

FabricNet: Multi-Task Deep Learning with CNN for Classification of Woven Fabric Structures and Density Estimation

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Abstract:

The textile industry has undergone a transformation thanks to artificial intelligence (AI), which has changed quality control, design, and production. Artificial intelligence (AI) powered tools and algorithms enhance a variety of industrial processes, including supply chain management, manufacturing, fabric design, and pattern development. Machine learning algorithms evaluate large data sets to identify trends, forecast demand, and enhance inventory control all of which result in more efficient and cost-effective operations. Artificial Intelligence (AI) can reverse engineer the manufacturing process, identify required materials and components, and evaluate the structure and characteristics of textiles. Artificial Intelligence (AI) methods such as computer vision, deep learning, and machine learning can be applied to analyze photos, videos, and other sorts of data in order to extract useful information about textiles. Due to manual visual inspection, woven fabric classification and warp and weft thread density counts have historically been extremely difficult. Additionally, early machine learning-based techniques rely solely on labor-intensive and prone to errors manual characteristics. To increase production, an automated system that integrates warp and weft thread counting with woven fabric classification is required, so this paper presents multi-task deep learning model for warp and weft thread counting, as well as classification and recognition of woven fabrics structure, based on data augmentation and transfer learning techniques. The results of the model were evaluated using evaluation metrics such as accuracy, classification loss for fabric classification and regression (mean absolute error) for warp and weft densities.

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