DESIGN2WEAR-AI

A Project Report submitted in partial fulfillment
For the award of the degree of

Bachelor of Technology
in
Electronics and Computer Engineering
By

1. Ms. Vaishnavi Sukumar Patil. (Sr. No. 22)
2. Ms. Aditi Anil Chougule. (Sr.No.23)
3. Ms. Shreya Kirankumar Darban. (Sr.No.24)

Under the Guidance of

Dr. Mrs. Rupali Shelke

Department of Electronics Engineering

Walchand Institute of Technology, Solapur
(An Autonomous Institute)

Affiliated To
Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Academic Year 2024-25

DECLARATION

We declare that

a. The work contained in this report is original and has been done by us under the guidance of our supervisor.

b. The work has not been submitted to any other Institute for any degree or diploma.

c. We have followed the guidelines provided by the Institute in preparing the report.

d. We have conformed to the norms and guidelines given in the Ethical Code of Conduct of the Institute.

e. Whenever we have used materials (data, theoretical analysis, figures, and text) from other sources, we have given due credit to them by citing them in the text of the report and giving their details in the references.

Name of the Student	**Signature**
1. Ms. Vaishnavi Sukumar Patil.	
2. Ms. Aditi Anil Chougule.	
3. Ms. Shreya Kirankumar Darban.	

Place: Solapur

Date:

Department of Electronics Engineering
Walchand Institute of Technology, Solapur

CERTIFICATE

This is to certify that the project report entitled ***DESIGN2WEAR-AI***

submitted by -

Name of the Student	*Roll No*	*Exam Seat No*
1. Ms. Vaishnavi Sukumar Patil.	22	2203112002
2. Ms. Aditi Anil Chougule.	23	2103111089
3. Ms. Shreya Kirankumar Darban.	24	2103111200

to the Walchand Institute of Technology, Solapur in partial fulfillment of the requirements for the award of the Degree of Bachelor of Technology in Electronics& Computer Engineering is a bonafide record of work carried out by them under my guidance and supervision. The contents of this report, in full or in parts, have not been submitted to any other Institute for the award of any Degree. This project is approved for the award of the Degree of Bachelor of Technology in Electronics& Computer Engineering

Dr. Mrs. R.J. Shelke	*Dr. S.R. Gengaje*	*Dr. V.A. Athavale*
Supervisor	**Head of the Department**	**Principal**

Date:

Place: Solapur

ACKNOWLEDGEMENT

We would like to express our deepest gratitude to all those who have supported and guided us throughout the successful completion of our project **"DESIGN2WEAR-AI"**.

First and foremost, we extend our sincere thanks to **Dr. Mrs. Rupali Shelke**, our project guide, for her valuable guidance, constant encouragement, and insightful feedback, which played a crucial role in shaping our project. Her expertise and dedication were instrumental in helping us navigate through challenges and enhance the overall quality of our work.

We are also grateful to **Dr. S.R. Gengaje**, Head of the Department of Electronics & Computer Engineering, Walchand Institute of Technology, Solapur, for providing us with the necessary facilities, environment, and resources to undertake this project effectively.

We thank all the faculty members of our department for their support and constructive suggestions during various stages of the project development.

Last but not least, we would like to thank our families and friends for their continuous encouragement, patience, and moral support throughout the course of this work.

Thank You,

Ms.Vaishnavi Sukumar Patil.
Ms. Aditi Anil Chougule.
Ms.Shreya Kirankumar Darban.

ABSTRACT

Design2Wear AI is a cutting-edge, AI-driven platform that offers personalized outfit recommendations tailored to individual user preferences. Built on Next.js with Firebase integration, this project allows users to create customized outfit suggestions by selecting specific attributes such as colour, occasion, season, style, skin tone, fabric, and size. The system leverages machine learning algorithms to generate real-time outfit suggestions that align with the user's choices, enhancing their fashion experience with AI-guided personalization.

The platform is designed to deliver a smooth user experience with an interactive and visually engaging interface. Firebase serves as the backend, enabling secure user authentication, data storage, and collection management for saving outfits. Users can revisit and download their favourite looks from their personalized collections, making it a convenient tool for planning outfits.

This project aims to bridge the gap between fashion and technology, democratizing access to personalized fashion advice. By integrating user-friendly design and celebratory visual elements, Design2Wear AI creates an enjoyable experience for users while helping them explore and express their personal style.

CONTENTS

Chapter No – 1

Introduction

INTRODUCTION

In today's digital age, fashion and technology intersect in increasingly innovative ways, offering personalized solutions to consumers. The demand for custom fashion experiences is on the rise, as people look for outfits that reflect their unique style, preferences, and needs. However, selecting the right clothing that fits one's personality, occasion, and aesthetic preferences can be challenging. Traditional online shopping often lacks personalization, leading to time-consuming browsing and sometimes unsatisfactory choices.

The **Design2Wear AI** project aims to address these challenges by leveraging artificial intelligence to deliver a customized fashion experience. This platform integrates advanced machine learning algorithms and user-friendly design to generate personalized outfit suggestions based on users' inputs such as colours, preferences, occasions, seasons, body type, and style. By collecting detailed input through an intuitive interface, Design2Wear AI creates a fashion profile for each user and suggests outfits tailored specifically to their preferences. Additionally, users can save and explore their past outfit collections, making it easier to track and experiment with various styles.

This project represents a significant step towards personalized fashion recommendations, bringing convenience and creativity to the user experience. As AI-powered systems become more advanced, the fashion industry can offer more interactive and responsive experiences, enhancing customer satisfaction and expanding the boundaries of digital fashion technology.

Chapter No – 2

Literature Survey

LITERATURE SURVEY

- **AI FOR FASHION (Author Dr. Csanák Óbudai Egyetem)**[1]

In that paper the the information has become probably the most valuable element for society and industrial progress today. The big data environment has radically transformed our daily life and the economic and business World. For the fashion industry, the Big Data Era, supported by applications of the Internet, is very challenging and poses a considerable scale of opportunities. Many types of data can be analysis in the context of Fashion: point-of-sale (POS) data, geographic information systems (GIS) data, social media data, virtual 3D data, sensory data, textile physical data. The management of the profitable use of these data requires advanced techniques. Data mining is an interdisciplinary subfield of computer science and statistics, the process of discovering patterns in large data sets involving methods at the intersection of machine learning, statistics, and database systems. [3,4].

- **A detailed review of artificial intelligence applied in the fashion and apparel industry (Author -Chandadevi Giri1 et)**[2]

In that paper Fashion and apparel (F&A) industry is one of the largest economies contributing 38% to the Asia Pacific, 26% to Europe and 22% to North America [1]. According to Business of Fashion, (2019), F&A sales are projected to grow by 7.5% and 5.5% in the Asia Pacific and Europe respectively. F&A is also one of the largest waste producers globally [3] because of problems like overproduction and product returns. The principal reason behind this is the consumer's dissatisfaction with the products offered by the industry in terms of size, color, and style. Hence, it is essential for the industry to become customer-centric for successfully regulating environment-friendly manufacturing practices. Consequently, it is important that the industry adopt sustainable production practices to alleviate waste production and management. One of the ways of achieving this can be by taking advantage of emerging Artificial Intelligence (AI) techniques for creating a sustainable digital supply chain [4]. In the past decades, AI has transformed many industries like health, transportation, and manufacturing due to its capability to solve problems using conventional mathematical models [5]–[7]. The application of AI has been recognized in the F&A industry at various stages such as apparel design, pattern making, forecasting sales production, supply chain management [8], [9].

- **Developing an AI-based automated fashion design system: refecting the work process of fashion designers (Author - Woojin Choi1 et)**[3]

In that paper the research aims to achieve two primary objectives. First, aims to collect and analyze existing cases of AI-based garment design tools in order to identify the similarities and diferences between the garment development processes of human designers and the existing AI-based garment design tools[1]. Second, based on this analysis, the research aims to develop an AI-based garment development system that takes into consideration the garment development process of human designers, incorporating fashion domain knowledge
[2].

Chapter No – 3

Problem Statment

PROBLEM STATEMENT

Modern consumers desire clothing options that reflect their personal style, yet navigating endless fashion choices can be overwhelming.

Chapter No – 4

Objectives & Scope

OBJECTIVES & SCOPE

The scope of the DESIGN2WEAR-AI project encompasses the development of an intelligent web-based fashion recommendation system using modern technologies such as AI, machine learning, and cloud services. The scope includes:

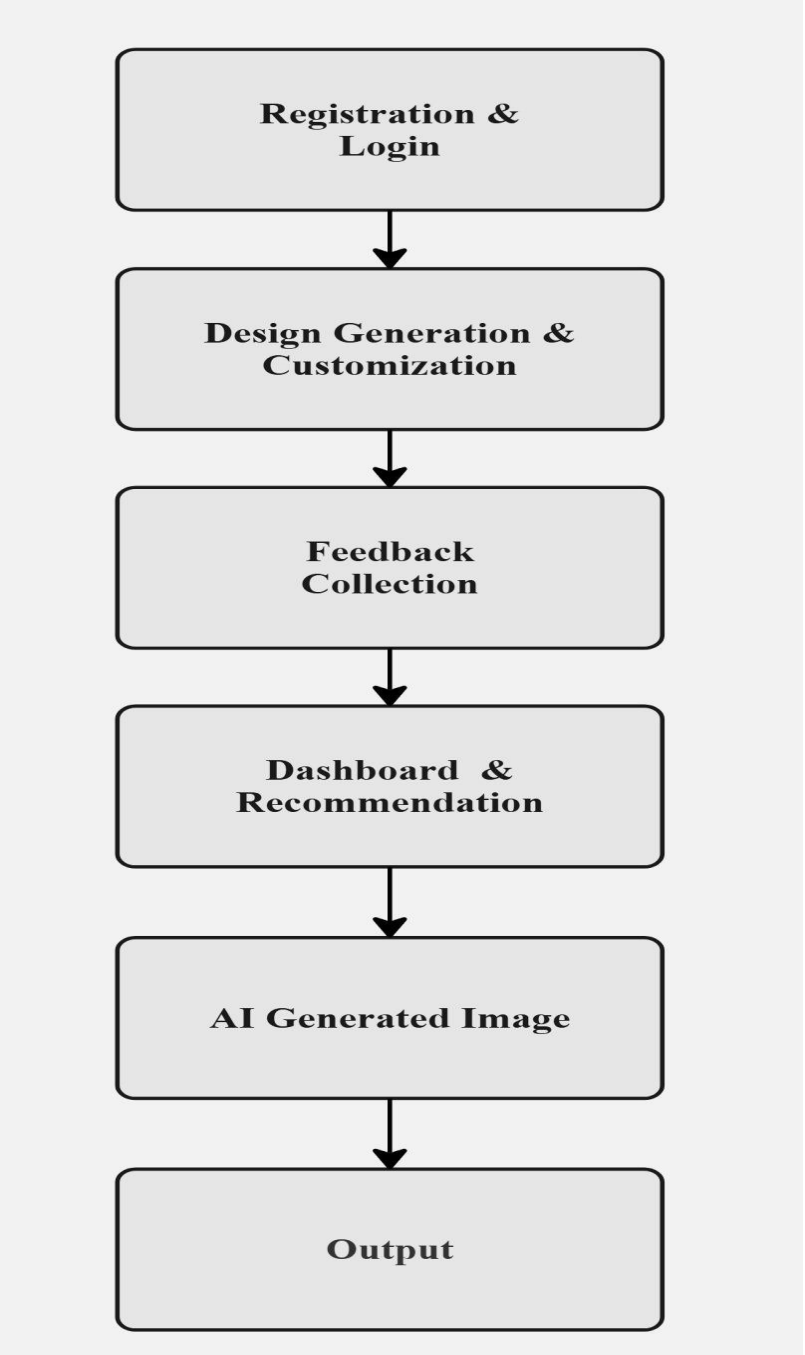
- User Interaction & Preference Collection: The system collects user-specific fashion preferences through an intuitive interface.
- Outfit Generation Engine: It processes user inputs and generates outfit suggestions using AI-based recommendation algorithms.
- Virtual Trial Experience: A visual try-on feature powered by Convolutional Neural Networks (CNNs) to help users visualize outfits on their own image.
- Feedback and Learning System: Integration of a feedback mechanism to continuously improve the accuracy of suggestions.
- Database Management: Secure storage of user data, preferences, and past interactions using Firebase Realtime Database.
- Authentication System: Secure login and user management using Firebase Authentication.
- Scalability and Future Expansion: The platform is designed to support scalability, integration of e-commerce features, AR/VR enhancements, and collaboration tools in future iterations.

Chapter No - 5

System Design

(Internal Workflow)

SYSTEM DESIGN



Chapter No – 6

Software Requirements

(Technology Stack)

TECHNOLOGY STACK

1. **Frontend**:
    - **Next.js**: A React framework that enables server-side rendering and efficient page transitions, ideal for SEO-friendly and fast-loading applications.
    - **React**: A JavaScript library for building dynamic user interfaces, allowing reusable components across the application.
    - **Tailwind CSS**: A utility-first CSS framework that simplifies the styling of components and creates a responsive, consistent design.

2. **Backend**:
    - **Node.js**: JavaScript runtime used to handle server-side logic and data processing.
    - **Firebase Functions**: Serverless functions that allow backend processing and trigger events directly within Firebase, improving scalability.
    - **Next.js API Routes**: API routes within Next.js to handle requests and manage communication between the frontend and backend seamlessly.

3. **Database**:
    - **Firebase Realtime Database**: A cloud-hosted, NoSQL database that provides real-time data syncing, enabling dynamic content updates based on user interactions.

4. **AI Tools**:
    - **AI Image-Generation Model**: Integrated AI model for generating outfit suggestions based on user input, enabling a personalized and creative recommendation experience.

5. **Authentication**:
    - **Firebase Authentication**: Provides secure and easy-to-integrate authentication options (e.g., email, Google login) to manage user access and protect data.

This stack is optimized to handle real-time interactions, provide a smooth user experience, and integrate AI-powered features for advanced outfit recommendations and visualizations.

Chapter No – 7

Coding & Development

CODING & DEVELOPMENT

```
"use client";
import Badge from "@/components/chip";
import Integrations from "@/components/aboutus";
import { LastButNotLeast } from "@/components/last-but-not-least";
import Testimonials from "@/components/testimonials";
import { useEffect } from "react";
import { useRouter } from "next/navigation";
import { getAuth, onAuthStateChanged } from "firebase/auth";
import { auth } from "../config/firebase-config";
import Hero from "@/components/hero";
import AppPreview from "@/components/app-preview";
import PrototypeImg from "@/components/prototype-img";
export default function Home() {
  const router = useRouter();

  useEffect(() => {
    const unsubscribe = onAuthStateChanged(auth, (user) => {
      if (user) {
        router.push("/dashboard");
      }
    });

    return () => unsubscribe();
  }, [router]);

  return (

    <section className="flex flex-col items-center justify-center gap-4 py-8 md:py-10 ">
      <Badge />
      <Hero />
      <PrototypeImg />
      {/* <AppPreview /> */}
```

```
            <Integrations />
            <Testimonials />
            <LastButNotLeast />
          </section>
        );
}
```

Key Algorithms

1. **User Authentication Logic (Firebase Auth)**
   - The app uses Firebase Authentication to track the user's login state.
   - It includes logic to **redirect authenticated users** to the `/dashboard` route automatically, enhancing user flow and access control.
2. **Conditional Navigation with `onAuthState Changed`**
   - This listener checks in real time if a user is authenticated.
   - If the user exists (logged in), they are **programmatically redirected** to the dashboard using Next.js `use Router`.
3. **Component-Based UI Rendering**
   - The app is composed of reusable React components (e.g., `Badge`, `Hero`, `Testimonials`) which encapsulate specific UI logic and design.
   - This approach helps in maintaining a **modular and scalable architecture**.

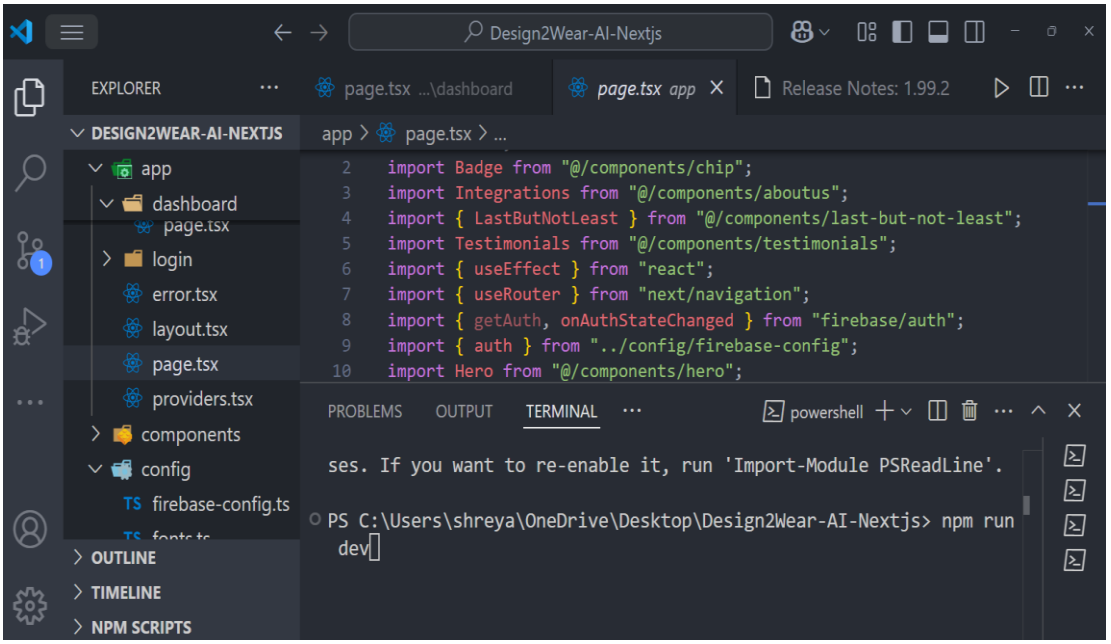
Summary

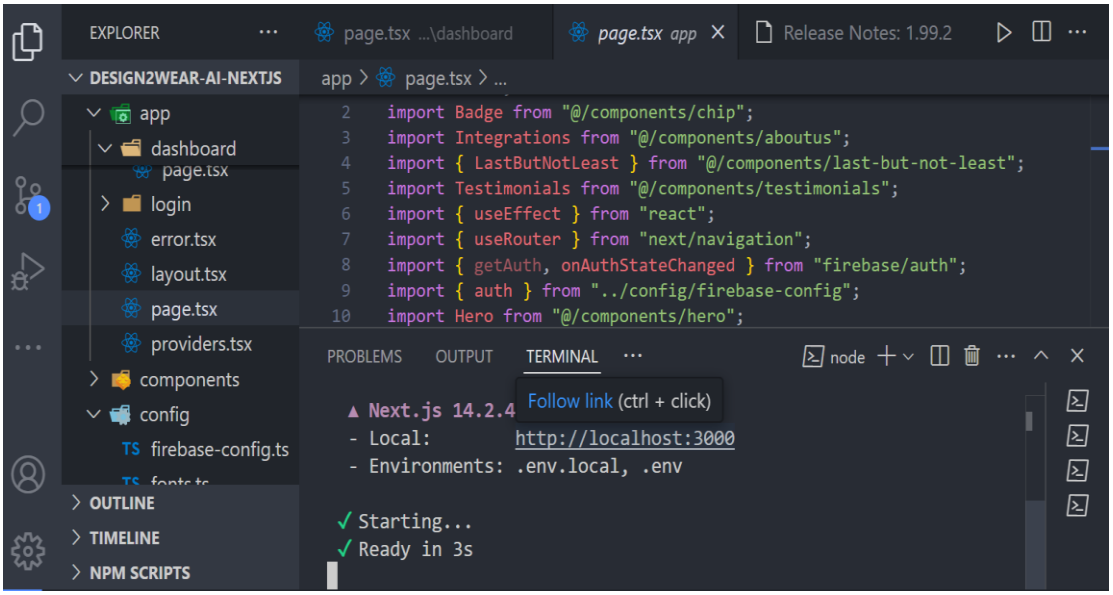
- **Purpose**: Landing page that conditionally redirects users and showcases the app via UI components.
- **Authentication**: Real-time auth status check via Firebase.
- **Navigation**: Uses Next.js's useRouter for redirecting.
- **UI Rendering**: Modular and clean layout with reusable components.

Chapter No – 8
Testing & Results

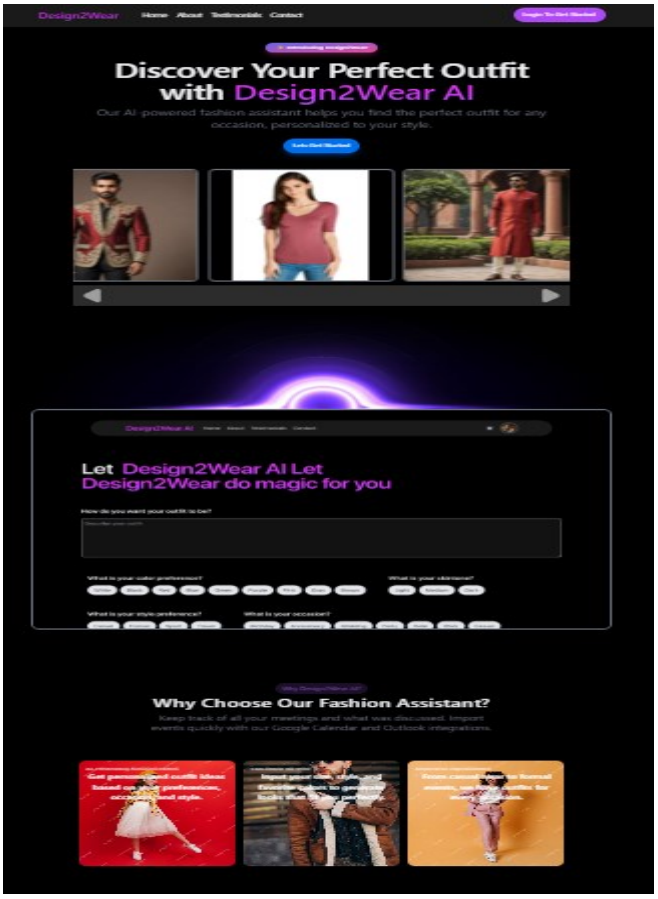
TESTING & RESULTS

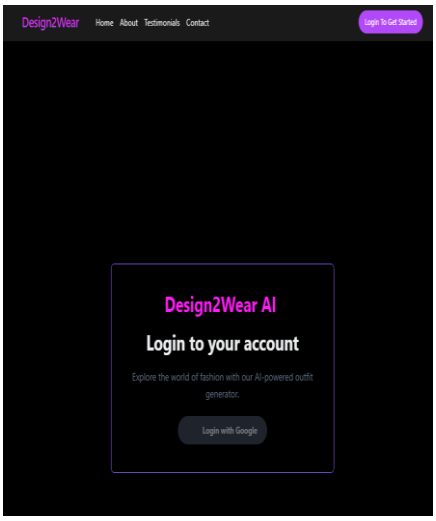
Testing –

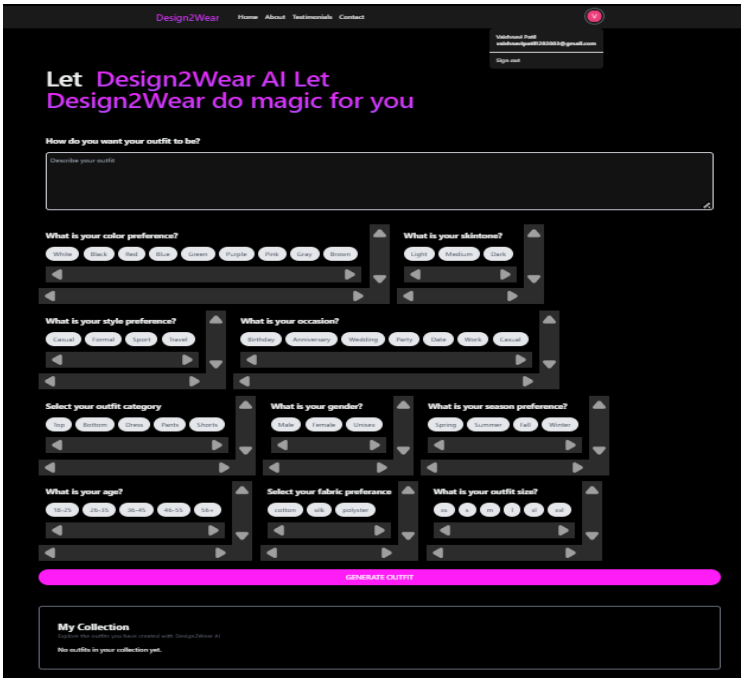




Output –

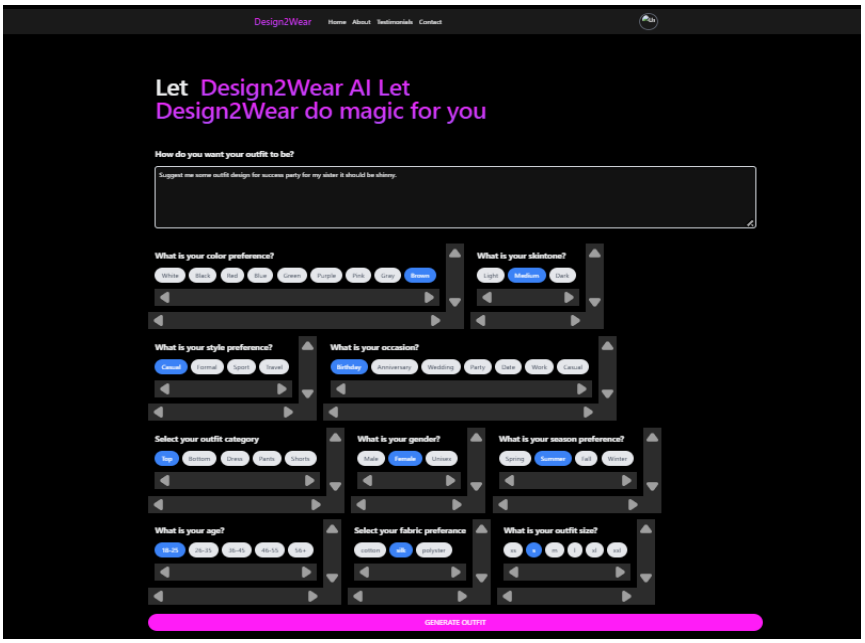

Design2Wear
Home About Testimonials Contact
Discover Your Perfect Outfit with Design2Wear AI
Our AI-powered fashion assistant helps you find the perfect outfit for any occasion, personalized to your style.
Let Design2Wear AI Let Design2Wear do magic for you
Why Choose Our Fashion Assistant?


Design2Wear
Home About Testimonials Contact
Login To Get Started
Design2Wear AI
Login to your account
Explore the world of fashion with our AI-powered outfit generator.
Login with Google


Design2Wear
Home About Testimonials Contact
Let Design2Wear AI Let Design2Wear do magic for you
How do you want your outfit to be?
Describe your outfit
What is your color preference?
What is your skintone?
What is your style preference?
What is your occasion?
Select your outfit category
What is your gender?
What is your season preference?
What is your age?
Select your fabric preference
What is your outfit size?
GENERATE OUTFIT
My Collection
No outfits in your collection yet.

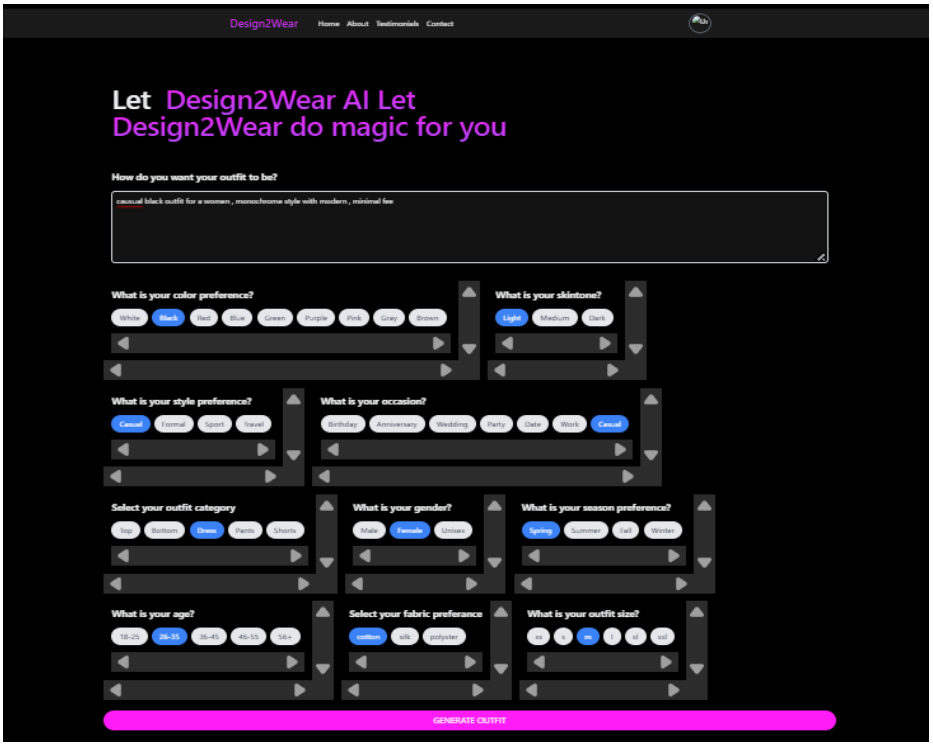
Result –

1) Input-1



Output 1 –

2) Input 2 –



Output 2 –

<u>Collections Of Output</u> –

Chapter No – 9

Challenges & Limitations

CHALLENGES & LIMITATIONS

Issues Faced and How They Were Resolved

1. **Firebase Authentication Integration**
   - **Issue**: Difficulty in managing user session persistence and auto-redirecting authenticated users.
   - **Resolution**: Implemented `onAuthStateChanged` listener from Firebase to detect user login state and used Next.js `useRouter` for smooth redirection to the dashboard.

2. **Machine Learning Model Performance**
   - **Issue**: Initial outfit recommendation models were not providing context-aware or personalized results.
   - **Resolution**: Fine-tuned the model with a better dataset and used cosine similarity for improved matching based on user preferences like season, style, and occasion.

3. **Image Generation Latency**
   - **Issue**: Delays in AI-generated outfit image rendering affected user experience.
   - **Resolution**: Implemented asynchronous loading with spinners and caching techniques to reduce loading time and improve UI responsiveness.

4. **UI Component Reusability**
   - **Issue**: Redundant code across multiple components led to maintainability issues.
   - **Resolution**: Refactored components like `Badge`, `Hero`, and `AppPreview` into reusable modules to improve scalability and reduce code duplication.

5. **Firebase Database Structuring**
   - **Issue**: Difficulty in querying nested user preference data efficiently.
   - **Resolution**: Restructured the Firebase Realtime Database schema for flatter, more query-efficient structures and used proper indexes for faster lookups.

6. **Styling Conflicts with Tailwind CSS**
    - **Issue**: UI elements were not consistently styled across pages due to conflicting utility classes.
    - **Resolution**: Defined a common styling guideline and created reusable CSS utility classes for consistent appearance across components.

7. **Responsive Design Issues**
    - **Issue**: Some elements were not rendering properly on mobile devices.
    - **Resolution**: Utilized Tailwind's responsive utilities (`md:`, `sm:`, `lg:`) and tested extensively on different screen sizes to ensure full responsiveness.

Chapter No – 10

Project Outcomes

PROJECT OUTCOMES

The DESIGN2WEAR-AI project successfully achieved its intended objectives by combining artificial intelligence with modern web technologies to deliver a personalized fashion experience. The key outcomes are as follows:

- **Functional AI-Based Recommendation System**

Developed a working web application capable of generating personalized outfit suggestions based on user preferences like color, style, occasion, and season.

- **User Authentication and Data Management**

Implemented Firebase Authentication for secure user login and session management.

Stored user preferences and outfit collections in Firebase Realtime Database for persistent access.

- **Interactive and Responsive User Interface**

Created a clean, responsive UI using Next.js, React, and Tailwind CSS, ensuring accessibility across devices including mobile and desktop.

- **Real-Time Outfit Generation**

Integrated machine learning models to process user inputs and generate outfit suggestions dynamically.

Included a feedback loop to refine recommendations based on user likes/dislikes.

- **Virtual Visualization of Designs**

Enabled users to preview outfits visually using AI-generated images, enhancing the try-before-you-wear experience.

- **Scalable & Modular Architecture**

Designed a modular codebase with reusable components, making it easier to maintain and expand the application in the future.

Chapter No – 11

Conclusion & Future Scope

FUTURE SCOPE

The project has strong potential for future growth and innovation. Some of the planned and possible enhancements include:

1) Advanced AI Personalization

Incorporating more refined models like transformers and deep personalization algorithms for even more accurate outfit suggestions.

2) E-Commerce Integration

Adding payment gateways, inventory systems, and shipping logistics to enable users to purchase their customized outfits directly from the platform.

3) AR/VR-Based Virtual Try-On

Enabling users to try on clothes virtually using augmented reality (AR) and virtual reality (VR), improving the decision-making process.

4) Sustainability Insights

Highlighting eco-friendly fashion options and analyzing the environmental impact of outfit choices to promote sustainable fashion habits.

5) Data Analytics Dashboard

Providing users and admins with insights on popular trends, user preferences, and AI performance for better decision-making and feature optimization.

6) Collaborative Features

Allowing designers and users to collaborate in real-time, enabling design sharing, voting, and community-based styling input.

7) Cross-Platform Mobile App

Expanding the platform to mobile apps for Android and iOS, improving accessibility and user reach.

CONCLUSION

DESIGN2WEAR-AI is an innovative platform combining AI-driven design generation with personalized user experiences. It allows users to create, visualize, and refine custom fashion designs, using features like virtual try-ons and feedback-driven recommendations. The platform provides a seamless interface, and as it grows, it will expand to include sustainability features, e-commerce integration, and cross-platform support. Ultimately, it aims to transform the fashion design process, making it more interactive, personalized, and user-friendly.

Chapter No – 12

References

REFERENCES

- AI FOR FASHION (Author Dr. Csanák Óbudai Egyetem)[1]https://www.researchgate.net/profile/Edit-Dr-Csanak

- A detailed review of artificial intelligence applied in the fashion and apparel industry (Author -Chandadevi Giri1 et)[2]https://ieeexplore.ieee.org/document/8763948

- Developing an AI-based automated fashion design system: refecting the work process of fashion designers (Author - Woojin Choi1 et)[3] https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=10223039

Chapter No – 13

Paper Publications

PAPER PUBLICATIONS