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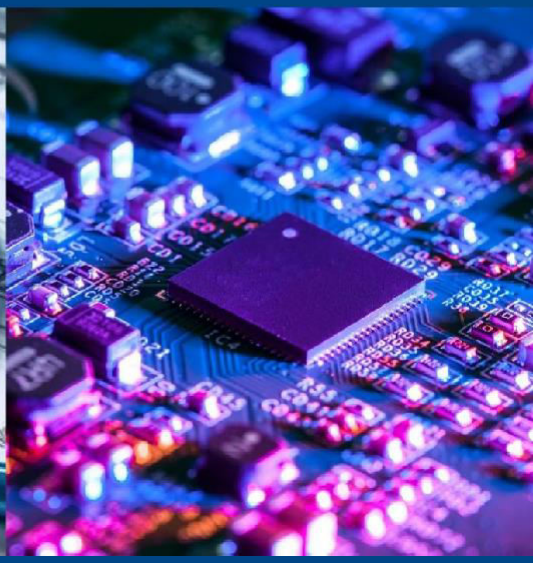

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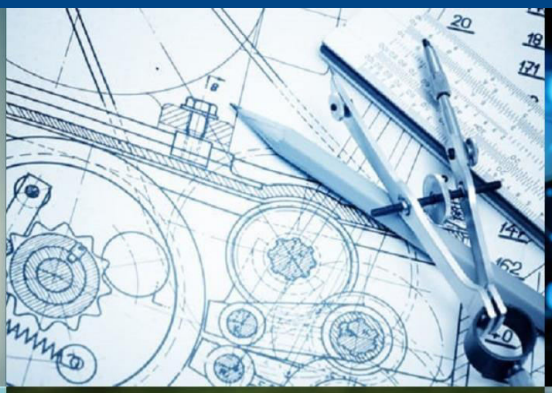

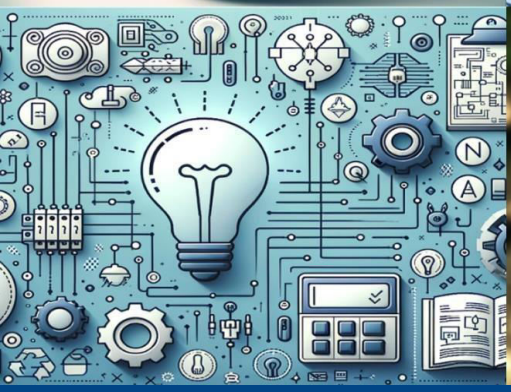

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PIXEON: AN AI-POWERED IMAGE EDITOR WEB APPLICATION

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ABSTRACT: Pixeon is an easy-to-use web-based image editor that combines basic editing tools with advanced AI-powered features. Built using modern technologies like Next.js, Fabric.js, and Tailwind CSS, the platform offers users a seamless experience for tasks such as cropping, resizing, and adjusting image settings. Users sign in securely through Clerk authentication to access a personalized dashboard. While many editing tools are free, premium AI features like background removal and addition require purchase, providing a balance between accessibility and advanced functionality. Pixeon aims to make professional-quality image editing accessible to everyone through a responsive and intuitive interface.

KEYWORDS: AI image editor, Next.js, Fabric.js, Clerk authentication, background removal, premium features, web application, image editing tools, Tailwind CSS.

I. INTRODUCTION

With the growing popularity of digital content creation, image editing has become an essential tool for individuals and businesses alike. Traditional image editing software often requires advanced skills and expensive licenses, which can limit access for many users. Pixeon aims to bridge this gap by offering a web-based AI image editor that combines user-friendly tools with powerful AI features. Built using modern web technologies such as Next.js and Fabric.js, Pixeon provides a responsive and intuitive platform where users can easily edit images. The system incorporates secure user authentication via Clerk, ensuring personalized and protected access to both free and premium tools. While basic editing features like cropping and resizing are freely accessible, advanced AI-powered tools such as background removal and enhancement are available through a purchase system, allowing users to access professional-level editing without overwhelming complexity or cost.

II. LITERATURE SURVEY

Image editing has evolved significantly over the years, with traditional desktop software like Adobe Photoshop and GIMP setting high standards for functionality. These applications offer powerful tools but often require users to have technical expertise and involve costly licenses. In response, many web-based image editors such as Canva and Pixlr have emerged, providing more accessible platforms with simplified interfaces. However, most of these web tools either lack advanced AI features or restrict them behind expensive subscriptions. Recent advancements in artificial intelligence have introduced intelligent image editing capabilities, such as automatic background removal, image enhancement, and style transfer. Projects like remove.bg and Adobe's Sensei AI integrate such functionalities, making complex editing tasks easier and faster. Despite these improvements, many AI-powered features remain locked behind paywalls or require software downloads, limiting accessibility. Pixeon is designed to combine the best of both worlds: the accessibility and convenience of web-based editors with powerful AI tools that are available on-demand through a fair purchase system. This approach aims to make advanced image editing both affordable and easy to use, without sacrificing quality or performance.

EXISTING SYSTEM

Currently, there are several popular image editing platforms available to users, each with its own strengths and limitations. Desktop applications like Adobe Photoshop and GIMP offer extensive editing features and professional-grade tools. However, these applications often have steep learning curves and require users to purchase licenses or download bulky software. Moreover, many existing systems lack seamless integration between user authentication,

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editing tools, and AI services, leading to fragmented user experiences. The need for a single platform that combines user-friendly basic editing features with on-demand, premium AI tools accessible via secure authentication remains unmet.

PROPOSED SYSTEM

The proposed system, Pixeon, is a modern, web-based image editor that integrates basic editing tools with advanced AI-powered features within a clean and user-friendly interface. It is designed to offer both accessibility and functionality by combining free editing capabilities with premium AI tools that can be unlocked through a simple purchase process.scoring Pixeon uses Clerk authentication to manage secure user logins and personalized access. Once signed in, users are directed to a dashboard where they can upload and edit images using tools like crop, resize, saturation, brightness adjustment, and more. These tools are available for free and are suitable for everyday editing tasks.

III. SYSTEM ARCHITECTURE

The system architecture of **Pixeon** follows a modern, full-stack web application model that integrates frontend, backend, authentication, and AI services into a seamless and scalable platform. The architecture is designed for performance, modularity, and user accessibility across devices.

[1] The user interface is built using Next.js, a powerful React-based framework that supports server-side rendering and optimized page loading. The editing canvas is powered by Fabric.js, which allows users to interactively manipulate images with tools like crop, resize, rotate, and more. Styling is handled by Tailwind CSS to ensure a clean, responsive, and customizable design. Shadcn UI components are used for consistent, accessible design elements throughout the interface.

[2] User authentication is managed using Clerk, a secure and developer-friendly authentication platform. Clerk handles sign-in, sign-up, session management, and user profile handling. Once authenticated, users are directed to a personal dashboard where they can access editing features.

[3] The backend logic is handled through Next.js API routes, where user requests (such as image uploads or AI processing requests) are received and processed. This layer also includes business logic for handling premium tool access—verifying whether a user has purchased specific AI features.

[4] Premium editing features like background removal, background addition, and image enhancement are powered by AI services. These services are accessed via APIs that process images on the backend. Only users who have purchased access can invoke these AI endpoints.

[5] For unlocking AI tools, the system includes a payment integration (such as Stripe or a similar service, depending on the implementation) where users can securely pay for access to premium features.

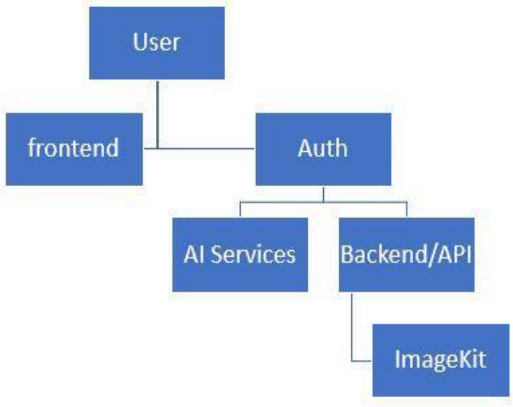

Fig 3.1 Modular diagram

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IV. METHODOLOGY

The development of Pixeon followed a structured, step-by-step approach to ensure a responsive, scalable, and user-friendly web application. The process began with requirement analysis, where both functional and technical needs were identified—such as the inclusion of basic image editing tools, AI-powered features, and secure user authentication. Based on the requirements, a modern tech stack was chosen: Next.js for building a dynamic and high-performance frontend, Fabric.js for canvas-based image editing, Tailwind CSS and Shadcn UI for a clean, responsive design, and Clerk for secure user authentication.Security Feedback: If violations occur, snapshots are saved, alerts are shown, and the test may be paused or terminated based on the configured rules. Repeated violations result in automatic disqualification.

V. DESIGN AND IMPLEMENTATION

The design of Pixeon focuses on simplicity, speed, and accessibility. The user interface was built using Next.js with Tailwind CSS and Shadcn UI to ensure a clean and responsive experience across all devices. Image editing is handled through Fabric.js, allowing real-time manipulation on a canvas. Users sign in using Clerk authentication, which provides secure and personalized access to the dashboard. The backend, developed using Next.js API routes and ConvexDB, manages user data, image records, and premium feature access. AI tools are integrated via external APIs, and premium access is controlled based on user purchases. All images are stored and served efficiently using ImageKit, ensuring fast loading and smooth performance.

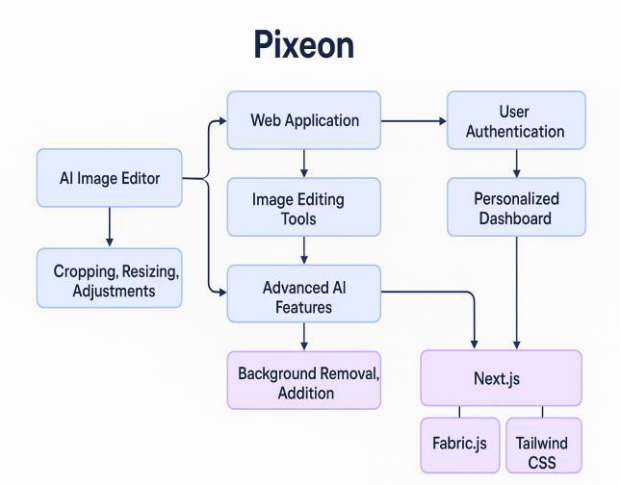

Fig 5.1 Sequential Diagram

VI. OUTCOME OF RESEARCH

The development of Pixeon resulted in a fully functional, web-based AI image editor that combines both basic and advanced editing tools in a single platform. Users can easily perform standard edits for free, while premium AI features offer professional-level capabilities like background removal and addition. The integration of secure authentication, a smooth UI, and fast image processing has made the tool practical, accessible, and scalable for real-world use.

VII. RESULT AND DISCUSSION

The implementation of Pixeon produced a working web application that successfully delivers on both functionality and usability. Users are able to register and log in through secure Clerk authentication, access a clean and responsive dashboard, and perform a variety of editing tasks with ease. The basic tools like cropping, resizing, brightness, and saturation controls work smoothly on the interactive canvas powered by Fabric.js. Advanced AI features, such as background removal and AI-based background addition, were integrated through third-party APIs and function reliably

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for users who have made a purchase. The application effectively distinguishes between free and premium tools, ensuring fair access control. The use of ImageKit enables fast image upload, storage, and delivery, resulting in minimal lag and high-quality image rendering.

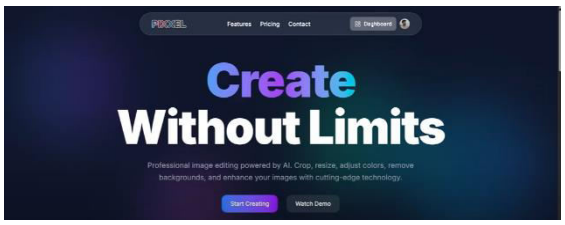

Fig 7.1 Registration page

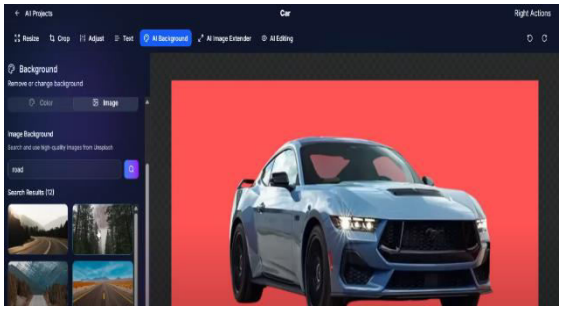

Fig 7.2 Image editing tools

VIII. CONCLUSION

Pixeon successfully demonstrates how modern web technologies and AI can be combined to create a powerful yet accessible image editing platform. The project fulfills its objective by offering a seamless user experience, where both free and premium tools are available based on user needs. With features like secure authentication, real-time canvas editing, and AI-based background processing, Pixeon provides a practical solution for users seeking professional-level editing without the complexity or cost of traditional software. The platform is scalable, user-friendly, and lays the foundation for future enhancements such as additional AI tools and collaborative editing features. Overall, the project proves that AI-driven image editing can be both efficient and widely accessible through a web-based application.

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