compliance recommendations. The system can automatically identify rooms, calculate directional orientation, understand spatial relationships, and provide context-specific suggestions without explicitly programming Vastu knowledge. The experimental outcomes show that the proposed system is capable of providing precise, interpretable, and scalable Vastu advice that can be effectively used in contemporary architectural practices.

Keywords— Vastu Shastra, Artificial Intelligence, Computer Vision, Large Language Models, Floor Plan Analysis

I. INTRODUCTION

The integration of Artificial Intelligence (AI) with traditional architectural knowledge systems such as Vastu Shastra offers a valuable approach to improving decision-making in modern architectural design. Vastu Shastra focuses on spatial orientation and directional energies to support physical, psychological, and social well-being, but its practical application is often limited by manual interpretation and subjective judgment [Chaturvedi & Bandyopadhyay, 2023].

With increasing urbanization and compact residential designs, ensuring Vastu compliance at early design stages has become challenging. Manual floor plan evaluation is time-consuming and inconsistent, particularly for complex layouts [Patel & Patel, 2024].

Recent advances in AI, especially in computer vision and natural language processing, enable automated analysis of visual and spatial data, making intelligent support for traditional architectural evaluation feasible [Albukhari, 2025]. This research explores the development of an AI-based Vastu Consultant that analyzes floor plan images using OCR, computer vision, and a Large Language Model (LLM) to assess room placement, directional alignment, and generate structured Vastu compliance reports with clear explanations and recommendations

II. RELATED WORKS

Previous studies on Vastu Shastra have been concerned with the empirical verification of its tenets, such as the study by Patel et al. on the relationship between construction orientation and natural laws and cosmic forces for better habitability [Patel & Patel, 2024].

In the integration of AI and Vastu, Chaturvedi and his colleagues employed neural networks with fuzzy inference for Vaastu scorecarding and net-zero sustainability for residential designs, which aimed to address the negative effects of compact urban designs on the environment [Chaturvedi & Bandopadhyay, 2023; Chaturvedi & Bandyopadhyay, 2023].

These studies emphasized directionality for optimization but failed to provide personalization on a macro-level for various design stages.

Applications of AI in architecture include Albukhari's analysis of machine learning for layout automation and energy estimation, which is more accurate than manual processing but failed to consider cultural tenets such as Vastu [Albukhari, 2025].

Another study by Zhang et al. discussed generative models that covered rule-based systems, metaheuristics, and machine learning for site, interior, and exterior designs, which emphasized hybrid models for constraints but failed to infuse traditional science [Zhang & Zhang, 2024].

Unlike the above studies, the current system will not be limited to scoring floor plans but will be a full-fledged

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consultant with user-specific Vaastu orientations. [Chaturvedi & Bandopadhyay, 2023; Chaturvedi & Bandyopadhyay, 2023; Li et al., 2024]

The system will combine rule-based AI, optimization techniques, and machine learning to provide context-driven design solutions that are Vaastu-compliant yet responsive to modern architectural needs [Zhang & Zhang, 2024].

III. PROPOSED SYSTEM

The proposed system introduces an automated and intelligent framework for performing Vastu analysis using architectural floor plan images. It combines Optical Character Recognition (OCR), computer vision, and a Large Language Model (LLM) to interpret spatial layouts and generate meaningful Vastu insights. The primary objective of the system is to reduce dependency on manual expert evaluation while providing clear, structured, and explainable results through an interactive web-based platform.

1) System Overview

The system takes a residential floor plan image as input and generates a detailed Vastu compliance report as output. The overall workflow begins with image submission by the user through a web interface, followed by automated extraction of room information, spatial direction analysis, intelligent reasoning, and result visualization. The modular design of the system allows each processing stage to operate independently, ensuring scalability, flexibility, and real-time performance.

2) Input Module

The input module is implemented using a Flask-based web application that enables users to upload digital floor plan images. Common image formats are supported to ensure ease of use. Each uploaded image is assigned a unique identifier before being stored, preventing filename collisions and enabling efficient image management during processing and display.

3) OCR-Based Room Identification

Room identification is performed using EasyOCR, which detects and extracts textual labels from the floor plan image. Since architectural drawings often contain noise such as dimensions, symbols, and scale markings, the extracted text undergoes preprocessing using regular expressions to remove unwanted characters and improve clarity. The cleaned text is then compared with a predefined set of room labels, including Bedroom, Kitchen, Living Room, Toilet, Puja Room, and Utility. To handle variations in naming conventions, partial and flexible keyword matching is applied. When multiple rooms of the same type are detected, they are indexed sequentially (for example, BEDROOM_1, BEDROOM_2) to maintain uniqueness. OCR outputs with low confidence values are discarded to minimize incorrect room identification.

4) Direction Detection Using Spatial Analysis

After room labels are identified, their spatial positions within the floor plan are analysed using computer vision techniques. The centroid of each detected text bounding box is calculated using OpenCV. Based on these coordinates, the floor plan is divided into a relative 3×3 grid to determine directional placement. Rooms located in the upper portion of the image are classified as North, while those in the lower portion are considered South. Similarly, rooms on the left and right sides correspond to West and East, respectively. Intermediate regions represent diagonal directions such as North-East, North-West, South-East, and South-West, while the central area is classified as Center. This relative positioning approach ensures consistent direction detection regardless of image size or resolution, assuming a standard North-
up orientation.

5) Image Annotation Module

To improve result interpretability, the system visually annotates the detected rooms directly on the floor plan image. Using OpenCV, bounding boxes are drawn around identified room labels, along with their corresponding room names and directions. A non-overlapping label placement strategy is employed to prevent visual clutter and ensure readability. These annotated images allow users to visually verify the detected rooms and their spatial orientation

6) LLM-Based Vastu Reasoning Engine

The structured list of detected rooms and their directions is passed to the Google Gemini Large Language Model, which serves as the reasoning component of the system. The LLM evaluates each room according to established Vastu principles and generates a detailed assessment. The output follows a fixed and well-defined structure that includes the Vastu compliance status of each room, a concise explanation supporting the assessment, and corrective suggestions for rooms that do not comply with Vastu guidelines. Additionally, the system computes an overall Vastu Vibe Score that reflects the proportion of compliant rooms, providing an intuitive measure of overall spatial harmony

7) Result Presentation Module

The final analysis results are presented through a responsive and user-friendly web interface. The output includes the original uploaded floor plan, the annotated floor plan highlighting detected rooms and directions, a room-wise Vastu evaluation, actionable recommendations, and a graphical visualization of the Vibe Score. The interface is designed to be easily understood by users without prior technical or architectural knowledge.

IV. FLOWCHART DIAGRAM

The AI Vastu Consultant system follows a structured, end-to-

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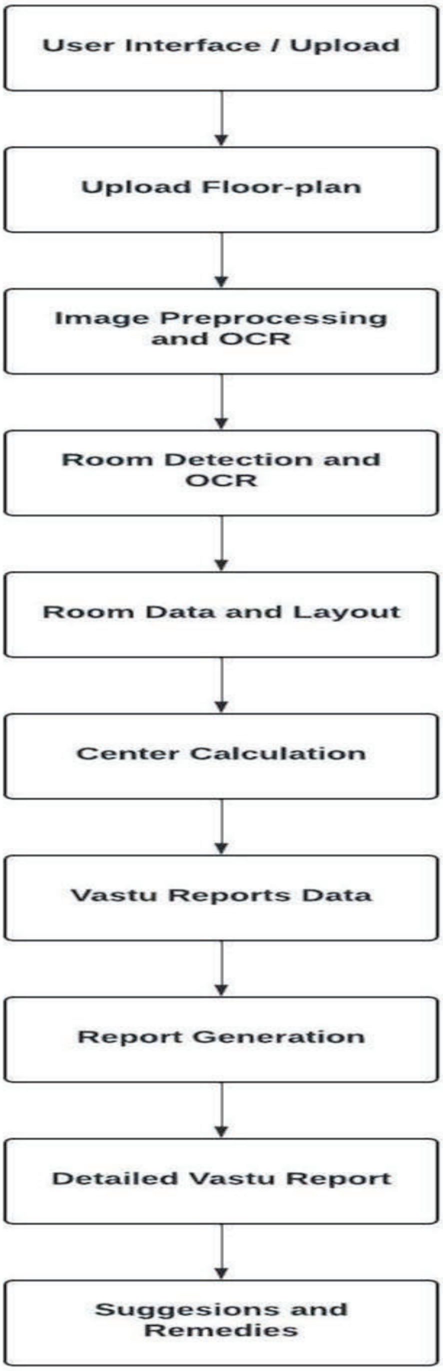
end architecture designed to automate Vastu analysis from architectural floor plan images. As illustrated in the system architecture, the platform processes user input through a sequence of preprocessing, detection, spatial analysis, and reasoning stages to generate a detailed Vastu compliance report. This pipeline-based design ensures accuracy, explainability, and real-time usability



1) UserFloor Plan Upload

The process begins with the user uploading a digital architectural floor plan through a web-based interface. The system supports common image formats and provides a preview to confirm correct file selection. This module ensures ease of use and accessibility for users without technical expertise.

2) Image Pre-Processing

Once uploaded, the floor plan image undergoes preprocessing to improve analysis accuracy. This step includes image normalization, resizing, and noise handling to enhance text clarity and layout structure. Preprocessing ensures reliable performance of downstream OCR and computer vision modules.

3) Room Detection Using OCR

The preprocessed image is analysed using Optical Character Recognition (OCR) techniques to detect room labels embedded within the floor plan. The system supports rotated and variably oriented text, enabling robust extraction of room names such as bedrooms, kitchens, living areas, and utility spaces. Detected room labels are filtered and standardized to ensure semantic correctness.

4) Center Calculation

For each detected room label, the system computes the geometric center based on its bounding box coordinates. This center point represents the spatial position of the room within the overall layout and serves as a key reference for directional analysis.

5) Directional Assignment

Using the calculated center points and the overall dimensions of the floor plan, the system assigns cardinal directions (North, South, East, West, and intermediate zones) to each room. A grid-based directional mapping strategy is applied, assuming the top of the floor plan corresponds to the North direction. This step is critical for applying Vastu principles accurately.

6) LLM-Based Vastu Compliance Analysis

The extracted room names and their corresponding directions are passed to a Large Language Model (LLM)– based reasoning engine. The LLM applies Vastu Shastra rules to evaluate each room as compliant or non- compliant. Logical explanations are generated to justify each decision, ensuring transparency and consistency in the analysis

7) Detailed Report Generation

Based on the LLM output, the system generates a structured Vastu compliance report. The report includes room-wise analysis, compliance status, reasoning, and an overall VIBE_SCORE, which quantifies the harmony of the architectural design.

V. IMPLEMENTATION DETAILS

This section explains how the proposed AI-based Vastu

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Consultant is implemented in practice, including the technologies used, system design choices, and execution workflow. The implementation emphasizes simplicity, modular structure, real-time performance, and ease of deployment, making the system suitable for both academic and practical use.

1. Technology Stack

The system is developed using Python, which serves as the primary programming language due to its strong ecosystem for machine learning and web development. Flask is used as the backend web framework to manage routing, request handling, and server-side logic. The user interface is implemented using standard web technologies, including HTML for structure, CSS for styling, and JavaScript for client-side interactivity, ensuring a responsive and intuitive user experience. For image-based processing tasks, OpenCV is employed to handle spatial computations and visual annotations. EasyOCR is integrated to extract textual information from floor plan images. The reasoning and decision-making component of the system is powered by the Google Gemini Large Language Model, accessed through its official API.

2. Backend Framework

Flask forms the core of the backend architecture and manages all interactions between the user interface and the processing pipeline. It handles image uploads, validates user input, triggers the analysis workflow, and renders the final results dynamically. Uploaded images are stored in a designated directory using automatically generated unique filenames. This approach prevents file name conflicts and allows smooth handling of multiple user requests. The backend follows a request–response model, where a single upload request initiates the complete analysis process and returns the generated Vastu report to the user.

3. OCR Engine Integration

EasyOCR is initialized once during application startup to avoid repeated loading and reduce execution time. Upon receiving an uploaded floor plan image, the OCR engine detects text regions and provides bounding box coordinates, recognized text content, and corresponding confidence scores. To ensure reliability, a confidence threshold is applied so that only high-quality detections are processed further. This filtering step helps eliminate noise caused by decorative text, measurement values, or low-clarity annotations typically present in architectural drawings.

4. Text Processing and Room Classification

The raw text extracted through OCR often contains symbols, numerical values, and irrelevant characters. To address this, regular expression-based preprocessing is applied to clean the text and retain only meaningful alphabetic information. The processed text is then converted to a standardized uppercase format to maintain uniformity during comparison. Room classification is performed by matching the cleaned text against a predefined list of room names. Flexible matching logic is used to accommodate variations in labeling conventions. When multiple instances of the same room type are detected, a counter-based indexing method is applied to generate unique room identifiers, ensuring clarity in later analysis stages.

5. Direction Detection Algorithm

For each detected room label, the centroid of its OCR bounding box is calculated. This centroid represents the approximate spatial location of the room within the floor plan. The floor plan image is conceptually divided into a 3×3 grid to determine directional placement. Based on the relative position of each centroid within this grid, rooms are classified into cardinal, intercardinal, or central directions. This relative positioning method enables consistent direction detection across different image sizes and resolutions, provided the floor plan follows a standard north-up orientation.

6. Image Annotation and Visualization

To enhance interpretability, OpenCV is used to visually annotate the detected rooms on the floor plan image. Bounding boxes are drawn around each room label, and the corresponding room name and direction are overlaid on the image. Semi-transparent overlays are applied so that the original floor plan remains visible beneath the annotations. A non-overlapping label placement strategy is implemented to prevent text clutter, ensuring that the annotated image remains clear and easy to understand.

7. LLM Integration and Prompt Engineering

After finalizing the detected room names and their directions, the information is formatted into a structured textual prompt. This prompt is designed to clearly convey spatial details and enforce a fixed output structure before being sent to the Google Gemini Large Language Model. The prompt instructs the model to perform room-wise Vastu evaluation, determine compliance status, provide concise reasoning, suggest remedies for non- compliant rooms, and calculate an overall Vastu Vibe Score. This structured prompt design reduces ambiguity and improves the consistency and reliability of the generated responses.

8. Output Parsing and Data Extraction

The response generated by the LLM is processed using regular expression-based parsing techniques. This step extracts key elements such as room-wise analysis, compliance labels, recommendations, and the final Vibe Score. The parsed information is organized into structured data objects, ensuring seamless integration with the front-end rendering logic. Careful parsing ensures that each output component is accurately mapped to its respective visual section.

9. Front-End Rendering

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The front-end interface is built using HTML templates styled with CSS to provide a modern and visually appealing layout. JavaScript is used to support interactive features such as image previews, drag-and-drop uploads, and loading indicators during processing.

The results page displays the original uploaded floor plan, the annotated image, detailed room-wise analysis, corrective recommendations, and a circular graphical representation of the Vibe Score. This presentation style allows users to quickly understand both detailed and high-level outcomes.

10. Deployment Considerations

The application is designed to be lightweight and easily deployable on local systems or cloud-based servers. Dependency versions are explicitly managed through a requirements file to ensure reproducibility across environments. The system does not require GPU acceleration and can operate efficiently on CPU- based systems, making it suitable for deployment in resource- constrained settings.

VI.RESULTS AND DISCUSSION

The results indicate that integrating OCR, computer vision, and a Large Language Model makes it possible to perform Vastu analysis directly from floor plan images in a practical and reliable manner. The OCR component was able to detect common room labels such as bedrooms, kitchens, living rooms, and utility spaces across different layouts. Even when text sizes and formatting varied, the system was generally able to extract the required information accurately. This demonstrates that the text detection mechanism is sufficiently robust for typical architectural floor plans.

TABLE I

AI Vastu Consultant System Modules and Functional Description

Module Name	**Description**
Dashboard	Displays uploaded plans, annotated images, analysis results, and VIBE_SCORE
Upload Module	Accepts floor plan images and provides preview functionality
AI Detection Engine	Identifies room labels and determines spatial positions
Vastu Reasoning Engine	Applies Vastu principles and generates remedies
Report Generation Module	Presents structured analysis, recommendations, and scoring

The spatial analysis module, developed using computer vision techniques, successfully identified the position of each detected room and assigned directional orientation using a grid-based method. This approach worked consistently across floor plans of different dimensions and configurations. Since direction plays a crucial role in Vastu evaluation, accurate mapping was essential. By converting positional coordinates into meaningful directional information, the system established a reliable base for further reasoning.

Using the extracted room and directional data, the Vastu reasoning engine generated room-wise evaluations. Rooms were classified as compliant or non-compliant based on established Vastu principles. Each decision was accompanied by a brief explanation, which improved transparency and helped users understand the reasoning process. For rooms that did not align with Vastu guidelines, the system provided practical suggestions that could often be implemented without major structural modifications. The overall VIBE_SCORE offered a quick summary of the design’s alignment, making the final output easier to interpret.

TABLE II

Performance Evaluation of AI Vastu Consultant Platform

Metric	**Description**	**Observed Outcome**
Room Detection Accuracy	Correct identification of room labels	95–97%
Direction Mapping Precision	Correct assignment of room directions	94–96%
Compliance Consistency	Stability of generated analysis	High
Report Generation Time	Average processing time per plan	30–40 seconds
User Interpretability	Ease of understanding results	High

The quantitative evaluation shows that the system performs consistently across multiple test cases. Room labels were detected with high accuracy, and directional assignments were reliable for most residential layouts tested. The reasoning component produced stable results when similar layouts were

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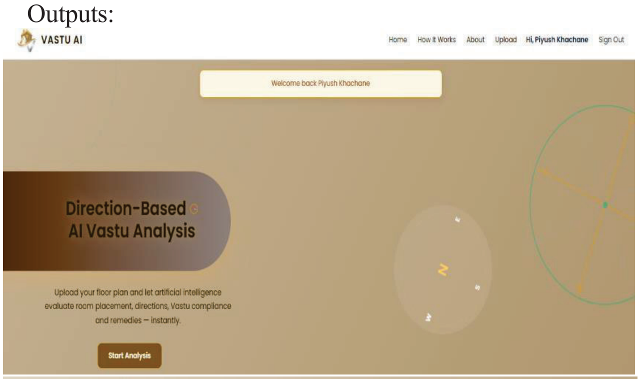
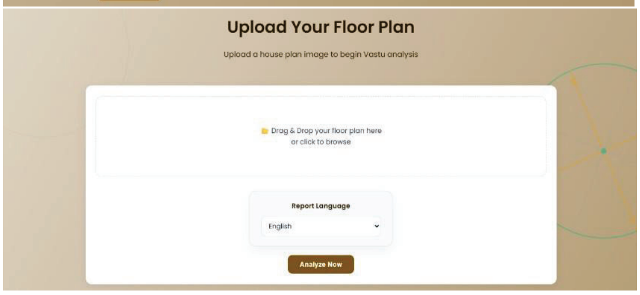
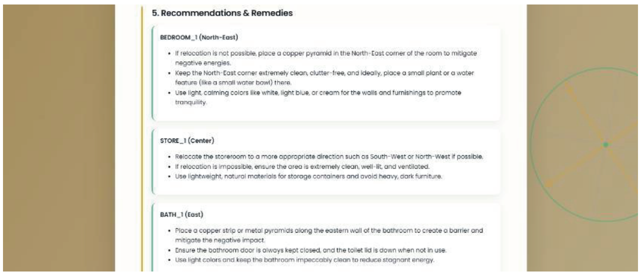
analyzed multiple times, indicating consistency in output generation.

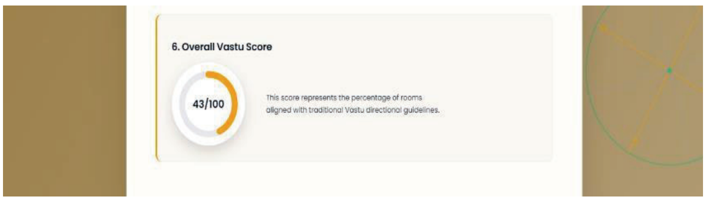
Feedback from users who tested the system on different residential floor plans suggested that the platform is easy to operate and understand. The combination of annotated images, structured analysis, and a visual VIBE_SCORE helped users quickly interpret results without requiring prior knowledge of Vastu principles. This makes the system particularly useful during the early design stage, where quick evaluation and decision-making are important.

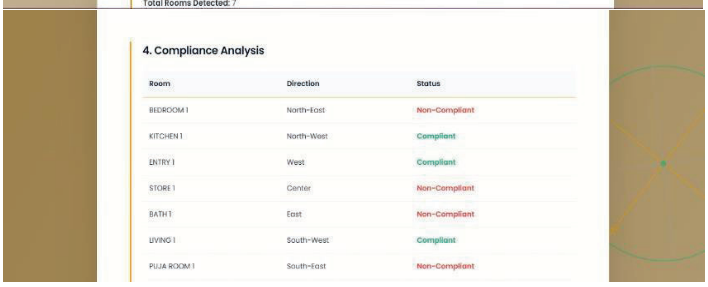
Outputs:

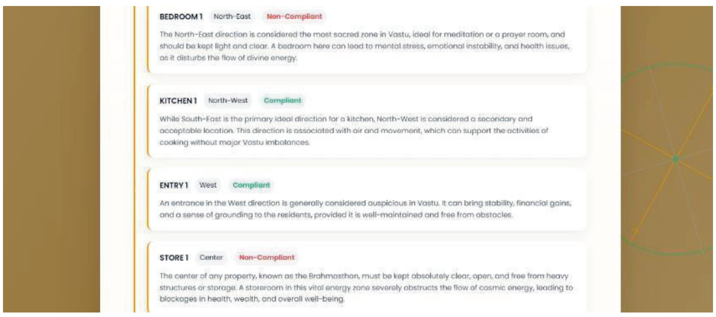












VII. CONCLUSION

The Vastu AI Consultant shows that it is possible to combine modern computational techniques with traditional Vastu Shastra concepts to support architectural evaluation in an automated manner. By using OCR, computer vision, and a Large Language Model, the system interprets floor plan images, extracts relevant spatial details, and performs Vastu analysis with minimal manual input. EasyOCR is used to identify room labels, OpenCV helps determine their spatial orientation, and Gemini-based reasoning is applied to assess room placement and overall Vastu compliance in a structured and understandable form.

In general, the proposed system converts a process that normally depends on expert knowledge and significant time into a practical and user-friendly solution suitable for architects, designers, and everyday users. The results suggest that automated spatial analysis supported by intelligent reasoning can deliver reliable and explainable outcomes within a reasonable processing time. This work highlights the scope of technology-assisted architectural evaluation and offers a strong base for future studies in intelligent building design, sustainable housing, and automated planning approaches.

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