Artificial Intelligence and Machine Learning

Project Documentation

Project Title :

Pattern Sense: Classifying Fabric Patterns using Deep Learning

Team Id: LTVIP2025TMID33870

Team members:

Team Size : 4

- **Team Leader :** Poka Sai Manikanta

- **Team member :** Pathan Mohammad Shoaib Khan
- **Team member :** Pathakota Vinay Kumar
- **Team member :** Parisa Deepthi

1. INTRODUCTION

• Project Overview

This project focuses on classifying fabric patterns using deep learning techniques. The model is trained to identify

various fabric types based on texture, color, and design using a CNN-based architecture. The objective is to assist

textile industries in automating fabric recognition and quality control.

2. Project Overview

• Purpose:
The goal of *Pattern Sense: Classifying Fabric Patterns using Deep Learning* is to develop an intelligent system that can automatically identify and classify various fabric patterns—such as floral, geometric, striped, and more—using deep learning techniques. This project aims to support the textile and fashion industries by improving pattern recognition efficiency and reducing manual effort.

• Features:

- Image-based fabric pattern detection using convolutional neural networks (CNNs)
- Real-time classification of common textile patterns
- User-friendly interface for uploading and analyzing fabric images
- High accuracy with robust model training and testing
- Potential integration into textile sorting, e-commerce, and quality control workflows

3. Architecture

Frontend:
Built with React/ HTML/CSS, featuring image upload, real-time result display, and user interaction capabilities.

Backend:
Developed using Python and Flask/ FastAPI. Integrates CNN models (TensorFlow/PyTorch) for fabric pattern classification and exposes REST APIs.

Database:

Custom or public datasets like Kaggle: Fabric Dataset, pattern results, and session metadata.

4. Setup Instructions

Prerequisites:

- Python 3.8+
- Node.js and npm
- Git

Installation:

git init

git add README.md

git commit -m "first commit"

git branch -M main

git remote add origin https://github.com/Deepthi2226/Pattern-Sense.git

git push -u origin main

Create a .env file in the root directory and set necessary environment variables.

5. Folder Structure

Client:

- /src/components: React components

- /src/assets: Static assets and styles

Server:

- /api: Flask route definitions
- /model: Deep learning model and preprocessing logic

6. Running the Application

- **Frontend:** API Gateway -> Model Inference Service -> Result
- **Backend:** Developed using Python and Flask/ FastAPI.

7. API Documentation

POST /classify

- Request: { image: <file> }
- Response: { pattern: "floral", confidence: 0.91 }

GET /patterns

- Returns list of available pattern types.

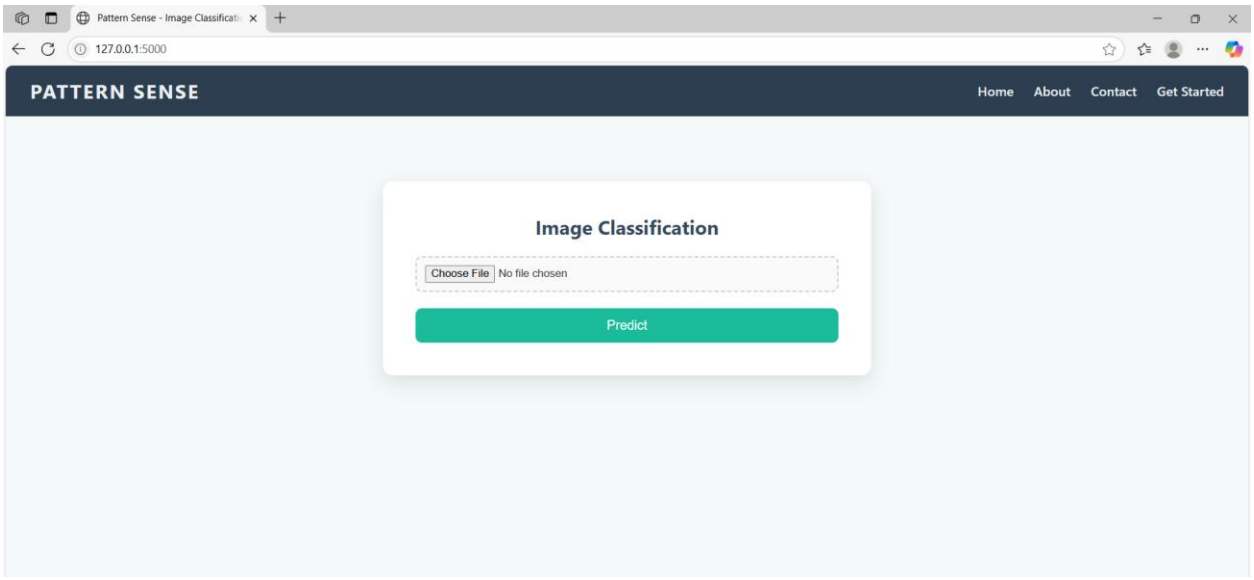
8. Authentication

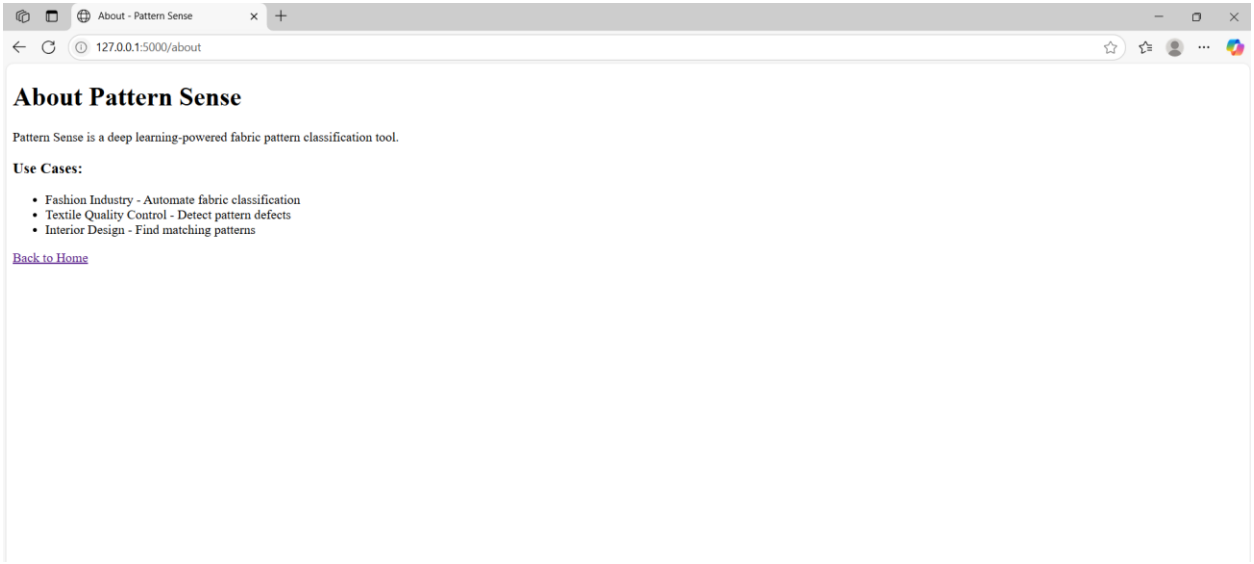
Uses JWT tokens for user login and API authorization. Tokens are stored in localStorage and verified on every protected request.

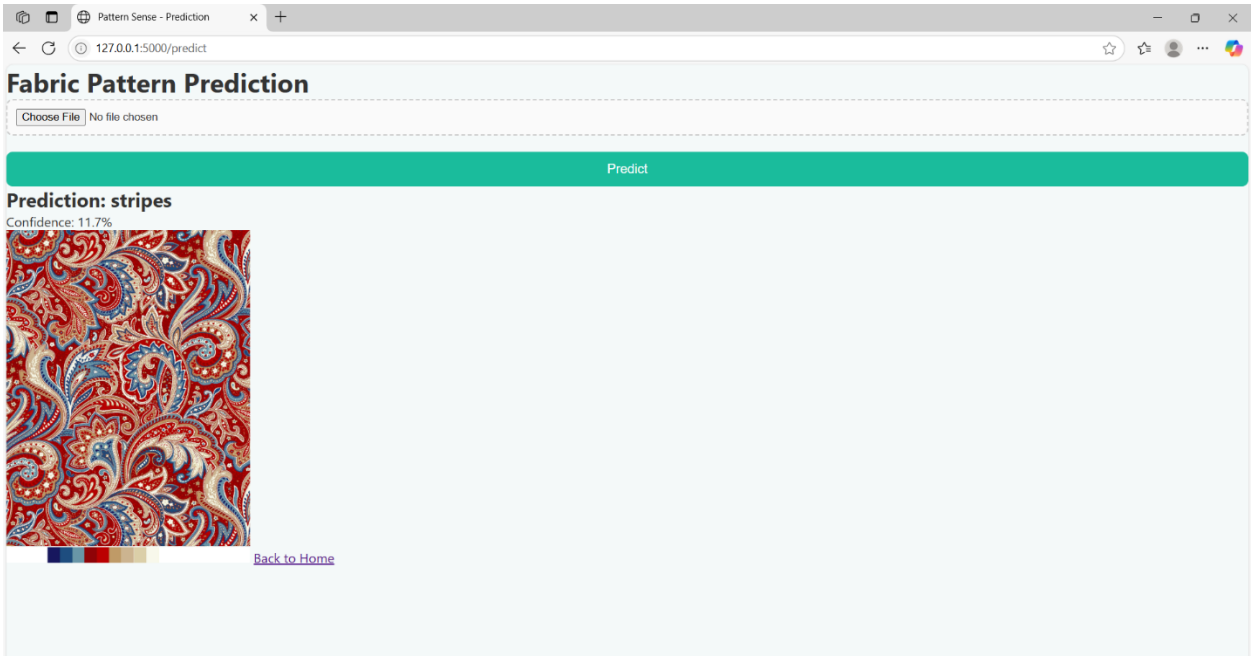
9. User Interface

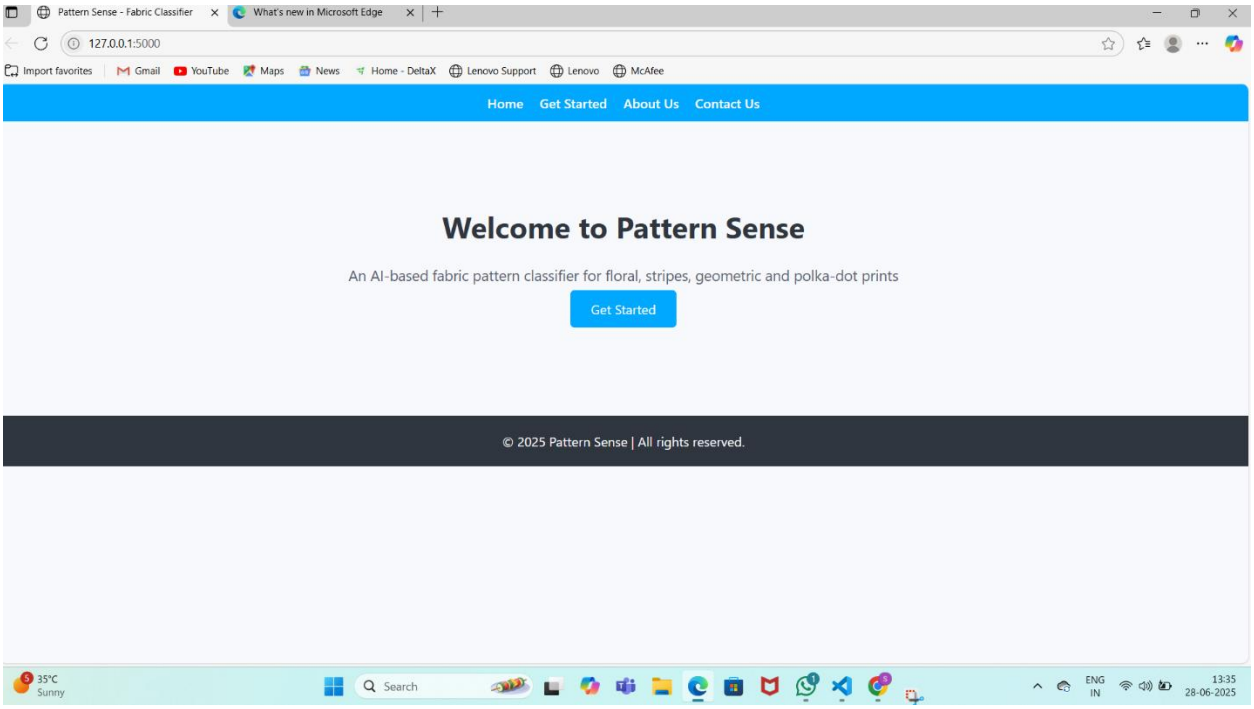
Includes:

- File upload interface
- Pattern classification result view
- Confidence score display


Pattern Sense - Image Classificati
127.0.0.1:5000
PATTERN SENSE
Home
About
Contact
Get Started
Image Classification
Choose File
No file chosen
Predict


About - Pattern Sense
127.0.0.1:5000/about
About Pattern Sense
Pattern Sense is a deep learning-powered fabric pattern classification tool.
Use Cases:
Fashion Industry - Automate fabric classification
Textile Quality Control - Detect pattern defects
Interior Design - Find matching patterns
Back to Home


Pattern Sense - Prediction
127.0.0.1:5000/predict
Fabric Pattern Prediction
Choose File
No file chosen
Predict
Prediction: stripes
Confidence: 11.7%
Back to Home


Pattern Sense - Fabric Classifier
What's new in Microsoft Edge
127.0.0.1:5000
Import favorites
Gmail
YouTube
Maps
News
Home - DeltaX
Lenovo Support
Lenovo
McAfee
Home
Get Started
About Us
Contact Us
Welcome to Pattern Sense
An AI-based fabric pattern classifier for floral, stripes, geometric and polka-dot prints
Get Started
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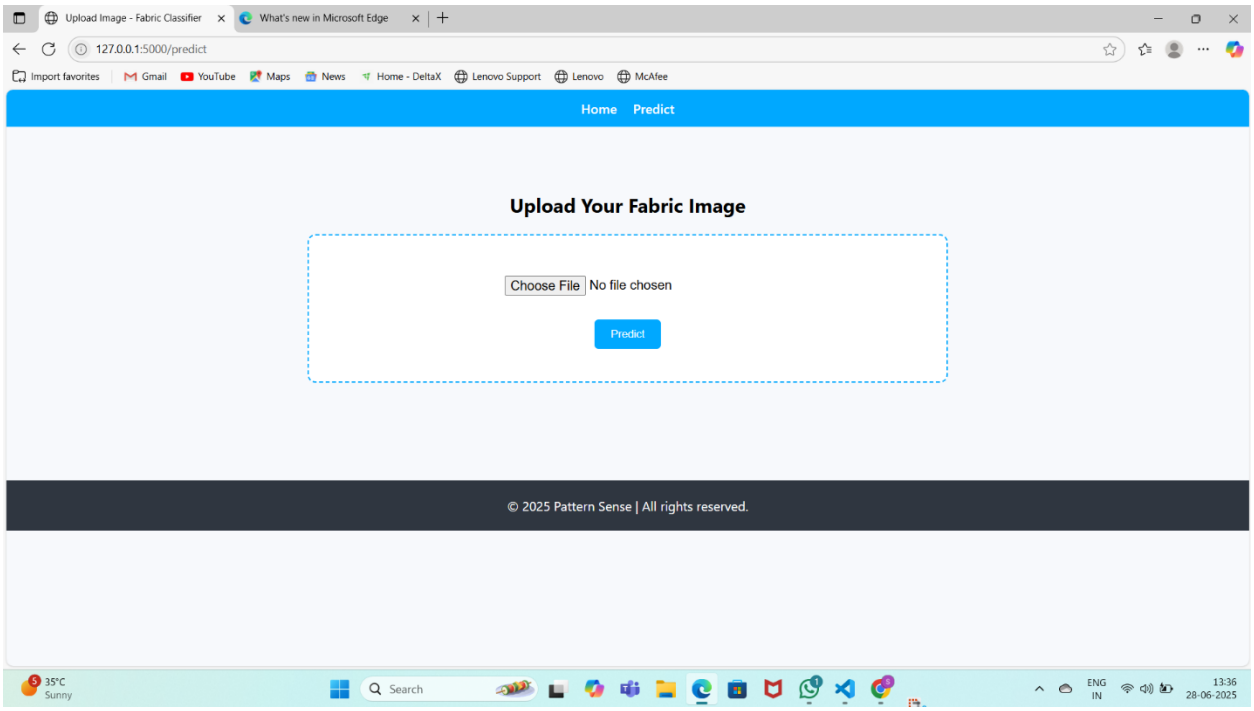
28-06-2025


Upload Image - Fabric Classifier
What's new in Microsoft Edge
127.0.0.1:5000/predict
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Gmail
YouTube
Maps
News
Home - DeltaX
Lenovo Support
Lenovo
McAfee
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Upload Your Fabric Image
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Predict
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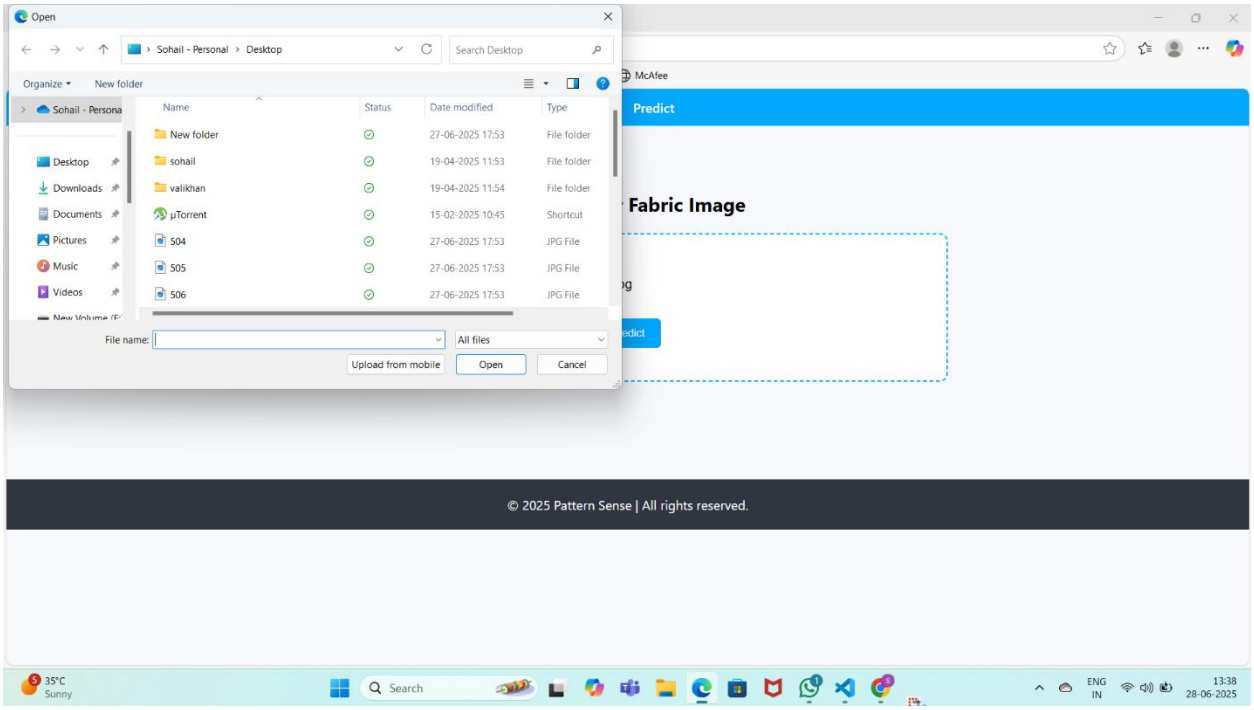
Open
Sohail - Personal
Desktop
Search Desktop
Organize
New folder
Sohail - Persona
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Downloads
Documents
Pictures
Music
Videos
Name
Status
Date modified
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New folder
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File folder
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valikhan
19-04-2025 11:54
File folder
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15-02-2025 10:45
Shortcut
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JPG File
File name:
All files
Upload from mobile
Open
Cancel
McAfee
Predict
Fabric Image
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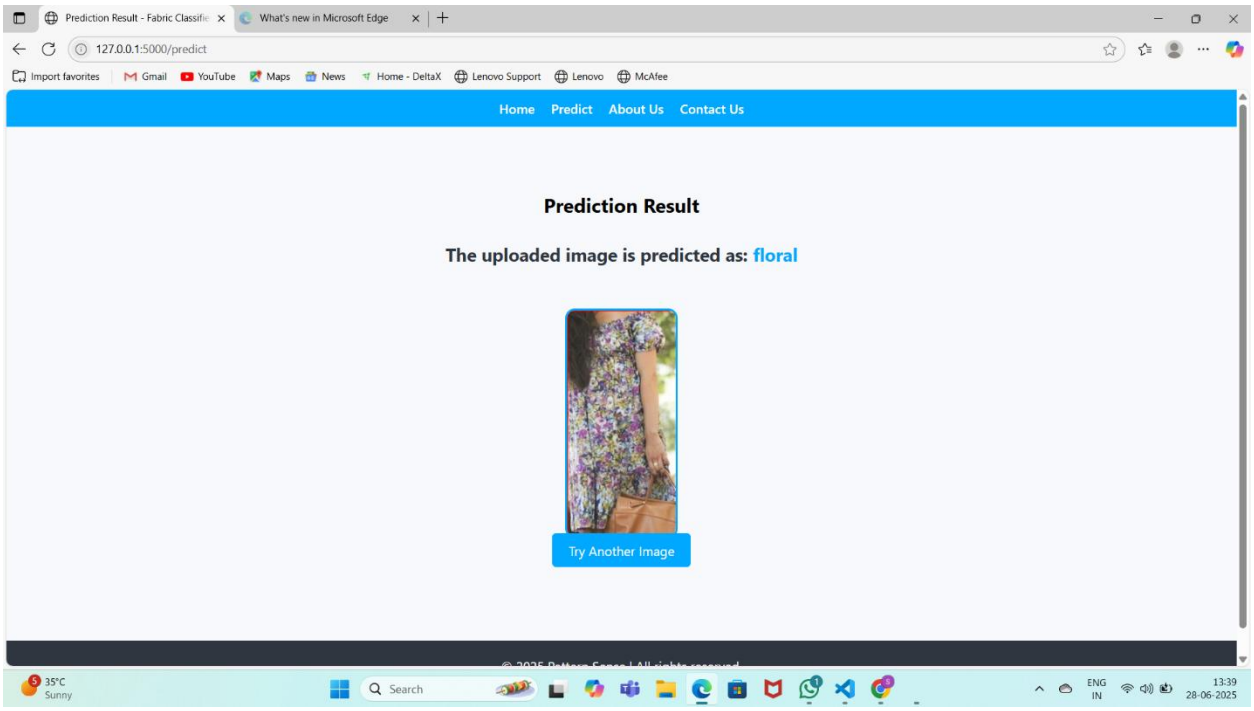
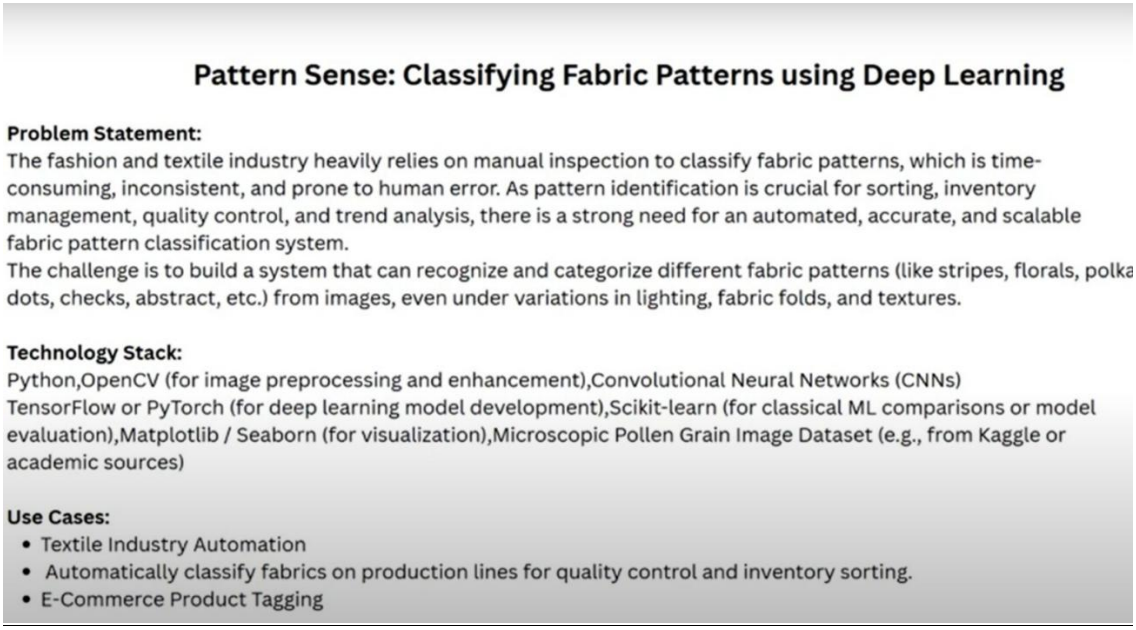


10. Testing

- Backend: pytest for unit and integration tests
- Frontend: Jest and React Testing Library
- Model: Accuracy, precision, recall metrics

11. Screenshots or Demo

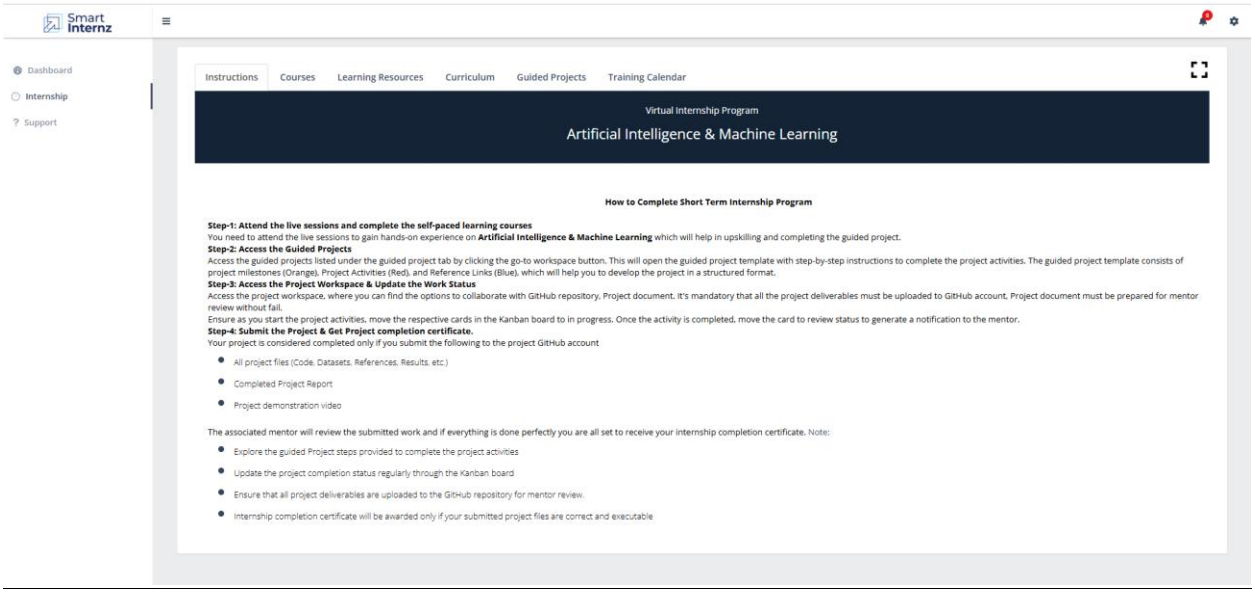


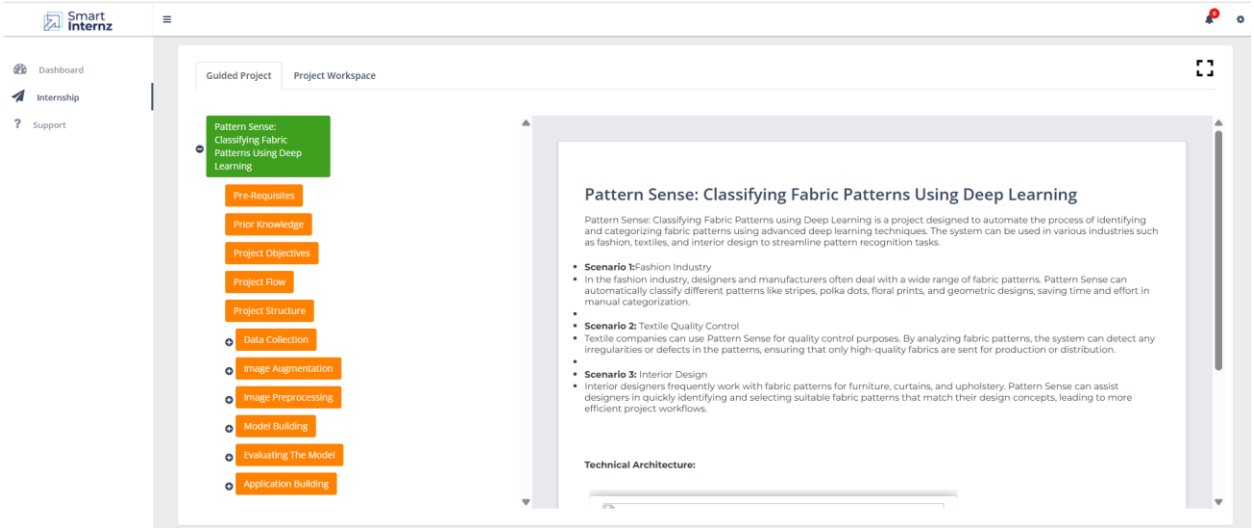
Pattern Sense: Classifying Fabric Patterns using Deep Learning

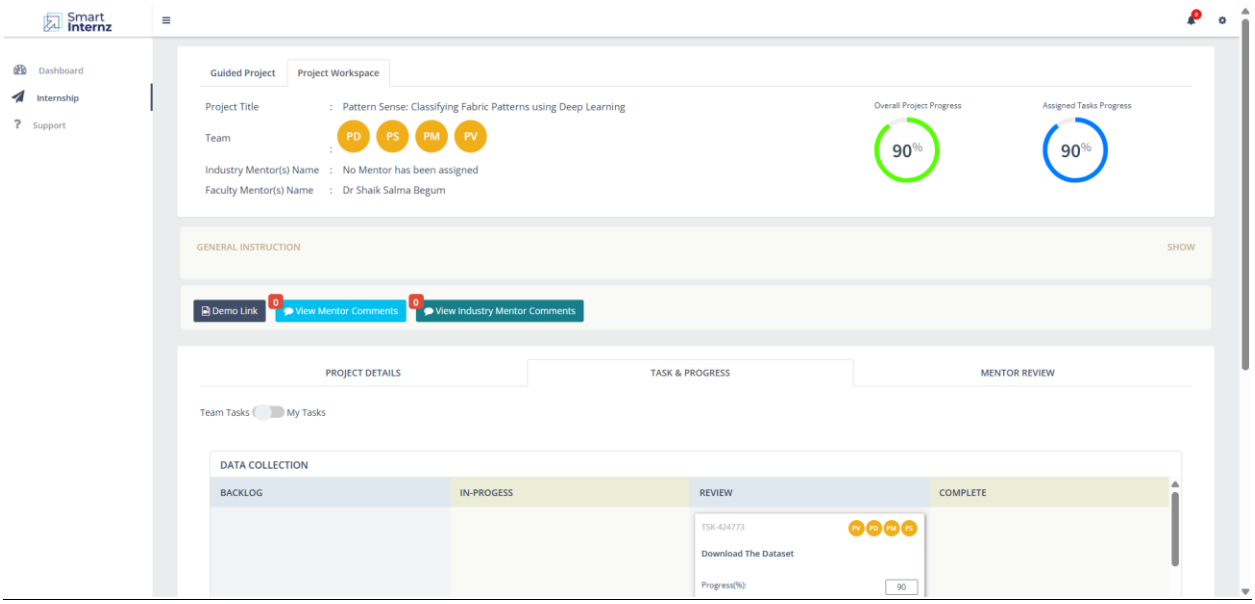
Problem Statement:
The fashion and textile industry heavily relies on manual inspection to classify fabric patterns, which is time-consuming, inconsistent, and prone to human error. As pattern identification is crucial for sorting, inventory management, quality control, and trend analysis, there is a strong need for an automated, accurate, and scalable fabric pattern classification system.
The challenge is to build a system that can recognize and categorize different fabric patterns (like stripes, florals, polka dots, checks, abstract, etc.) from images, even under variations in lighting, fabric folds, and textures.

Technology Stack:
Python,OpenCV (for image preprocessing and enhancement),Convolutional Neural Networks (CNNs)
TensorFlow or PyTorch (for deep learning model development),Scikit-learn (for classical ML comparisons or model evaluation),Matplotlib / Seaborn (for visualization),Microscopic Pollen Grain Image Dataset (e.g., from Kaggle or academic sources)

Use Cases:
- Textile Industry Automation
- Automatically classify fabrics on production lines for quality control and inventory sorting.
- E-Commerce Product Tagging


Smart Internz
Dashboard
Internship
Support
Instructions
Courses
Learning Resources
Curriculum
Guided Projects
Training Calendar
Virtual Internship Program
Artificial Intelligence & Machine Learning
How to Complete Short Term Internship Program
Step-1: Attend the live sessions and complete the self-paced learning courses
You need to attend the live sessions to gain hands-on experience on Artificial Intelligence & Machine Learning which will help in upskilling and completing the guided project.
Step-2: Access the Guided Projects
Access the guided projects listed under the guided project tab by clicking the go-to workspace button. This will open the guided project template with step-by-step instructions to complete the project activities. The guided project template consists of project milestones (Orange), Project Activities (Red), and Reference Links (Blue), which will help you to develop the project in a structured format.
Step-3: Access the Project Workspace & Update the Work Status
Access the project workspace, where you can find the options to collaborate with GitHub repository. Project document. It's mandatory that all the project deliverables must be uploaded to GitHub account. Project document must be prepared for mentor review without fail.
Ensure as you start the project activities, move the respective cards in the Kanban board to in progress. Once the activity is completed, move the card to review status to generate a notification to the mentor.
Step-4: Submit the Project & Get Project completion certificate.
Your project is considered completed only if you submit the following to the project GitHub account
All project files (Code, Datasets, References, Results, etc.)
Completed Project Report
Project demonstration video
The associated mentor will review the submitted work and if everything is done perfectly you are all set to receive your internship completion certificate. Note:
Explore the guided Project steps provided to complete the project activities
Update the project completion status regularly through the Kanban board
Ensure that all project deliverables are uploaded to the GitHub repository for mentor review.
Internship completion certificate will be awarded only if your submitted project files are correct and executable


Smart Internz
Dashboard
Internship
Support
Guided Project
Project Workspace
Pattern Sense: Classifying Fabric Patterns Using Deep Learning
Pre-Requisites
Prior Knowledge
Project Objectives
Project Flow
Project Structure
Data Collection
Image Augmentation
Image Preprocessing
Model Building
Evaluating The Model
Application Building
Pattern Sense: Classifying Fabric Patterns Using Deep Learning
Pattern Sense: Classifying Fabric Patterns using Deep Learning is a project designed to automate the process of identifying and categorizing fabric patterns using advanced deep learning techniques. The system can be used in various industries such as fashion, textiles, and interior design to streamline pattern recognition tasks.
Scenario 1:Fashion Industry
In the fashion industry, designers and manufacturers often deal with a wide range of fabric patterns. Pattern Sense can automatically classify different patterns like stripes, polka dots, floral prints, and geometric designs, saving time and effort in manual categorization.
Scenario 2: Textile Quality Control
Textile companies can use Pattern Sense for quality control purposes. By analyzing fabric patterns, the system can detect any irregularities or defects in the patterns, ensuring that only high-quality fabrics are sent for production or distribution.
Scenario 3: Interior Design
Interior designers frequently work with fabric patterns for furniture, curtains, and upholstery. Pattern Sense can assist designers in quickly identifying and selecting suitable fabric patterns that match their design concepts, leading to more efficient project workflows.
Technical Architecture:



Demo Link:

https://drive.google.com/drive/folders/1BeMVez6ykDYWFxonzX0nxVOIGk4Ipv4_?usp=sharing

12. Known Issues

- Accuracy may reduce with low-light images.
- Model needs more diverse training data for abstract patterns.

13. Future Enhancements

- Real-time webcam-based classification
- Integration with production line systems, Integration with ERP systems for automated tagging and stock updates
- Multilingual user interface for global accessibility
- Offline mode for on-device prediction in low-connectivity environments
- Extend to detect defects in fabric
- Mobile app integration for field use
- Multi-label classification for hybrid patterns
- Incorporate texture-based models for better accuracy