

Department of Computer Science and Engineering

SMARTSIZER: A REAL-TIME MULTIBRAND CLOTHING SIZE PREDICTION ENGINE USING RANDOM FOREST

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Problem Statement and Motivation

Problem:

Online shoppers face confusion due to **non-standard clothing sizes** across brands, leading to **returns and poor fit**. Size charts lack **personalization**.

□ Motivation:

Build an ML-based system to:

- ✓ Predict brand-specific sizes from measurements
- ✓ Improve fit and reduce returns
- ✓ Enable easy API integration and scaling

Existing System

- Most e-commerce platforms use static size charts or generic recommendations.
- Some offer user reviews for sizing guidance, which are often subjective and inconsistent.
- Virtual try-on tools exist, but they rely on image estimation and may lack accuracy.
- Few platforms support brand-specific sizing log

Objectives

develop a machine learning system to **predict accurate clothing sizes** across multiple brands

- ✓ Use **body measurements** to offer **personalized, brand-specific recommendations**
- ✓ Deploy models via **FastAPI** for real-time interaction
- ✓ Ensure **scalability and modularity** for adding new brands
- ✓ Reduce **return rates** and improve **customer satisfaction** in online fashion retail

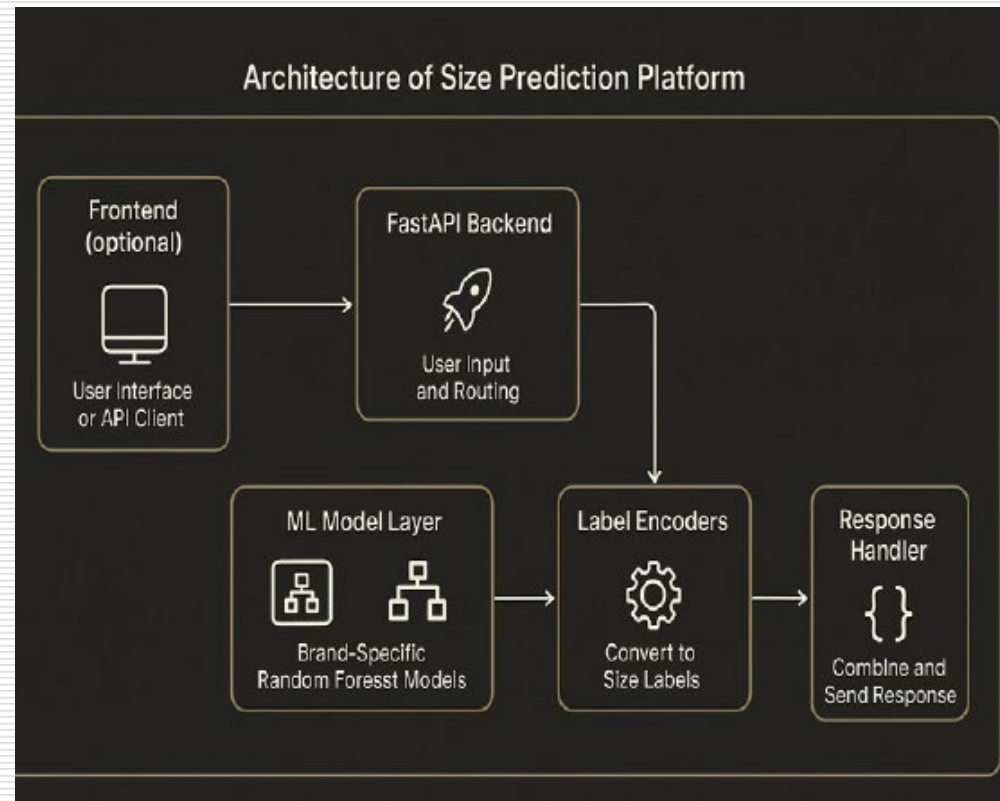
Abstract

- Choosing the right clothing size across brands is difficult due to inconsistent sizing standards. This project presents an **AI-powered platform** that predicts the best-fit size for each brand using **user body measurements** (chest, shoulder, front length, sleeve length). **Random Forest classifiers** are trained separately for brands like Zara, H&M, Nike, Puma, and Adidas. The models are deployed via a **FastAPI backend**, offering **real-time, brand-wise size predictions** through a RESTful API. This system reduces size mismatches, lowers return rates, and improves the **personalized shopping experience** in e-commerce.

Proposed System

- This system uses **machine learning** to predict accurate clothing sizes across brands based on user body measurements.
 - ◆ **Inputs:** Chest, shoulder, front length, sleeve length
 - ◆ **Processing:** Brand-specific **Random Forest classifiers** trained on labeled data
 - ◆ **Backend:** FastAPI handles user input via a POST endpoint and returns real-time predictions
 - ◆ **Model Storage:** Trained models and encoders stored in a **centralized Pickle file**
 - ◆ **Output:** Personalized size recommendation for each brand (e.g., Zara, Nike, H&M)
 - ◆ **Scalability:** Easily extendable to more brands with new data
 - ◆ **Goal:** Reduce return rates and improve fit confidence in online shopping

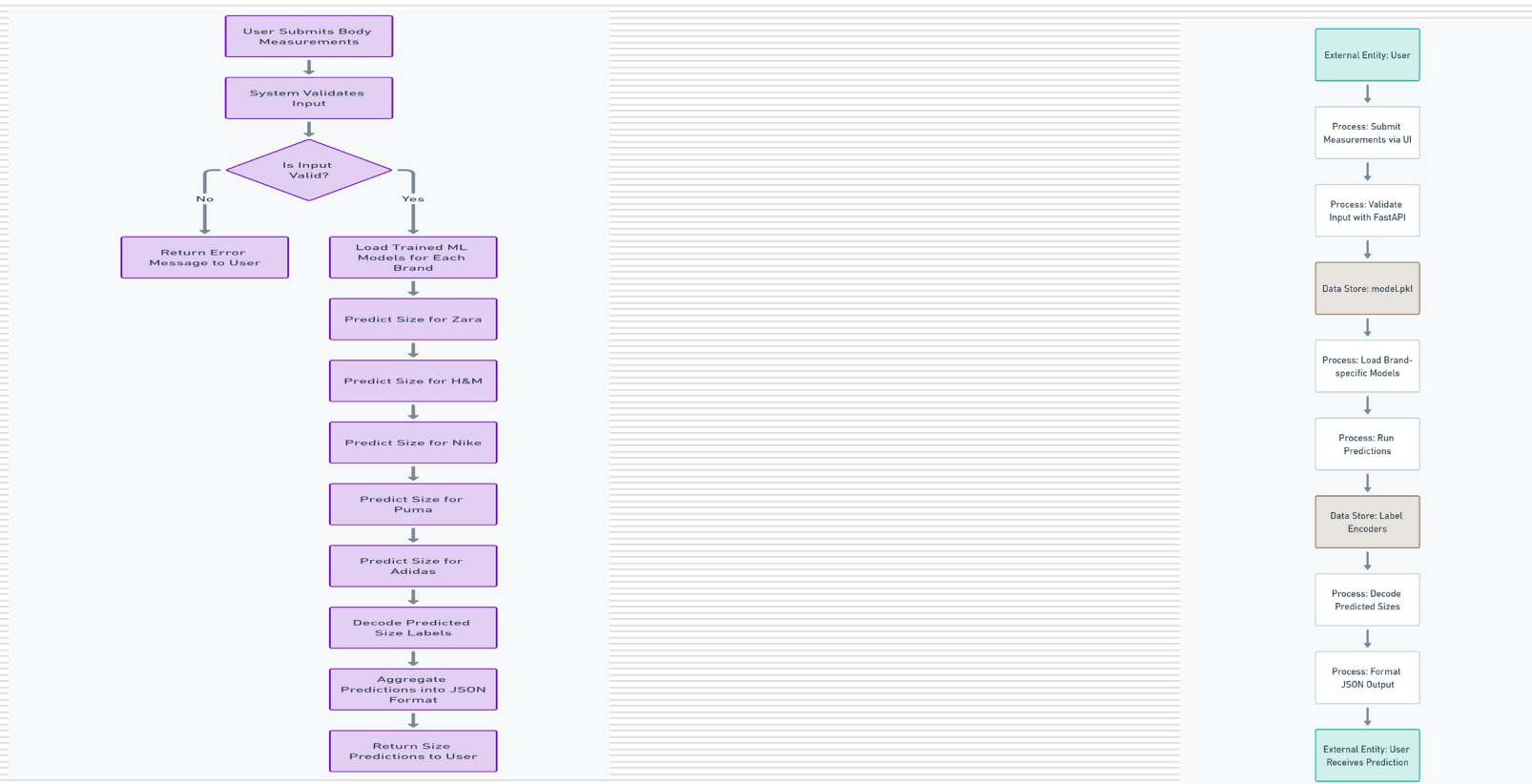
System Architecture



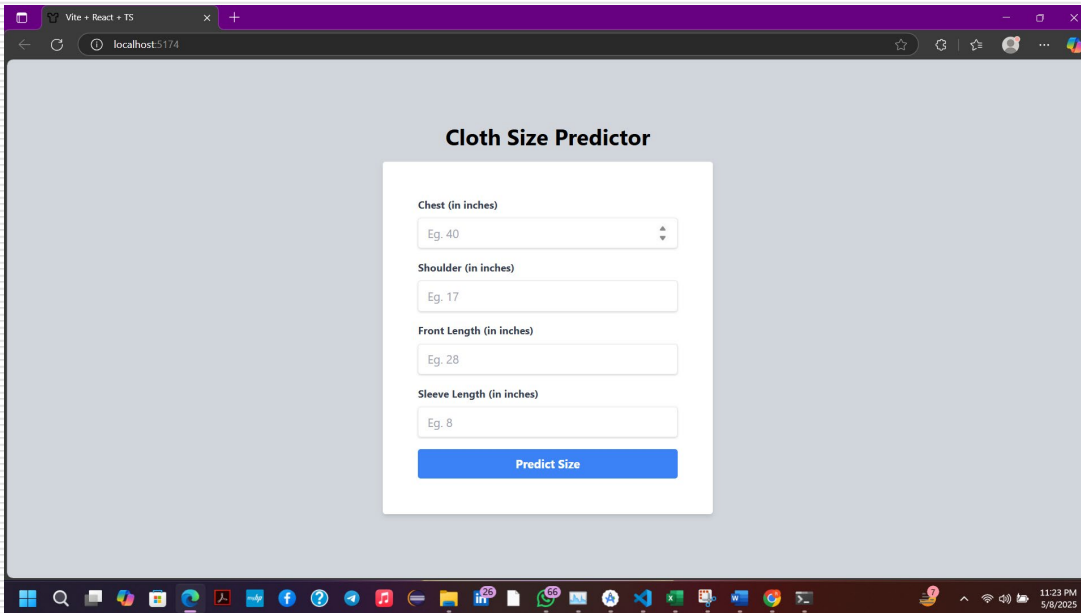
List of Modules

- - Dataset Description
 - Data Preprocessing
 - Brand-wise Size Prediction using ML
 - Model Training and Serialization
 - API Development using FastAPI
 - System Integration and Testing

Functional Description for each modules with DFD and Activity Diagram



Implementation & Results of Module



The screenshot shows a web browser window with the address bar at localhost:5174. The page title is "Cloth Size Predictor". The form contains five input fields with placeholder text "Eg. 40", "Eg. 17", "Eg. 28", and "Eg. 8". A blue button labeled "Predict Size" is at the bottom of the form.

Cloth Size Predictor

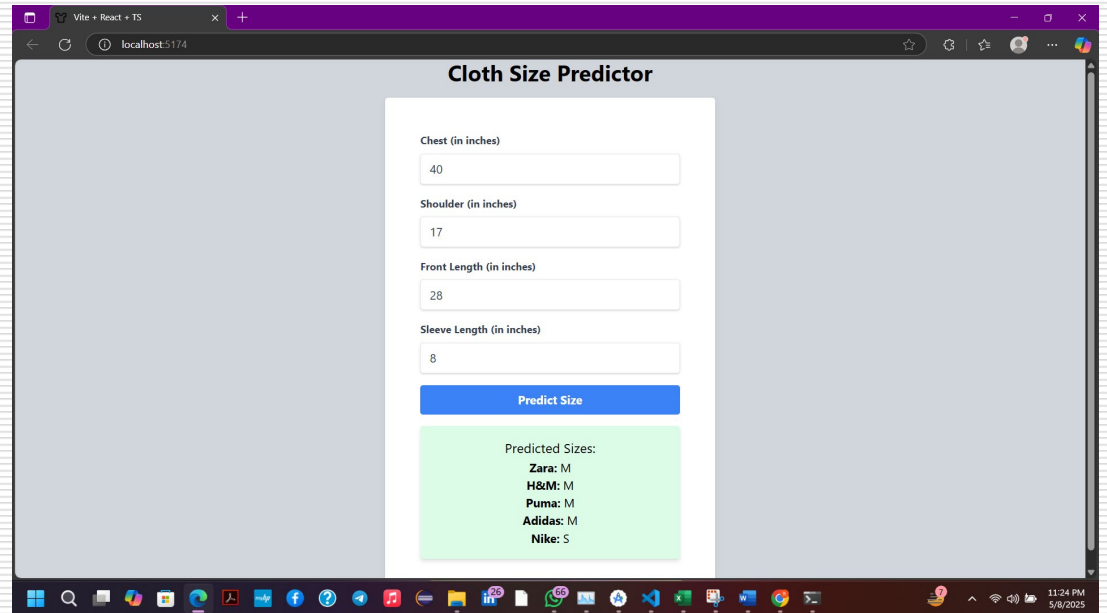
Chest (in inches)
Eg. 40

Shoulder (in inches)
Eg. 17

Front Length (in inches)
Eg. 28

Sleeve Length (in inches)
Eg. 8

Predict Size



The screenshot shows the same web browser window, but now the "Predicted Sizes" section is visible. It lists predicted sizes for Zara, H&M, Puma, Adidas, and Nike based on the input values.

Cloth Size Predictor

Chest (in inches)
40

Shoulder (in inches)
17

Front Length (in inches)
28

Sleeve Length (in inches)
8

Predict Size

Predicted Sizes:
Zara: M
H&M: M
Puma: M
Adidas: M
Nike: S

Conclusion & Future Work

- ◆ The system successfully predicts **brand-specific clothing sizes** using Random Forest classifiers based on user body measurements.
- ◆ Integrated via **FastAPI**, it delivers **real-time, personalized size recommendations**, reducing guesswork and returns.

Future Work

- ✓ Add more body measurements (waist, hips) for higher accuracy
- ✓ Extend support to more brands and garment types
- ✓ Explore advanced models (e.g., XGBoost, CNNs)
- ✓ Build a user-friendly frontend or mobile app
- ✓ Integrate user feedback and virtual try-on tools

References

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Thank You