Fashion Recommendation System

P Saikarthik

VU21CSEN0100398

1. Introduction

This project involves the development of a web application that predicts a user's body shape based on specific body measurements and provides personalized clothing recommendations. The model is deployed using Flask, a lightweight web framework for Python. The application integrates a trained machine learning model that predicts body shapes and presents tailored fashion advice through a user-friendly interface.

2. Objective

The primary goal is to create a system that:

Predicts a user’s body shape based on input measurements.

Provides personalized fashion recommendations.

Allows easy integration with existing web technologies.

3. Methodology

3.1 Model Training

The body shape prediction model is built using TensorFlow and Keras. The model is trained on a dataset comprising various body measurements (e.g., bust, waist, hip, waist-to-hip ratio, and bust-to-hip ratio) with corresponding body shape labels. The trained model is saved as shape_prediction_model.h5, and a LabelEncoder object is used to encode the categorical body shape labels.

A1 selection1_image

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	selection1	selection1	selection1	selection1	selection1_name_url												
2	https://ad	â‚¹1,794	https://wv	Curves By	https://www.nykaafashion.com/mish-organza-black-apple-cut-hem-short-dress-set-of-2/p/12163851												
3	https://ad	â‚¹22,898	https://wv	Majorelle	https://www.nykaafashion.com/majorelle-apple-mini-dress-yellow/p/9693553												
4	https://ad	â‚¹40,378	https://wv	Nicholas	https://www.nykaafashion.com/nicholas-katherine-u-shape-strapless-midi-dress/p/13843514												
5	https://ad	â‚¹850	https://wv	CRIMSOUI	https://www.nykaafashion.com/crimsoune-club-womens-yellow-checked-dress-in-shirt-shape-with-belt-set-of-2/p/13501578												
6	https://ad	â‚¹1,499	https://wv	Original Sc	https://www.nykaafashion.com/the-souled-store-original-solids-apple-mint-women-shirt-dress/p/13847397												
7	https://ad	â‚¹799	https://wv	Solid Cool	https://www.nykaafashion.com/the-souled-store-solid-cool-aqua-melange-apple-cut-pocket-dresses-for-women/p/5665305												
8	https://ad	â‚¹596	https://wv	Apple Butt	https://www.nykaafashion.com/kazo-apple-butter-basic-spaghetti-dress/p/2216697												
9	https://ad	â‚¹4,233	https://wv	All Shapes	https://www.nykaafashion.com/radharaman-all-shapes-midi-dress/p/10873110												
10	https://ad	â‚¹4,566	https://wv	Apple Red	https://www.nykaafashion.com/tjori-apple-red-cotton-block-printed-draped-flared-dress/p/8535485												
11																	
12																	
13																	

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	C
1	selection1	selection1	selection1	selection1	selection1_cost_url												
2	https://ad	Womens S	https://wv	â‚¹3,555	https://www.nykaafashion.com/oh-rare-womens-solid-color-hip-hugging-pencil-shaped-casual-mini-dress-black/p/15018130												
3	https://ad	Womens S	https://wv	â‚¹3,555	https://www.nykaafashion.com/oh-rare-womens-solid-color-hip-hugging-pencil-shaped-casual-mini-dress-orange/p/15018131												
4	https://ad	Womens S	https://wv	â‚¹3,555	https://www.nykaafashion.com/oh-rare-womens-solid-color-hip-hugging-pencil-shaped-casual-mini-dress-beige/p/15018129												
5	https://ad	Womens S	https://wv	â‚¹3,555	https://www.nykaafashion.com/oh-rare-womens-solid-color-hip-hugging-pencil-shaped-casual-mini-dress-white/p/15018132												
6	https://ad	Hourglass	https://wv	â‚¹4,995	https://www.nykaafashion.com/qua-hourglass-waistcoat-dress/p/16186185												
7	https://ad	Shaped Cu	https://wv	â‚¹4,475	https://www.nykaafashion.com/na-kd-shaped-cups-satin-mini-dress-brown-leopard/p/6055037												
8	https://ad	Plum Hour	https://wv	â‚¹27,435	https://www.nykaafashion.com/cultnaked-plum-hourglass-romper/p/13843342												
9	https://ad	Hourglass	https://wv	â‚¹3,295	https://www.nykaafashion.com/qua-hourglass-shirt-lavender-dress/p/10613599												
10	https://ad	Heart Shaj	https://wv	â‚¹10,399	https://www.nykaafashion.com/lioness-heart-shaped-maxi/p/13531012												
11	https://ad	Aquarius B	https://wv	â‚¹2,565	https://www.nykaafashion.com/salt-attire-aquarius-blue-boat-neck-shaped-shift-dress/p/14457569												
12	https://ad	Sea Star Pu	https://wv	â‚¹1,568	https://www.nykaafashion.com/salt-attire-sea-star-purple-shaped-shift-dress/p/14457758												
13	https://ad	Hourglass	https://wv	â‚¹27,440	https://www.nykaafashion.com/cultnaked-hourglass-mini-dress/p/10372265												
14	https://ad	Ruby Red S	https://wv	â‚¹2,385	https://www.nykaafashion.com/salt-attire-ruby-red-shaped-shift-dress/p/14457753												
15																	

3.2 Flask Application

The Flask web application serves as the interface for users to input their measurements and receive predictions. The application structure is as follows:

```
from flask import Flask, request, jsonify, render_template
import numpy as np
from tensorflow import keras
import pandas as pd
from sklearn.preprocessing import LabelEncoder

app = Flask(__name__)
```

Model and Encoder Loading: The model and LabelEncoder are loaded at the start of the application.

Preprocessing Function: A utility function preprocesses the user input into the format expected by the model.

Prediction Endpoint: Handles HTTP POST requests, processes the input data, makes predictions, and returns the predicted body shape in JSON format.

Rendering Templates: Various routes render HTML templates corresponding to different body shapes, providing personalized fashion advice.

3.3 User Interface

The user interface includes an HTML form (index.html) where users can input their measurements. Based on the prediction, the application dynamically redirects to a page that provides clothing recommendations tailored to the predicted body shape.

4. Implementation

4.1 Routes and Functionality

Home Route (/): Displays the main form for input.

Predict Route (/predict): Accepts form data, makes a prediction using the pre-trained model, and returns the result in JSON format.

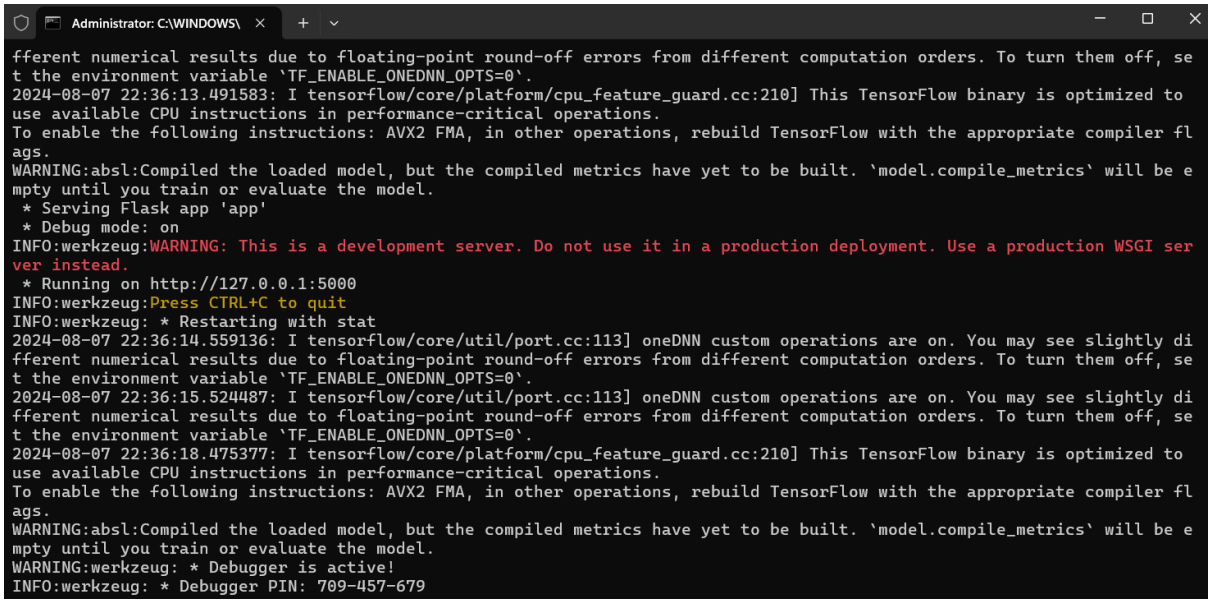
Shape Routes: Specific routes like /inverted-triangle.html, /pear.html, etc., render pages that provide fashion advice for each body shape.

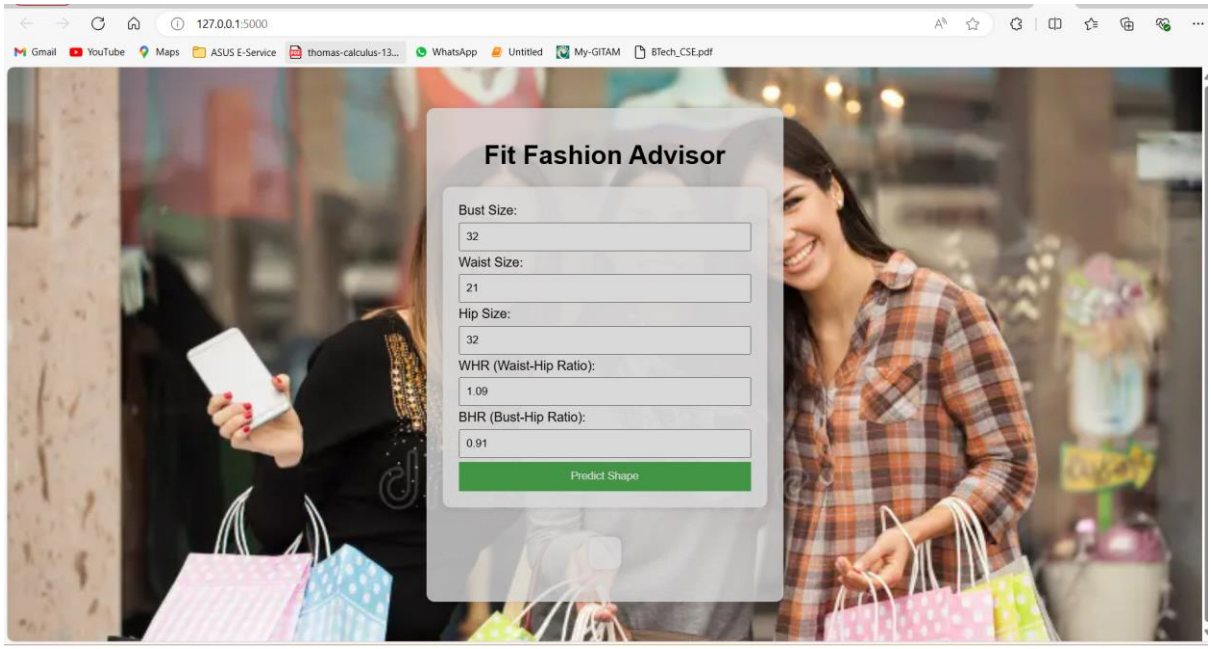
```python
from flask import Flask, request, jsonify, render_template
import numpy as np
from tensorflow import keras
import pandas as pd
from sklearn.preprocessing import LabelEncoder

app = Flask(__name__)

# Load your trained model and label encoder
model = keras.models.load_model('shape_prediction_model.h5')
labelencoder = LabelEncoder()
labelencoder.classes_ = np.load('label_encoder.npy', allow_pickle=True)

# Function to preprocess input data
def preprocess_input(a1, b1, c1, d1, e1):
    return np.array([[a1, b1, c1, d1, e1]])

# Route to render the HTML form
@app.route('/')
def home():
    return render_template('index.html')

# Route to handle prediction request
@app.route('/predict', methods=['POST'])
def predict():
    # Get data from POST request
    data = request.form.to_dict()
    a1 = int(data['bust'])
    b1 = int(data['waist'])
    c1 = int(data['hip'])
    d1 = float(data['whr'])
    e1 = float(data['bhr'])
```

```
33
34      # Preprocess input
35      input_data = preprocess_input(a1, b1, c1, d1, e1)
36
37      # Make prediction
38      y_pred = model.predict(input_data)
39      predicted_class = np.argmax(y_pred, axis=1)
40      predicted_shape = labelencoder.inverse_transform(predicted_class)[0]
41
42      # Return prediction as JSON response
43      return jsonify({'predicted_shape': predicted_shape})
44
45  # Route to render inverted triangle shape
46  @app.route('/inverted-triangle.html')
47  def inverted_triangle():
48      return render_template('inverted.html')
49
50  # Routes to handle other shapes
51  @app.route('/pear.html')
52  def pear():
53      return render_template('pear.html')
54
55  @app.route('/hourglass.html')
56  def hourglass():
57      return render_template('hourglass.html')
58
59  @app.route('/triangle.html')
60  def triangle():
61      return render_template('triangle.html')
62
63  @app.route('/apple.html')
64  def apple():
65      return render_template('apple.html')
```

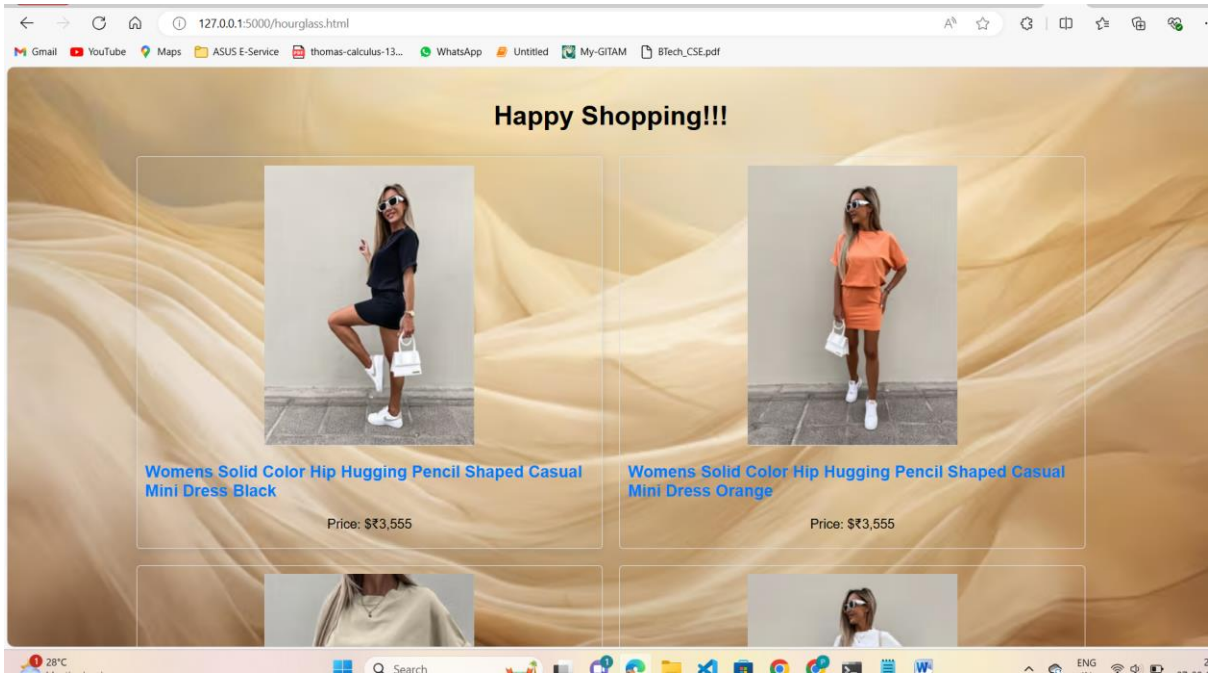
```
66
67  @app.route('/rectangle.html')
68  def rectangle():
69      return render_template('rectangle.html')
70
71  if __name__ == '__main__':
72      app.run(debug=True)
73
```

OUTPUT:


Administrator: C:\WINDOWS\
fferent numerical results due to floating-point round-off errors from different computation orders. To turn them off, se
t the environment variable `TF_ENABLE_ONEDNN_OPTS=0`.
2024-08-07 22:36:13.491583: I tensorflow/core/platform/cpu_feature_guard.cc:210] This TensorFlow binary is optimized to
use available CPU instructions in performance-critical operations.
To enable the following instructions: AVX2 FMA, in other operations, rebuild TensorFlow with the appropriate compiler fl
ags.
WARNING:absl:Compiled the loaded model, but the compiled metrics have yet to be built. `model.compile_metrics` will be e
mpty until you train or evaluate the model.
* Serving Flask app 'app'
* Debug mode: on
INFO:werkzeug:WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI ser
ver instead.
* Running on http://127.0.0.1:5000
INFO:werkzeug:Press CTRL+C to quit
INFO:werkzeug: * Restarting with stat
2024-08-07 22:36:14.559136: I tensorflow/core/util/port.cc:113] oneDNN custom operations are on. You may see slightly di
fferent numerical results due to floating-point round-off errors from different computation orders. To turn them off, se
t the environment variable `TF_ENABLE_ONEDNN_OPTS=0`.
2024-08-07 22:36:15.524487: I tensorflow/core/util/port.cc:113] oneDNN custom operations are on. You may see slightly di
fferent numerical results due to floating-point round-off errors from different computation orders. To turn them off, se
t the environment variable `TF_ENABLE_ONEDNN_OPTS=0`.
2024-08-07 22:36:18.475377: I tensorflow/core/platform/cpu_feature_guard.cc:210] This TensorFlow binary is optimized to
use available CPU instructions in performance-critical operations.
To enable the following instructions: AVX2 FMA, in other operations, rebuild TensorFlow with the appropriate compiler fl
ags.
WARNING:absl:Compiled the loaded model, but the compiled metrics have yet to be built. `model.compile_metrics` will be e
mpty until you train or evaluate the model.
WARNING:werkzeug: * Debugger is active!
INFO:werkzeug: * Debugger PIN: 709-457-679


127.0.0.1:5000
Gmail
YouTube
Maps
ASUS E-Service
thomas-calculus-13...
WhatsApp
Untitled
My-GITAM
BTech_CSE.pdf
Fit Fashion Advisor
Bust Size:
32
Waist Size:
21
Hip Size:
32
WHR (Waist-Hip Ratio):
1.09
BHR (Bust-Hip Ratio):
0.91
Predict Shape


Fit Fashion Advisor
Bust Size:
32
Waist Size:
21
Hip Size:
32
WHR (Waist-Hip Ratio):
1.09
BHR (Bust-Hip Ratio):
0.91
Predict Shape
Predicted Shape: hourglass
Shop Now



5. Conclusion

This project successfully demonstrates the integration of machine learning models with web technologies using Flask. The application provides a seamless user experience from input to prediction, coupled with actionable fashion recommendations. Future enhancements could include expanding the dataset for better accuracy, adding more body shapes, and integrating this service with e-commerce platforms for direct product recommendations.

🌐 Sources

towardsdatascience.com - Deploy a machine learning model using Flask

akbarikevin.medium.com - Building and Deploying a Machine Learning Model with Flask

talent500.co - Deploying Machine Learning Models with Flask: A Step-by-Step Guide

analyticsvidhya.com - How to Deploy a Machine Learning Model using Flask?

toptal.com - Python Machine Learning Prediction With a Flask REST API

github.com - A tutorial for deploying a model with Flask