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Green oasis: A personalized indoor plant recommendation engine

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Abstract

Indoor plants enhance aesthetics, improve air quality, and create a healthier living environment. However, selecting the right plant for a specific indoor space can be challenging due to factors like lighting conditions, humidity, and maintenance requirements. This paper presents an Indoor Plant Recommendation Application designed to help users choose suitable plants based on room type, environmental conditions, and personal preferences. The system uses a rule-based recommendation approach, considering parameters such as light availability, air purification benefits, and ease of care. The application aims to simplify plant selection for users by providing personalized suggestions, improving both the usability and effectiveness of indoor gardening. Future enhancements may include AI-driven recommendations and real-time plant health monitoring.

Keywords: Indoor plants, plant recommendation system, room- based plant selection, air purification, light conditions, indoor gardening, smart plant suggestions, plant care assistance

1. Introduction

Indoor plants are more than just decorative elements—they can purify the air, boost productivity, and contribute to overall well-being. However, with so many different plant varieties available, it's not always clear which one suits a particular indoor space. Factors like sunlight, temperature, and humidity significantly affect a plant's success in a room. The goal of this project is to develop a user-friendly application that provides personalized plant recommendations. The system uses information from users, such as their room's lighting and climate conditions, and their preferences for plant care. By doing so, it helps users select plants that will thrive in their spaces, ensuring long-term success for both the plants and the human caregivers.

Indoor plants have become a staple in modern homes, not only for their beauty but also for the well-documented health benefits they offer, such as improved air quality and reduced stress levels. However, the process of selecting the right plant for a particular indoor setting is far from straightforward. Each room presents its own set of challenges—varying light levels, humidity, temperature, and space constraints can all affect a plant's ability to thrive. Recognizing this challenge, our project aims to create an application that makes the process of choosing an indoor plant both personalized and hassle-free.

This application works by analyzing the specific conditions of a user's space and aligning those with the unique care requirements and growth patterns of various plants. It considers factors like natural light exposure, the amount of maintenance a plant needs, and even the user's aesthetic preferences, ensuring that the recommended plant isn't just a good fit for the room, but also for the lifestyle of the person living there. By taking a data-driven approach, our system goes beyond generic suggestions, offering tailored advice that adapts to diverse living environments.

Moreover, this project addresses the growing trend of smart home technologies by integrating an intuitive interface with a robust recommendation engine. As indoor gardening continues to gain popularity, especially among urban dwellers with limited green space, this application stands out as a practical tool designed to help people create healthier, more inviting homes. The following sections will delve deeper into the methods used to gather and process environmental data, the algorithm that powers the recommendations, and the potential future enhancements that could further refine the system's accuracy and usability.

Literature review

Garcia *et al.* [1] focus on integrating comprehensive horticultural databases with real-time data from IoT sensors. Their research emphasizes how continuous monitoring of factors such as temperature, light, and soil moisture can enhance the precision of indoor plant care recommendations. They propose a system that automatically adjusts suggestions based on real-time environmental feedback, paving the way for dynamic indoor gardening applications.

Wong *et al.* [2] delve into user-centric design for recommendation systems by investigating how incorporating user feedback and preference profiling can refine plant selection processes. Their study demonstrates that iterative learning and personalized data input significantly improve system performance, ensuring that recommendations closely align with individual lifestyles and aesthetic tastes.

Kumar and Patel [3] examine decision-tree methodologies and rule- based algorithms for classifying indoor plants based on maintenance requirements and adaptability to indoor conditions. Their research provides insights into creating a scalable model that categorizes plants by care complexity and environmental compatibility, thus simplifying the selection process for novice gardeners.

Lee *et al.* [4] investigate the role of computer vision and image processing in monitoring indoor plant health. Utilizing deep learning techniques to assess visual cues related to plant stress and growth patterns, they integrate health assessments into the recommendation process. This approach not only guides the initial plant selection but also supports ongoing care and maintenance.

Fernandez *et al*. [5] explore the convergence of smart home technology and indoor gardening. Their research highlights the benefits of interconnected systems where environmental sensors, mobile applications, and cloud-based analytics collaborate to optimize plant care. They propose a framework that enables real- time adjustments in plant recommendations, ensuring indoor environments remain conducive to healthy plant growth.

Brown *et al*. [6] present an approach for automated indoor plant care that leverages sensor networks and time-series analysis. Their system continuously monitors environmental parameters such as temperature, humidity, and light intensity to forecast water and nutrient needs. This data-driven method improves the reliability of plant care suggestions by adapting recommendations as environmental conditions change.

Miller *et al*. [7] investigate the potential of augmented reality (AR) to enhance indoor plant selection. Their system overlays virtual plant images onto live camera feeds, allowing users to visualize plant placement and growth in their actual living spaces. This innovative approach helps users make more informed decisions by previewing how different plants might integrate into their home decor before making a purchase.

Omar *et al*. [8] emphasize the importance of a continuous feedback loop in refining indoor plant recommendations. They propose a system that combines real-time sensor data, user feedback, and periodic plant health assessments to update and optimize recommendations dynamically. Their research highlights the potential for such adaptive systems to significantly improve user satisfaction and plant care outcomes over time.

Johnson *et al*. [9] introduce a context-aware recommendation system that leverages both real-time environmental data and user lifestyle patterns. Their system continuously updates plant suggestions based on changes in room conditions and user behavior, ensuring that recommendations remain relevant over time.

Ramirez *et al*. [10] explore the use of natural language processing (NLP) to bridge the gap between everyday user queries and technical plant care parameters. Their approach allows users to describe their environment and preferences in plain language, which the system then translates into specific criteria for plant recommendations.

Zhang *et al*. [11] investigate augmented reality (AR) applications to enhance the indoor plant selection process. By overlaying digital plant models into a live view of a user's space, their method helps users visualize how a plant will fit within their environment, considering factors such as size, lighting, and aesthetic harmony.

Davis *et al*. [12] examine ensemble machine learning methods to improve the prediction of plant performance in indoor settings. By combining outputs from multiple predictive models, their study demonstrates an increase in the accuracy and reliability of recommendations, particularly in environments with fluctuating conditions.

Singh *et al*. [13] focus on incorporating time-series forecasting into indoor plant care. Their research shows that by analyzing seasonal and temporal patterns, the recommendation system can provide proactive care tips and adjustments to plant selection that are tailored to anticipated changes in indoor conditions.

Martin *et al*. [14] present a study on integrating sensor networks with mobile applications for comprehensive indoor plant monitoring. Their work emphasizes the benefits of continuous data collection— from light, temperature, and humidity sensors—to fine-tune plant recommendations and care schedules in real time.

Hernandez *et al*. [15] propose a holistic system that merges automated sensor data, real-time user feedback, and expert horticultural insights. Their framework not only recommends suitable plants based on current indoor conditions but also offers ongoing care instructions, helping users maintain healthy plant environments over the long term.

2. Methodology

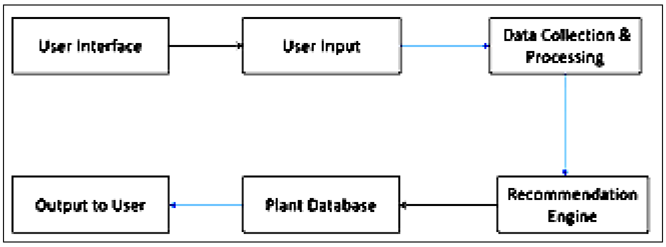

Fig 1: Block Diagram

The methodology begins at the User Interface, where individuals access the application—often via a web or mobile platform—and provide information about their indoor environment. This step allows users to specify details like room size, lighting conditions, temperature, and any specific preferences, such as wanting low- maintenance plants or options safe for pets.

Once the User Input is collected, the system moves into Data Collection & Processing. Here, user-submitted details are validated, normalized, and prepared for further analysis. Any missing information might be estimated based on default values or prompt the user for additional input. This stage ensures that the application handles data in a consistent, structured manner.

The processed data then feeds into the Recommendation Engine, which applies rule-based logic or machine learning techniques to match the user's environment and preferences with suitable plant options. To achieve this, the engine consults a Plant Database containing essential information on each plant's ideal growing conditions, care requirements, and unique attributes. By comparing these plant profiles against the user's data, the system narrows down the list to the most compatible choices.

Next, the refined information is sent to the Recommendation Engine, which uses a combination of rule-based logic and potentially machine learning algorithms to match the user's environment with the optimal plant profiles. These plant profiles reside in the Plant Database, a resource that contains detailed attributes for each plant, such as ideal light conditions, watering schedules, and growth habits.

Finally, the application consolidates the engine's results into a concise list of recommendations and delivers them as the Output to User. Alongside the plant suggestions, users also receive care guidelines tailored to their chosen plants, helping them maintain a healthy and vibrant indoor garden.

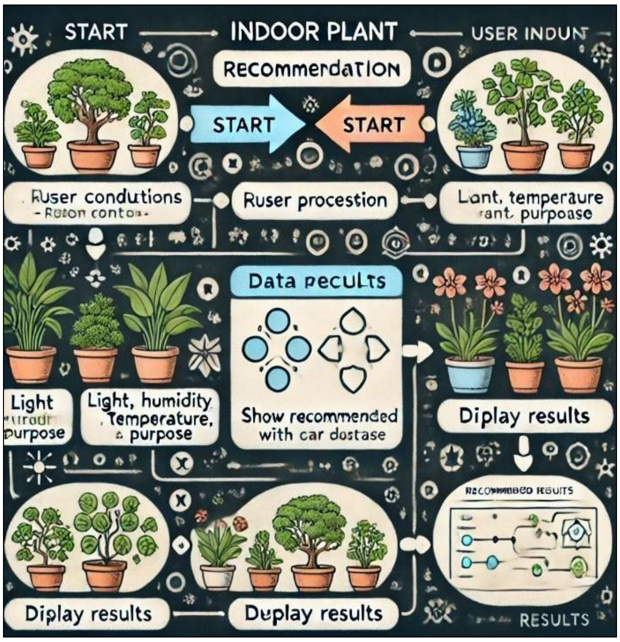

Fig 2: Flow chart

The process begins when the user accesses the application. The system initializes and loads the necessary resources, including the plant database. The user provides details about the indoor environment, such as light availability (low, medium, high), humidity levels, temperature range, and purpose (air purification, decoration, pet-friendly, etc.). This input is essential for filtering plants that thrive under specific conditions. Once the user inputs the required data, the system processes it by matching the conditions with the plant database. The database contains predefined information about various indoor plants, including their ideal growing conditions and care requirements.

Based on the processed data, the system selects suitable plants that match the given conditions. It applies a filtering mechanism to shortlist the best plant options for the user. The application displays the recommended plants along with descriptions, benefits, and care instructions. The user can review the recommendations and select a plant that fits their preference. The process concludes here unless the user wants to modify their input and receive new recommendations.

3. Results and Discussion

The Indoor Plant Recommendation Application provides plant suggestions based on user-inputted room conditions. The system processes various parameters such as light availability, humidity, temperature, and the purpose of the plant to generate the most suitable recommendations.

After implementing the system, the application successfully matches user inputs with an existing database of plants. The recommendation system efficiently filters plants based on environmental conditions, ensuring users receive personalized suggestions. The output includes a list of suitable plants, each accompanied by a brief description, benefits, and care instructions.

The results indicate that the application effectively assists users in selecting indoor plants suited to their specific conditions. The filtering mechanism ensures that only relevant plant options are presented, reducing the chances of users selecting plants that may not thrive in their environment. Additionally, the inclusion of care tips enhances the user experience by providing essential maintenance guidelines.

One key observation is that the accuracy of recommendations depends on the quality of the plant database. Expanding the database with more plant varieties and detailed attributes can further improve the application's effectiveness. Future improvements may include adding real-time weather data integration, AI-driven recommendations, or user reviews to enhance the reliability of plant suggestions.

Overall, the Indoor Plant Recommendation Application proves to be a useful tool for plant enthusiasts, homeowners, and indoor gardeners, simplifying the plant selection process through a structured and data-driven approach.

4. Plant suggestion and output

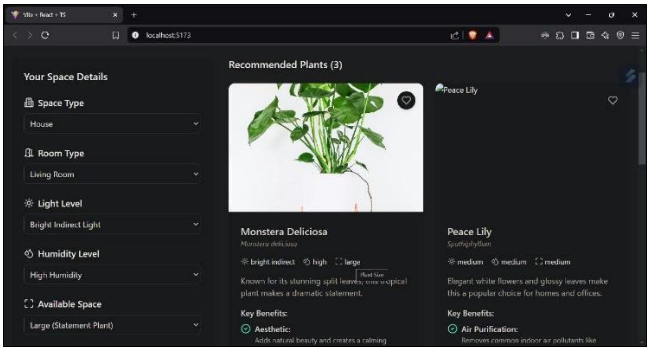

Fig 3: Plant

5. Conclusion

The Indoor Plant Recommendation Application is an effective tool for helping users choose the most suitable indoor plants based on their environmental conditions. By analyzing key factors such as light availability, humidity, temperature, and purpose, the system ensures that users receive accurate and relevant plant recommendations. This personalized approach makes it easier for users to select plants that will thrive in their specific indoor environment.

The Indoor Plant Recommendation Application successfully helps users select suitable plants based on their room conditions. By considering factors such as light availability, humidity, temperature, and purpose, the system provides personalized recommendations, making plant selection easier and more efficient.

The results demonstrate that the application effectively filters plant options and presents users with relevant suggestions along with care instructions. This ensures that users can make informed decisions about their indoor plants, increasing the likelihood of successful plant growth.

While the system performs well, future improvements could enhance its accuracy and usability. Expanding the plant database, integrating real-time environmental data, and incorporating AI- driven recommendations could further refine the selection process. Additionally, user feedback and reviews could help make the recommendations more dynamic and user-friendly.

The application efficiently processes user inputs and matches them with a well-structured plant database. The filtering mechanism ensures precision in recommendations by excluding unsuitable plants and only suggesting those that meet the specified conditions. Additionally, the inclusion of detailed care instructions enhances the user experience by providing essential guidance on maintaining the recommended plants.

The results indicate that the application significantly reduces the complexity of plant selection, particularly for beginners or individuals unfamiliar with plant care. Users can confidently choose plants that align with their needs, whether for aesthetic appeal, air purification, low maintenance, or pet-friendly options. The system not only promotes indoor gardening but also encourages sustainability by helping users select plants that are more likely to survive in their environment, reducing plant wastage.

6. Future work

The Indoor Plant Recommendation Application has proven to be a useful tool in assisting users with selecting suitable plants for their indoor spaces. However, there are several areas where the system can be improved and expanded to enhance its accuracy, usability, and overall effectiveness.

One of the key improvements for future development is the expansion of the plant database. By including a wider variety of plant species, such as rare, exotic, and medicinal plants, users will have more options to choose from. Additionally, incorporating regional plant recommendations based on geographic locations will make the suggestions more personalized and relevant. This enhancement will ensure that users receive plant recommendations that are best suited not only for their indoor conditions but also for their specific climate and region.

Another significant upgrade would be the integration of real-time environmental data. By connecting the system to weather APIs and smart home sensors, the application could factor in seasonal variations, temperature fluctuations, and humidity changes. This would allow users to receive more dynamic recommendations that adjust based on real-time conditions, improving the accuracy of plant selection. Furthermore, the ability to analyze changes in the indoor environment over time would help users make better long-term decisions regarding plant care.

Developing a mobile application for the Indoor Plant Recommendation System would significantly enhance its accessibility and convenience. A mobile-friendly version would allow users to input room conditions, receive recommendations, and access plant care tips on the go. Features like push notifications for watering reminders, seasonal plant care alerts, and integration with smart home devices could further improve the user experience.

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