SMART FASHION RECOMMENDER APPLICATION

A PROJECT REPORT

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It was a great learning experience.We would like to take this opportunity to express our gratitude.

DATE:

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TITLE

1. ABSTRACT

The rapid progress of computer vision, machine learning, and artificial intelligence combined with the current growing urge for online shopping systems opened an excellent opportunity for the fashion industry. As a result, many studies worldwide are dedicated to modern fashion-related applications such as virtual try-on and fashion synthesis. However, the accelerated evolution speed of the field makes it hard to track these many research branches in a structured framework. This paper presents an overview of the matter, categorizing 110 relevant articles into multiple sub-categories and varieties of these tasks. An easy-to-use yet informative tabular format is used for this purpose. Such hierarchical application-based multi-label classification of studies increases the visibility of current research, promotes the field, provides research directions, and facilitates access to related studies.

Keywords: Smart Fashion, Virtual Try-on, Fashion Synthesis, 3D Modeling

2. INTRODUCTION

Clothing is a kind of symbol that represents people's internal perceptions through their outer appearance. It conveys information about their choices, faith, personality, profession, social status, and attitude towards life. Therefore, clothing is believed to be a nonverbal way of communicating and a major part of people's outer appearance [1]. Recent technological advancements have enabled consumers to track current fashion trends around the globe, which influence their choices. Additionally, consumers' clothing choices and product preference data have become available on the Internet in the form of text or opinions and images or pictures. Since these images contain information about people from all around the world, both online and offline fashion retailers are using these platforms to reach billions of users who are active on the Internet. Therefore, e-commerce has become the predominant channel for shopping in recent years. The ability of recommendation systems to provide personalized recommendations and respond quickly to the consumer's choices has contributed significantly to the expansion of e-commerce sales. According to different studies, e-commerce retailers, such as Amazon, eBay, and Shopstyle, and social networking sites, such as Pinterest, Snapchat, Instagram, Facebook, Chictopia, and Lookbook, are now regarded as the most popular media for fashion advice and

recommendations. Therefore, the purpose of this paper is to present an integrative review of the research related to fashion recommendation systems. Moreover, Guan et al. cited research published until 2015. Therefore, the first objective of this paper is to review the most recent research published on this

topic from 2010 to 2020. The previous study did not provide an in-depth analysis of the computational methods or algorithms corresponding to the fashion recommendation systems. This review study aims to fulfill this research gap and rigorously study the principles underlying, the methods used by, and the performance of the state-of-the-art fashion recommendation systems. To the best of our knowledge, this in-depth study is first of its kind. It includes research articles related to image parsing, clothing and body shape identification, and fashion attribute recognition, which are critical parts of fashion recommendation systems (FRSs). This review paper also provides a guideline for a research methodology to be used by future researchers in this field. The first section of this review discusses the history and background of FRSs. This review paper has identified state-of-the art algorithms and filtering techniques that have high potential to become more popular in the future. The sections of this paper are arranged in the order of the important FRS components, so that the reader can gain a substantial understanding of components such as algorithmic models before moving to other important components such as filtering techniques

3.History and Overview of Recommendation System

The era of recommendation systems originally started in the 1990s based on the widespread research progress in Collective Intelligence. During this period, recommendations were generally provided to consumers based on their rating structure. The first consumer-focused recommendation system was developed and commercialized by Goldberg, Nichols, Oki and Terry in 1992. Tapestry, an electronic messaging system was developed to allow users only to rate messages as either a good or bad product and service. However, now there are plenty of methods to obtain information about the consumer's liking for a product through the Internet. These data can be retrieved in the forms of voting, tagging, reviewing and the number of likes or dislikes the user provides. It may also include reviews written in blogs, videos uploaded on YouTube or messages about a product.

4. RECOMMENDATION SYSTEM

The selection of an effective and accurate filtering technique is crucial for developing a successful recommendation system. Therefore, an elaborate understanding of these techniques is required before implementing them in a commercial platform.

a. Content-Based Filtering Technique:

The content-based filtering (CBF) technique examines the features of a recommended item by classifying users and products profile data based on the products features. The use of domain- dependent algorithms emphasizes the analysis of the products features, which are utilized to generate predictions. Although the applications of content-based filtering techniques have been more successful in recommending web pages, publications and news articles, researchers have implemented this technique to develop fashion recommendation system as well. In this technique, user profiles are matched with the features extracted from the product content, which provides the recommendation where the user has evaluated a specific product in the past. The products that have the highest relation

with the positively scored or rated items are generally recommended to users. The content-based technique uses different kinds of models to explore the similarity between items to generate a meaningful recommendation, which is the main distinctive feature between content-based and collaborative filtering techniques.

b. Collaborative Filtering (CF) Technique

The collaborative filtering (CF) algorithm is one of the most successful techniques among all of the filtering techniques available for the recommendation system. CF is a domain-independent prediction technique for analyzing hard-to-describe content by observing metadata. This filtering technique is formed by using a dataset of the preferences of a group of users to make a recommendation to another group of users who show similar types of behavior. The fundamental assumption of CF is based on the similarities of users, which build a neighborhood group. Therefore, this technique is called user-based collaborative filtering. In collaborative filtering, automatic predictions are made based on the reviews given by other people. Therefore, the major assumption is that if two people have similar interests in a common dataset then their interests would be similar for the rest as well. Although the CF technique is critical and has some issues, such as data sparseness and the cold-start problem, recommendation systems based on CF techniques have successfully worked for many renowned business stores and services. Yu et al. proposed a collaborative clothing recommendation system that overcomes the problem of capturing the aesthetic preferences of users by using a novel tensor factorization model [159]. They used the Amazon dataset and the Aesthetic Visual Analysis (AVA) dataset to train the recommendation models and the aesthetic network, respectively. The Amazon dataset contains records of 39,371 users and 23,022 items. The AVA dataset contains over 250,000 images with aesthetic ratings from 1 to 10 and 14 photographic styles representing complementary colors, duotones, light on white, long exposure, high dynamic range, motion blur, negative image, silhouettes, soft focus, vanishing point and image grain. They proposed a dynamic collaborative

filtering model using both aesthetic features and CNN features (DCFA) and compared it with baseline models such as the matrix factorization (MF) method, state-of-the-art visual-based recommendation method (VBPR) and state-of the-art context- aware recommendation method (CMTF).

c. Hybrid Filtering Technique

The hybrid filtering (HF) technique combines multiple recommendation techniques to achieve better system optimization and avoid different limitations and challenges of a basic recommendation system. The concept behind implementing the hybrid technique is that the combination of algorithms would provide more appropriate and effective recommendations to users than a single algorithm. Hence, this is the disadvantage of using one algorithm-based recommendation system. This construction is beneficial when the dataset lacks user preferences; information about such preferences builds the foundation of collaborative recommendations. Their recommendation system has two properties. Firstly, it is knowledge-based, which helps it learn a pairwise preference or occurrence matrix based on the knowledge learnt from examples such as images uploaded to fashion blogs. Secondly, it has features of content-based filtering as it uses a deep learning network for learning the feature representation. They used 10,000 street-style images for image segmentation, 45,645 street-style images for product localization and 14,000 online fashion images for texture classification. Their proposed DeepLab-MSc- LargeFOV + CRF for image segmentation outperformed other baseline models such as fully convolutional networks (FCN), combination of convolutional networks (FCN) and the conditional random field (CRF)

network model. The proposed model achieved 73.99% mean intersection over union (IoU), which was higher than the other baseline models.

d. Hyperpersonalization Filtering Technique

Personalization is a system that uses the profiling of customers to make certain assumptions about the users. These assumptions are based on certain specific features and traits gathered from the profiling. For example, suggesting ads to buyers since they have ordered or searched for a similar product online is a very common strategy used these days. This technique of personalization can bring a huge boom in sales for companies according to their sales reports. Hyperpersonalization uses the same strategy and works more on it. Hyperpersonalization is an advanced technique built over the concept of personalization, in which the model not only investigates the item or product that was bought, but also looks into other details such as location of purchase, mode of purchase, cost of purchase, keywords inserted during purchase, demographics of the person who purchased, etc

e. Strengths and Weakness of Filtering Techniques

The successful outcome of the recommendation system depends on the relevance of the filtering technique and its compatibility with the proposed model. Therefore, researchers should consider the strengths and weaknesses of the corresponding filtering techniques while conducting research on fashion recommendation systems. It presents the strengths and weakness of the each of the recommendation filtering techniques discussed above.

f. Prospects, Challenges and Recommendations for Future Research

There has been significant progress recently in fashion recommendation system research, which will benefit both consumers and retailers soon. The use of product and user images, textual content, demographic history, and cultural information is crucial in developing recommendation frameworks. Product

attributes and clothing style matching are common features of collaborative and content-based filtering techniques. Researchers can develop more sophisticated hyperpersonalized filtering techniques considering the correlation between consumers clothing styles and personalities. The use of virtual sales advisers in an online shopping portal would provide consumers with a real time offline shopping experience. Retailers can collect the data on users purchase history and product reviews from the recommendation system and subsequently use them in style prediction for the upcoming seasons. The integration of different domain information strengthens the deep learning paradigm by enabling the detection of design component variation, which improves the performance of the recommendation system in the long run.

5.LITERATURE REVIEW

To put this survey in context, we identified and present related review and

survey articles to explain in which ways our article differs from and extends earlier work. In a recent work, a survey of fashion recommender application, i.e., visual, audio, and/or textual features. The domains studied in this survey include various ones such as media streaming for audio and video recommendation, e-commerce for recommending different products including fashion items, news, and information recommendation, social media, and so forth. While fashion RS were also discussed, the authors only included a small portion of the topics and papers in this domain. Here, we discuss and present a comprehensive survey of significant tasks, challenges, and types of content used in the fashion RS field. We have also identified surveys where the authors present a literature review of techniques at the intersection of fashion and computer vision (CV) and/or natural language processing (NLP). While we find these works relevant to this article, they remain largely different from the review presented here as those systems are not focused on RS but on other aspects of the fashion domain, such as text generation from images or pose estimation. Moreover, as another point of difference, we also provide recent techniques dealing with item visual and textual content representation exploited by RS approaches. Perhaps the most relevant work to our current survey is a recent book chapter by Jaradat et al. [75] on fashion RS. This chapter focuses on discussing the state of the art of fashion recommendation systems; in particular, the authors affirm that deep learning represented a turning point with respect to the canonical approaches and therefore the authors examined four different tasks that use this new approach. Additionally they provided examples and possible problems and their evaluation. In particular,

the authors focused their review on tasks related to social media and the size recommendation problem where we introduce this task in detail). In our survey, in addition to analyzing the state of the art of the most commonly used algorithms in a wide range of tasks, we went in depth to understand which are the main features used by the more modern fashion recommender systems. In fact, an extensive discussion is held on how both the user and the items, with their characteristics, can be a source for the definition of models with accurate recommendations.

6.METHODLOGY

Learning Phase

A learning algorithm is applied in this phase to filter and exploit the

users' features based on the feedback collected in the information collection phase. The learning algorithms used in this phase are helpful for drawing out the appropriate patterns relevant for application during the recommendation stage

Recommendation Phase

The recommendation phase recommends the types of items that a user or consumer may prefer. Recommendations can be provided either directly based on the dataset collected during the information collection phase (which might be memory- or model-based) or through the browsing history of users observed by the system Recommendations can also be provided by combining the learned information with the rating matrix to recommend learning resources Researchers reported improved recommendation accuracy using hybrid models in comparison with product content-based or other user-preference-based collaborative models

Channels of Scholarly Dissemination Related to Fashion Recommendation System (FRS)

Articles published from January 2010 to June 2020 have been considered for the review purpose of this article. Various online literature resources or databases

such as Scopus, Web of Science, Science Direct, and Design and Applied Arts Index (DAAI) have been used to find the literature. Boolean operator techniques i.e., “AND” or “OR” strategies were used to search articles from these sources. Keywords grouped in three categories as listed below were used to conduct the final search.

Group 1: Fashion OR Style OR Apparel OR Clothing

Group 2: Recommend

Group 3: Filtering Technique OR Algorithm OR Model OR uzzy Techniques OR Model OR Image Processing OR Image Retrieval OR Image Feature extraction.

Final Search = Group 1 AND Group 2, Group 1 AND Group 2 AND Group 3

Overall, 230 scholarly articles and 9 web sources have been reviewed. Among these, 214 scholarly articles were found containing the required keywords when using the search strategy mentioned above. Among these, 132 articles are indexed in Scopus, 26 in Web of Science, 3 in Science Direct and 1 in the Design and Applied Arts Index (DAAI) database. In addition, 50 articles and 2 patents were found in Google Scholar, published in different peer-reviewed journals and conferences.

7. PROJECT PHASE

PHASE 1

PROBLEM SOLUTION

PROPOSED SOLUTION:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Customers feels difficult when Search many websites to find Fashion clothes and accessories.
2.	Idea / Solution description	Customers directly make online shopping based on customer choice without any search.
3.	Novelty / Uniqueness	The customer will talk to Chat Bot regarding the Products. Get the recommendations based on information provided by the user
4.	Social Impact / Customer Satisfaction	The user friendly interface, Assistants formchat bot finding dress makes customer satisfied.
5.	Business Model (Revenue Model)	The chat bot sells our Products to customer. Customers buy our products and generate revenue
6.	Scalability of the Solution	We can easily scalable our Applications by increases the items and products

SOLUTION ARCHITECTURE:

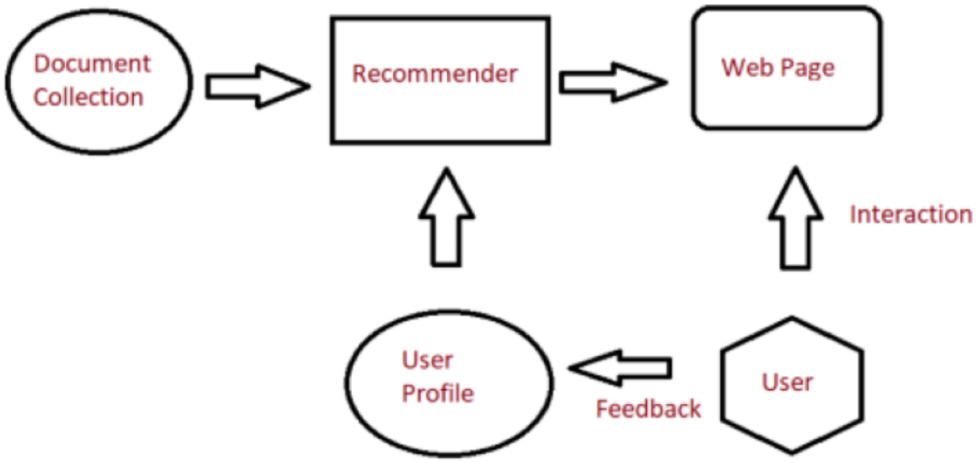
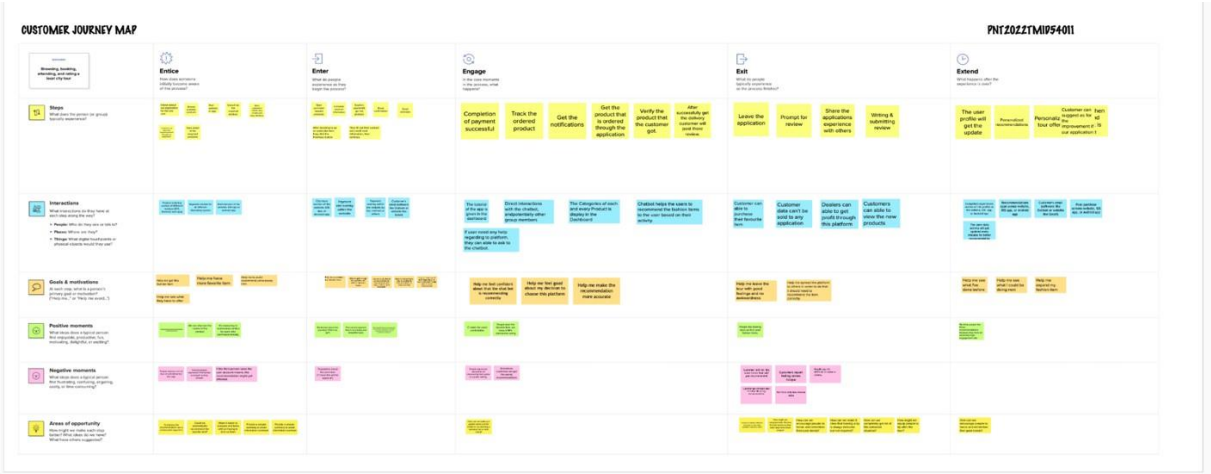


Fig: Recommender System

PHASE 2 :

CUSTOMER JOURNEY



Data Flow Diagram & User Stories

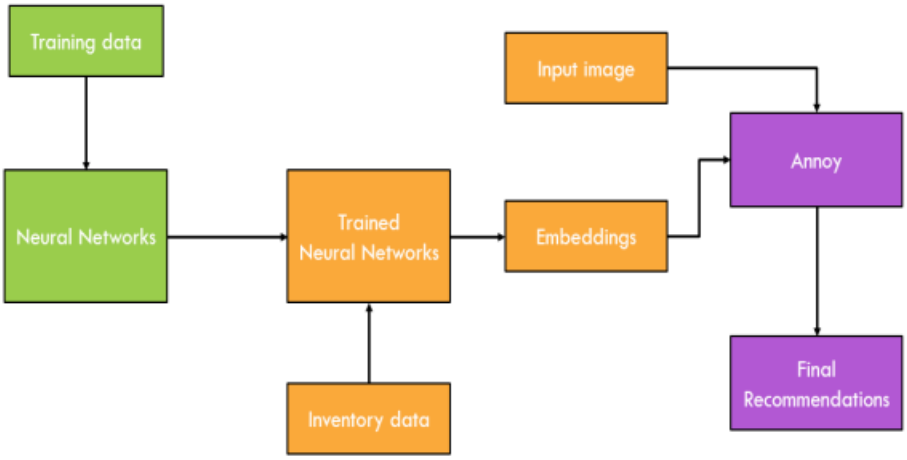
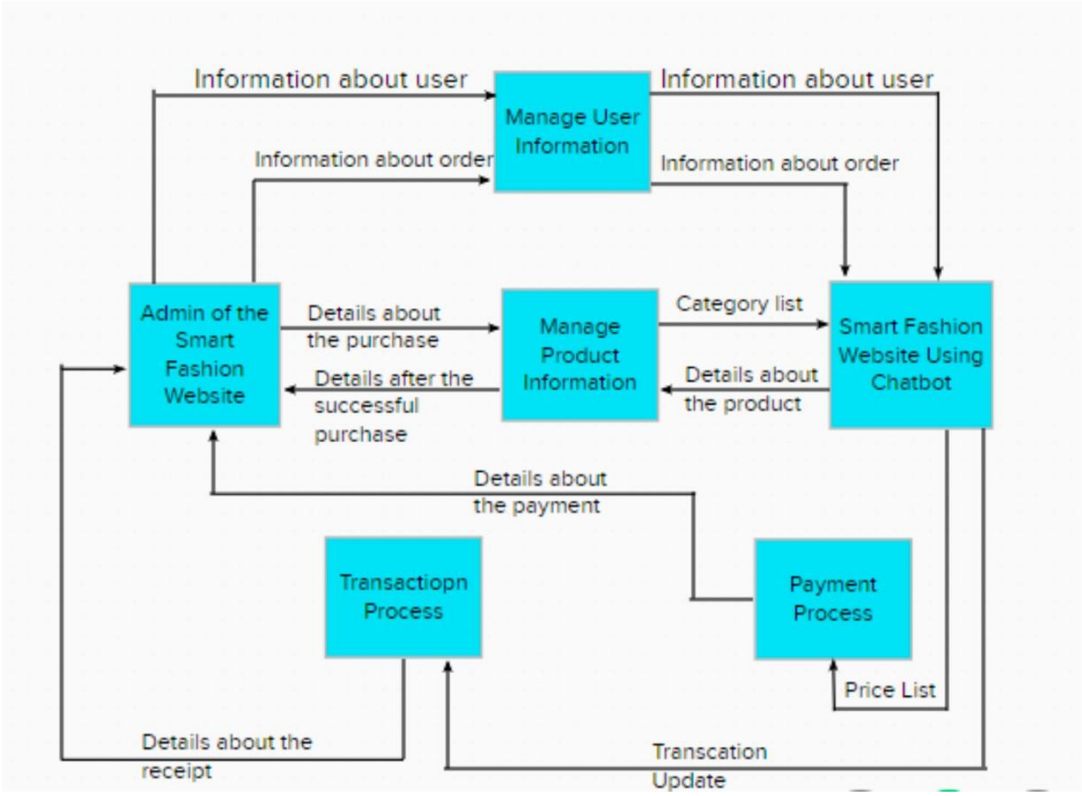


Figure 1. Block diagram of proposed system

DFD LEVEL 1:



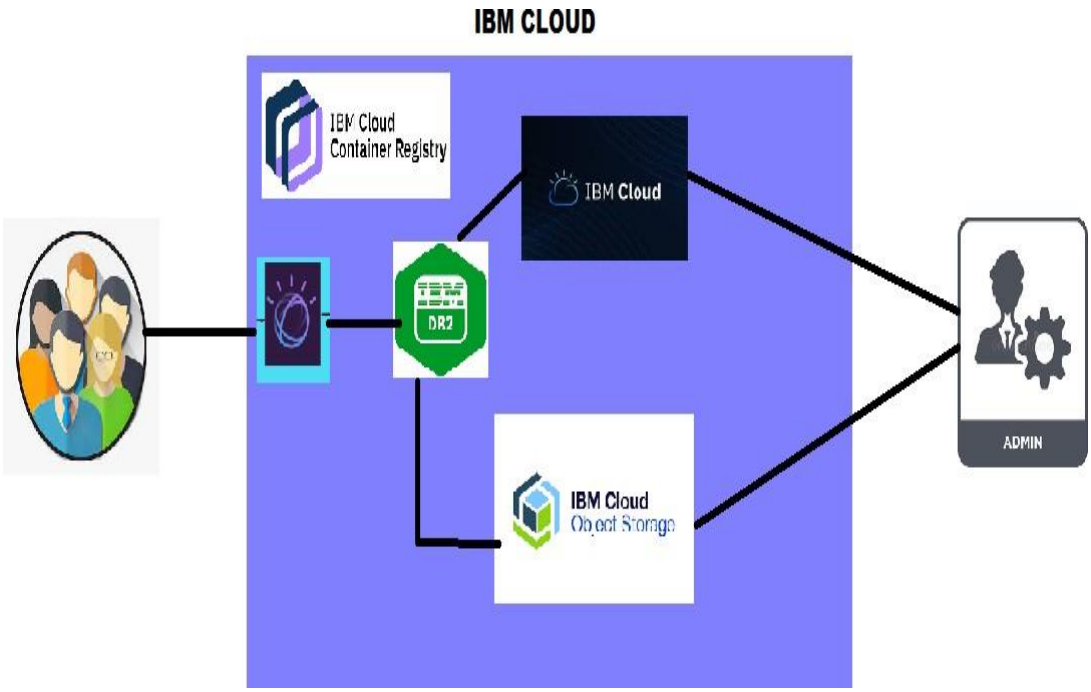
User Flow:

Work Flow:

SOLUTION REQUIRMENT :

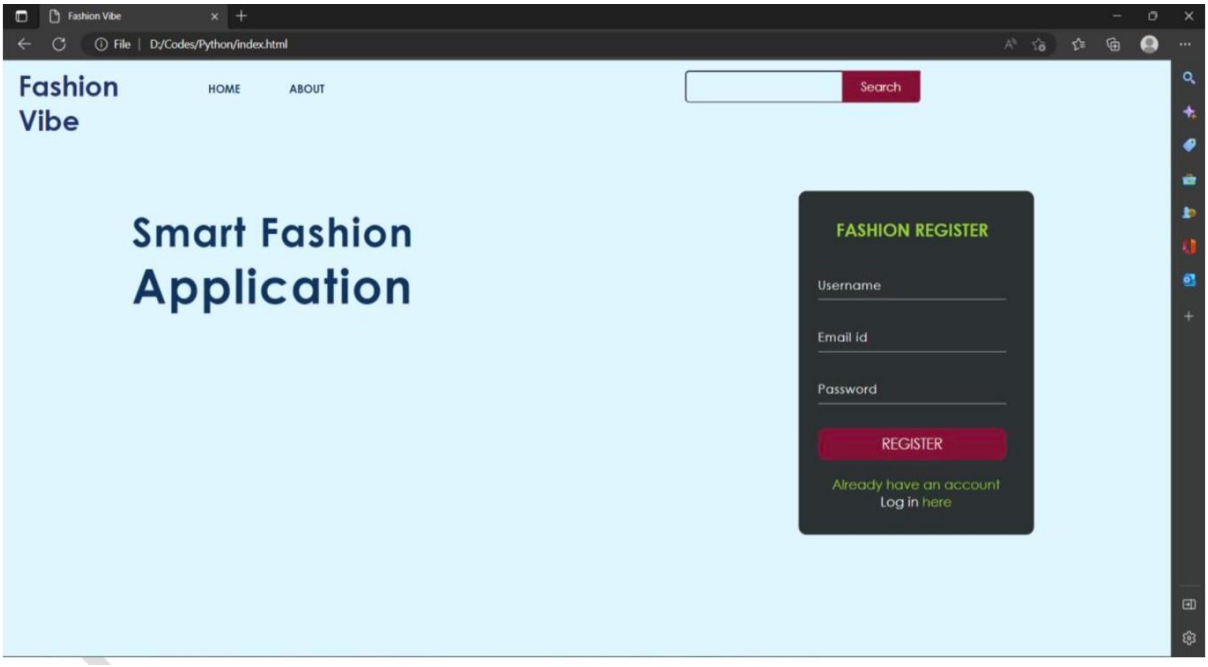
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form
FR-2	User Interaction	Interact through the Chat Bot
FR-3	Buying Products	Through the chat Bot Recommendation
FR-4	Track Products	Ask the Chat Bot to Track my Orders
FR-5	Return Products	Through the chat Bot
FR_6	New Collections	Recommended from chat Bot

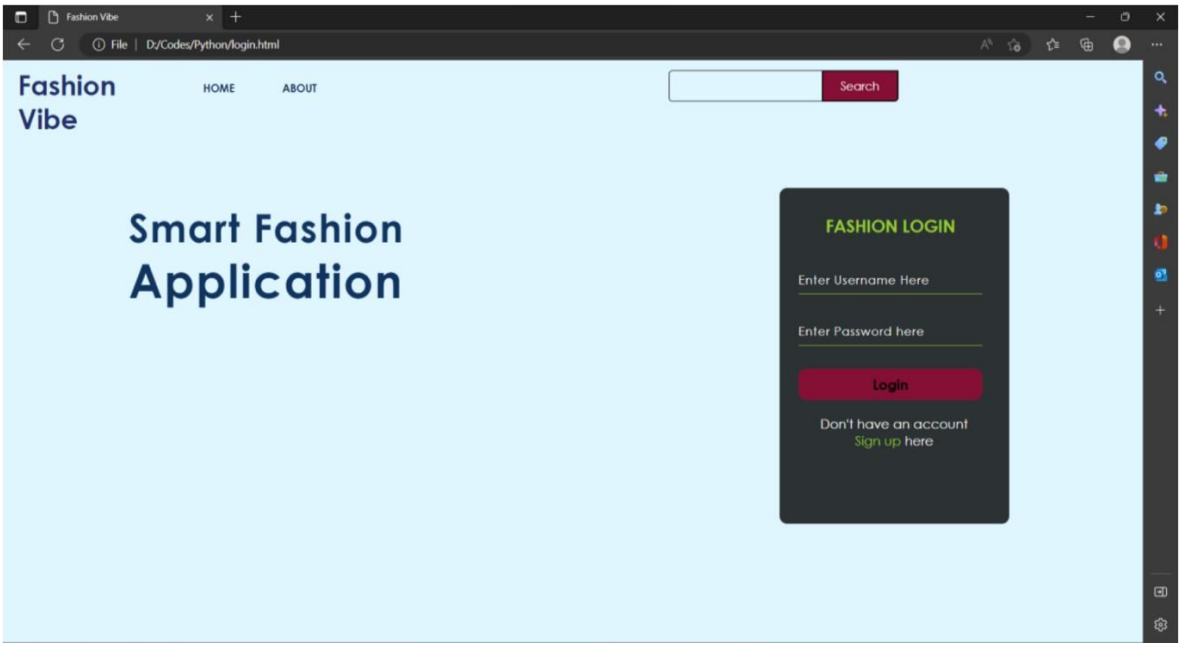
TECHNICAL ARCHITECTURE:

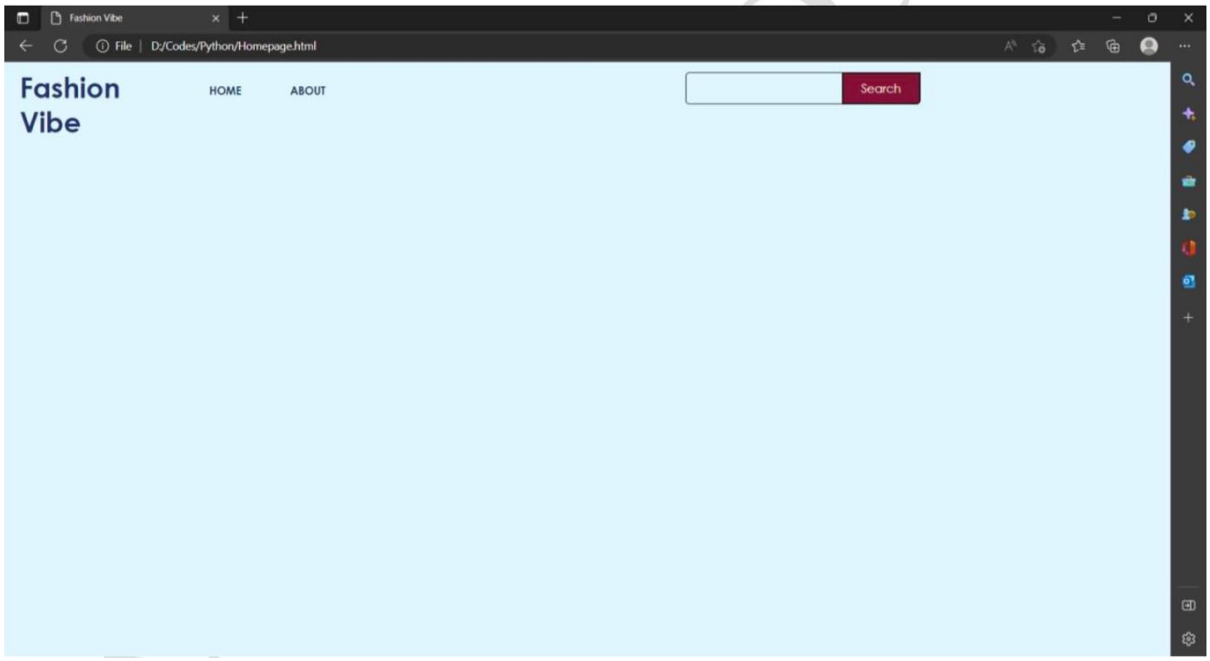


PROJECT DEVELOPMENT PHASE

LOGIN PAGE






Fashion Vibe
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Fashion Vibe
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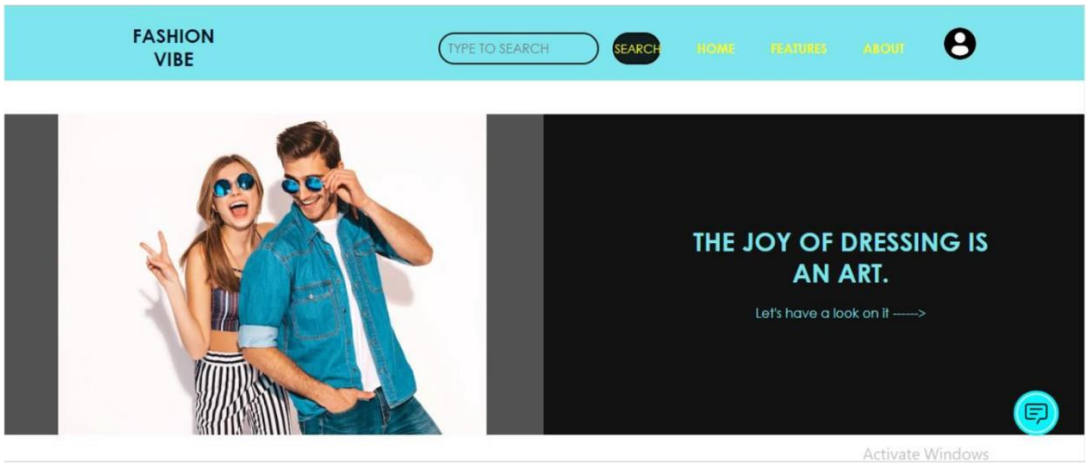
HOME PAGE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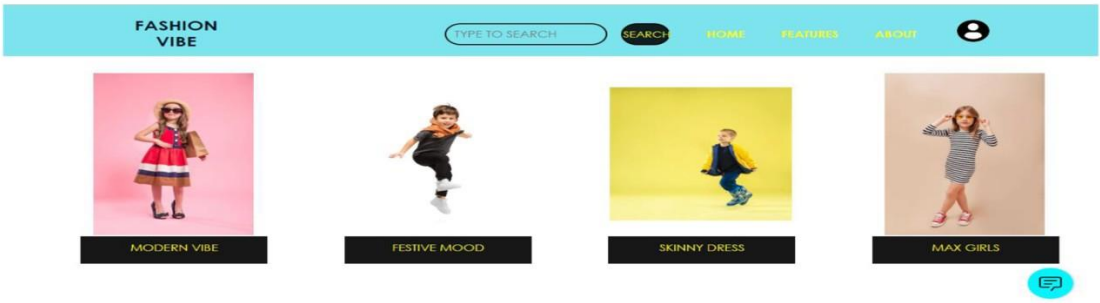
THE JOY OF DRESSING IS AN ART.
Let's have a look on it ----->
Activate Windows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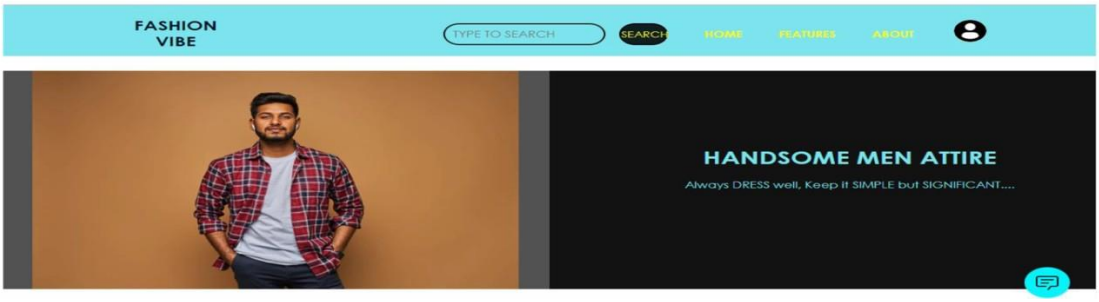
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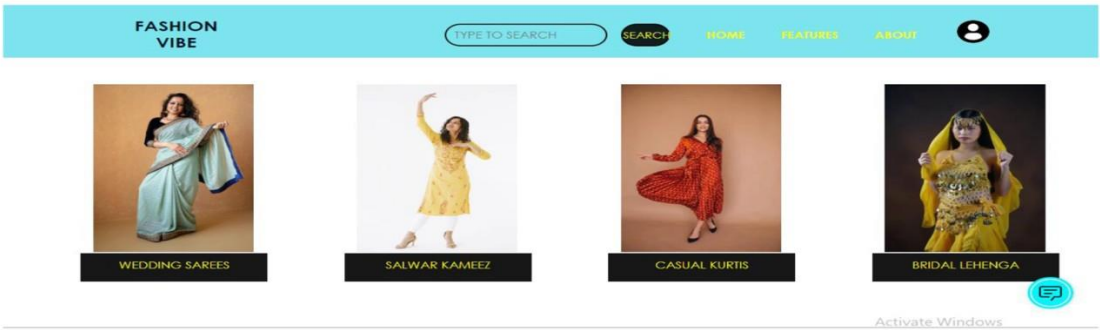
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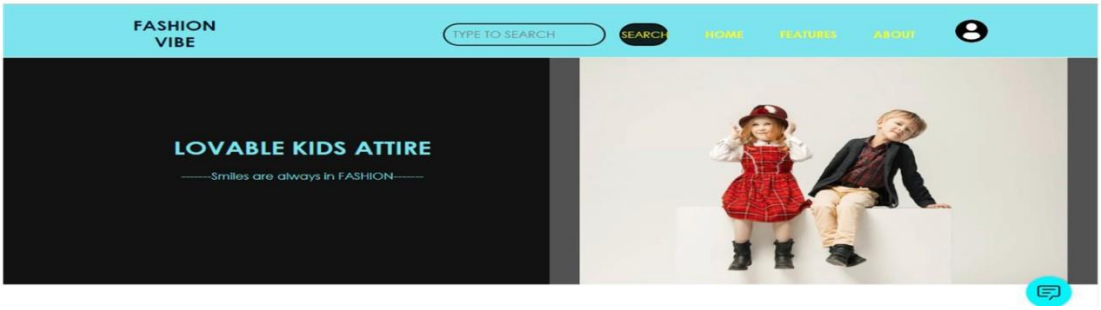
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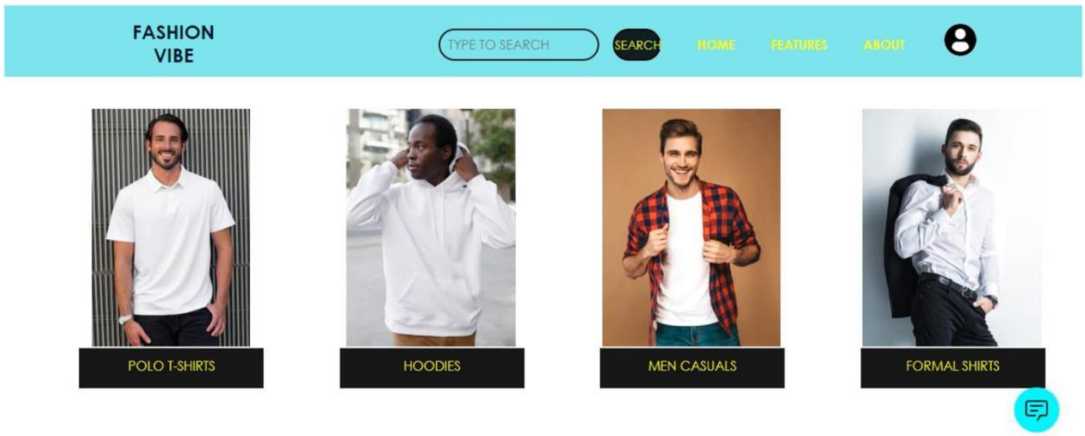
-------Smiles are always in FASHION-------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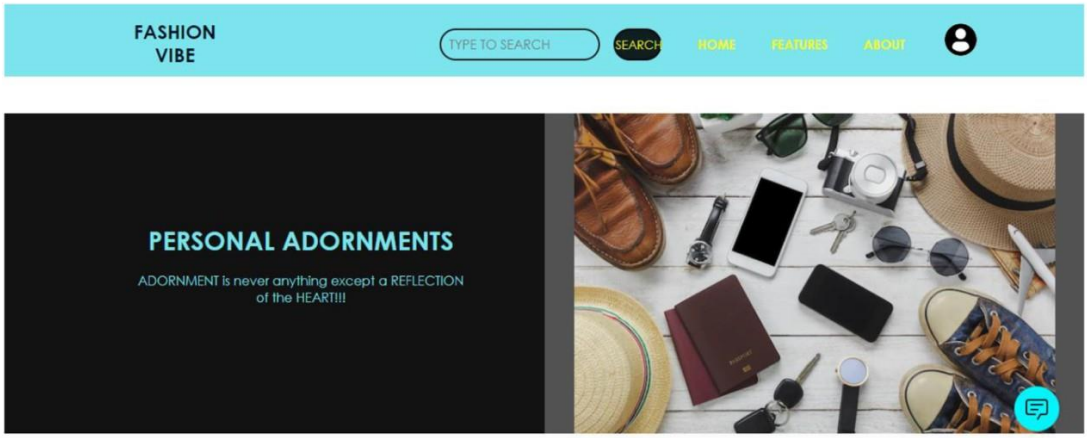
MEN CASUALS
FORMAL SHIRTS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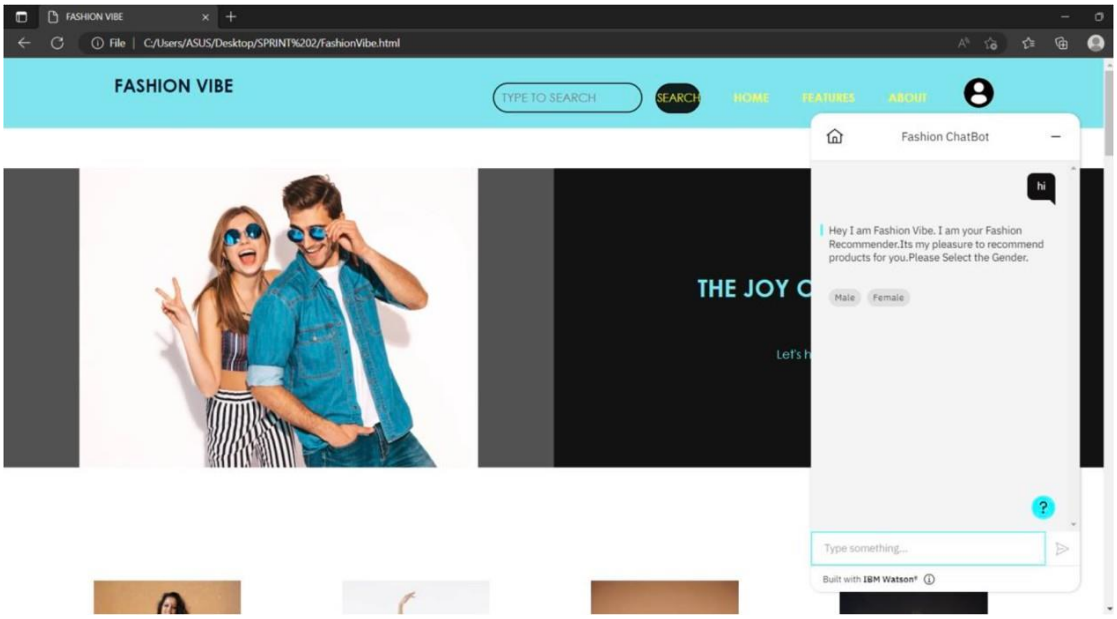
PERSONAL ADORNMENTS
ADORNMENT is never anything except a REFLECTION
of the HEART!!!

CHAT BOT




```
#############################################################
#                         WARNING!!!!                       #
# This is a sandbox environment. Using personal credentials #
# is HIGHLY! discouraged. Any consequences of doing so are  #
# completely the user's responsibilites.                    #
#                                                           #
# The PWD team.                                             #
#############################################################
[node1] (local) root@192.168.0.28 ~
$ docker pull uifd/ui-for-docker
Using default tag: latest
latest: Pulling from uifd/ui-for-docker
841194d080c8: Pull complete
Digest: sha256:fe371ff5a69549269b24073a5ab1244dd4c0b834cbadf244870572150b1cb749
Status: Downloaded newer image for uifd/ui-for-docker:latest
docker.io/uifd/ui-for-docker:latest
[node1] (local) root@192.168.0.28 ~
$ docker run uifd/ui-for-docker
2022/11/08 09:13:47 Unix socket /var/run/docker.sock does not exist
[node1] (local) root@192.168.0.28 ~
$ docker run -d -p 9000:9000 --privileged -v /var/run/docker.sock:/var/run/docker.sock uifd/ui-for-docker
b8bddb08bb99652d924c9bcca447ad1bcdf4de7c625d20ca5dbc5e4c70cd2a00
[node1] (local) root@192.168.0.28 ~
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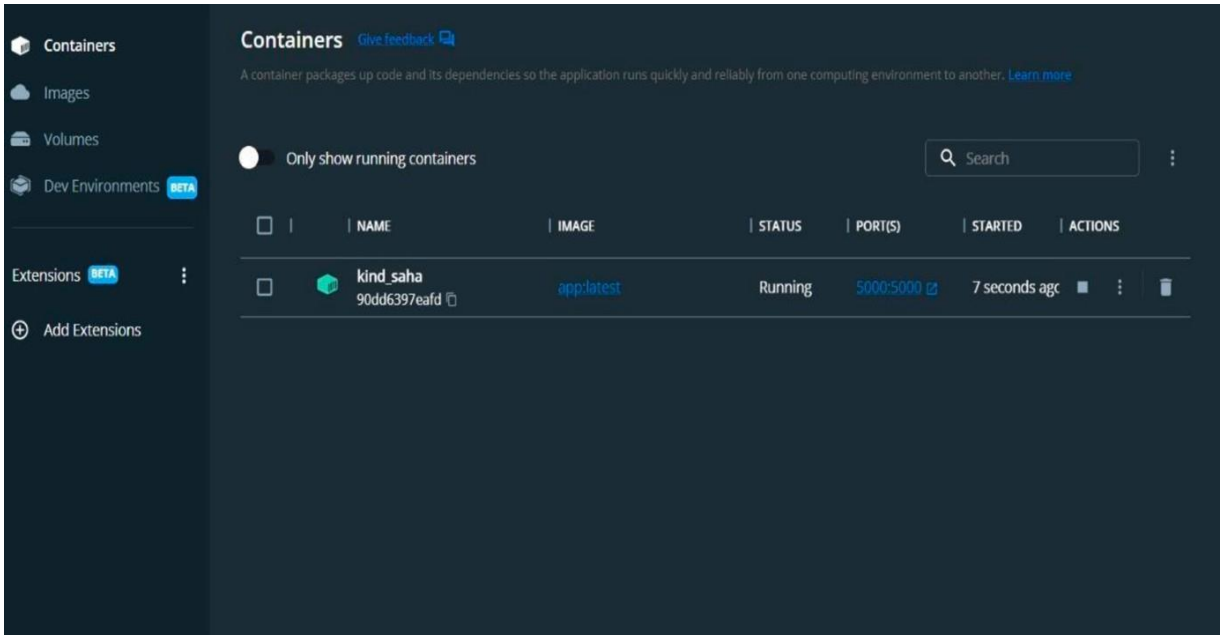
Containers
Images
Volumes
Dev Environments BETA
Extensions BETA
Add Extensions
Containers Give feedback
A container packages up code and its dependencies so the application runs quickly and reliably from one computing environment to another. Learn more
Only show running containers
Search
NAME
IMAGE
STATUS
PORT(S)
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ACTIONS
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5000:5000
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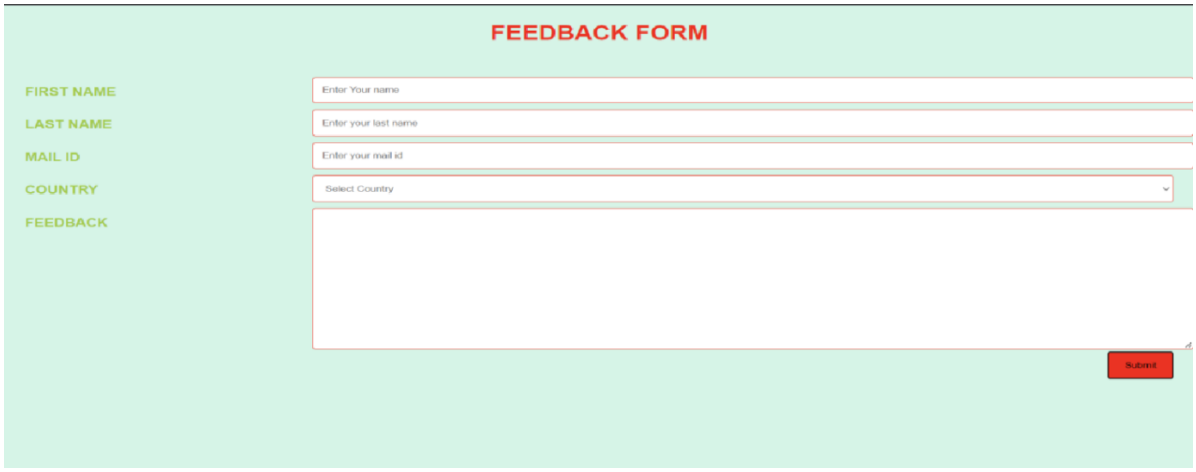
FEEDBACK


FEEDBACK FORM
FIRST NAME
Enter Your name
LAST NAME
Enter your last name
MAIL ID
Enter your mail id
COUNTRY
Select Country
FEEDBACK
Submit

9.DISCUSSION :

This scholarly article has provided a comprehensive review of the

methods, algorithmic models and filtering techniques used in the recent fashion recommendation-based research papers. However, this review paper has some limitations too. Primarily, the focus of this comprehensive review paper was to explore fashion recommendation-based articles published in last decade that explicitly described their frameworks, algorithms, and filtering techniques. To achieve this goal, the articles were searched using keywords relevant to the topic title instead of using the PRISMA technique. However, it did not affect the article extraction methodology, because the authors included and studied all the research papers relevant to the research focus. However, future researchers could conduct a systematic literature review on the same topic. The initial keyword searching did not include “garment” and “outfit”; however, this did not influence the search results because we also studied the fashion recommendation articles that contained these keywords. The future research can also conduct a review of the datasets that have been used in fashion recommendation-based research articles. Additionally, further reviews of fashion recommendation systems can apply our proposed potential algorithms to any of the available fashion image datasets to evaluate the performance of the recommender systems.

10. CONCLUSION :

Recommendation systems have the potential to explore new opportunities for retailers by enabling them to provide customized recommendations to consumers based on information retrieved from the Internet. They help consumers to instantly find the products and services that closely match with their choices. Moreover, different stat-of-the-art algorithms have been developed to recommend products based on users' interactions with their social groups. Therefore, research on embedding social media images within fashion recommendation systems has gained huge popularity in recent times. This paper presented a review of the fashion recommendation systems, algorithmic models and filtering techniques

based on the academic articles related to this topic. The technical aspects, strengths and weaknesses of the filtering techniques have been discussed elaborately, which will help future researchers gain an in- depth understanding of fashion recommender systems. However, the proposed prototypes should be tested in commercial applications to understand their feasibility and accuracy in the retail market, because inaccurate recommendations can produce a negative impact on a customer. Moreover, future research should concentrate on including time series analysis and accurate categorization of product images based on the variation in color, trend and clothing style in order to develop an effective recommendation system.

12.FUTURE SCOPE :

Online selling and purchasing offer innumerable benefits to both sellers and buyers, and these advantages are also the reasons for the rising scope of eCommerceWell, to put it bluntly, the scope of e-business in the near future looks to be ever-increasing and growing, because the trend has really caught on here. E-commerce giant Amazon is keen to conquer the Indian market and has already invested a great

deal, especially with its 49% stake in the Future Group.

Indian online retail giant Flipkart has already opened a few offline stores and plans more stores in smaller cities. They plan to combine online and offline stores to maximize their selling potential.Google and Tata Trust have launched a joint program ‘Saathi’ to increase internet and mobile penetration among rural women.The Government of India is also making a huge push for Ecommerce by providing numerous sops to startups, cyberparks, and so on through its Digital India program.As of now, there are close to 20,000 E-commerce companies in India, with many more expected to join the bandwagon every month.

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