Classifying Fabric Patterns using Deep Learning

1. Introduction

Fabric pattern classification is a crucial task in textile and fashion industries. Using deep learning, especially convolutional neural networks (CNNs), provides a powerful approach to automatically recognize and categorize fabric patterns such as floral, striped, dotted, and checked.

2. Problem Statement

Manual classification of fabric patterns is time-consuming and prone to human error. The goal of this project is to automate the classification process using a deep learning model.

3. Objectives

- Build a dataset of fabric pattern images
- Preprocess the dataset for training
- Design and train a deep learning model
- Evaluate the model performance
- Deploy or present the classification results

4. Dataset Description

The dataset consists of images of different fabric patterns collected from various online resources. Each image is labeled with a corresponding pattern type such as floral, striped, dotted, or checked.

5. Data Preprocessing

- Resize images to a fixed dimension (e.g., 128x128)
- Normalize pixel values
- Apply data augmentation (rotation, flip, zoom) to enhance model generalization

6. Model Architecture

The model used is a Convolutional Neural Network (CNN) with the following layers:
- Convolutional layers with ReLU activation
- MaxPooling layers

- Flatten layer
- Dense layers with softmax for classification

7. Training and Validation

The model is trained using categorical crossentropy loss and Adam optimizer. Training is performed over multiple epochs with batch size optimization. A portion of the dataset is used for validation to monitor overfitting.

8. Results

The trained model achieved over 90% accuracy on the validation set. Confusion matrix and classification report show high precision and recall for most classes.

9. Evaluation Metrics

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

10. Conclusion

Deep learning models, particularly CNNs, are effective in classifying fabric patterns. This project demonstrates a scalable solution for automating pattern recognition in textiles.

11. Future Work

- Expand the dataset with more pattern types
- Optimize model using transfer learning
- Deploy model as a web or mobile app for real-time use

12. References

- Goodfellow et al., Deep Learning (2016)
- TensorFlow and Keras Documentation
- Fabric pattern datasets from Kaggle and academic sources