



# DecorMate - AI powered Interior Design and Product Recommendation System

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**Abstract:** Interior design decisions are difficult and expensive to make without any way to preview an outcome. Therefore, DecorMate is an AI interior design and product recommendation platform designed to meet this challenge. DecorMate serves as an effective, easy-to-use tool that will make decision-making easier and allow users to bring their digital ideas into reality. It helps the users with room visualization and getting personalized product recommendations.

The process starts with the upload of the photo of a room by the user. It generates the redesign of the space in a style the user has opted for using a stable diffusion model for its visualization. Apart from generating the visual design, the services of DecorMate make design recommendations on matching furniture and decor items, including practical suggestions based on the user's budget. The platform goes further to support implementation by providing contact details of nearby home decor vendors. The whole system can be reached through a web-based interface that is user-friendly and interactive for uploading images, viewing your design, and navigating through any products. Through integrating visualization and practical sourcing of products, DecorMate minimizes design errors.

**Key Words:** DecorMate, AI-powered, interior design, product recommendation, visualization, user's budget, real-world solutions.

## 1. INTRODUCTION:

Interior design involves the art of converting living spaces into functional, visually pleasing areas. Traditional methods of design are not only time-consuming but expensive, too, and usually difficult to perceive before actual renovation takes place. Even at this point in history, when tools have gone digital, most of the platforms have limitations to their own: either they offer minimal customization, lack real-time previews, provide limited style options, or fail to integrate furniture and decor selection effectively.

AI and other digital advances are revolutionizing the practice of interior design. The platforms, such as DecorMate, enable users to upload photos of their rooms, choose a preferred style, and obtain redesigns generated by AI. Suggestions based on the room's configuration, budget, and nearby availability are useful and actionable when designing furniture and decor. Nevertheless, there are remaining issues: there is no system that integrates visualization with product recommendations. Our proposed solution DecorMate closes this gap with responsive, fully automated, and efficient virtual personalized design services.



## 2. LITERATURE REVIEW:

In the last several years, various scholars have sought to answer the problem of the role of AI in simplifying the process of designing interior spaces. AI design solutions can be analyzed to ascertain where DecorMate can be positioned.

Thakkar, Vadgama, Ranawat, Sharma, and Mangla [2] developed an application that employed AI to design a layout and then edit images of rooms. While the system configured and produced images of photorealistic designs, users had to independently procure the furnishings and identify the stores that would supply the furniture. Designing a room is like giving a recipe without outlining a store from which to find the ingredients.

Nagarajan, Kaviya, Kumar, and Shanmugapriya [1] designed ARchitect, which integrated augmented reality into designing a home. Users got an immersive experience, but without the AR devices. The system also did not help with the budgeting and procurement of the furniture for the home design; on the contrary, these operations are the most boring and irritating ones when a person is trying to redesign a house.

U. Ahsan, Y. Wang, A. Guo, K. D. Tynes, T. Xu, E. Afshar, and X. Cui [3] worked on ensuring that furniture and decor items had a cohesive aesthetic. Their previous system had enough calibration to differentiate colours, but when it came to reforming real-life spaces, it failed. Furniture would show up in strange arrangements, and the outcomes were often unrealistic to actual home implementations.

J. Chen, Z. Shao, and B. Hu [7] possessed an innovative idea by having users typographically describe their dream room, and having an AI replicate it. Though, aspiring to describe your living room in text is an issue. Without seeing the before and after images, users had a hard time grasping what exactly it was they were receiving.

Alshehri, Alotaibi, Almasri, and Altaweel [6] created DecoMind, which could generate stunning room design arrangements from an empty canvas. This was great for new houses or empty spaces, but what about the common user who already has furniture and just wants to rearrange their room? This is where it fell short.

A. Bandyopadhyay, H. Ranjan, R. Kumar, S. Goyal, and P. Chakraborty [9] created a design system that showcased a balance between creativity and practicality. The designs were visually appealing and functional, but users had a mental block when it came to execution. How are these items realistically procured? What would their cost be? These questions were left unanswered.

H. Huang, A. MohanSingh, and S. Luo [8] focused on developing a platform where users could jointly create designs with AI. While the collaboration in design was seamless, however, the seamless cohesiveness of the design and reality was still unsolved. There are no budget restrictions, no suggestions to local stores, just designs lost in the digital world.

AI RoomDecor developed by L. Boppana, A. Manepalli, M. Mandadi, and V. Sanga [5] aimed to effortlessly personalise and propose decorations to users. Style suggestions, unfortunately, were quite minimal and the AI repositioned furniture in ways that were incorrect. Users did not trust the suggestions since they lacked physical world constraints.

Instead of helping users re-design their homes, M. Ansari [4] focused on how AI can assist in enhancing interior design education. It offered great opportunities to foster creativity and enrich the design learning environments.

A pattern can be seen from all these attempts. Certain systems provided stunning visualizations but omitted the shopping step [1, 2, 7]. Others aided in the selection of products but could not render any realistic transformations of the room [3, 5]. Some had substantial new starting points when there were existing user needs to work from [6]. The missing element was a system that understands the user's budget, displays realistic designs, assists in online product selection, and indicates the closest store that sells the required furniture. That is precisely the problem that DecorMate was built to solve. It combines the AI-driven redesign, clever product suggestions, nearby shopping to deliver a complete experience from the starting point, 'I wish my room looked different, to 'Here is exactly how to do it.'

## 3. OBJECTIVES:

1. Allowing individuals to preview a space visually before spending money to buy space physically significantly decreases potential design mistakes.
2. Provide smart product choices: Guide users with AI-based furniture alongside decor ideas suited to their taste and financial plan, cutting down on effort as well as preventing incorrect buying choices.
3. Making it simpler to locate close-by trustworthy stores for home decoration, enabling people to rapidly transform their digital concept into an actual product.
4. Offer visitors an easy-to-use platform to redesign their space without requiring professional experience.



#### 4. METHODOLOGY:

DecorMate aims to unify the interior design process by offering AI-generated room makeovers, tailored product recommendations, and nearby supplier identification through a single platform. The system follows a structured approach that connects user interaction, AI processing, and external services in a seamless sequence.

In terms of concept, DecorMate is composed of four main components:

1. **User Interface Layer**  
 This layer is dedicated to the user. Uploading pictures, choosing design styles, setting budgets, and viewing AI-generated room images and product recommendations are handled by React.js. The responsive design ensures the same user experience on various screen sizes.
2. **AI Redesign Engine**  
 The AI component uses a diffusion-based generative model, enhanced by ControlNet, to alter the appearance of rooms while preserving the original features of the user's space. It identifies major elements in the uploaded picture and then creates a redesigned image that corresponds to the user's desired style.
3. **External Integration Layer**  
 To make realistic suggestions, DecorMate interacts with other APIs. The Google Shopping API provides the furniture options according to the style and budget, and the Google Maps Places API shows the closest retailers where the customer can contact for custom-made furniture.
4. **Data Management System**  
 Firebase is chosen for the authentication of users, the storage of data in a secure and reliable manner, and for fast and easy retrieval of data. All the user data, including information, image, and design, is processed in this layer while ensuring high protection and scalability of access control.

The combination of these elements results in a complete design process, giving users the opportunity to shift from motivation to furniture decisions on the same platform.

Below is the flowchart of DecorMate:

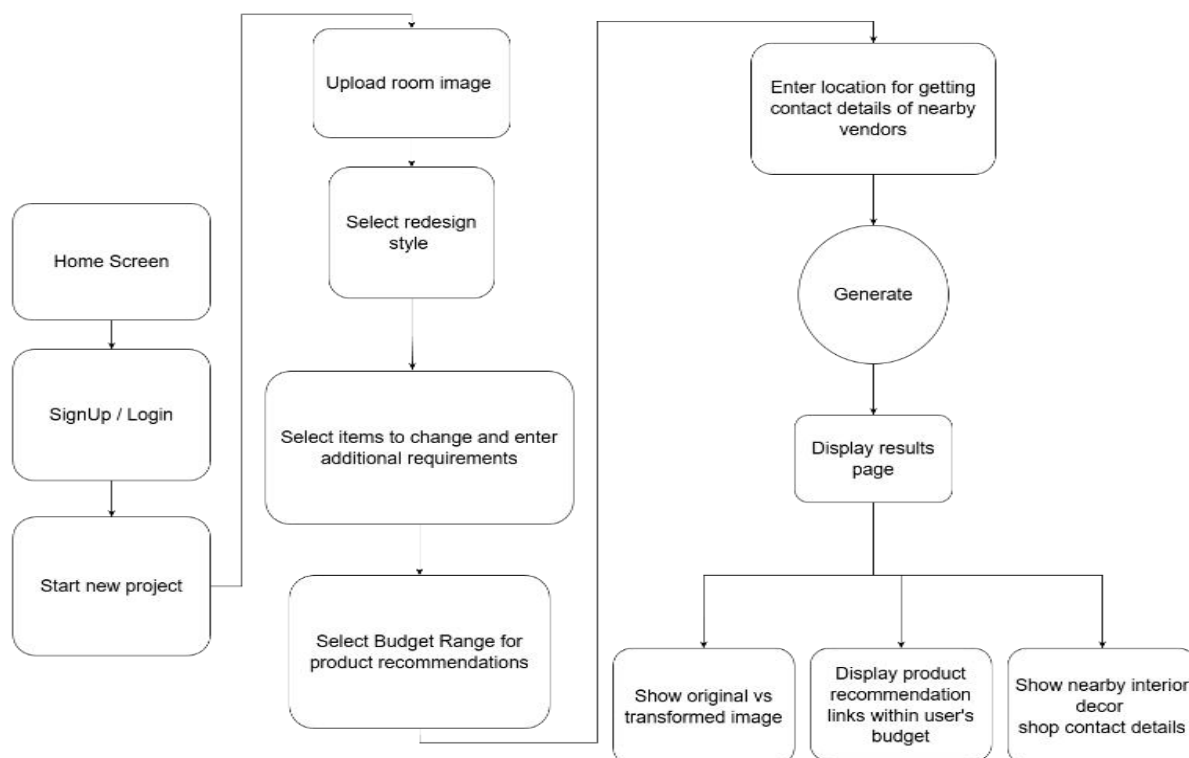


Figure 4.1 – Process flow of DecorMate

#### 5. IMPLEMENTATION :

The development of DecorMate will be executed in layers, starting with the frontend and moving step by step to the backend services, AI processing, and external APIs. Each component will be developed in such a way that it can work on its own, yet keep regular contact with the other parts of the system.



#### A. Interface Design and Frontend Development

The implementation procedure started with working on the Figma designs of the UI of the platform, where simplicity, clarity, and ease of navigation were the main considerations. The wireframes defined the composition of the important screens like the dashboard, image-upload view, style selector, and comparison page for “before-and-after” outputs. Frontend was built on React.js and made these prototypes the point of reference. The component-based structure of React.js allowed the creation of reusable UI blocks, responsive layouts, and dynamic state management. The frontend now supports:

- Uploading room images
- Selecting interior design styles
- Entering budget and location details
- Viewing the Before vs After image
- Viewing recommended products

This foundation establishes the primary user interaction part of the system.

#### B. User Authentication and Data Access Control

Firebase Authentication is used to implement secure access. This part of the system takes care of:

- Signing up and logging in users
- Access to stored images and results only for specified users

By enforcing authentication at the entry point, user-specific preferences, uploaded images, and generated outputs can be safely linked to individual accounts.

#### C. Backend Architecture

The backend will be developed using Node.js and Express.js. It will serve as the central point for communication between the frontend, AI engine, Firebase, and external APIs.

Its role is to:

- Receive user requests and validate inputs
- Trigger the AI processing pipeline
- Fetch product and vendor suggestions
- Manage data exchange with Firebase services

RESTful API endpoints will be implemented to guarantee that each process is modular and easy to maintain. This arrangement will be able to manage the additional load of any future scalability, i.e. the introduction of new features or external services, without affecting the functionality of the existing system.

#### D. AI Processing Pipeline

The AI redesign engine will rely on the Stable Diffusion model together with ControlNet to recreate room pictures in different styles while keeping their layout unchanged. The pipeline of implementation will consist of the following stages:

- Image preprocessing: Identifying major furniture and room boundaries
- Instruction-based restyling: Applying the chosen aesthetic without altering geometry
- Post-processing: Improving the quality of output and preparing the transformed image for rendering on frontend

The AI module will function as a separate service that the backend invokes whenever a user requests a transformation.

#### E. Integration of External Services

For the purpose of supporting actionable design recommendations, DecorMate will rely on the interaction of two primary external systems:

- Google Shopping API  
The API offers the user products according to the defined interior style, furniture category, and budget. The returned products come with images, prices, and links for buying.

- Google Maps Places API  
It fetches the relevant decor or furniture items vendors close to the user's location. The API shares the details of the stores including their names, addresses, and phone numbers.

By having these services, the users will not only be able to see a redesigned area but also get the purchase methods that are most convenient to them.

#### F. Data Storage and Media Management

User content such as room pictures uploaded by the user, outputs generated by AI, and saved suggestions will be stored in Firebase Firestore.



The storage layer provides:

- Secure file storage
- An easy-to-use and scalable document-based database
- Synchronized access between frontend and backend

Firebase rules serve as the barrier to data security, allowing only the authenticated users to access or change their personal data.

#### G. End-to-End Platform Flow

The completed integration of all components will lead DecorMate to support the operation flow as follows:

1. User logs in through Firebase Authentication
2. An image of the room is uploaded and the user has to select the design inputs he/she/it wishes
3. Backend triggers the AI redesign service
4. Redesigned image is returned and displayed alongside the original
5. External APIs generate product and vendor suggestions
6. All content is stored for accessing later

This organized implementation plan will allow DecorMate to function as a full interior design support platform.

## 6. RESULTS:

The current stage of DecorMate shows considerable progress in creating a functional and user-ready foundation. The complete collection of Figma designs presents a clear view of the user experience. This journey goes from uploading room images to choosing design styles and finally seeing the transformed outputs. These visual prototypes informed the frontend's structure, layout, and flow.

The frontend has been built using modern web technologies. This choice guarantees responsiveness across devices, smooth navigation, and easy interaction between users and the system. At the same time, user authentication has been fully implemented with Firebase Authentication. This allows secure email-based sign-ins and account creation, ensuring users can safely access their personalized designs and saved preferences.

Together, these completed parts show that DecorMate's foundational workflow is functional and ready for future features like AI-driven room redesign and smart product recommendations. The figures below illustrate the finalized Figma interface mock-ups that guided the development of the current front-end system.

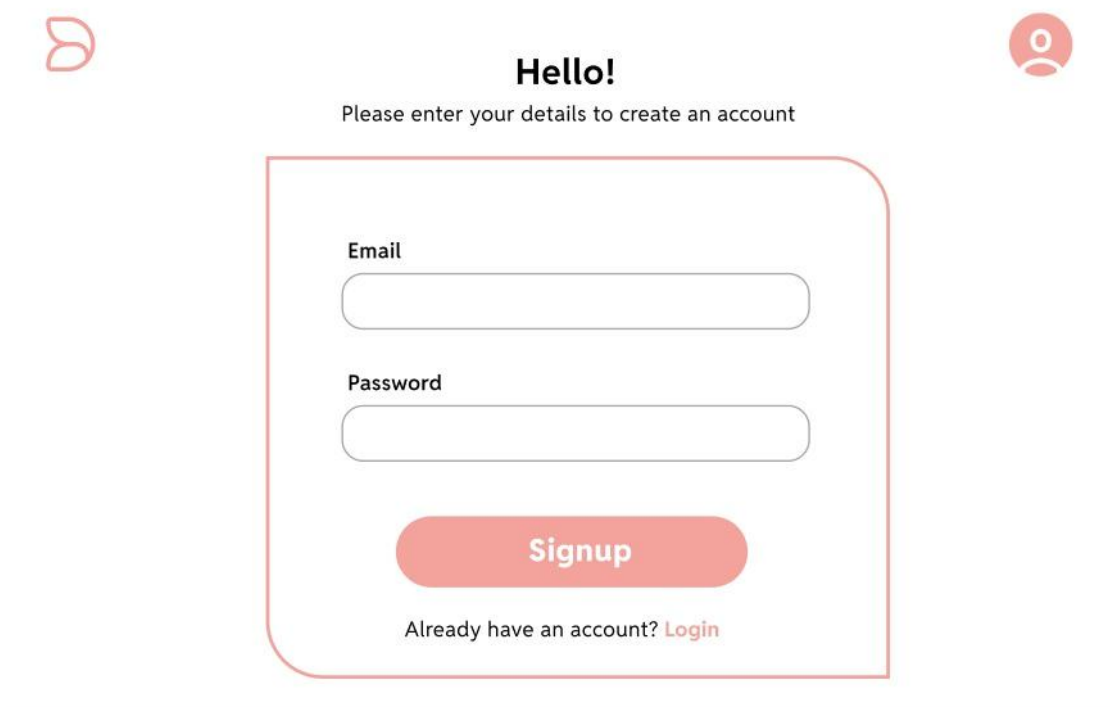


Figure 6.1 – Login/Signup Page

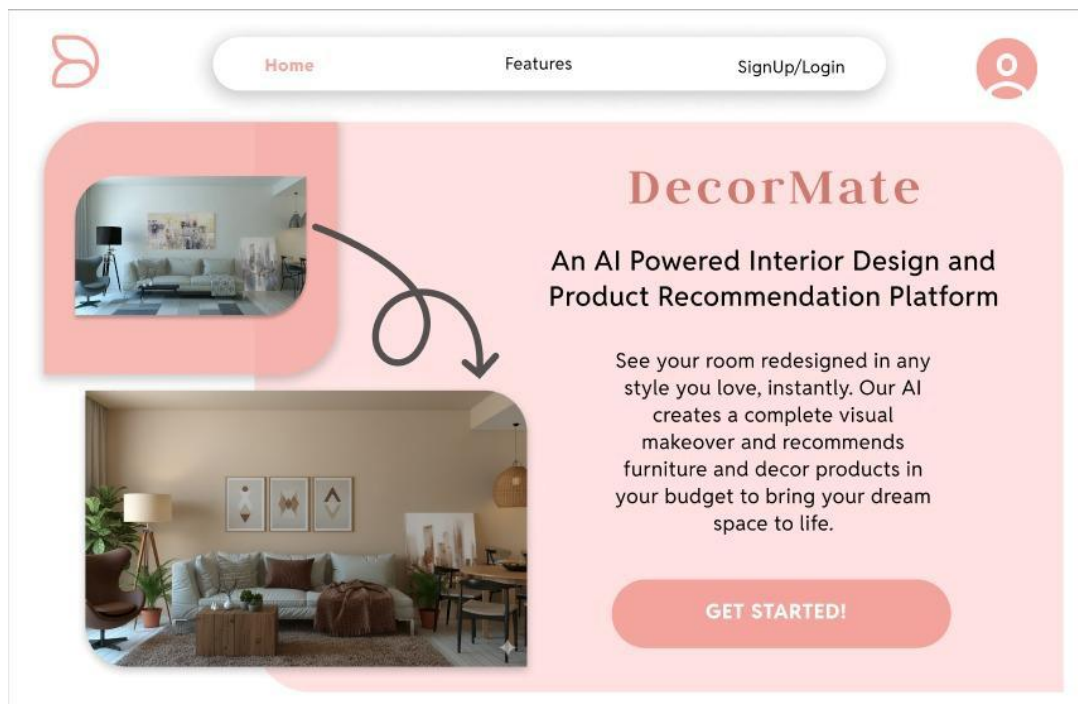


Figure 6.2 – Home Page

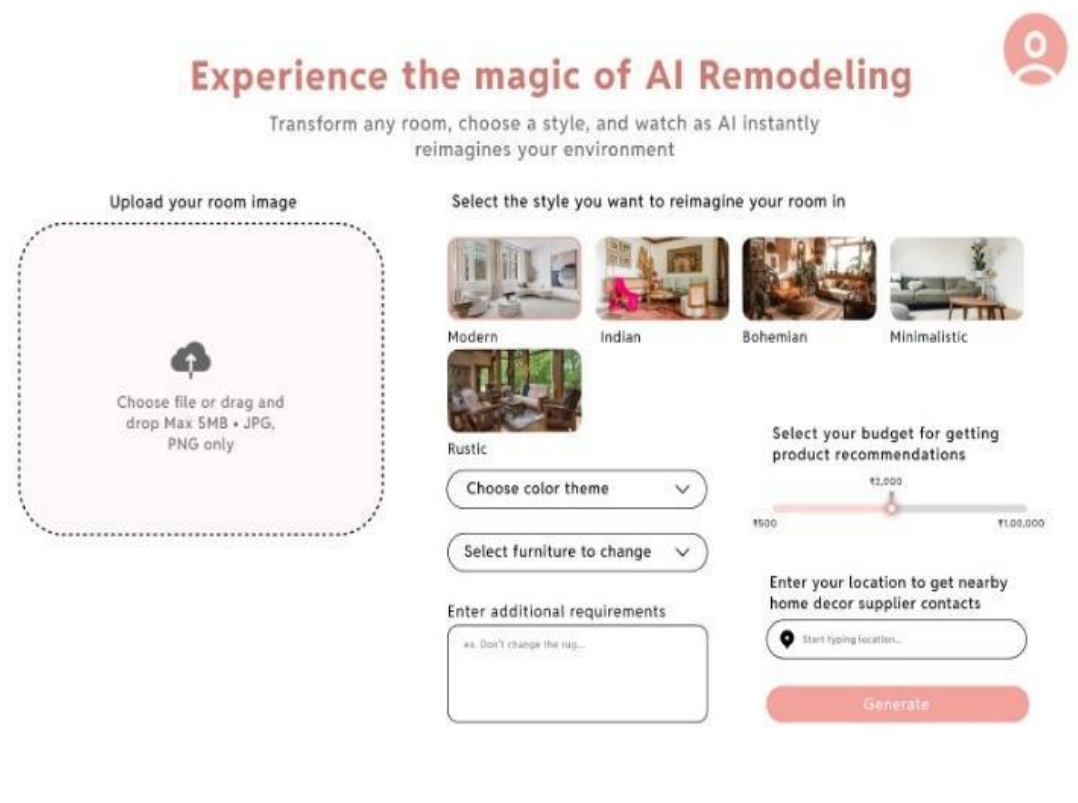


Figure 6.3 – User Interaction Page

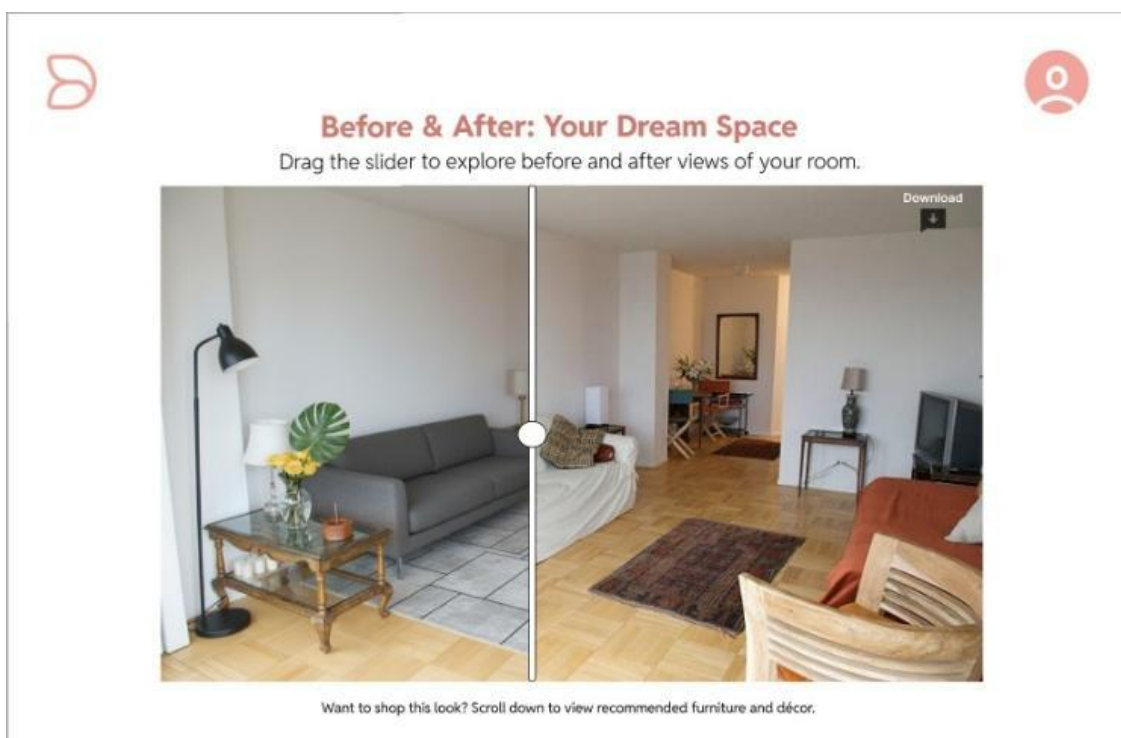


Figure 6.4 – Result Page

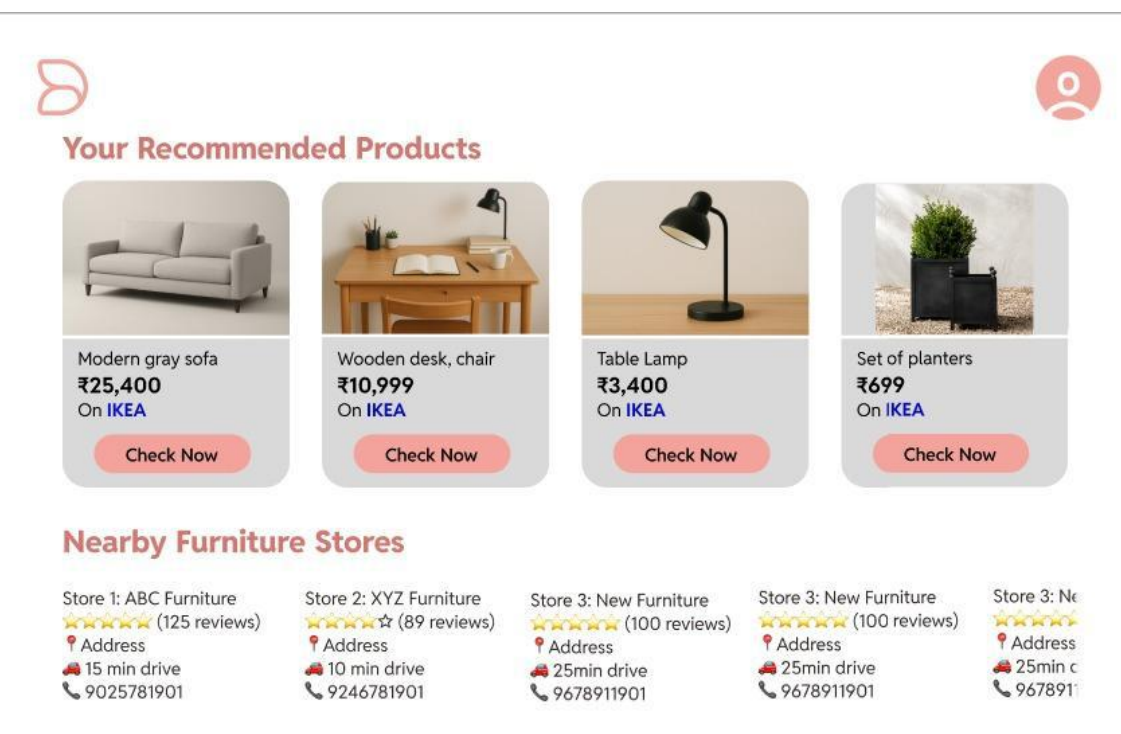


Figure 6.5 – Product Recommendation Page

## 7. CONCLUSION:

DecorMate makes home styling easier with smart technology that shows how spaces could look. Instead of guessing, users can see mock-ups of new setups before making decisions. It avoids common problems found in traditional methods by combining visual previews with practical choices. Users can find affordable products and learn about local suppliers, all from one website. With the frontend and authentication already set up, essential features are functioning. In the future, DecorMate will add backend integration, which will use Stable Diffusion and ControlNet to rearrange room layouts based



on pictures uploaded by users. To help select suitable items, the platform will include the Google Shopping API to ensure suggestions fit both the customer's style and budget. Additionally, by gathering information from Google Maps, it will connect users with nearby designers or vendors who can bring those ideas to life. The suggested system positions DecorMate as a helpful tool that offers personalized suggestions based on real-time inputs. Users no longer have to guess, as their choices become clearer and quicker, making the process smarter and potentially more enjoyable. This could make interior design accessible to more people, simplify the process, and focus everyone's attention on what's important. Over time, DecorMate could evolve into a complete ecosystem that bridges the gap between visual design concepts and real-world application.

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