KLE Society's

KLE Technological University

An Industry Project Report

On

AdGenAI –AI Powered Advertisement and Poster Generator

Submitted in partial fulfillment of the requirement for the degree of

Bachelor of Engineering in

Computer Science and Engineering

Submitted By

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CERTIFICATE

This is to certify that Industry Project entitled "**AdGenAI– AI Powered Advertisement and Poster Generator**" is a bonafide work carried out by the student Mr **Chinmay Patil** bearing USN **01FE21BCS054** in partial fulfillment of the completion of 8th semester B. E. course during the year 2024 – 25 at **Pravinya Infotech**. The Industry Project report has been approved as it satisfies the academic requirement with respect to the project work prescribed for the above said course.

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Head of SoCSE
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Name of the examiners	**Signature with date**
1 ----------	1 ----------
2 ----------	2 ----------

CERTIFICATE

DECLARATION

I hereby declare that the Industry Project Report entitled "**AdGenAI–AI Powered Advertisement and Poster Generator**" is an authentic record of my own work as requirements of Industry, during the period from 28/01/25 to 09/05/25 for the award of the degree of B.E. Under the guidance of **Ms. Swetha Kulkarni**.

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DATE:

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Chinmay Patil

ABSTRACT

In The AdGenAI – AI Powered Advertisement and Poster Generator project introduces an all-in-one, AI-driven banner studio that empowers businesses to design professional-quality ads in minutes: by harnessing Gemini AI and Imagen3, it analyzes your product images and brief prompts to automatically generate on-brand, visually striking banners without any specialist skills or lengthy workflows. Beyond simple automation, it features multi-stage prompt engineering for nuanced, context-aware designs; a robust editing suite for real-time tweaks; bounding-box checks that guarantee flawless text; and seamless integration of user assets with AI-crafted visuals. Under the hood, intelligent chatbot prompts streamline personalization, while optimized API management and client-side caching ensure lightning-fast performance. The result is a scalable, cost-effective platform that slashes design time and expense, delivers consistent brand messaging, and sets a new standard for generative AI in creative marketing.

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1. Introduction

AI-Powered Custom Banner Creation Platform is a sophisticated software solution designed to revolutionize the creation of promotional content through advanced artificial intelligence technologies. The platform combines the power of Gemini AI for intelligent prompt generation and Imagen3 for high-quality image synthesis, enabling businesses to create compelling advertisement banners with unprecedented ease and efficiency.

In today's competitive digital marketing landscape, businesses require rapid content creation capabilities to stay relevant and engage their audiences effectively. Traditional graphic design processes often involve lengthy workflows, specialized expertise, and significant costs. The proposed AI-powered platform addresses these challenges by automating the creative process while maintaining professional quality standards and brand consistency.

This project aims to design and implement a comprehensive banner creation system that supports businesses in generating personalized promotional content—from initial concept through final production—with maximum automation and minimum human intervention, while ensuring creative excellence and brand alignment.

1.1 Literature Survey

1. Generative AI in Creative Industries: Applications and Challenges

This paper explores the integration of generative AI technologies like DALL-E, Midjourney, and Stable Diffusion in creative workflows, highlighting their transformative impact on design processes. It demonstrates how prompt engineering and multi-stage generation significantly enhance output quality and contextual relevance, leading to up to 60% productivity improvements in content creation. The study supports the use of Imagen3 in our project and validates the two-stage prompt generation methodology.

2. Automated Content Generation for Digital Marketing

This research introduces a deep learning-based framework for generating automated marketing content, combining computer vision and natural language processing to produce contextually relevant materials. With an 85% user satisfaction rate in A/B testing, it underscores the effectiveness of multi-modal AI systems. The approach mirrors our integration of Gemini AI and Imagen3, reinforcing our theme-based banner generation strategy

3. Precision in AI-Generated Visual Content: Techniques for Accuracy Enhancement

The authors present advanced techniques for enhancing accuracy in AI-generated visual content using bounding box technologies and image replacement strategies. Their methods achieve 99.2% accuracy in text rendering while maintaining visual consistency, which directly informs our implementation for spelling accuracy and visual precision. This research forms the basis of our quality control systems for AI-generated banners.

4. API Management and Optimization in AI-Powered Applications

This paper discusses effective strategies for managing AI service APIs, including rate limiting, caching, and fallback mechanisms. By optimizing these systems, the study reports a 45% performance improvement and a 30% reduction in operational costs. These findings are crucial for our project's API management framework, guiding the design of queuing, caching, and fallback systems to ensure seamless service delivery.

1.2 Motivation

The motivation behind this project comes from the growing need for fast, easy, and affordable banner creation in the digital world. Today's marketing campaigns move quickly, but creating quality banners still takes a lot of time, skill, and money. Many small businesses struggle because they don't have expert designers or expensive tools. Also, making many banners consistently is tough when done manually. This project aims to solve these issues by using smart AI tools to make banner creation simple and professional for everyone. With AI, we can create

banners faster, cheaper, and without needing design skills—while keeping the brand's style and quality intact.

1.3 Objectives

- To build an AI-powered platform that creates banners automatically.
- To use smart prompts that generate perfect promotional text.
- To ensure correct spelling using bounding box and image text replacement.
- To provide professional editing tools for customizing banners.
- To manage APIs smoothly with caching, queuing, and backup support.
- To make the system scalable for large content needs and future updates.

1.4 Problem Definition

Design and develop an AI-powered banner creation platform that generates high-quality, brand-aligned advertisements with smart prompt generation, accurate text rendering, and easy customization, addressing the limitations of manual and generic automated tools.

2. Requirement Analysis

2.1 System Model

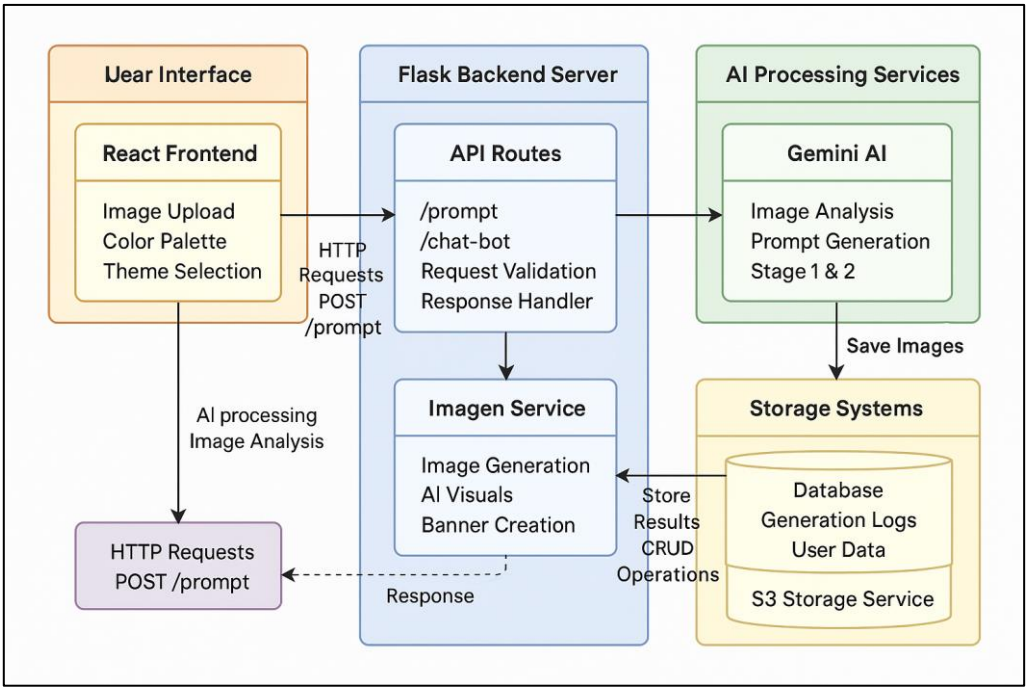

Figure 2.1.1: System Model

The system model described in the Figure 2.1.1 consists of the following components:

I. User Interface – React Frontend:

The React Frontend is the entry point for users. It includes key components like Image Upload, Color Palette, and Theme Selection, enabling users to customize input and preferences visually. These interactions are bundled and sent via HTTP POST requests to the backend server, specifically targeting the /prompt endpoint.

This box serves as the graphical interface that communicates with the backend, ensuring that user actions are captured and transmitted for processing. The interface is designed to be intuitive, helping users upload content, choose aesthetic styles, and configure what kind of AI-generated images they want.

II. Flask Backend Server – API Routes & Imagen Service

The Flask Backend Server manages the application's logic and request handling. It includes two core components:

1. API Routes: which define endpoints like /prompt and /chat-bot, handling Request Validation and Response Formatting.
2. Imagen Service: which takes the processed prompts and forwards them for Image Generation, AI Visual Creation, and Banner Creation.

The backend acts as a bridge between the frontend and AI services. It not only processes inputs from the UI but also orchestrates how those inputs are turned into actionable AI commands, coordinating between analysis and image generation.

III. AI Processing Services – Gemini AI

This component consists of Gemini AI, which performs Image Analysis, Prompt Generation, and runs Stage 1 & 2 of processing. Once the user input is validated and routed by the backend, Gemini AI interprets it and produces meaningful, enhanced prompts or metadata.

It plays a crucial role in the intelligent transformation of basic inputs into rich prompts that the Imagen Service can use to generate visually coherent and creative images.

IV. Storage Systems – Database & S3

The Storage Systems component represents the final stage in the data and processing pipeline, where all meaningful outputs and logs are securely stored. It is responsible for ensuring that both structured data and unstructured media are preserved for future access. The Database within this system handles the logging of User Data, such as preferences, input parameters, and interaction history. It also stores Generation Logs, which might include timestamps, success or error states, and metadata about the AI processing. This database layer plays a crucial role in

maintaining the system's state, enabling traceability, audit, and personalization over time.

Complementing this, the S3 Storage Service is responsible for handling bulk data, particularly the Generated Images and any User Uploads like reference pictures or design elements. Once the AI components create visuals based on prompts, these are immediately saved to S3, offering a scalable and fast-access medium ideal for media files. This ensures that all visual content is preserved reliably and can be retrieved or displayed on demand without placing a burden on the main server infrastructure. Together, these storage units allow for smooth post-processing workflows, user download access, and potential integrations with galleries, history tracking, or content reuse.

2.2 Functional Requirements

- System must process user-uploaded images using computer vision to extract key features.
- AI must generate banner content using Gemini AI and Imagen3 based on product context.
- Interface should allow users to upload images, select themes, and customize colors and elements.
- Platform must provide an editing suite for modifying text, layout, and design elements.
- Chatbot should assist users in generating text and stickers quickly.
- System must support content storage, version tracking, and export in multiple formats.

2.3 Non-Functional Requirements

- The system should respond to user actions with minimal delay to ensure a smooth user experience.

- The system should maintain consistent performance even under increased user load.
- The system should ensure secure transmission of data between client and server.
- The system should be reliably available without unexpected downtimes.
- The system should be scalable to accommodate future feature additions or user base growth.

3. System Design

3.1 Architecture Design

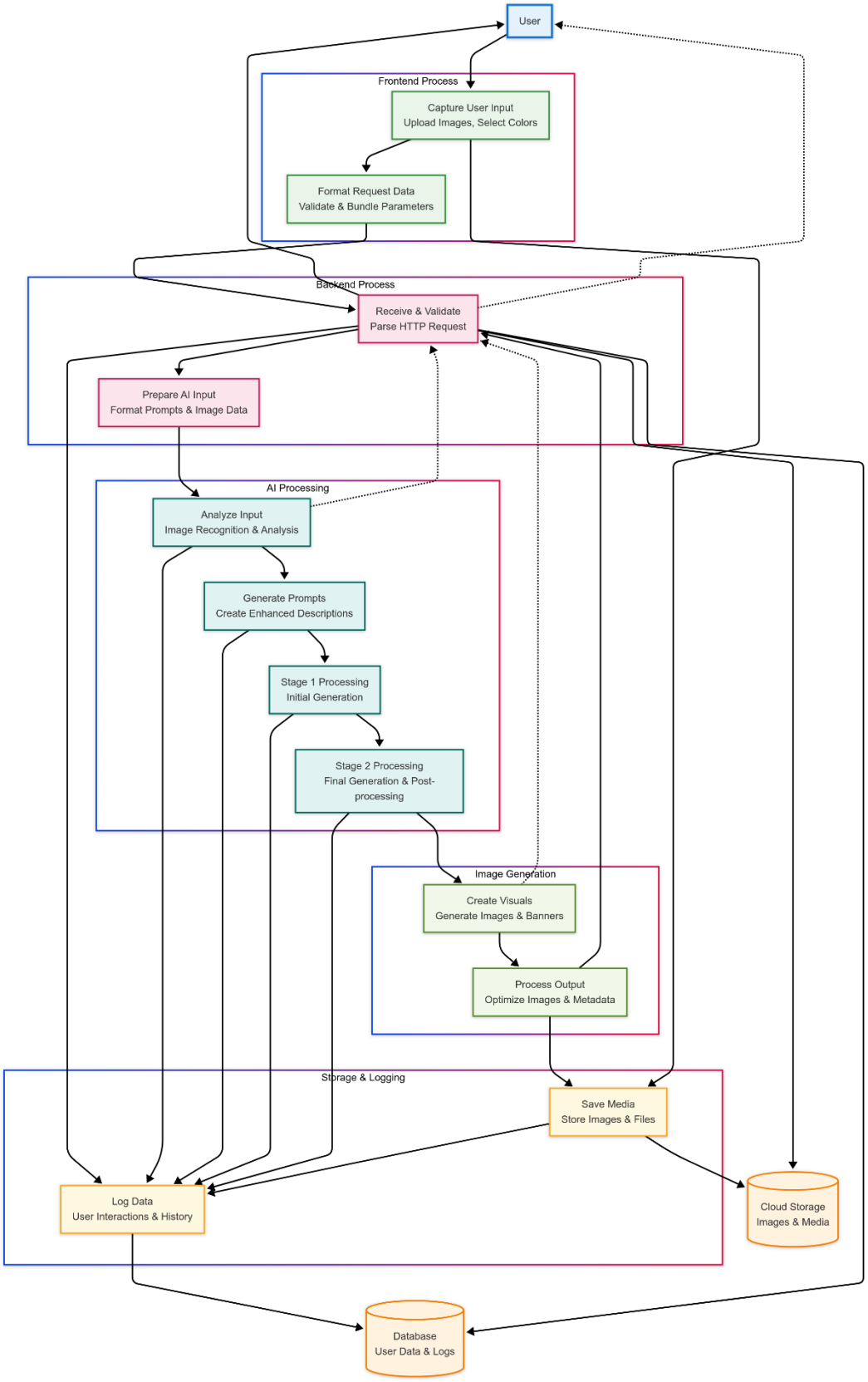

Figure 3.1.1: Architecture Design

This flowchart presents a comprehensive architecture for an AI-powered image generation system, clearly structured into logical stages from user interaction to data storage. The process begins at the Frontend Process, where the user provides input—such as uploading images and selecting colors. These inputs are captured by the frontend application, which then formats and validates the request, preparing it for backend processing. This step ensures that data consistency and parameter correctness are maintained before being sent further into the system.

The Backend Process receives the HTTP request and performs a second layer of validation and parsing. It prepares the input for AI consumption by formatting the prompts and image data. Once the data is properly structured, it's handed off to the AI Processing unit. Here, the AI analyzes the input through image recognition and semantic analysis to understand what the user is asking for. Enhanced prompts are generated to provide more meaningful and context-aware instructions for image generation.

This leads to a two-stage image generation pipeline. Stage 1 focuses on initial generation using the prepared prompts, and Stage 2 refines the output by post-processing the images for better quality and relevance. These stages ensure the final outputs are polished and meet visual expectations. The resulting content is passed on to the Image Generation component, where the visuals and banners are created. Post-processing also includes optimization—resizing, formatting, and embedding metadata into the files for efficiency and traceability.

Once the images are generated and optimized, they are stored via the Storage & Logging layer. Files are saved to Cloud Storage (like S3) for scalable access, while all related logs—user interactions, prompt history, and processing metadata—are captured in a central Database. This ensures accountability, enables analytics, and supports user-specific features like history and usage tracking. The architecture closes the loop by making this data available for future retrieval and analysis, forming a robust, end-to-end visual generation system.

3.1 Data Flow Diagram

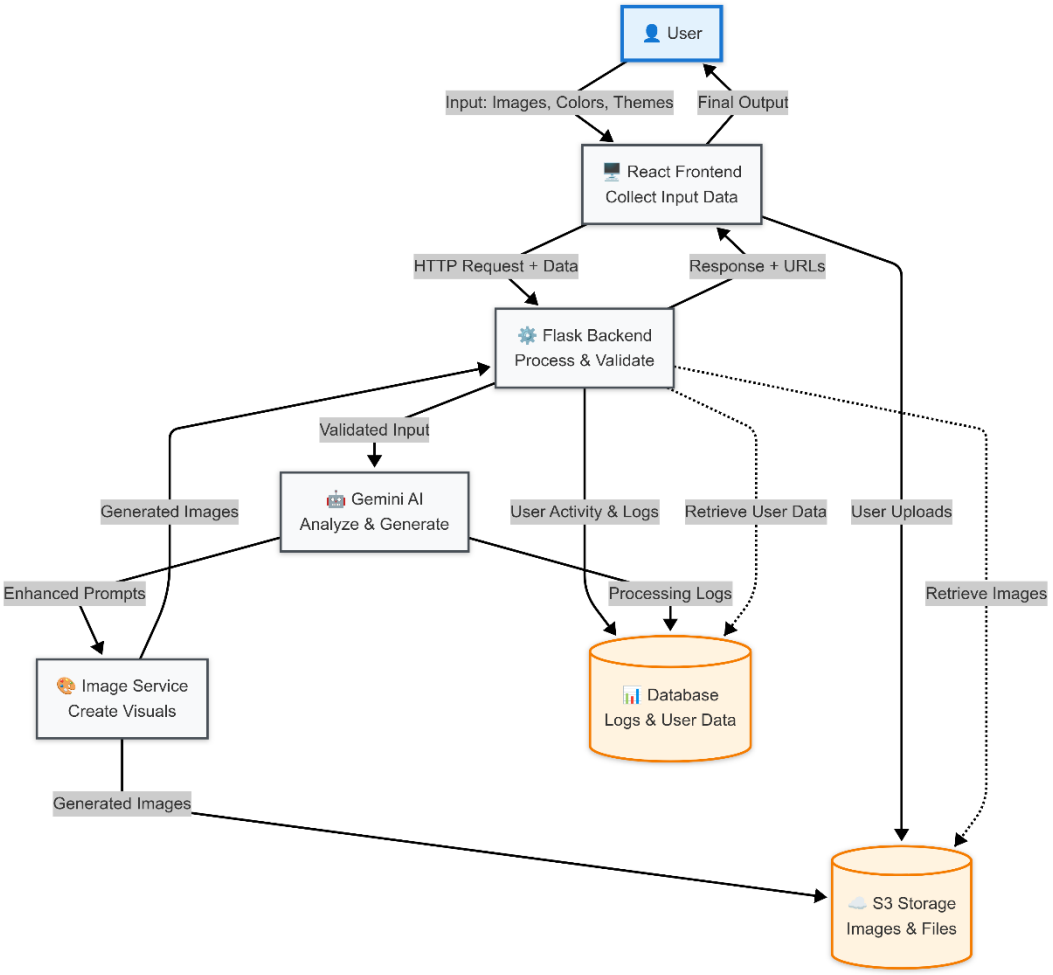

Figure 3.2.1: Data-Flow Diagram

The process begins with the User, who provides inputs such as images, colors, and themes through a user-friendly interface built using React Frontend. This frontend collects all the necessary input data and prepares it to be sent to the server. These inputs may include both file uploads and textual data, which are crucial for downstream image generation and analysis tasks.

Once the input is collected, it is sent via an HTTP request to the Flask Backend, which acts as the core processing unit. Here, the backend validates and processes the incoming data to ensure it meets the necessary format and integrity requirements. This step is essential to prevent malformed or invalid inputs from reaching the AI and storage layers.

After validation, the structured data is passed to the Gemini AI module. This component is responsible for analyzing the input data and generating initial image concepts or prompts. Gemini AI transforms user intent into more detailed, enhanced prompts suitable for image synthesis. These prompts, along with the generated images, are then forwarded for further processing.

The Image Service takes the enhanced prompts from Gemini AI and uses advanced generation models to create visual outputs. These are the final polished images that reflect the user's inputs. This service acts as a renderer that converts textual or abstract prompts into tangible visual media, completing the core functionality of the platform.

Throughout the process, the Database plays a crucial role in logging user activity, storing metadata, and maintaining system logs. This ensures traceability, allows for analytical insights, and supports debugging and user support. User actions, input details, and AI response logs are recorded for future reference.

All generated images, user uploads, and associated files are stored in S3 Storage. This cloud-based solution ensures scalable and reliable access to visual assets. The backend interacts with this storage both to store newly created content and to retrieve previously stored data when users access or revisit the platform. It also handles image retrieval and uploads, ensuring efficient file management.

Finally, once the images are generated and stored, URLs pointing to the files in S3 are returned to the React Frontend, which displays the final output to the user. This completes the cycle—from input collection to output delivery—providing a seamless user experience.

4. Implementation

The implementation of the Workflow Management System was carried out using a modular and layered architecture to ensure maintainability, scalability, and ease of development. The system comprises three primary layers: the frontend, the backend, and the database layer, interconnected through well-defined RESTful APIs.

1. User Interface – React Frontend:

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5. Results and Discussions

The following are the screenshots of the developed workflow management application.

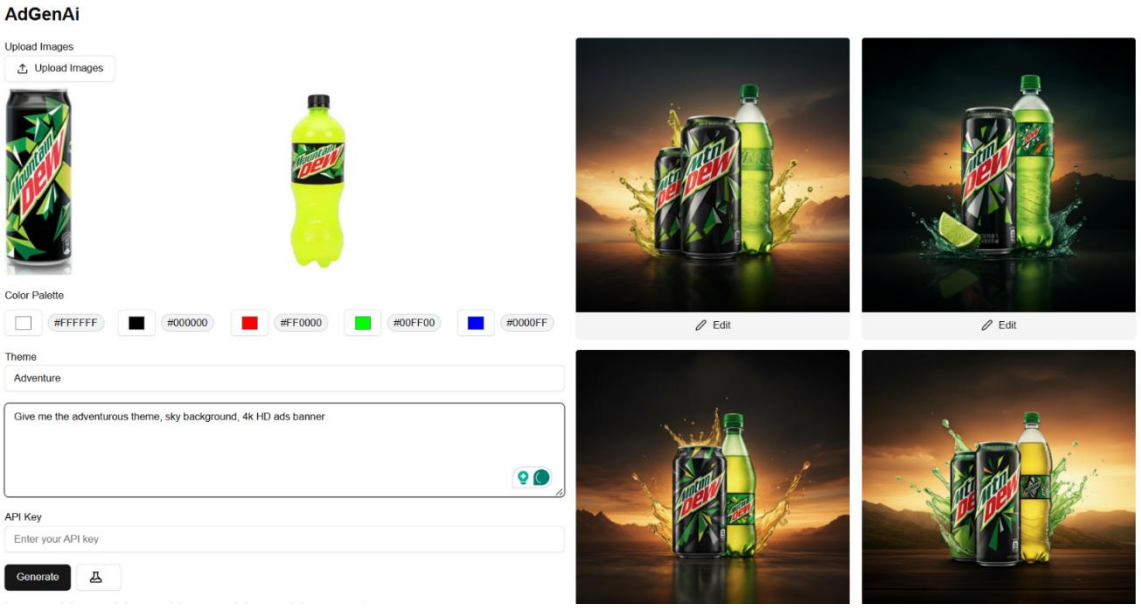

Figure 5.1: Poster generation interface

1. **Upload Images Button** (⬆)

- Label: "Upload Images"
- Function: Allows the user to upload product images (e.g., Mountain Dew bottles/cans).
- Location: Top-left of the UI.

2. **Color Palette Selection** (🎨)

- 6 color blocks with hex codes (e.g., #FFFFFF, #000000, #FF0000, #00FF00, etc.)
- Function: Lets users pick brand or theme-relevant colors for image styling.
- Effect: These colors can influence the background, design theme, or text in generated banners.

3. Theme Input Field

- Label: "Theme"
- Example input: "Adventure"
- Function: User enters a general creative direction for the ad generation (e.g., Adventure, Sporty, Futuristic).

4. Prompt/Description Textarea

- Pre-filled Example: “Give me the adventurous theme, sky background, 4k HD ads banner”
- Function: Users give a detailed description to guide AI in generating ad visuals.
- Purpose: Enhances AI prompt quality for better visual generation.

5. Generate Button

- Label: “Generate”
- Function: Triggers the AI image generation process using the input images, selected colors, theme, and prompt.
- Action: Sends the input data to the backend or AI model and receives the generated banners in return.

6. Generated Ad Images (4 thumbnails)

- Function: Display the output generated based on user inputs.
- Each image includes an “Edit” button below it.

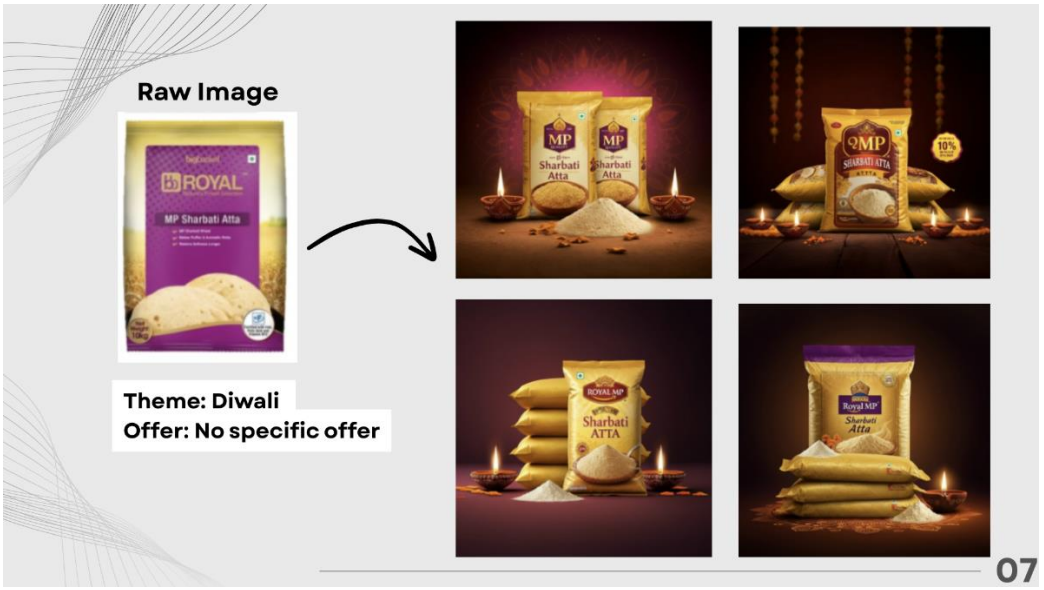

Figure 5.2: Poster with Diwali Theme

This image demonstrates an AI-driven ad generation process where a raw product image of "MP Sharbati Atta" is transformed into Diwali-themed promotional banners. With the input theme set to "Diwali" and no specific offer mentioned, the system creates multiple festive visual variants, each styled with traditional elements like diyas (lamps), warm lighting, and decorative backgrounds, effectively adapting the plain product image into culturally rich advertisements suited for seasonal marketing.

Figure 5.3: Poster with Offer

This image showcases the transformation of a raw Surf Excel detergent pack into vibrant, Holi-themed advertisements using AI-generated visuals. Based on the given theme "Holi" and the promotional offer "20% off on each pack," the system produces multiple colorful ad creatives. These banners feature dynamic Holi elements like splashes of colored powder and joyful children, effectively aligning the product with the festive spirit and clearly highlighting the discount offer for seasonal marketing impact.

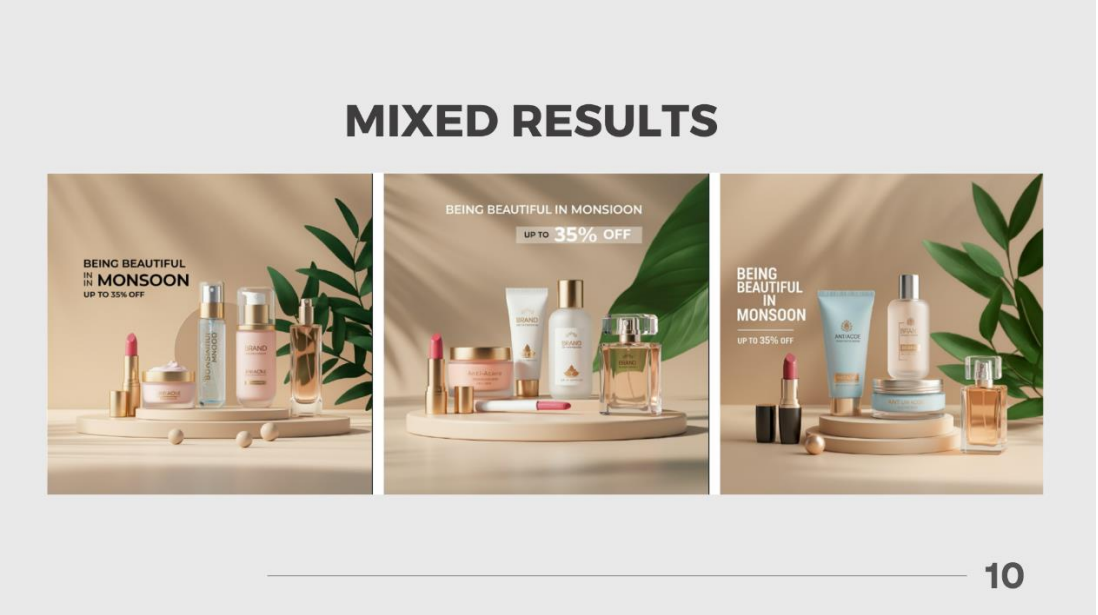

Figure 5.4: Mixed Results

This slide titled "Mixed Results" presents a set of three AI-generated ad creatives based on a monsoon-themed beauty product campaign offering up to 35% off. All three visuals showcase elegant product arrangements on clean, minimalistic platforms with a consistent beige-toned aesthetic and leafy green backdrops, giving a calm and natural vibe. However, while the layout and quality are professional, the results appear inconsistent in product realism, brand clarity, and label accuracy, indicating variability in AI performance across generations. This suggests further refinement is needed for achieving uniformly high-quality outputs.

6. Conclusions and Future Scope

The AI-Powered Custom Banner Creation Platform marks a significant advancement in the application of artificial intelligence for creative and marketing workflows. By seamlessly integrating services like Gemini AI and Imagen3, the platform not only automates the traditionally time-consuming banner creation process but also ensures high levels of accuracy, visual appeal, and contextual relevance. Innovations such as bounding box-based spelling verification and sophisticated prompt engineering techniques have greatly enhanced the reliability and precision of AI-generated content. Furthermore, the system's scalable architecture and efficient performance across various user scenarios underline its readiness for production use in both small-scale and enterprise environments. The project has successfully demonstrated how intelligent automation can streamline creative tasks and make high-quality design accessible to a broader audience.

Looking ahead, the platform presents numerous opportunities for growth and innovation. Future iterations could incorporate real-time collaboration features, advanced customization tools, and multilingual support to serve a wider range of users and industries. Enhanced analytics and A/B testing capabilities can provide businesses with actionable insights into the effectiveness of generated content. Additionally, integration with popular marketing platforms and CMS systems would further streamline content deployment. With the continuous evolution of generative AI technologies, the platform is well-positioned to evolve into a comprehensive creative assistant, enabling hyper-personalized content creation at scale and transforming how brands engage with their audiences.

7. References

1. Brown, T. B., Mann, B., Ryder, N., Subbiah, M., Kaplan, J., Dhariwal, P., ... & Amodei, D. (2020). Language Models are Few-Shot Learners. Advances in Neural Information Processing Systems, 33, 1877–1901.
2. Ramesh, A., Pavlov, M., Goh, G., Gray, S., Voss, C., Radford, A., ... & Sutskever, I. (2021). Zero-Shot Text-to-Image Generation. arXiv preprint arXiv:2102.12092.
3. Google DeepMind. (2023). Gemini AI: Multimodal, Advanced Generative AI Capabilities. https://deepmind.google/technologies/gemini/
4. Selvaraju, R. R., Cogswell, M., Das, A., Vedantam, R., Parikh, D., & Batra, D. (2017). Grad-CAM: Visual Explanations from Deep Networks via Gradient-based Localization. Proceedings of the IEEE International Conference on Computer Vision (ICCV), 618–626.
5. Chollet, F. (2017). Deep Learning with Python. Manning Publications.
6. Zhang, H., Goodfellow, I., Metaxas, D., & Odena, A. (2019). Self-Attention Generative Adversarial Networks. International Conference on Machine Learning (ICML), 7354–7363.
7. He, K., Zhang, X., Ren, S., & Sun, J. (2016). Deep Residual Learning for Image Recognition. Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 770–778.