## ✅ **Project Overview:**

**Objective:** Develop a deep learning model that can classify different types of fabric patterns (e.g., floral, striped, polka dots, checks, plain) from images.

## 🔷 **Phase 1: Problem Definition & Requirements**

### Goals:

* Detect and classify fabric patterns from images.
* Prepare dataset (custom or public).
* Build and evaluate CNN-based classification model.

### Deliverables:

* Functional requirement document.
* Label schema (e.g., categories like floral, striped, etc.)

## 🔷 **Phase 2: Dataset Collection & Preprocessing**

### Steps:

1. **Collect dataset**
   * Use public datasets (e.g., Fashion-MNIST, DeepFashion, or fabric-specific datasets from Kaggle).
   * Or scrape images from websites (using Python + BeautifulSoup or Selenium).
   * Label dataset using tools like LabelImg or CVAT.
2. **Organize dataset**
   * Folder structure: dataset/train/<class\_name>/, dataset/test/<class\_name>/
3. **Preprocess**
   * Resize images (e.g., 224x224)
   * Normalize pixel values
   * Data augmentation (flip, rotate, zoom, brightness)

### Tools:

* Python, OpenCV, PIL, TensorFlow/Keras preprocessing layers

## 🔷 **Phase 3: Model Development**

### Model Choices:

* **CNN (Custom-built)**
* **Pretrained models (Transfer Learning):**
  + MobileNetV2, ResNet50, EfficientNetB0

### Architecture (if custom CNN):

text

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Input → Conv2D → ReLU → MaxPool → Conv2D → ReLU → MaxPool → Flatten → Dense → Softmax

### Steps:

1. Choose model type
2. Define model in TensorFlow/Keras or PyTorch
3. Compile with optimizer, loss, and metrics
4. Train with validation split
5. Save best model

## 🔷 **Phase 4: Model Evaluation**

### Evaluation Metrics:

* Accuracy
* Precision, Recall, F1-score
* Confusion Matrix

### Tools:

* Scikit-learn
* Matplotlib/Seaborn for visualization

## 🔷 **Phase 5: Model Deployment (Optional)**

### Options:

* Flask or FastAPI to create a REST API
* Streamlit for a GUI-based web app
* TensorFlow.js or ONNX if deploying in browser

## 🔷 **Phase 6: Documentation & Reporting**

### Deliverables:

* Project report (objectives, methodology, results)
* Code documentation (README.md)
* GitHub repo

## 🔷 **Phase 7: Project Timeline (Example)**

| **Week** | **Task** |
| --- | --- |
| 1 | Requirement gathering, research, dataset identification |
| 2 | Data collection and labeling |
| 3 | Data preprocessing and augmentation |
| 4 | Model design and training |
| 5 | Evaluation and tuning |
| 6 | Deployment (Flask/Streamlit), documentation |
| 7 | Final testing, presentation/reporting |

## 💡 Optional Enhancements

* Add fabric texture classification
* Use attention-based CNNs
* Deploy on edge devices (Raspberry Pi, Jetson Nano)