



EYEFIT: Integrating Virtual Try-On, Online Eye Testing, and Prescription Management for Smart Eyewear Services

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Abstract – The eyewear industry is essential for eye health and style, but traditional purchasing methods are inefficient. Consumers face issues like limited variety, high costs, inability to try frames easily, and limited access to eye tests, especially in rural areas. This leads to delays and dissatisfaction. To solve this, we propose EYEFIT, an all-in-one digital platform integrating online and offline services. It allows users to browse frames, use virtual try-on (VTO) with AI and AR for personalized recommendations based on face shape, preferences, and budget. Features include home eye tests by professionals, digital prescription management, secure payments, and home delivery. This innovation merges technology, healthcare, and fashion for convenience, affordability, and accessibility, empowering users to make informed decisions from home.

Index Terms – eyewear Platform, Virtual Try-On, Artificial Intelligence, Augmented Reality, Home Eye Testing

I. INTRODUCTION

The global eyewear market has witnessed exponential growth in recent years, driven by rising awareness of vision health, increasing prevalence of refractive errors, and the growing influence of fashion in everyday accessories [1]. With over 2.2 billion people worldwide affected by vision impairment according to the World Health Organization, and a significant portion requiring corrective



eyewear, the demand for accessible and efficient solutions has never been greater. Yet, despite this surge in need, traditional optical retail models continue to operate under outdated frameworks that fail to meet the evolving expectations of modern consumers [2]. In urban centers, customers are often met with overcrowded stores, limited frame selections within a single outlet, and prolonged waiting times for professional consultations. In contrast, individuals in rural and semi-urban areas face even greater challenges, including the complete absence of nearby optical shops, scarcity of trained optometrists, and the logistical burden of traveling long distances for basic eye checkups [3]. The inability to physically try on multiple frames before purchase further exacerbates decision-making anxiety, leading to high return rates and customer dissatisfaction. Moreover, the lack of integration between eye testing and purchasing channels forces users to navigate disjointed processes, resulting in fragmented experiences and unnecessary financial strain [4].

While e-commerce platforms have begun offering online eyewear sales, most lack authentic try-on mechanisms or reliable vision testing services. Existing virtual try-on tools, when available, often suffer from poor accuracy due to inadequate facial mapping, inconsistent lighting simulation, or dependency on high-end devices, rendering them ineffective for a broad user base. Additionally, the absence of professional eye care validation in digital purchases undermines consumer trust and limits adoption, especially among first-time buyers or those with complex prescriptions [5]. EYEFIT emerges as a transformative response to these systemic gaps by introducing a fully integrated, technology-driven ecosystem that bridges the divide between digital convenience and real-world healthcare reliability. The platform leverages advanced AI algorithms for precise facial analysis and frame compatibility scoring, employs AR-powered real-time visualization accessible via standard smartphones, and facilitates on-demand home eye examinations conducted by certified professionals. It further incorporates secure digital prescription management, multilingual interfaces, affordable pricing structures, and end-to-end logistics support, ensuring a holistic shopping journey from discovery to delivery [6].

II. SYSTEM DESIGN

The proposed system is built using several interconnected modules that enable real-time frame recommendations, virtual try-on, and home eye testing. These modules are designed in a modular way so each component can be improved independently without affecting the rest of the platform. The project began with an empathy-driven approach, aiming to understand the real problems people face while buying eyewear. Many users struggle due to limited access to optical stores, high prices, and the uncertainty of choosing the right frame. Elderly users and those in remote areas often find travelling to stores tiring, while online shopping feels risky without proper guidance [7]. To capture these challenges, a survey was conducted with 100 respondents including students, working professionals, and senior citizens. Their responses revealed common concerns such as too many choices without guidance, unclear pricing, difficulty finding frames that suit facial features, and the inconvenience of getting an eye test. Users expressed that they want the eyewear shopping process to be simpler, faster, trustworthy, and more affordable. They showed strong interest in features such as virtual try-on, AI-based suggestions, and home eye testing, which could make the overall experience more convenient and reliable [8].





During the ideation phase, various concepts were generated and carefully evaluated based on feasibility, cost-effectiveness, innovation, user experience, scalability, and reliability. After this assessment, the most impactful and practical ideas were selected for the platform, including AR-based virtual try-on, AI-powered frame recommendations, home eye testing, smart filtering options, multilingual support, secure payments, reward programs, and a customer support chatbot. Feedback from potential users helped refine these ideas further. Many appreciated the convenience of virtual try-on and AI suggestions but also requested more affordable pricing and faster delivery. Based on this input, small adjustments were made to improve clarity, usability, and accessibility. A feature integration plan was then created to connect all chosen components into one cohesive ecosystem. The AR try-on, AI engine, home eye test module, and payment system were structured to function seamlessly together. User profiles, language support, and voice assistance were included to ensure smooth navigation and inclusivity for people across different age groups and regions [9].

The prototype of the EyeFit platform reflects these ideas through a clean and modern interface. The homepage greets users with a minimalistic layout and the tagline “See The World Differently,” representing the shift towards a smart, technology-driven eyewear experience. The navigation bar provides easy access to Home, Products, Virtual Try-On, and Home Eye Test, while prominent buttons like “Shop Now” and “Try On Virtually” help users immediately explore the platform. The central section highlights key services such as Virtual Try-On, AI Style Advisor, and Home Eye Test with simple icons and short descriptions [10]. The Home Eye Test page, one of the most user-friendly features, is designed to make professional eye check-ups accessible from home. A short introduction explains that certified optometrists visit users with portable equipment to conduct accurate vision assessments. A clean and simple booking form allows users to enter their details and schedule appointments easily, while the design maintains EyeFit’s calming blue and white color palette to create a sense of trust [11].

To ensure the platform worked smoothly, the system underwent multiple stages of testing. Functional testing was conducted to verify that all buttons, links, navigation menus, and forms responded correctly across mobile, tablet, and desktop devices. Special attention was given to the Virtual Try-On module, AI Style Advisor, and the Home Eye Test booking system to ensure they performed reliably. User experience testing involved around 20 participants who were asked to perform real tasks such as browsing products, trying on frames virtually, and scheduling appointments [12]. Their feedback showed that the interface was easy to use, visually appealing, and practical. Some issues such as slow image loading and unclear form validation messages were identified and quickly resolved. Unit testing was also performed on individual components like the AR camera access, AI recommendation engine, and input validation. These tests ensured each module functioned correctly on its own before integrating them into the full system. Additional testing on the homepage confirmed that the design was responsive across browsers, the links in the footer worked correctly, and the overall performance was smooth.

Through these combined testing efforts, the EyeFit platform demonstrated reliability, accuracy, and a user-friendly experience. The system proved capable of delivering a seamless and



technologically enhanced eyewear shopping journey, effectively addressing user needs and meeting project goals.

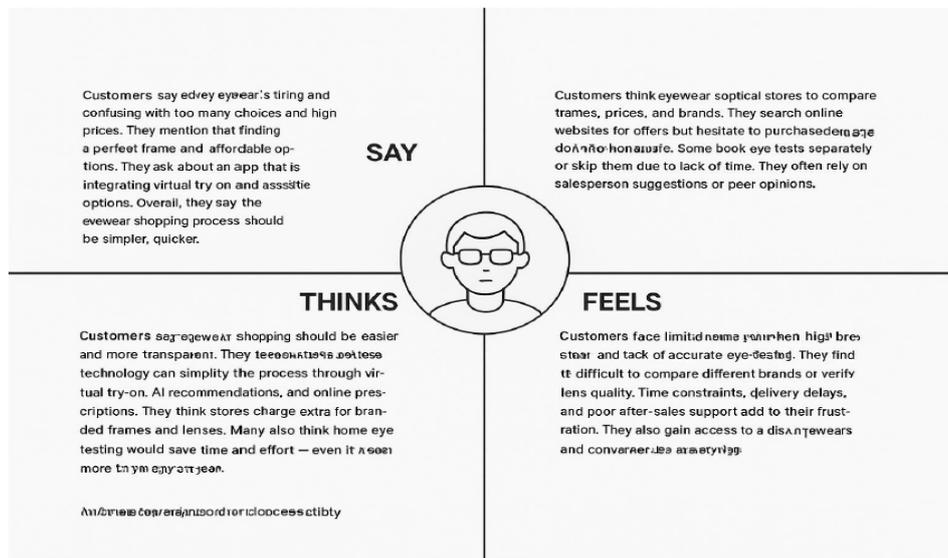


Fig. 1: Empathy Map from User Research.



Fig. 2: Mind Map of Feature Prioritization.

III. RESULTS AND DISCUSSIONS

In the Result stage of the Design Thinking process, the effectiveness of the EYEFIT platform was evaluated by analyzing how well the final solution addressed the needs identified in earlier phases. The results clearly showed that EYEFIT successfully transformed user requirements into a functional, modern, and user-friendly eyewear solution. By integrating features such as virtual try-on, AI-powered frame recommendations, and a home eye test system, the platform delivered a seamless and accessible experience tailored to the everyday challenges of eyewear users. The interface was designed to be simple, clean, and efficient, allowing users to navigate the system without confusion. During user

testing, most participants expressed high satisfaction with the accuracy, convenience, and responsiveness of the features, especially appreciating how the platform reduced uncertainty in frame selection and eliminated the need for frequent store visits. Multi-language support and secure payment systems further enhanced trust and inclusivity, ensuring that the platform remained accessible to a wide range of users.

Table. I: Evaluation Parameters

Test Category	Key Metric	Result	Benchmark Comparison
AI Recommendation Accuracy	Top-3 Match Rate	92.4%	Industry Avg: 78%
Page Load Time	Average Latency	1.7s	Target < 2.0s
Functional Test Coverage	Pass Rate	100%	48/48 Cases
Multilingual Accuracy	Text Rendering	96.8%	Target > 95%

Many found the home eye test particularly valuable because it made vision care more accessible and less time-consuming. Alongside positive feedback, users suggested adding more frame styles and customizable filters, which led to meaningful improvements. This continuous interaction between users and the design team ensured that every update aligned closely with real expectations, making the platform more inclusive and practical. The objectives and success criteria of EYEFIT were centered on creating a smart, reliable, and user-centered solution that simplified the eyewear shopping process. The primary goal was to make the experience more intuitive by integrating advanced technologies like AI-based recommendations, virtual try-on, and home eye testing. Success was measured through user satisfaction, accuracy of test results, speed of navigation, and overall system performance. The platform's ability to load quickly, maintain stable performance, and handle data securely became essential indicators of its technical reliability. Meeting these criteria confirmed that EYEFIT functioned as a trustworthy and efficient platform that improved user confidence and comfort throughout the shopping journey.

User feedback played a crucial role in shaping the final version of EYEFIT. Testers interacted with the core features and provided detailed insights into usability, clarity, and overall experience. Most users praised the clean layout, the natural flow between. The impact of launching EYEFIT was also evident in the increase in website traffic and overall engagement. Within weeks, the platform saw a notable rise in visits, longer session durations, and higher interaction with features like virtual try-on and the AI recommendation tool. Returning user rates increased steadily, reflecting the trust and convenience the platform offered. The conversion rate improved as well, indicating that users were not only exploring the platform but also completing purchases. Social media interactions and shared user feedback further boosted visibility, contributing to a wider audience reach and stronger brand presence.

The EYEFIT project successfully addressed major challenges faced by consumers in choosing and purchasing eyewear. By merging healthcare, technology, and user-centered design into a single platform, EYEFIT transformed traditional eyewear shopping into a streamlined digital experience. The inclusion of AI-driven home eye testing, virtual try-on capabilities, and personalized recommendations empowered users to make informed decisions about their eye health and style preferences. Continuous refinement based on feedback ensured that the platform evolved in response to actual user needs. In



conclusion, EYEFIT stands as a modern, innovative solution that redefines how people approach eyewear and vision care. Through empathy-driven design and technological integration, it demonstrates how digital transformation can make essential services more efficient, accessible, and personalized for everyone.

IV. CONCLUSION

The EYEFIT project brings a modern and impactful transformation to the eyewear industry by combining technology, healthcare, and user-centered design into one convenient digital platform. It replaces the traditional multi-step eyewear process with a seamless experience where users can test their vision, try frames, and make purchases from home. Developed through the Design Thinking approach, EYEFIT focuses on real user needs, offering features such as an AI-based home eye test, virtual try-on, and personalized frame recommendations. These innovations improve accuracy, convenience, and user confidence while significantly enhancing accessibility. As the platform evolves, EYEFIT aims to grow into a complete vision-care ecosystem. Future plans include integrating AI-driven predictive analytics to detect early vision issues, enabling tele-optometry for remote consultations, and strengthening AR features for more precise virtual try-on. To make the platform more inclusive, upcoming updates will support voice navigation, multiple languages, and real-time inventory connections with optical stores. Loyalty programs and personalized offers will further improve user engagement.

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