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FabricGuard
Fabric Quality Assessment Using Transfer Learning

A Dissertation by

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ABSTRACT

Fabric quality assessment is a critical process in the textile sector that has, until now, relied on manual checking, which is time consuming, untrustworthy, and prone to errors. This causes colossal economic losses and non-standard production. Manual methods are no longer efficient enough to detect subtle and advanced defects with increasing demand for high-quality materials. There is an urgent need to have an automated, scalable, and intelligent system for assessing the quality of fabrics with accuracy.

To counter this, a machine learning solution was developed that included EfficientNetB3 with a SE Block Attention Module for texture classification and defect detection. It uses transfer learning, attention blocks, and texture analysis techniques (GLCM + LBP) to improve accuracy and generalization. A Progressive Web App (PWA) was developed using HTML, CSS, JavaScript (Bootstrap), and a FastAPI backend. It also has a PostgreSQL database to maintain prediction history and provide reports.

The model achieved test accuracy of 85% in defect detection and performed sturdily on different fabric textures. Including texture classification made the system more dependable and expressive. Data augmentation, dropout regularization, and model fine-tuning led to performance improvements. The system is real-time assessable, user-friendly, and responsive. Future improvements will include dataset enrichment, edge deployment, and real-time analyzing abilities.

Keywords:
Fabric Quality Assessment, Fabric defect detection, Attention Mechanisms, Texture Analysis, EfficientNetB3, Deep Learning, Transfer Learning, Progressive Web Application