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AI SaaS Platform Using PERN Stack

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Abstract: In recent years, Artificial Intelligence has made a revolution in web applications through automatic generation of content, image processing, productivity services, and so on. This paper will describe the design and implementation of AI-integrated Software as a Service (SaaS) built with the PERN stack that consists of PostgreSQL, Express.js, React.js, and Node.js. In this regard, the platform will incorporate various AI tools into one web app, which would give users access to AI services through a friendly and centralised environment. Specifically, the software will include Article Generator, Blog Title Generator, AI Image Generator, Background Removal, Object Removal, and Resume Review services. To achieve that goal, this project uses cutting-edge AI APIs that include the OpenAI API, Gemini API, Clipdrop API, and Cloudinary services for content generation and image manipulation. Besides, Clerk authentication is used for managing users' accounts, while Neon PostgreSQL serves as the database to securely store information. As for the frontend, Vercel is utilized to deploy the application.

To conclude, the suggested system aims at saving users' time and effort spent when using artificial intelligence technology for the creation of content and editing images. Additionally, the application implements a concept of partial free access according to which a user is allowed to use certain AI programs, such as Article Generator and Blog Title Generator, within a specific limit. The usage of advanced programs will be possible after purchasing access through subscriptions.

Keywords: Artificial Intelligence, SaaS Platform, PERN Stack, React.js, Node.js, PostgreSQL, OpenAI API, Gemini API, Image Processing, Cloud Computing

I. INTRODUCTION

The use of artificial intelligence is gaining immense importance within modern software applications. Artificial intelligence-based tools are extensively used for content creation, image processing, automation, and increased productivity. There are many AI-powered tools available on the internet, but all such tools offer just one type of feature. Hence, a user needs to switch applications whenever he/she wants to perform another task.

The objective of this paper is to design an AI SaaS platform using the PERN stack. The idea behind designing the proposed model is to integrate more than one type of tool on a single AI platform. Using the platform, users will be able to perform various tasks like creating an article, generating a blog title, creating AI images, removing background from images, removing unwanted images, and checking resumes.

The frontend of the application is implemented using React.js, whereas Node.js and Express.js are employed for the API backend. The data is stored in a scalable database using Neon PostgreSQL cloud database, and Clerk is used to authenticate and manage users securely. The project is hosted on Vercel for dependable and fast cloud deployment.

The primary aim of the project is to design and develop an efficient and scalable AI application that can perform several intelligent tasks from a single interface.

II. LITERATURE REVIEW

Some studies have addressed intelligent content generation as well as the development of AI-powered SaaS platforms employing machine learning and deep learning approaches.

For example, M. Armburst et al. put forward a conceptual framework for the architecture of SaaS, emphasising cloud scalability and multi-tenancy. These authors laid the foundation for developing easily available AI-powered platforms offered as a service, which is an essential aspect of the proposed platform's subscription-based approach.

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Ramesh et al. (2022) have presented DALL-E 2, an innovative text-to-image diffusion model designed to create photorealistic and artistic images based on natural language prompts. The commercial application of AI for creating images was proven by these authors, motivating the incorporation of the technology in the proposed platform.

Lastly, Brown et al. (2020) have presented GPT-3, a huge language model featuring 175 billion parameters to generate coherent and context-specific text in various fields of knowledge. The authors demonstrated how useful LLMs can be in the content generation practices of professionals.

The combination of the four technologies — PostgreSQL, Express.js, React.js, and Node.js — called PERN stack was proven by S. Kumar and A. Patel to be effective when developing full-stack web applications. In particular, they focused on the potential application of the PERN stack to SaaS services, which require efficient real-time interaction with APIs as well as efficient database management.

Further, Google DeepMind developed an innovative multimodal artificial intelligence model named Gemini (2023), able to understand and generate text and images, thus increasing the range of opportunities for creating AI-based SaaS applications. In conclusion, a system capable of integrating different AI providers, subscription management, and content generation interfaces is required.

III. PROBLEM STATEMENT

Creating an AI-powered SaaS platform that would consist of different intelligent tools for content creation, image processing, and productivity management based on the PERN stack. In today's digital world, the importance of content is immense for communication, education, growing businesses, and being active online. But the creation of content and its manual image editing take a lot of time and effort, especially because they need to be creative and skilful. Currently existing services provide only some of those functions and make users use different apps at once. The suggested AI SaaS Platform will consist of several AI-powered tools such as Image Generation, Article Generator, Blog Title Generator, Background Removal, Object Removal, Review Generator, and Resume Analyser, all in one web app. It is developed based on the PERN stack and allows doing content creation and image editing processes easier.

IV. OBJECTIVE

• To create an AI-driven SaaS platform with the help of the PERN stack.
To create a scalable software application to be used on a Software as a Service (SaaS) platform with the help of PostgreSQL, Express.js, React.js, and Node.js to manage the AI-driven services effectively.

• To offer several AI-based tools within one application.
To integrate various types of AI capabilities like creation of content, processing of images, and analysis of resumes into one platform without the need for several applications.

• To make content creation and image processing simpler. To make the process of creating digital content and processing images less complicated and time-consuming thanks to AI-driven algorithms.

• To create articles, headlines, and reviews with the help of AI. To use sophisticated AI models to produce quality text content to assist writers, students, marketers, and companies in their activities.

• To build an AI-powered resume evaluation tool. To build a tool that will evaluate resumes and give feedback on how users can better enhance their professional profiles and increase their chances of being hired.

• To build an adaptive and scalable website.
To build a web interface that will be able to provide a good user experience to many users simultaneously.

• To increase productivity and decrease manual labor via AI technologies. To automate manual labor that is involved in content generation and image manipulation.

V. METHODOLOGY

The methodology for the proposed AI SaaS Platform will offer multiple AI services from a single web-based platform. The methodology involves an organised approach, which starts from user authentication, requests for AI, management of cloud storage, and result production.

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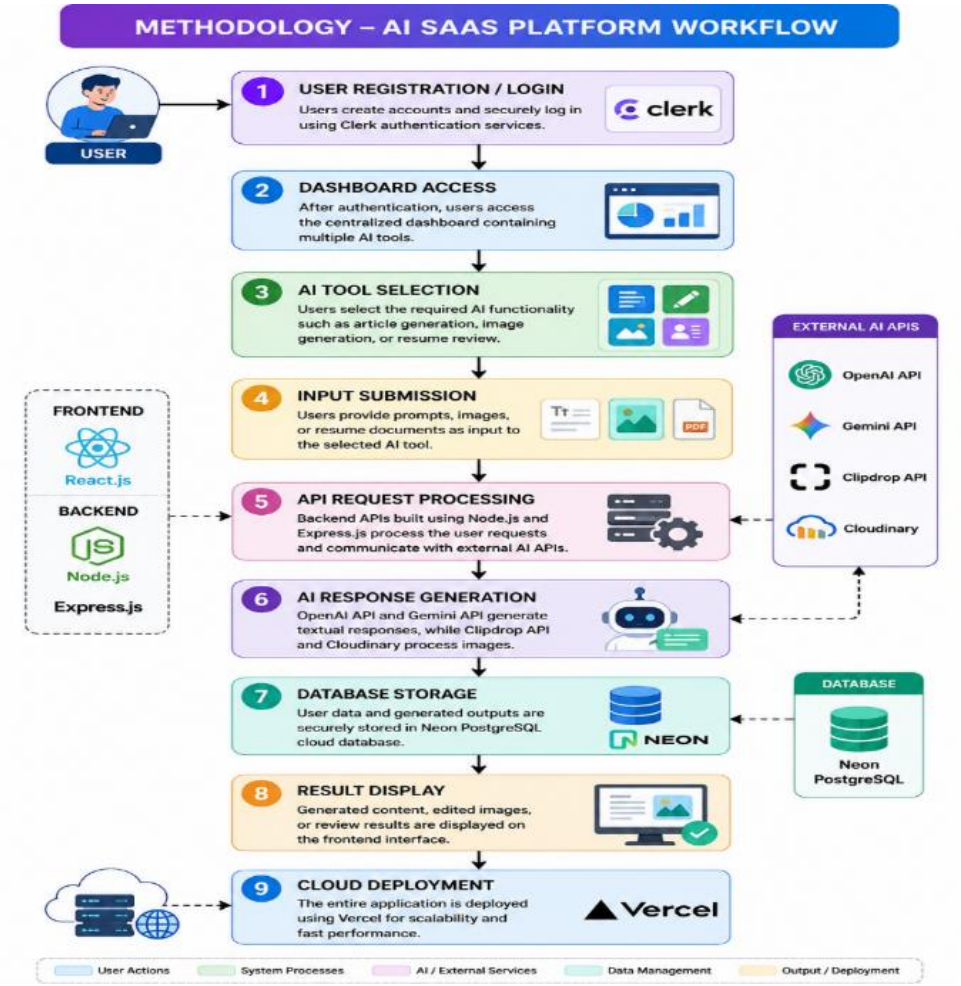

Workflow of the System

1. User Registration/Login: Users can register and log in securely using the Clerk authentication service.
2. Access to Dashboard: Once authenticated, users access the unified dashboard that includes various AI tools.
3. Selection of an AI Tool: Users choose the desired AI feature based on whether they need an article, image, or resume review.
4. Providing Input: Users provide prompts, images, or resumes as input to the respective AI tool.
5. Processing API Requests: Backend APIs built with Node.js and Express.js process user requests and interact with external AI APIs.
6. AI Responses: The OpenAI API generates text-based responses, and the Gemini API performs the same task. The Clipdrop API and Cloudinary handle images.
7. Database Storage: All user details and outputs are stored securely in the Neon PostgreSQL cloud database.
8. Output Display: Responses in the form of text, edited images, or reviews are displayed to users on the front end.
9. Deployment in Cloud: The entire system is deployed on Vercel in the cloud environment.

VI. RESULTS AND DISCUSSION

The developed AI SaaS Platform was tested using various user inputs to evaluate the functionality and performance of each integrated AI tool. The results demonstrate the effectiveness of the platform in generating content, processing images, and analyzing documents through a unified web interface.

1. Article Generator

The Article Generator was tested by providing a topic prompt such as "Benefits of Artificial Intelligence in Education." The AI model processed the input and generated a well-structured article containing an introduction, key points, and a conclusion. The generated content was grammatically correct, relevant to the topic, and produced within a few seconds.

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Result: The tool successfully generated meaningful and coherent articles, reducing the effort and time required for content creation.

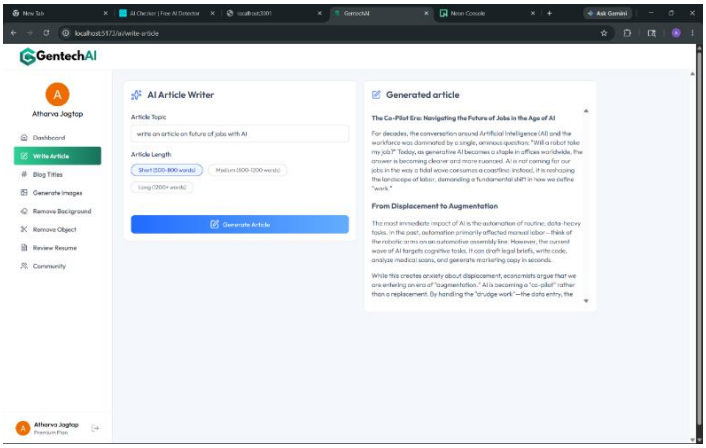

Fig.1 Article Generator

2. Blog Title Generator

The Blog Title Generator was evaluated using keywords related to technology and digital marketing. Based on the provided keywords, the system generated multiple creative and SEO-friendly blog titles. The generated titles were relevant, engaging, and suitable for attracting readers.

Result: The tool effectively assisted users in generating attractive blog titles for content creation and marketing purposes.

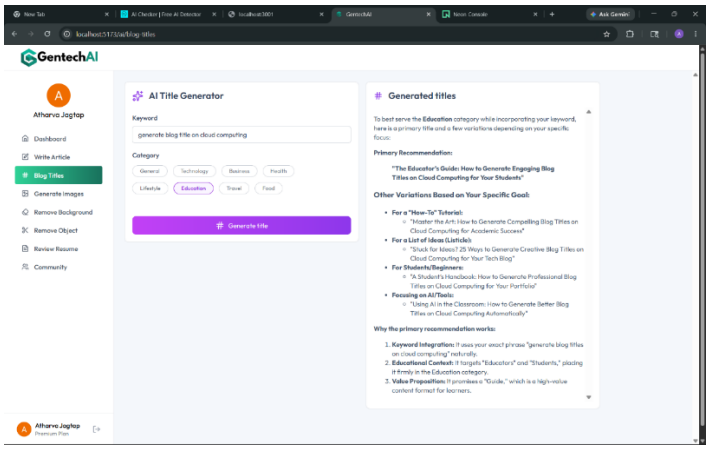

Fig.2 Blog Title Generation

3. AI Image Generator

The Image Generator was tested using descriptive text prompts such as "A futuristic smart city at sunset." The AI model generated images corresponding to the given description. The generated images reflected the prompt accurately and demonstrated the capability of AI-based image synthesis.

Result: The system successfully produced high-quality images from textual descriptions, demonstrating the effectiveness of AI-powered image generation.

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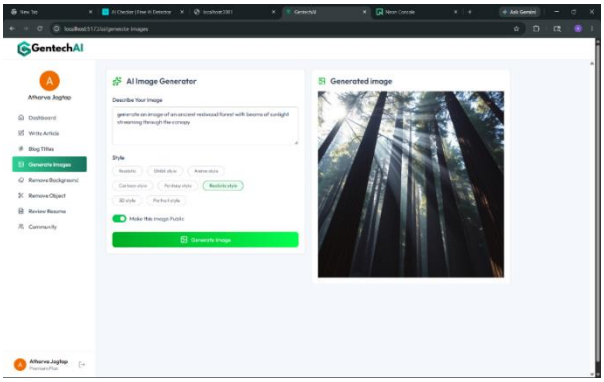


Fig.3 Image Generation

4. Background Removal

The Background Removal tool was tested by uploading images containing foreground objects with complex backgrounds. The AI model automatically detected the primary object and removed the background while preserving image quality.

Result: The tool accurately removed backgrounds and produced clean images suitable for professional and creative use.

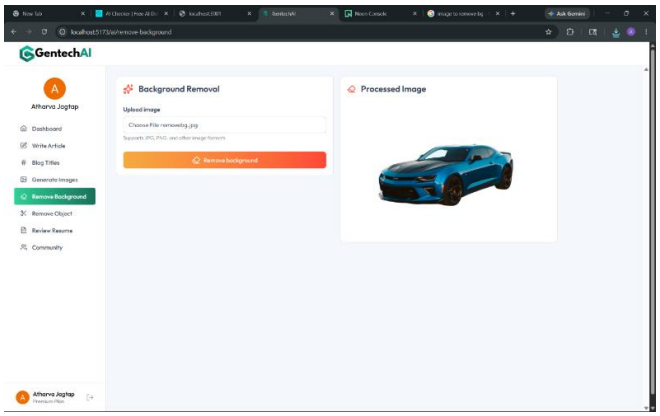
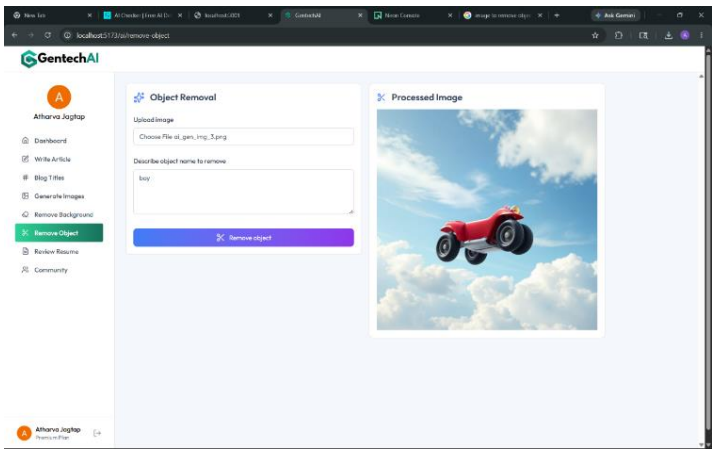


Fig.4 Background Removal

5. Object Removal

The Object Removal module was evaluated using images containing unwanted objects. Users selected the object to be removed, and the AI model reconstructed the affected area while maintaining visual consistency.

Result: The system successfully removed unwanted objects from images and generated visually appealing outputs with minimal distortion.



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6. Resume Analyzer

The Resume Analyzer was tested by uploading resumes in PDF format. The system analyzed resume structure, skills, formatting, and content quality. It then generated suggestions and feedback to improve the resume's effectiveness.

Result: The tool provided useful recommendations for enhancing resume quality and professional presentation.

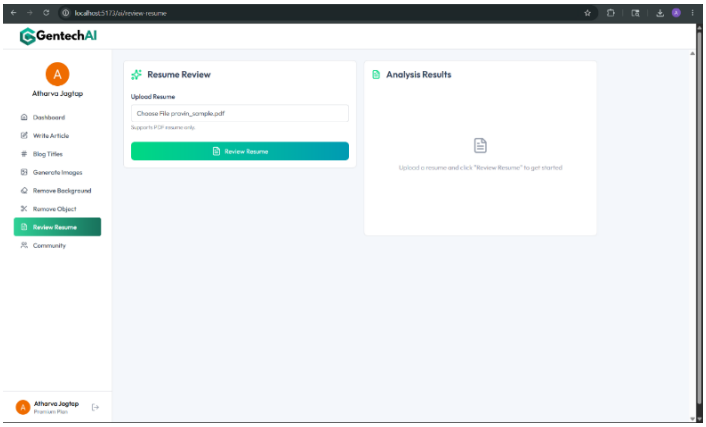

Fig.6 Resume Review

Discussion

The results demonstrate that the AI SaaS Platform effectively integrates multiple AI services into a single cloud-based environment. Each module successfully performed its intended functionality while maintaining a user-friendly experience. The centralized architecture reduced the need for multiple standalone applications and improved user productivity. The integration of modern web technologies and AI APIs enabled fast response times, secure access, and scalable performance, validating the practicality of the proposed AI SaaS solution.

VII. CONCLUSION

This paper presented the design and implementation of an AI-powered Software-as-a-Service (SaaS) platform developed using the PERN stack. The proposed system successfully integrates multiple AI functionalities, including Article Generation, Blog Title Generation, Image Generation, Background Removal, Object Removal, and Resume Analysis, within a single web-based environment. The platform leverages modern web technologies and AI APIs to provide an efficient, scalable, and user-friendly solution for content creation and image processing tasks.

The experimental results demonstrated that the system effectively generates high-quality outputs while reducing manual effort and improving user productivity. The integration of React.js, Node.js, Express.js, Neon PostgreSQL, and Clerk Authentication ensured reliable performance, secure user management, and seamless interaction between system components. By consolidating multiple AI services into a unified platform, the proposed solution eliminates the need for several standalone applications and enhances overall user experience.

The developed platform validates the feasibility of integrating diverse AI tools within a SaaS architecture and provides a strong foundation for future enhancements. Further improvements may include the addition of advanced AI models, multilingual support, mobile applications, real-time collaboration features, and personalized AI-driven recommendations.

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