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**Department of Computer Engineering  
2020-21**

**Project Phase II Report**

**for**

**Pocket Fashionista - A Complexion based Outfit Color Advisor  
using Neural Networks**



This is to certify that the Project entitled “**Pocket Fashionista - A Complexion based Outfit Color Advisor using Neural Networks**” by **Tejashri Wagh, Anisha Gharat and Siddesh Sonawane** is approved for Phase-II presentation.

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## Introduction

Whenever we go shopping either be it a store or online , we do follow the ongoing trend of being a fashion enthusiast. But there is always a case where we get the perfect T-shirt with the perfect color but can't match the pants with that color , or the cloth color does not match your complexion but it did match the model's skin tone. Or we just need to change our wardrobe , but are confused with selecting the suitable color combination which matches with the user's looks and skin type.

So the solution to this is a program which recommends the user a list of color combinations according to the user's skin tones. The model especially focuses on Indian skin tone. It can be a personal fashion advisor on the basis of users' complexion . The user will upload one of his pictures , and the face detection algorithm will detect the skin colour of the user. Algorithms will match the skin colour within the skin colour meter and recommend the best possible colour combinations for the top and bottom combined. The system can also suggest the best color and outfit combinations according to the weather and also on the basis of occasions where the user has the liberty to choose the choices according to the surrounding and in accordance with it the intelligent recommendations will be provided. It will also help the user to try different color combinations from their own wardrobe which they never might have thought of.

Color plays a very important role in coordination, and even the same clothes may have different images depending on color matching. However, the conventional invention is focused on the coordination or sale of the product while the user directly dresses, and thus does not really help users who lack color sense or do not fully utilize the clothes they own.

So we also plan to make a virtual trial room where after suggesting the color combinations of various outfits , it will display the T-shirt and Pant of the recommended color on his body , just like some of the snapchat filters when the camera is faced towards the user.

The outcome of this project will be an app which recommends the colors and outfits to a user which is personalized for that specific user. The never ending confusion of matching color to make it a perfect outfit can be solved through this process.

## Literature Survey

Many of the people find it difficult to get the best possible colour combinations of their clothes in their day to day life and also for some special events or occasions. While shopping online many people get confused while selecting the clothes. There is a need for assistants that can intelligently recommend clothes to the users along with the different colour combinations that can perfectly suit the user's profile and give a personalized recommendation to the user.

In context with this issue, many systems have been developed to provide personalized recommendations to the user. In [1], a recommendation system for clothes based on Season, occasion, posture and skin colour is proposed. Here recommendations are based on personalised clothing styles according to fabric styles and colour. A broad classification of the personalized indicators for recommendation makes this work remarkable. Also a simple mobile interface which is provided to the user gives an optimal solution. User preference is also given importance in certain works such as giving recommendations from the users closet or wishlist[8].

Another few approaches go with the users input that is taken into consideration for providing recommendations. Knowledge graph technique is used for such implementations wherein it constructs knowledge graph of user, knowledge graph of clothing and knowledge graph of context, utilizing Apriori algorithm to capture the intrinsic correlations between clothing attributes and context attributes[4]. It recommends which has the most similar to user's collected clothes through the similarity of clothing ontology to improve the efficiency and accuracy of the recommendation. Also recommendations that are particularly suitable to a user based on the user's personal preference, history of clothing items and the user's evaluations of previous system recommendations are also made[5].

An improved approach which gives a really personalized recommendation system is where users are prompted to provide their Photos so as to give recommendations based on their facial features and skin tone that suit them well. Skin segmentation technique has powered this system[9]. Providing weather based suggestions for apparel is a challenging task to be achieved. The user is given personalized recommendations based on the ongoing weather so that he can feel both comfortable and trendy in whichever weather is going on[6].

Virtual trials of clothes have gained importance over the years. This not only helps to visualise how the clothes will look on the users body but also helps to save the users time in trying out the clothes[2][7]. Basically image warping techniques are used for solving this problem. Fitting the clothes to 2D or 3D models is achieved by Warping techniques. Complexity of the model's pose and even the scenario body parts can overlay over the clothes are well overcome in such solutions[2]. Event based recommendations are given to the user so that he can get proper fashion tips which we can follow and impress his social circle[3]. This makes him confident to attend the social events by following the latest fashion trends via a small personal fashion advisor.

## **Research Gap Identified**

In most of the works proposed earlier, the authors have mentioned skin segmentation and skin color detection only on the basis of 3 colors , that is black ,white , and brown. Which do not completely relate to the particular indian skin tones. Indian Skin tones lie on the meter between fair and dark and accordingly seven skin colour metres can distinguishably identify the indian skin tones .

As mentioned above, the color recommendation system was implemented on the basis of some specific color as an input, which may not apply to every single user and hence there is a need to specifically provide choices and recommendations based on the user's suitability which can be achieved through the skin color.

Personalized recommendation systems involve suitable recommendations for various events in the users life or based on the surrounding. So Weather and Occasion based recommendations will also be provided to the user.

And lastly , an optimum solution for saving a lot of time and energy, is by providing a Virtual Trial Room System, where the user can actually figure out, which color combination recommended by the system looks best on users personality in seconds.

## **Problem Statement**

People usually find it difficult to get the best clothing color combinations that suit their skin tone well and go well with the existing fashion trends.

The aim is to develop a complexion based clothing color recommendation system that will help to choose the best possible clothes color combinations.

It will also allow the users to virtually visualize how they will look in the recommended color combinations.

The application will allow users to make best choices with their clothes color combinations and thus saving their time and energy in even trying out the clothes.

Easy for merchants to master the real-time demand of consumers.

## **Motivation**

There is always a case where we get the perfect T-shirt with the perfect color but can't match the pants with that color, or the cloth color does not match your complexion but it did match the model's skin tone. Or we just need to change our wardrobe, but are confused with selecting the suitable color combination which matches with the user's looks and skin type. Minimise the constant confusion in selection of suitable color of outfit.

We encounter various posts related to fashion and outfits, on social media, online portals etc. Thus there is perplexity in figuring out perfect outfits just by looking at the photos on social media.

Recapturing the essence of Fashion as Fashion is the new language of modern era.

Temporal clothing functions (weather, social activity, practicality, mood, and physical self).  
Constant factors such as clothing orientation and personality dimensions

## **Objectives**

To study current consumer trends and identify target demographics.

- To provide the most suitable color combination.
- To promote an understanding of fashion and outfits.
- To minimise time and energy required to select among options and try it on mobile screen.
- To provide a personalised experience in relation to various events and variable factors like weather.

## **Expected Outcomes**

1. Skin Detection and Classification Module
2. Weather and Event Based recommendation Module
3. Color recommendation Module
4. Virtual Try On Module

## **Functional and Non-Functional Requirements**

### **Functional Requirements -**

1. SQLite - Storing the customers wishlist in the storage database.
2. Darksy API - to provide weather details over locations.
3. Google Maps API - to fetch user location and send to the Darksy API.
4. Fashion Datasets and Amazon datasets - to provide a variety of different event specific or weather specific outfits.
5. Webcam/camera - Interactive image capturing device for live virtual trials.

### **Non - Functional Requirements -**

1. The system needs a strong and healthy security mechanism in place so that unauthorized users are not allowed access.
2. A user should get the required data during the fetch request easily.
3. Responses to queries shall be quick after the user submits the query.
4. The system should have 24/7 availability.
5. Any no. of users can access the system at any time.
6. Better component design to get better performance during peak time.

## **Proposed Solution**

### **1. Skin Detection and skin tone classification -**

Color segmentation will be used for skin detection-using HSV and YCbCr based on threshold. For this, techniques like Python3 and OpenCV are needed. After detection of skin we will use our own technique for classification of skin tone. That will be based on some indian skin tones. Based on skin tone classification outfits colors will be recommended.

### **2. Complexion Detection -**

The user will upload his/her picture. The system will classify the person's skin tone from the Indian skin tones meter using OpenCV. The skin complexion which best suits the user will be further used to determine the color combination of the outfits to be recommended. The feature extraction techniques will be applied to give similar recommendations.

### **3. Reviewing User's Wishlist+Wardrobe -**

The user's wishlist will now be checked. The color combination of shirt and pant that suits the most according to his/her skin tone will be recommended. The existing clothes in the wardrobe of the user can also be shuffled so as to give different combinations.

### **4. Event based recommendations -**

The user will be prompted to enter an event/occasion in his life. The dataset from E-commerce giants like Amazon will be used to classify clothes according to images. The event-specific outfits from the dataset will be segregated. Then images will be transformed to feature vectors to get a similarity index. After this, Euclidean similarity technique will be used to find similar outfits specific to the event.

### **5. Weather based recommendations -**

The Google Maps API can be used to get the current geolocation or city for which weather information has to be gained. The ongoing season will be determined by the system using Darksky API. This weather information will be now used to recommend clothes that will be best suited to the weather-oriented trend and will be comfortable for the user.

### **6. Virtual Trial Room -**

Based on the recommended outfits the user will get a live demo trial on his own live picture through a webcam/camera. This way the user will be able to try out the suggested outfit without even trying it on. The user will also be able to try out different combinations of clothes. This will be done using haar-cascades object detection technique and OpenCV.

## **Feasibility Study of Proposed Solution**

### **A. Technical Feasibility:**

1. Studied complete functionality to be provided in the system.
2. Check if everything is possible using different types of ML algorithms, frontend and backend platform.
3. Outfit recommendation systems available in the market are dependent on the closest dataset, provide recommendation of outfits only based on past history of the user, etc.
4. They do not provide recommendations based on skin tone for color combo. also not provide services such as virtual try-on, etc. to be solved with the proposed system.
5. As we use Python language and ML algorithms, Django framework, SQLite database, flask server and OS - Windows 10, Ubuntu, etc. This all Tech stack is feasible for project Development.
6. Project can be undertaken by two possibilities 1) Mobile App, 2)Website

### **B. Operational Feasibility :**

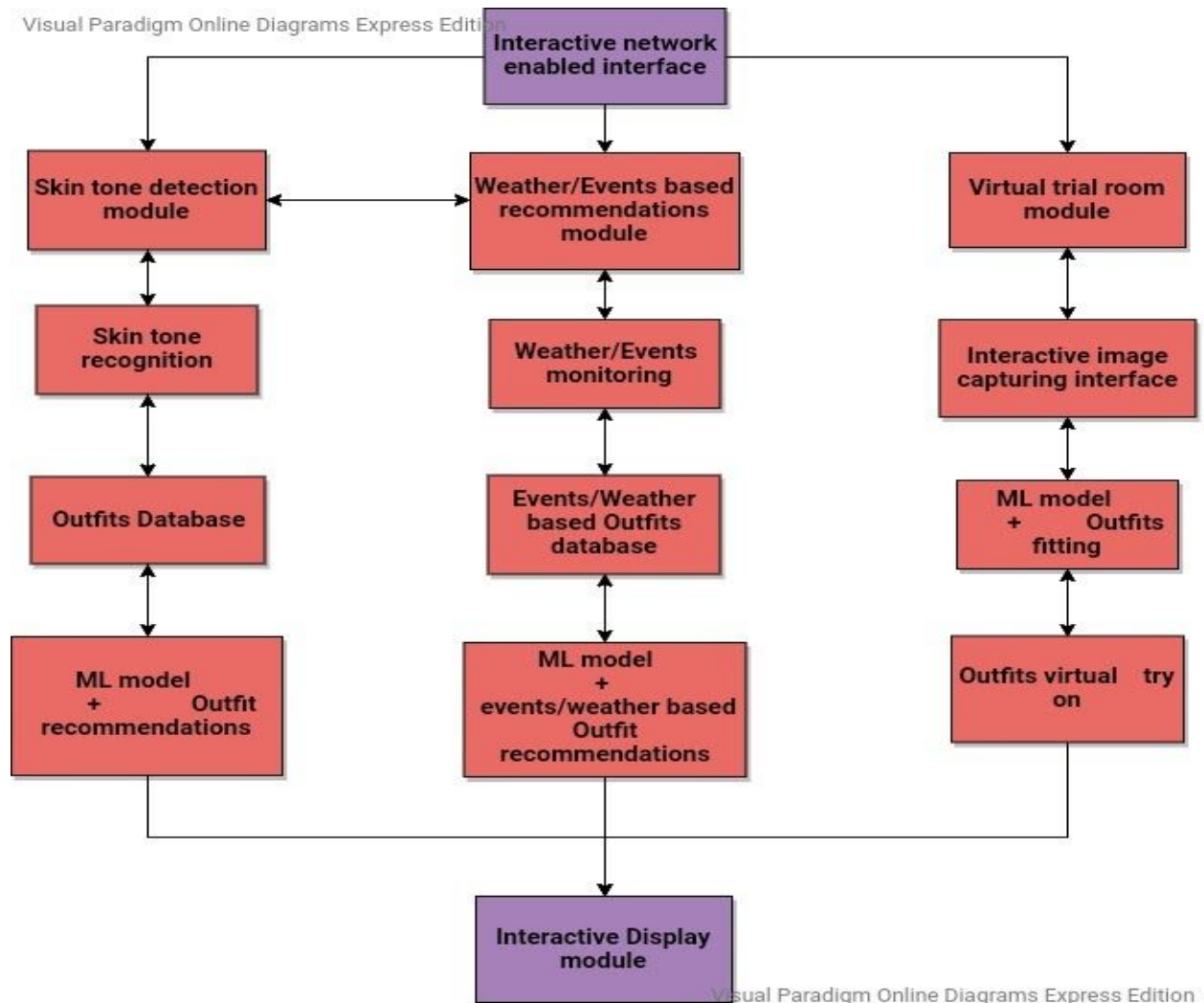
1. The project will be implemented in a way that it will allow the functioning of recommendations smoothly.
2. It will provide a user-friendly user interface in a modular fashion.
3. Proposed system is fully GUI based and will be very user friendly.
4. User guides will be provided so that they feel comfortable to use with a new application.

### **C. Economical Feasibility**

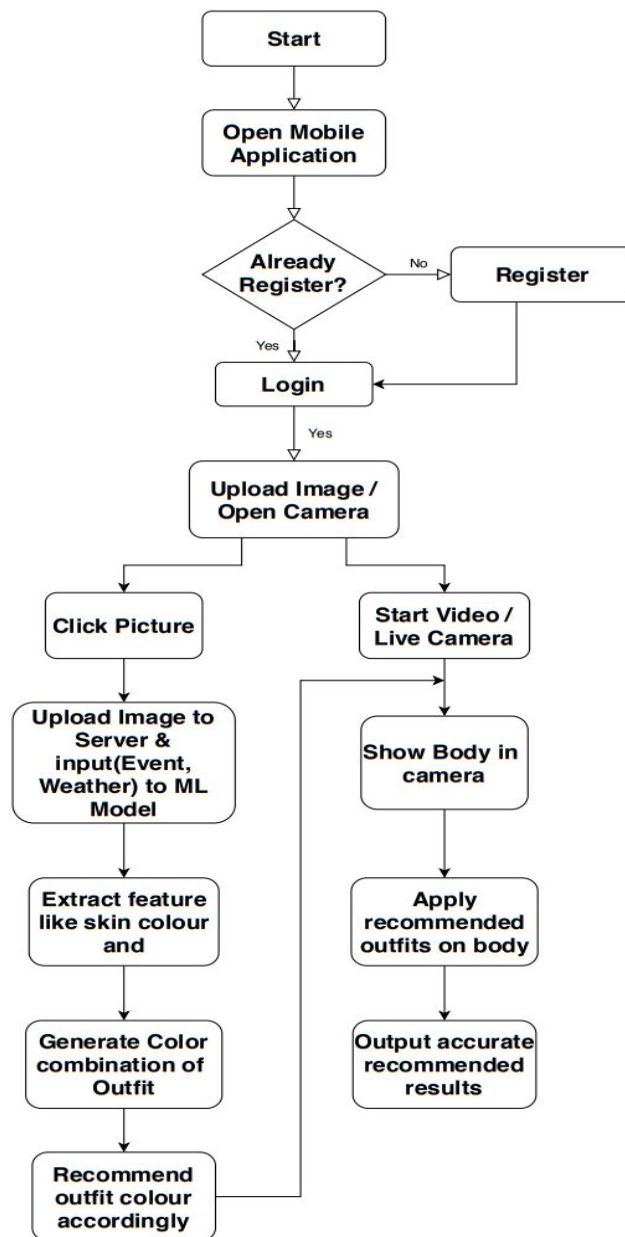
1. It's a very important aspect for project development.
2. We decided the technology based on the minimum possible cost factor.
3. The above mentioned technology is economically feasible.
4. Cost will be needed for weather API, and Internet cost will added



# System Block Diagram



## Method Flowchart



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