IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 1, May 2022
Impact Factor: 6.252

Recommendation System for Outfit Selection

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Abstract: *Wearing matched clothes is very essential when going out in the physical world. Wearing matched clothes that show some level of style and that adhere to the norms of social standards boosts a person's confidence and creates a very good impression. Clothing style has always been a nebulous and difficult-to-quantify concept. The same style of clothing may be perceived differently by different people, which is why pertaining to people's preferences Because fashion is not only popular but also extremely profitable, in our daily lives, we deal with a variety of complex issues. In current history, an abundance of research has begun to use, Fashion research using computer vision. Fashion research using computer vision Our proposed system focuses on helping the user to find optimized matching pair of clothes taking into account intricate details like style, patterns, colors, textures, etc. for tops and bottoms selection. It also helps in providing similar items recommendation based on user's input. Our system is developed for the various features that must be kept in mind for making a robust system that finds clothes matching the user as well as makes similar clothes recommendations.*

Keywords: Resnet 50, Data Image Generator, Encoding values, Intersection, Web Scraping

I. Introduction

The fashion industry plays an important role in the global economy, involving large industrial chains such as garment design, production, and sales. Indeed, there has been an increase in global demand for clothing in recent years [2]. Fashion is an inherently visual concept, and computer vision and artificial intelligence (AI) are playing a growing role in shaping its future. Dressing in a socially acceptable combination of clothes is considered essential in modern society, especially in places where professionalism is synonymous with attire. People must find appropriate clothing to wear on a daily basis.

In terms of personal appearance, what people wear influences how they present themselves and how they feel about themselves. When people wear baggy clothes, they appear more relaxed and have poor posture because the bagginess conceals their form. This affects a person's confidence level, making people think of them as less confident, and this has an effect on a person's confidence over time.

Outfit selection is a common problem that people face on a daily basis; it is a very broad problem that involves a significant amount of visual and social factors that can be implicit and abstract. People must find appropriate clothing to wear on a daily basis. Given the importance of the topic and the needs of users, we were inspired to create a system that would provide the best-case combinations of matching clothes as well as similar item recommendations.

II. Literature Survey

2 .1 Finding Matching Clothes using Machine Learning and Deep Learning

Based on current social standards of color-matching, the algorithm attempts to make a first step in computing whether a pair of items, in this case a tie and a shirt, may be worn together or not. A dataset of images of 41 pairs of shirts and matching ties is used to create the system. Only the areas of the shirt where the tie is worn were considered. Non-matching pairs were created by matching each shirt and tie to its own.For each image, a colour histogram is constructed. It is then normalised in order to account for the luminescence. The histogram is created by dividing the RGB colour space into equal bins and determining where each pixel falls in each bin. Finally, in order to improve performance, the sum of pixels at each bin is normalised, resulting in a normalised colour histogram with a number between 0 and 1 for each feature in the features vector. It has been observed that unnormalized histograms perform worse. Each pair's colour histograms are concatenated and a corresponding label of +1 and 0 is attached.

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The feature vector was then subjected to a series of classification algorithms to determine which one performed the best. The classification algorithms used were Ridge Regression, Standard NN, and Siamese NN. It was discovered that the Standard Neural Network performed the best. It is predicted that artificially creating matching pairs of shirts and ties will improve the performance of the Siamese Neural Network [3].

2.2 Personalized Clothing-Recommendation System

A clothing-recommendation system that suggests personal combinations based on the contents of a user's wardrobe. Recommendation systems are used by online shopping websites to suggest items that users may be interested in. Such systems make recommendations to users based on the behaviour of other users, assuming that all users behave similarly; personal preferences are not captured.

A clothing-recommendation system, on the other hand, should make recommendations on personal item selections based on personal preferences rather than other users' behaviour, because it is uncommon to find other users who own the same articles of clothing as the target user. Based on the user's personal preferences, history of clothing items, and evaluations of previous system recommendations, the proposed system makes recommendations that are particularly suitable to the user. The experimental results show that, in most cases, the system can recommend more appropriate combinations of clothing items than existing systems under the same conditions.[4]

2.3 Cloth Recommender System Based on Item Matching

Recommender systems have become a necessary component of our everyday lives. To improve the user experience, most social websites include recommender algorithms. Clothing is one of the most popular domains on online shopping platforms like Amazon, so a recommender is really important. Previous recommender systems were frequently focused on fetching things based on user desire, that is, closeness to the user's previous purchases. In the Clothing domain, however, the matching relationships between candidate goods and previously purchased items are equally critical for recommendation. If a user has recently purchased a shirt, he or she may prefer to purchase a new pair of jeans rather than suit pants. This type of matched relationship can also be found in other areas of life. The goal of this study is to recommend new garments that are more compatible with a user's existing wardrobe. This novel recommendation technique would be more effective in the Clothing domain and would complement existing recommendation research. The results of our experiments suggest that our strategy can improve recommendation performance in the Clothing sector.[5]

2.4 Summary

Thus, it can be inferred that online shopping holds a big market place in nowadays. Especially Professionalism is based on attire. People find difficult to match clothes. To overcome this problem, we developed a system with single platform that provides clothes matching and similar products recommending based on user’s input.

III. Objective and Scope of Study

Our Proposed system is to find the most similar items recommendation and their matching products based on user’s input in single platform. It also enables users to check their product details and redirect to online shopping website to buy. Clothes matching aggregates similar offers into a single search result, providing users with more options and convenience. It will also allow users for quick shopping with minimal time. The scopes are:

- When online shopping, most people struggle to find a product that matches the selected top or bottom. It aids in the finding of product matches as well as the most similar products.
- This system is for people who are not good at selecting appropriate clothing.
- It assists people in matching clothes online in a single platform and saves users' time.

3.1. Dataset

The data set consists of 7000 images divided into different categories for women such as tops, jeans, Shararas, and so on, and men such as t-shirts, shirts, jackets, pants, and so on. In addition, the dataset contains nearly ten columns for men and women separately. The below Table I describes clothes category and their counts in each category as a table.

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Table 1: Clothes category and their counts

Clothing Category	Count	Clothing Category	Count
Women Tops	520	Men Jackets	520
Women Shirts	520	Men Formal Shirts	518
Women Jackets	520	Men Shirts	520
Women Jeans	450	Men Jeans	200
Women Sharara	396	Men Three-Fourths	455
Women Formal Pants	390	Men Formal Pants	640

IV. IMPLEMENTATION

4.1 Proposed System

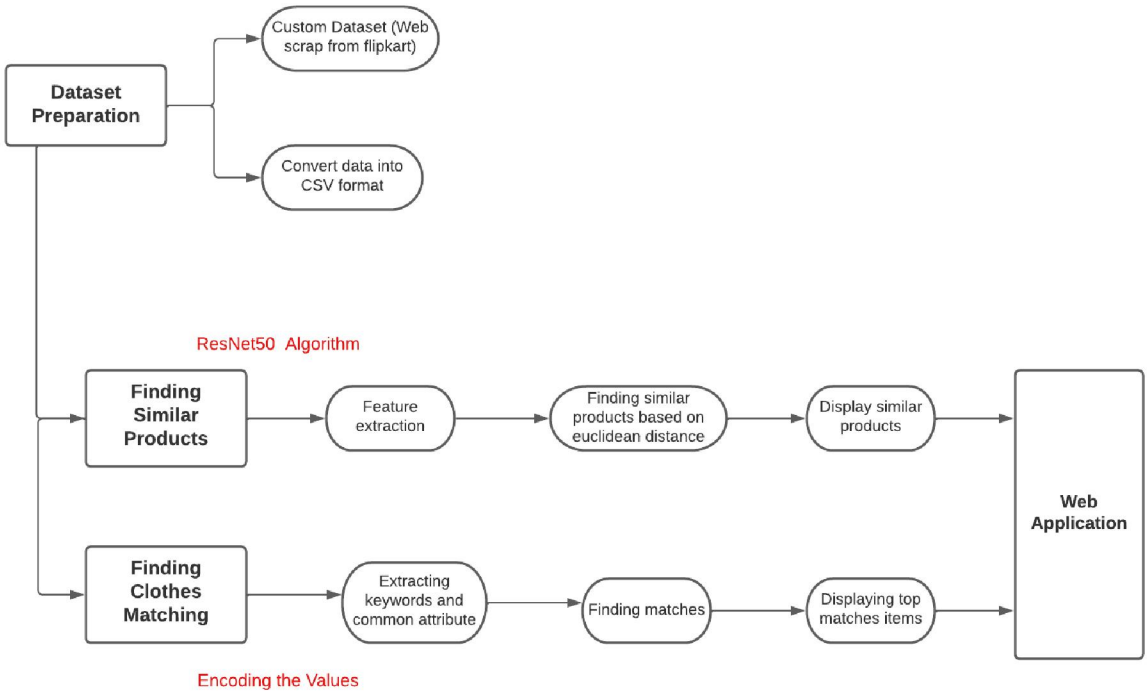

Figure 1: Proposed System

Our proposed system consists of four modules:

- Dataset Preparation
- Finding similar Products
- Finding matching clothes
- Web Application

4.2 Dataset Preparation (Web Scraping)

Preparing a custom dataset, which entails scraping the relevant data from shopping website and converting it to a csv file using beautiful soup in python library. The online shopping website, Web Scraping service is suitable for a wide range of data. Many web pages contain useful product information. As a result, data scraping from the product website is required.

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SNO	Name	Price	Color	Sleeve	Pattern	Image	Fabric	Redirect	Type	Category
0	Men Regular Fit	205	Yellow	Half Sleeve	Solid	https://rukminim	Cotton Lycra Ble	https://www.flipk	Formal Shirt	Men
1	Men Regular Fit	469	Light Green	Full Sleeve	Solid	https://rukminim	Cotton Satin Ble	https://www.flipk	Formal Shirt	Men
2	Men Slim Fit Sol	429	Green	Full Sleeve	Solid	https://rukminim	Pure Cotton	https://www.flipk	Formal Shirt	Men
3	Men Slim Fit Sol	429	White	Full Sleeve	Solid	https://rukminim	Pure Cotton	https://www.flipk	Formal Shirt	Men
4	Men Slim Fit Sol	429	Light Blue	Full Sleeve	Solid	https://rukminim	Pure Cotton	https://www.flipk	Formal Shirt	Men
5	Men Slim Fit Sol	420	Maroon	Full Sleeve	Solid	https://rukminim	Pure Cotton	https://www.flipk	Formal Shirt	Men
6	Men Regular Fit	369	Pink	Full Sleeve	Solid	https://rukminim	Cotton Blend	https://www.flipk	Formal Shirt	Men
7	Men Slim Fit Sol	2,165	White	Full Sleeve	Solid	https://rukminim	Pure Cotton	https://www.flipk	Formal Shirt	Men
8	Men Slim Fit Sol	429	Grey	Full Sleeve	Solid	https://rukminim	Pure Cotton	https://www.flipk	Formal Shirt	Men
9	Men Regular Fit	369	Green	Full Sleeve	Solid	https://rukminim	Cotton Blend	https://www.flipk	Formal Shirt	Men
10	Men Slim Fit Sol	389	White	Full Sleeve	Solid	https://rukminim	Cotton Blend	https://www.flipk	Formal Shirt	Men
11	Men Slim Fit Sol	779	Light Blue	Full Sleeve	Solid	https://rukminim	Pure Cotton	https://www.flipk	Formal Shirt	Men
12	Men Slim Fit Sol	429	Light Blue	Full Sleeve	Solid	https://rukminim	Pure Cotton	https://www.flipk	Formal Shirt	Men

Figure 2*:* Dataset

4.3 Finding Similar Products

To find similar products, the model uses the Resnet50 algorithm. The image is sharpened and smoothed using the 50 layers. In image data generator approaches, important features such as colour, pattern, type, and so on are retrieved using ResNet50. Recommendation of related products based on Euclidean distance. The distance between the input image and all of the other products. The closer the distance, the more accurate the product's similar products goods are.

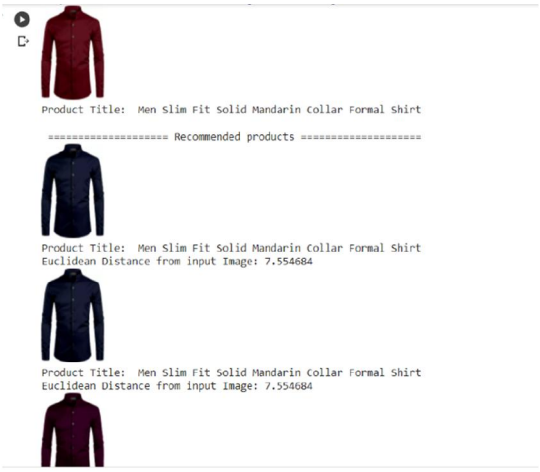

Figure 3: Similar Products

4.4 Finding Clothes Matching

The dataset for clothes matching contains a mix of categorical and numerical data. Values are encoded (converting categorical values into binary values). For top and bottom categories colour and pattern are used for finding intersection between clothes. Based on the user's input, the system will find the best-matched top wear or bottom wear.

Figure 3*:* Matching Clothes

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4.5 Web Application

All categories of scraped data for men's and women's tops and bottoms are displayed individually in the application. Users can browse all of the products, just as on shopping website, and choose any product. The system will produce matches and its similar products based on the user's input. To purchase that product, users will be redirected to shopping website.

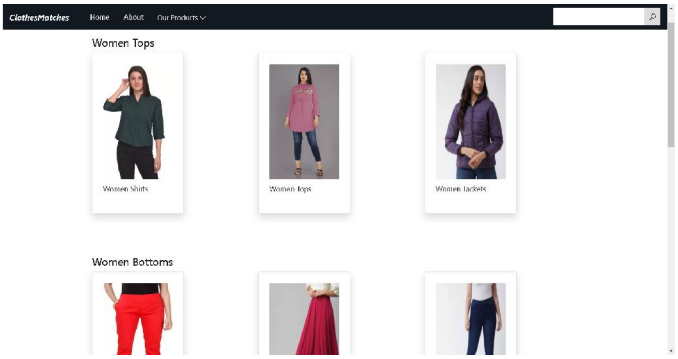

Figure 4*:* Web page

V. RESULTS

Our system provides clothes matching and similar items recommendation with single platform. Datasets were scraped from shopping website so it is easily for customers to view product details in our systems and it will redirect to shopping website if they like the selected products. Replacing VGG-16 layers in Faster R-CNN with ResNet. They observed relative improvements of 28%. ResNet uses skip connection to add the output from an earlier layer to a later layer. This aids in the mitigation of the vanishing gradient issue. Thus ResNet50 uses Euclidean distance between target image to all other images where the less distance will be considered as most similar products. For finding matching clothes we used to find some common attributes and keywords to find matched clothes.

VI. CONCLUSION AND FUTURE WORK

Outfit recommendations engines are the best way to deliver customers with an improved user experience. Through machine learning and specific algorithms, a product recommendations engine can help bring customers the relevant products they want or need. As a part of an ecommerce personalization strategy, product recommendations dynamically populate products onto websites, apps. Future related work includes by using camera the system has to extract features like skin colour, size, height. After extracting features users can virtually (2D) try on the matched clothes to find if the clothes are fits or not.

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