SVKM's NMIMS

School of Technology Management and Engineering

A REPORT ON

STYLE SUGGEST WEBSITE

Submitted In partial fulfilment for the degree
of B.Tech. CSBS
In
ENGINEERING & TECHNOLOGY MANAGEMENT

Submitted By

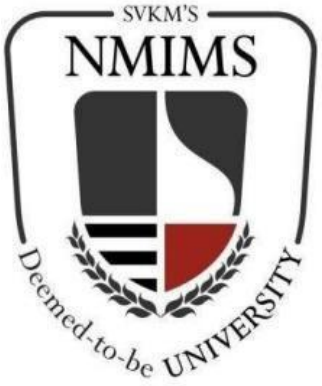
Team Brute-Force

Mitanshu Holkar

Gitanshi Agarwal

Palash Mehta

Rohit Singh



Department of Computer Engineering

SVKM'S-NMIMS (Deemed-to-be-University), Indore Campus

[2022-2023]

TABLE OF CONTENTS

ABSTRACT

In today's highly competitive world of ecommerce, personalization has become a key factor in driving customer engagement and loyalty. With millions of products available at the click of a button, online shoppers are often overwhelmed by the sheer number of choices and are left struggling to find the products that best match their preferences and needs. As a result, ecommerce platforms have started using recommendation systems to personalize the shopping experience for their users, increasing user engagement and improving customer satisfaction.

In the fashion industry, where style and trends are constantly evolving, personalized recommendations are even more critical. Consumers have specific preferences when it comes to style, color, fabric, and brand, and a fashion recommender system can help them navigate through the vast selection of clothing items available on an ecommerce platform. By providing personalized recommendations that align with a user's individual style and preferences, a fashion recommender system can help users discover clothing items they may not have otherwise found, increasing their satisfaction with the shopping experience and ultimately driving sales for the platform.

PROBLEM STATEMENT

P3: // Effortlessly Elevate Your Fashion Game with the AI-Powered Clothing Recognition for Personalised Recommendations //
The solution should be able to detect the kind of garment, such as shirts, pants, gowns, etc., and make correct suggestions for related items.
The solution should utilise open-source computer vision libraries, such as TensorFlow or OpenCV, to make development and integration with other applications simple.
The solution should also provide an intuitive interface that enables users to post photographs and receive recommendations without difficulty.

The problem is that many people struggle with finding clothing that matches their personal style and preferences, particularly when shopping online. To address this issue, the company wants to develop an AI-powered clothing recognition solution that can make personalized recommendations based on user photos.

The solution should be able to detect the type of garment in the photo, such as shirts, pants, gowns, etc., and make correct suggestions for related items. To achieve this, the solution should utilize open-source computer vision libraries such as TensorFlow or OpenCV, which can simplify development and integration with other applications.

The solution should also provide an intuitive interface that enables users to easily upload photos and receive recommendations without difficulty. This interface should be user-friendly and provide clear instructions on how to upload photos and receive recommendations.

The goal of this solution is to help users effortlessly elevate their fashion game by providing personalized recommendations that match their style and preferences. By utilizing AI-powered clothing recognition, the solution can accurately identify the type of garment and provide suggestions for related items, thereby improving the shopping experience for users. Additionally, by utilizing opensource computer vision libraries, the solution can be developed and integrated more easily with other applications.

However, the development of such a solution requires significant investment in AI and machine learning technology, as well as expertise in computer vision and software development. Additionally, the solution may require access to a large database of clothing images to ensure accurate recommendations.

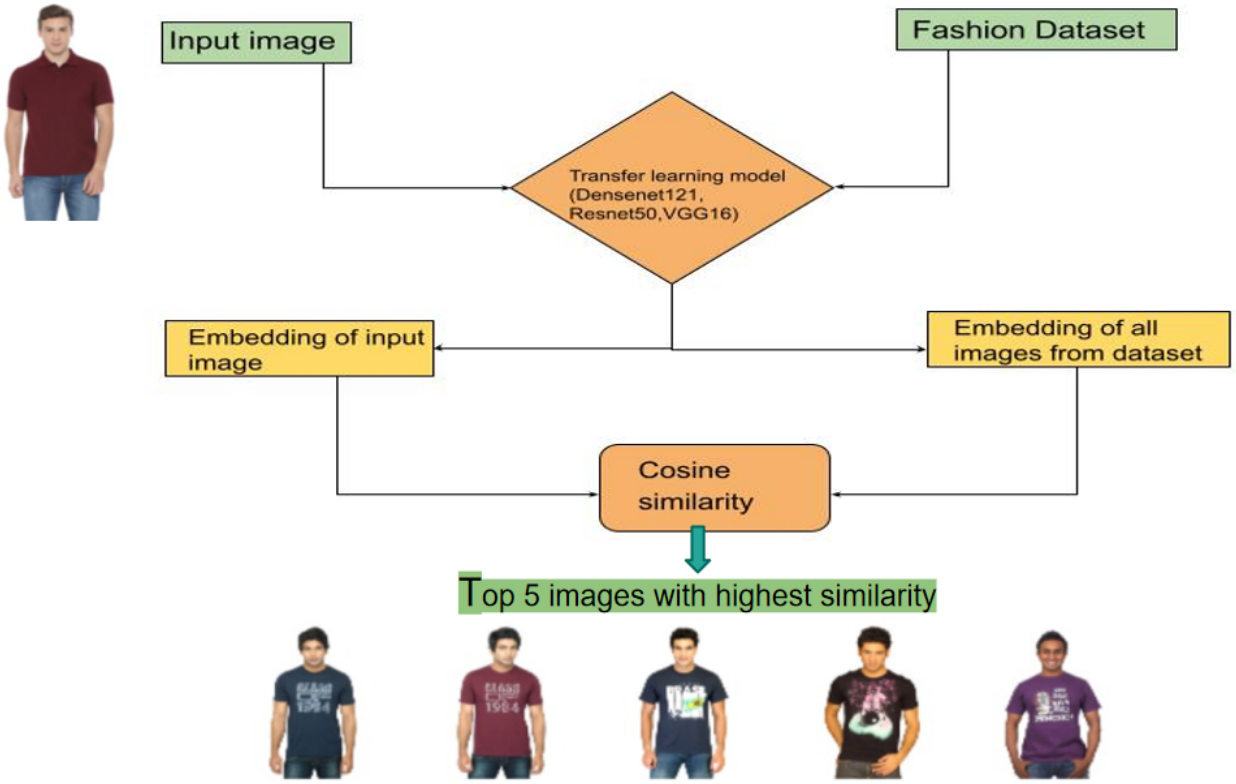
INTRODUCTION

In today's highly competitive world of ecommerce, personalization has become a key factor in driving customer engagement and loyalty. As a result, ecommerce platforms have started using recommendation systems to personalize the shopping experience for their users, increasing user engagement and improving customer satisfaction.

Style Suggest Website, an ecommerce platform focused on fashion, can greatly benefit from implementing a fashion recommender system. By providing users with personalized clothing recommendations, Style Suggest can enhance the shopping experience for its users, increasing engagement, and building customer loyalty.

Please go to the main Page to select any attire and get recommendations for the similar products. This application is used to detect the kind of garment,such as ladies tops, etc., and make correct suggestions for related items. We have used open-source computer vision libraries, such as TensorFlow and OpenCV, to make development and integration with the dataset given to us.

The image dataset given to us consist of ladies clothing. Therefore uploading ladies garments will work for this model. The same model can be used for a huge dataset of garments for any gender.



Hardware & Software Requirements

While performing the task, the technology required and used are:

Technology Used: Python, TensorFlow, Keras, NumPy, Pandas, Scikit-learn, Matplotlib
Software Used: Google Collab, PyCharm, Git and Github
Others: Internet connection and laptop

Hardware Requirements:

- CPU: Intel Core i3 or higher
- RAM: 4GB or more
- NVIDIA® GPU card with CUDA® architectures 3.5, 3.7, 5.2, 6.0, 6.1, 7.0 and higher than 7.0. See the list of CUDA®-enabled GPU cards.
- Latest NVIDIA® GPU drivers. CUDA® 10.1 requires 418.x or higher.
- CUDA® Toolkit 10.1
- cuDNN SDK 7.6
- Storage: 50GB or more (for storing the dataset and trained models)

Software Requirements:

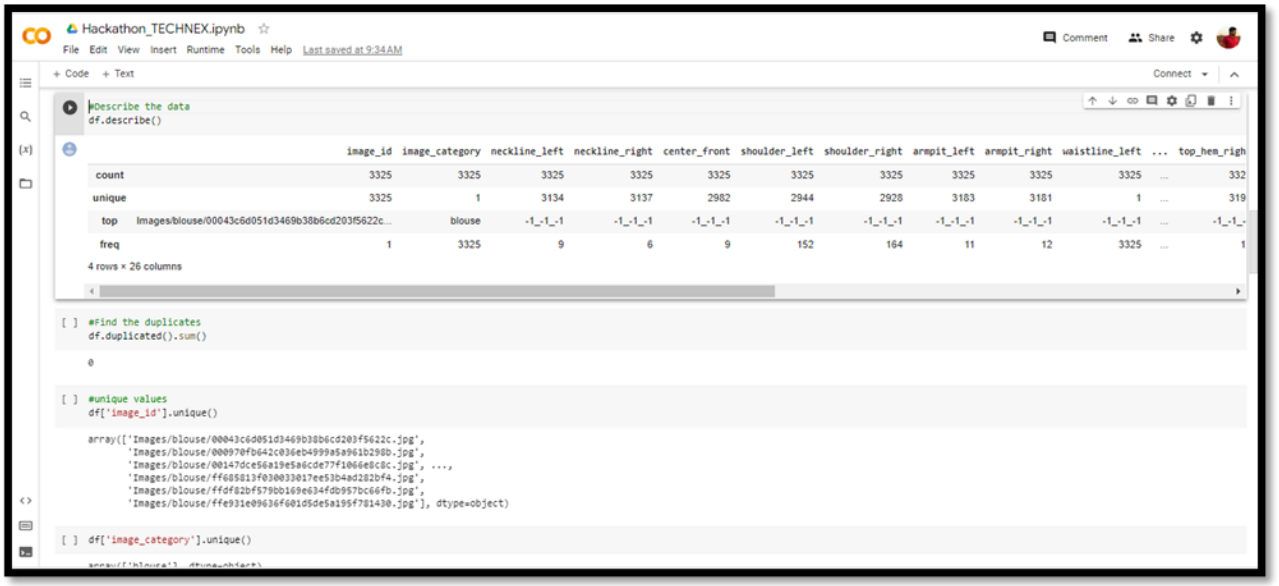
- Operating System: Windows, Linux, or macOS
- Python: version 3.7
- TensorFlow: version 2.0 or higher
- Keras: version 2.0 or higher
- NumPy: version 1.18 or higher
- Pandas: version 1.0 or higher
- Scikit-learn: version 0.23 or higher
- Matplotlib: version 3.2 or higher

Software Description

4.1 StyleSuggest Website

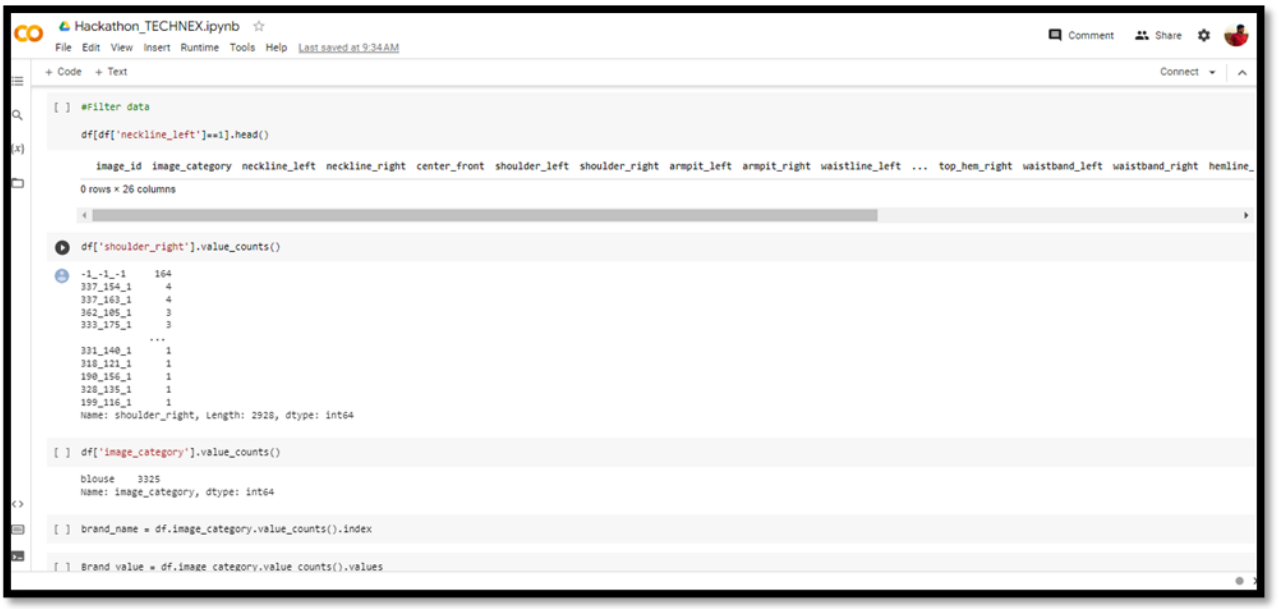
1. **Collect Data:** Collect data on users' preferences, such as their past purchase history, search queries, and ratings. It can be collected on the clothing items themselves, such as style, colour, fabric, and brand.

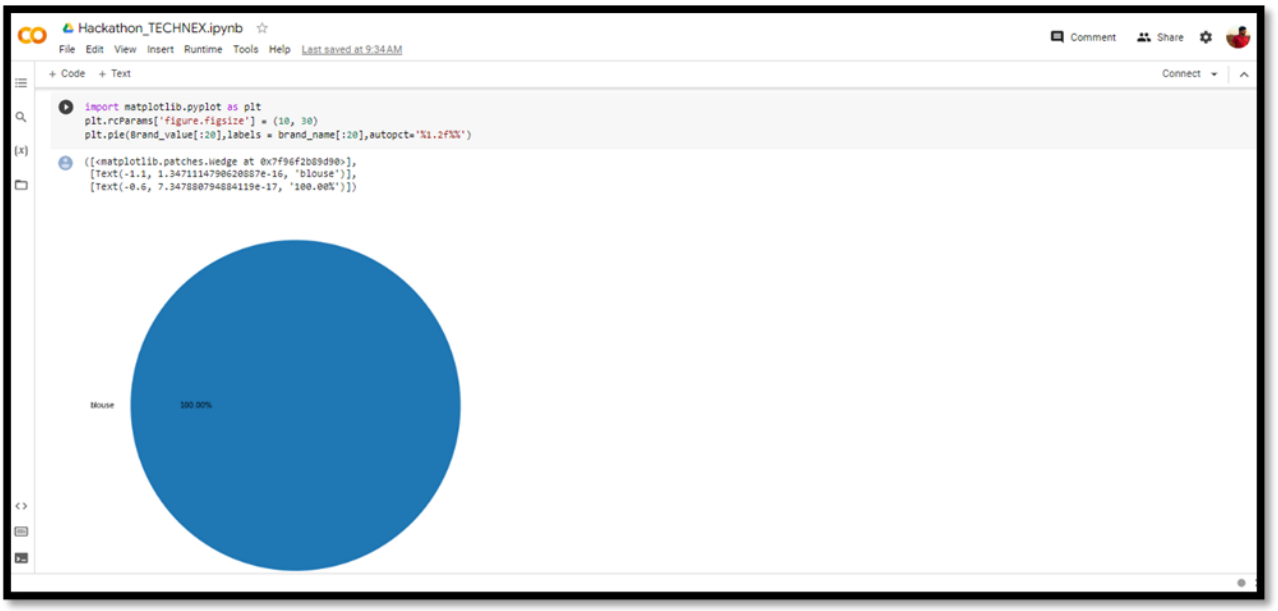
2. **Pre-process Data:** The collected data is then preprocessed and cleaned to remove any inconsistencies, duplicates, or missing values. This step also involve data normalization and feature engineering to transform the data into a format suitable for modelling.



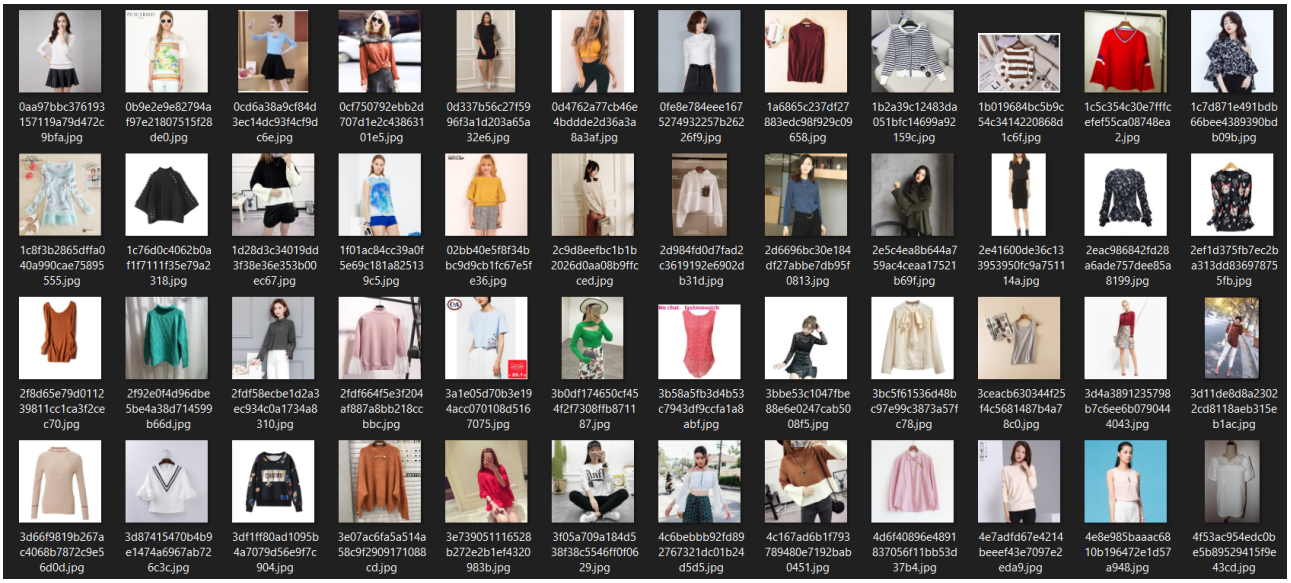
3. **Exploratory Data Analysis (EDA)**: EDA is performed to gain insights into the data

and identify any patterns, trends, or relationships that may exist.





4. **Import Images Dataset given by the company**: Women fashion Images dataset is used in our model which as given to us.



5. **Import model:** A CNN model is loaded named resNet. It is build in keras module. This is used as it is high performing CNN model which is trained on a ImageNet dataset which has high accuracy and perfectly matches to the requirement.

```python
import tensorflow
from tensorflow.keras.preprocessing import image
from tensorflow.keras.layers import GlobalMaxPooling2D
from tensorflow.keras.applications.resnet50 import ResNet50,preprocess_input
import numpy as np
from numpy.linalg import norm
import os
from tqdm import tqdm
import pickle

model = ResNet50(weights='imagenet',include_top=False,input_shape=(224,224,3))
model.trainable = False

model = tensorflow.keras.Sequential([
    model,
    GlobalMaxPooling2D()
])

```

6. **Extract features**: We have a dataset for 373 images. Generally the image has resolution of 224,224,3. A A CNN model consist of various layers and the image flow wothing those layers pixel by pixel. going through the layers the model see complex features. ResNet, short for Residual Neural Network, is a deep learning architecture that is commonly used for image recognition tasks. In the STYLE SUGGEST website ResNet is used as a feature extraction method to extract features from clothing images. For every image that goes to Resnet model, it given 2048 features. So there will be a total of [373,2048] array. On the basis of this array, it will compare the vector of the input image features with the model array.

```python
def extract_features(img_path,model):
    img = image.load_img(img_path,target_size=(224,224))
    img_array = image.img_to_array(img)
    expanded_img_array = np.expand_dims(img_array, axis=0)
    preprocessed_img = preprocess_input(expanded_img_array)
    result = model.predict(preprocessed_img).flatten()
    normalized_result = result / norm(result)

    return normalized_result

filenames = []

for file in os.listdir('images'):
    filenames.append(os.path.join('images',file))

feature_list = []

for file in tqdm(filenames):
    feature_list.append(extract_features(file,model))

pickle.dump(feature_list,open('embeddings.pkl','wb'))
pickle.dump(filenames,open('filenames.pkl','wb'))
```

7. **Generate Recommendations:** The extracted features are then used to improve the recommendations provided by the hybrid filtering approach. Specifically, the extracted features are combined with the user-item interaction data to form a hybrid feature representation of the user-item interaction matrix using scikit learn. This hybrid feature representation is then used in the matrix factorization algorithm to enhance the recommendations provided by the collaborative filtering approach. The euclidian distance is used between two vectors and the five closest neighbourers are being identified.

```
def recommend(features,feature_list):
    neighbors = NearestNeighbors(n_neighbors=6, algorithm='brute', metric='euclidean')
    neighbors.fit(feature_list)

    distances, indices = neighbors.kneighbors([features])

    return indices

# steps
# file upload -> save
uploaded_file = st.file_uploader("Choose an image")
```

```
if uploaded_file is not None:
    if save_uploaded_file(uploaded_file):
        # display the file
        display_image = Image.open(uploaded_file)
        st.image(display_image)
        st.header('Here are the recommended similar Clothing suggestions')

        # feature extract
        features = feature_extraction('/uploads/uploaded_file.name',model)
        #st.text(features)
        # recommendention
        indices = recommend(features,feature_list)
        # show
        col1,col2,col3,col4,col5 = st.columns(5)
        with col1:
            st.image(filenames[indices[0][0]])
        with col2:
            st.image(filenames[indices[0][1]])
        with col3:
            st.image(filenames[indices[0][2]])
        with col4:
            st.image(filenames[indices[0][3]])
        with col5:
            st.image(filenames[indices[0][4]])
    else:
        st.header("Some error occured in file upload")
```

In addition to feature extraction, TensorFlow is also used to train and evaluate other machine learning models used in the fashion recommender system, such as the matrix factorization algorithm. TensorFlow provides a flexible and powerful framework for

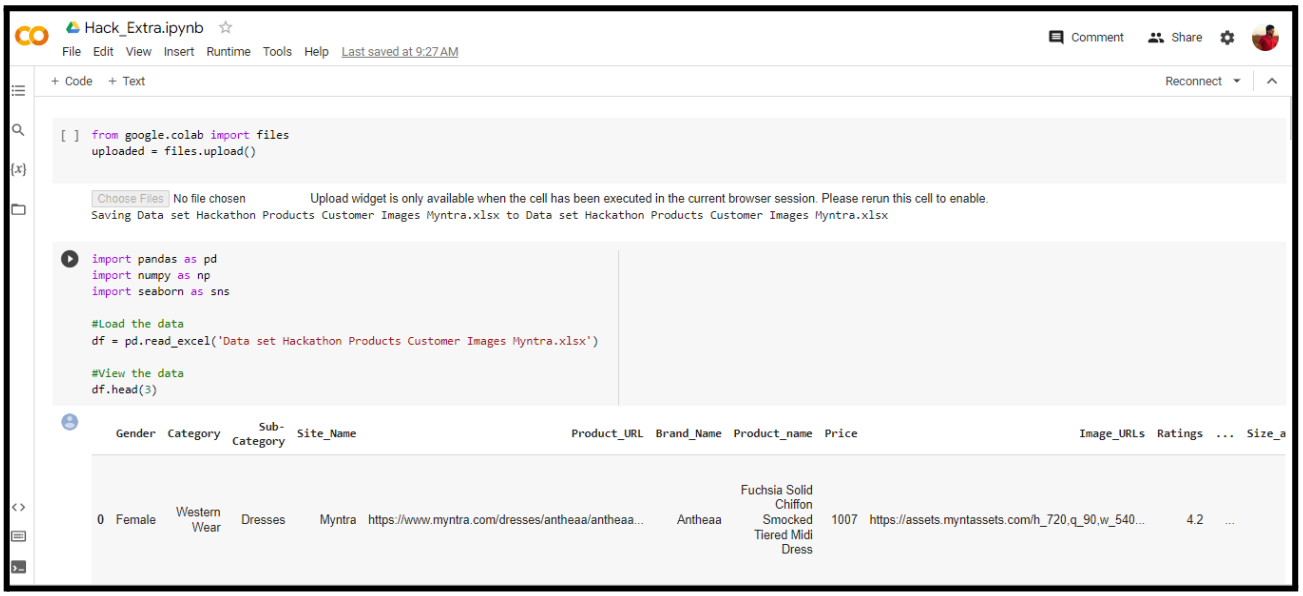
building and training machine learning models, making it an ideal choice for developing the complex recommendation system used by StyleSuggest.

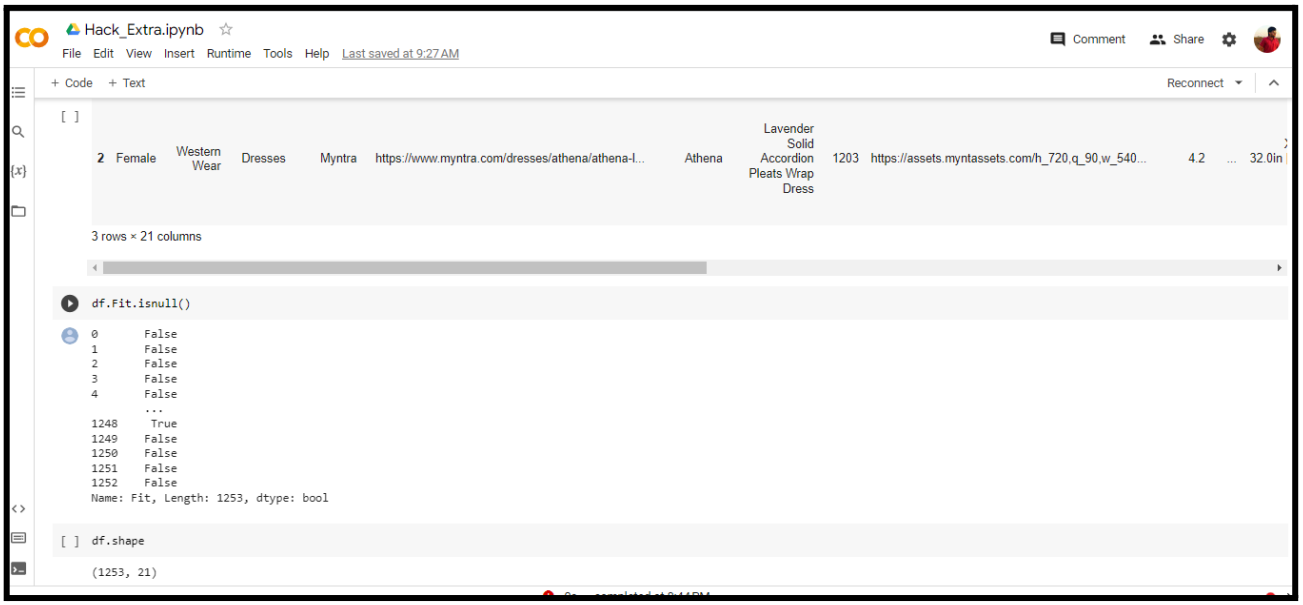
Link for the Github Repository is - https://github.com/devmitanshu/StyleSuggest

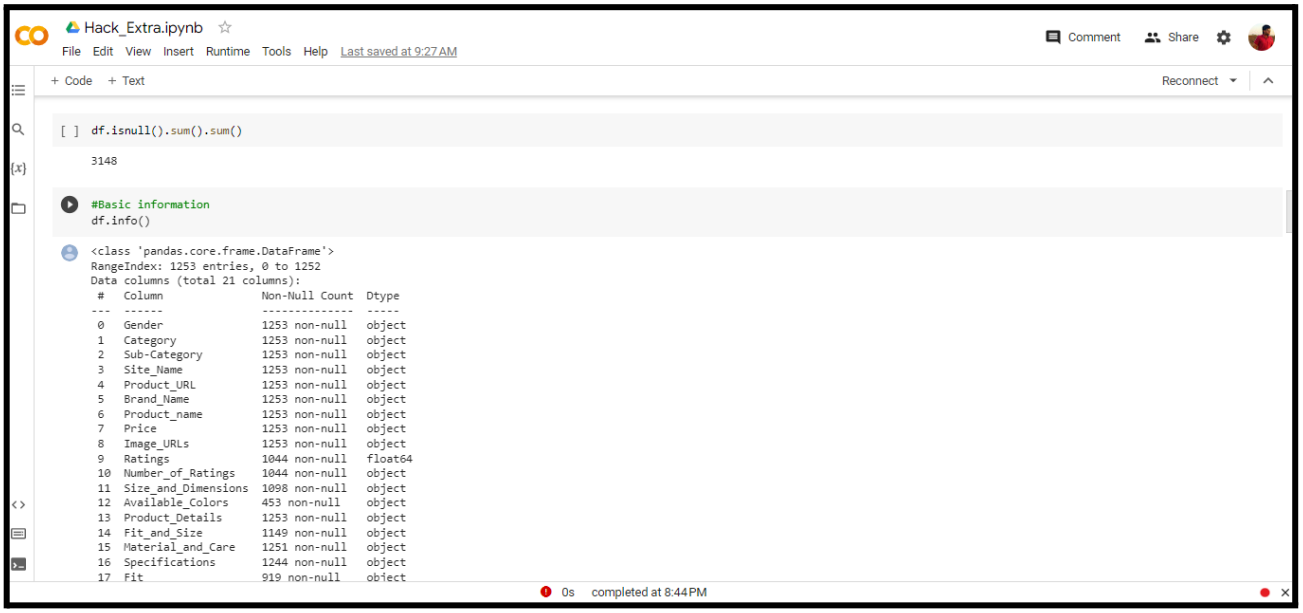
Link for the deployed version is -

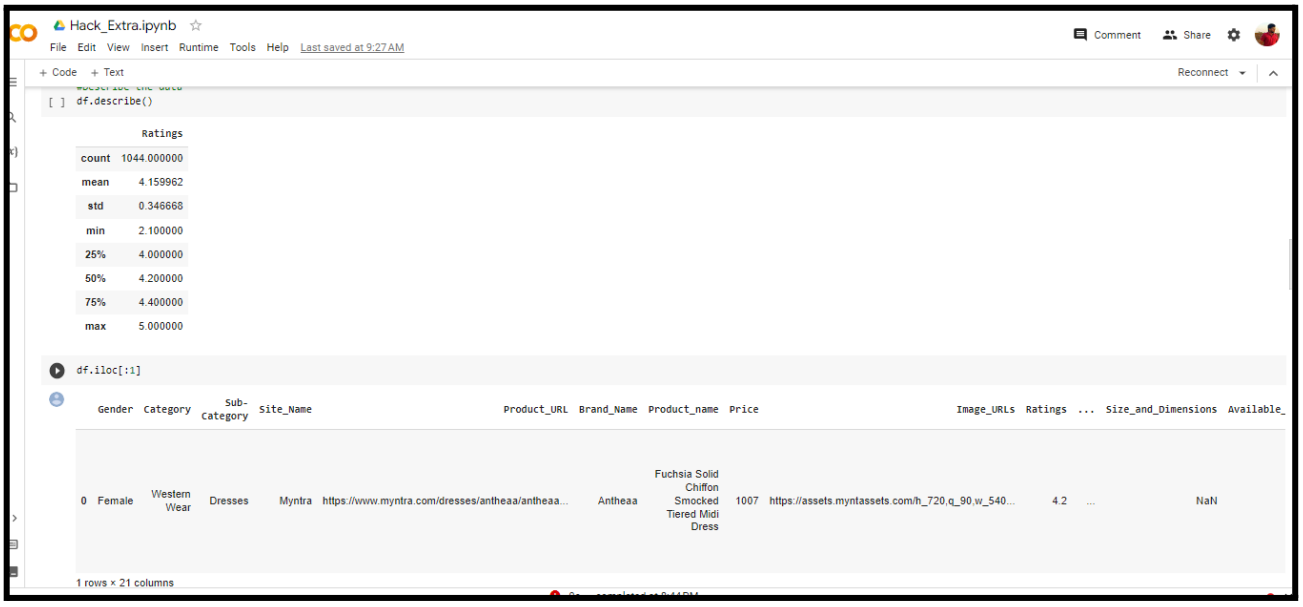
https://devmitanshu-stylesuggest-homepage-e4bm07.streamlit.app/

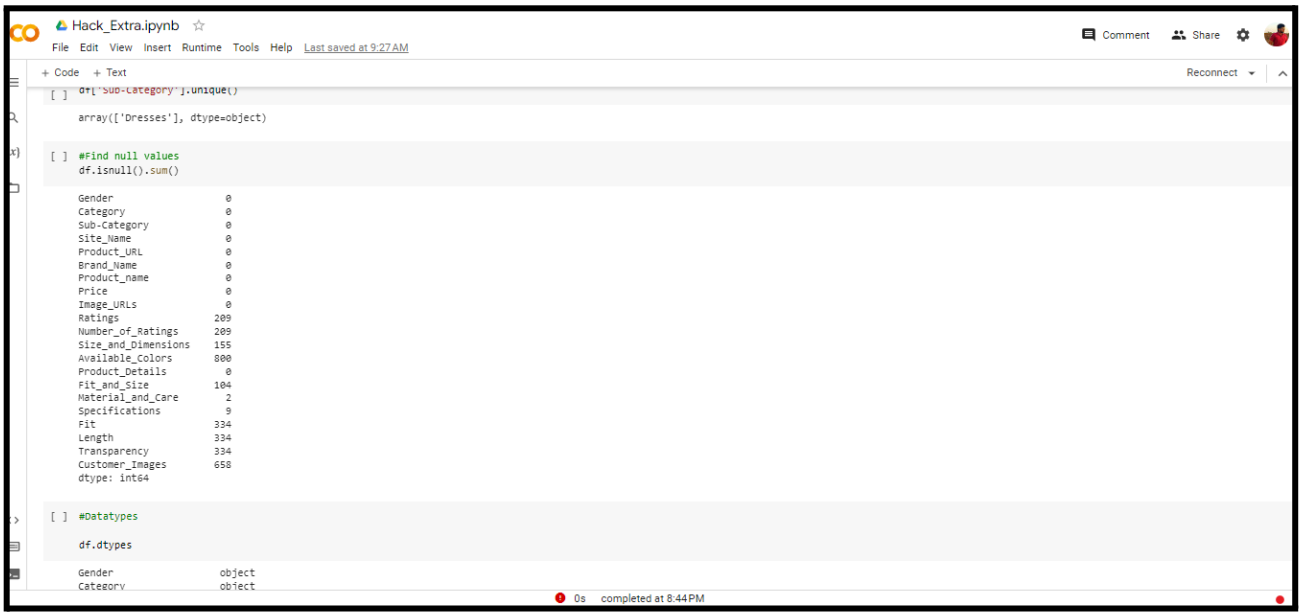
4.2 EDA of Clothing Dataset

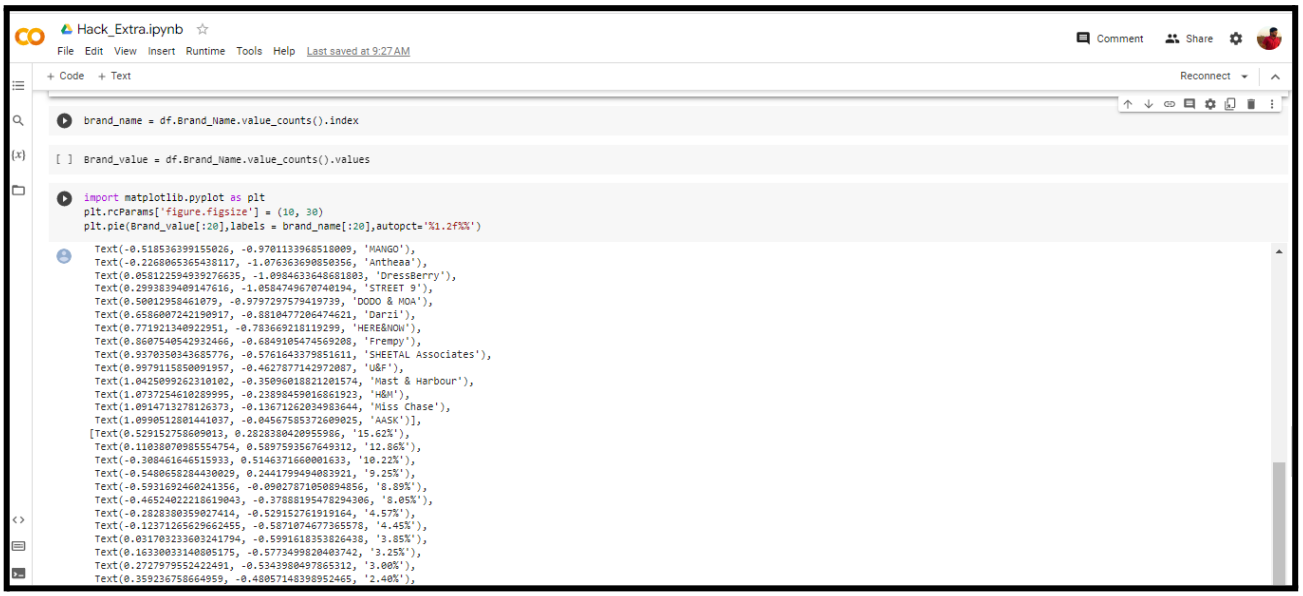


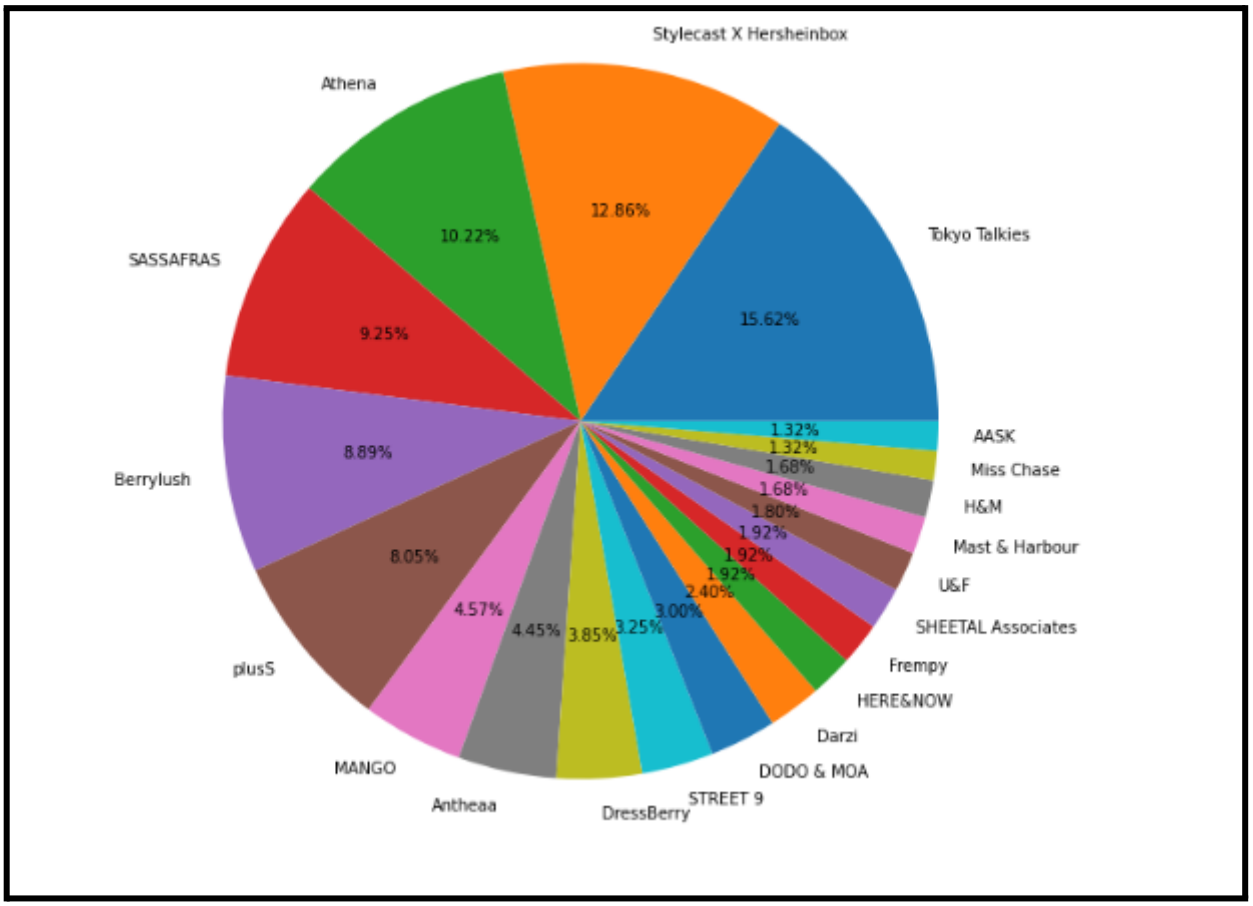



Hack_Extra.ipynb
File Edit View Insert Runtime Tools Help Last saved at 9:27 AM
Comment Share
+ Code + Text
Reconnect
[ ] df.isnull().sum().sum()
3148
#Basic information
df.info()
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1253 entries, 0 to 1252
Data columns (total 21 columns):
Column Non-Null Count Dtype
0 Gender 1253 non-null object
1 Category 1253 non-null object
2 Sub-Category 1253 non-null object
3 Site_Name 1253 non-null object
4 Product_URL 1253 non-null object
5 Brand_Name 1253 non-null object
6 Product_name 1253 non-null object
7 Price 1253 non-null object
8 Image_URLs 1253 non-null object
9 Ratings 1044 non-null float64
10 Number_of_Ratings 1044 non-null object
11 Size_and_Dimensions 1098 non-null object
12 Available_Colors 453 non-null object
13 Product_Details 1253 non-null object
14 Fit_and_Size 1149 non-null object
15 Material_and_Care 1251 non-null object
16 Specifications 1244 non-null object
17 Fit 919 non-null object
0s completed at 8:44 PM


Hack_Extra.ipynb
File Edit View Insert Runtime Tools Help Last saved at 9:27 AM
Comment Share
+ Code + Text
Reconnect
[ ] df.describe()
Ratings
count 1044.000000
mean 4.159962
std 0.346668
min 2.100000
25% 4.000000
50% 4.200000
75% 4.400000
max 5.000000
df.iloc[:1]
Gender Category Sub-Category Site_Name Product_URL Brand_Name Product_name Price Image_URLs Ratings ... Size_and_Dimensions Available_
0 Female Western Wear Dresses Myntra https://www.myntra.com/dresses/antheaa/antheaa... Antheaa Fuchsia Solid Chiffon Smocked Tiered Midi Dress 1007 https://assets.myntassets.com/h_720,q_90,w_540... 4.2 ... NaN
1 rows × 21 columns


Hack_Extra.ipynb
File Edit View Insert Runtime Tools Help Last saved at 9:27 AM
Comment Share
+ Code + Text
Reconnect
[ ] df['Sub-Category'].unique()
array(['Dresses'], dtype=object)
[ ] #Find null values
df.isnull().sum()
Gender 0
Category 0
Sub-Category 0
Site_Name 0
Product_URL 0
Brand_Name 0
Product_name 0
Price 0
Image_URLs 0
Ratings 209
Number_of_Ratings 209
Size_and_Dimensions 155
Available_Colors 800
Product_Details 0
Fit_and_Size 104
Material_and_Care 2
Specifications 9
Fit 334
Length 334
Transparency 334
Customer_Images 658
dtype: int64
[ ] #Datatypes
df.dtypes
Gender object
Category object
0s completed at 8:44 PM





Conclusion: -

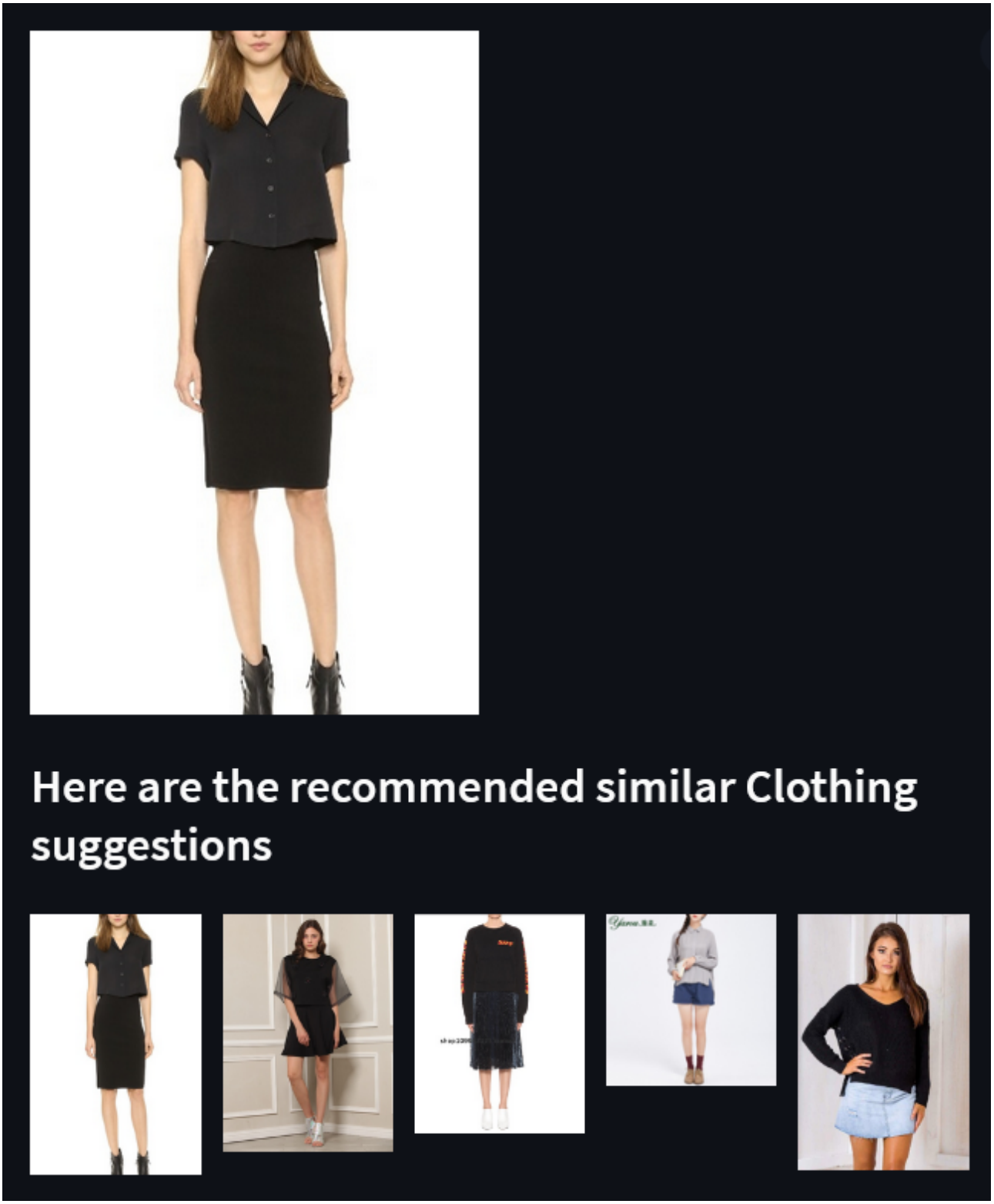
EDA is to find more insights from the datasets. By performing the EDA in the above dataset we can find that most of the people buy the clothes from the top brands like Tokyo talkies, Style cast X Heresheinbox, Athena, SASSAFRAS, and etc.

Average Price Range = 1037

Max Price = 5994

Min Price = 251

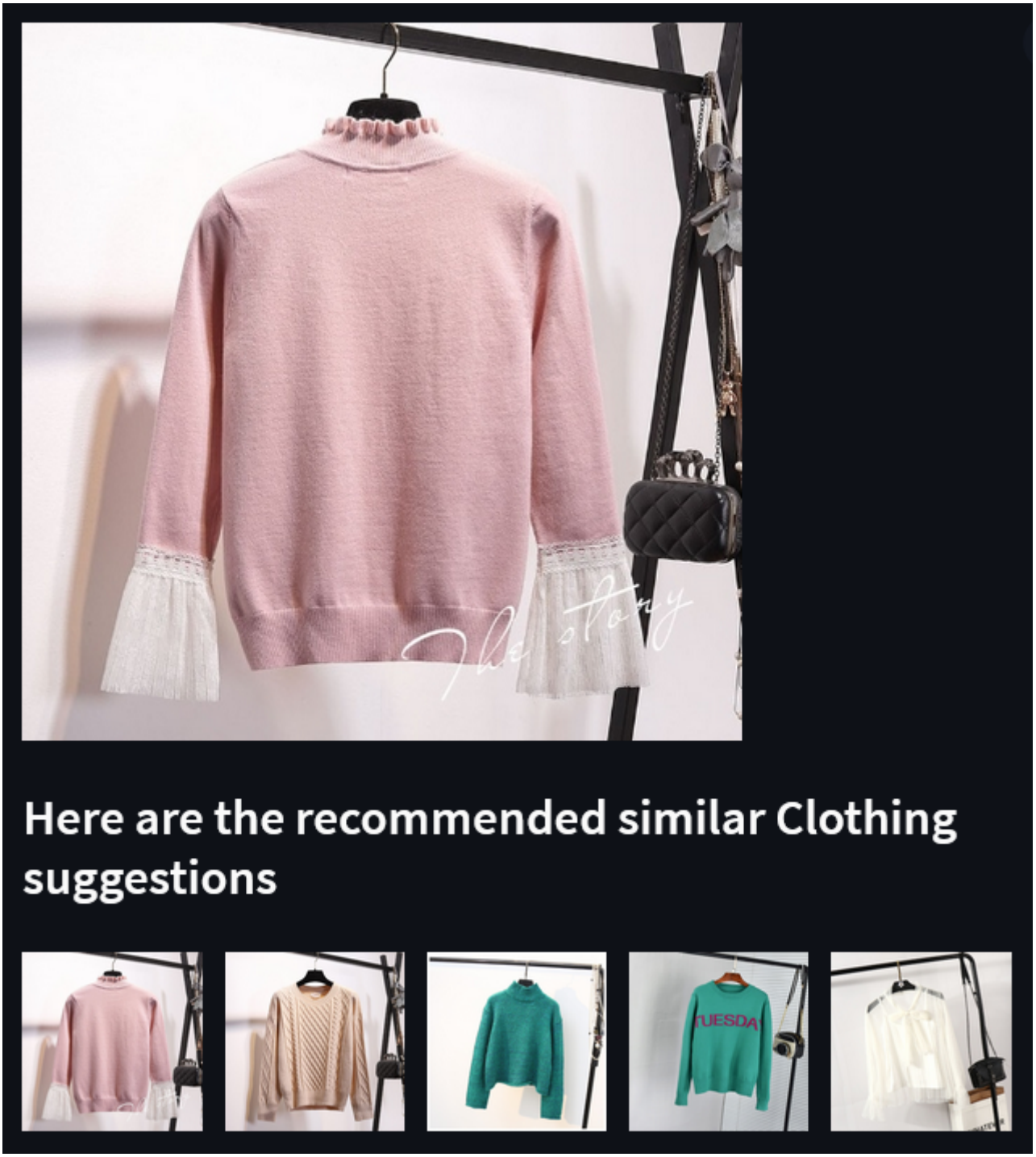
Testing and Results



Here are the recommended similar Clothing suggestions






Here are the recommended similar Clothing suggestions

CONCLUSION

In conclusion, the Style Suggest fashion recommender system project is an innovative and useful application that provides personalized fashion recommendations to users. The project utilizes a variety of algorithms, including deep learning models such as ResNet and TensorFlow, to develop accurate and efficient recommendations based on user preferences.

The project's methodology involves several important steps, including data collection, preprocessing, EDA, modeling, evaluation, and implementation. The data is preprocessed and cleaned to remove any inconsistencies, and EDA is used to gain insights into the data and identify any patterns or trends that exist. Various machine learning models are then developed, evaluated, and fine-tuned to improve their performance.

Overall, the project's success is a testament to the power of machine learning and deep learning algorithms in developing personalized and efficient recommendation systems. The application of such technology to the fashion industry is a great example of how technology can be used to enhance user experiences and streamline e-commerce operations.

REFERENCES

- https://medium.com/@arsanatladkat/how-to-setup-tensorflow-2-3-1-cpu-gpu-windows-10-e000e7811e2b

- https://towardsdatascience.com/understand-and-implement-resnet-50-with-tensorflow-2-0-1190b9b52691