Chapter 19
Fine-Grained Deep Feature Expansion Framework for Fashion Apparel Classification Using Transfer Learning

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ABSTRACT

The chapter focuses on developing a deep learning-based image classification model for fashion and apparel. With the rise of online retail services, there is a growing need for accurate and efficient apps to categorize fashion garments based on their attributes from image data. The study proposes a fine-grained deep feature expansion framework using transfer learning to address this need. The dataset consists of approximately 44,000 images of fashion apparel with six categories, including gender, subcategory, article type, base color, season, and usage. The images are preprocessed to remove corrupted images and resized to 256 by 256 pixels. The proposed framework employs pre-trained CNN models such as ResNet50 or Vgg19 for feature extraction, fine-tuning, and transfer learning. The CNN architecture consists of several layers: convolutional layers, residual blocks, max-pooling layers, and dense layers.

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INTRODUCTION

Fashion and apparel classification is an exacting task in computer vision due to the high variability and deformability of clothing items, making distinguishing between highly similar categories or subcategories difficult (Abdullahi et al., 2023). Deep learning techniques have proven to be effective in learning image representations that capture the underlying features of fashion and apparel items. In particular, transfer learning has significantly improved image classification tasks by reducing overfitting and requiring fewer training examples (Anand et al., 2023). However, transfer learning in the context of fashion and apparel classification has not been extensively explored (Angeline et al., 2023). This chapter proposes a fine-grained deep feature expansion framework for fashion and apparel classification using transfer learning to address this gap (Jain et al., 2022). The recommended approach expands the feature space of pre-trained models and increases the selective ability of learned features to improve the performance of classifying fashion and apparel (Arslan et al., 2021).

The proposed framework comprises two main components: Feature Expansion and Fine-grained classification (Chadrasekar & Beaulah David, 2014). Feature expansion involves expanding the feature space of pre-trained models using a combination of local and global features (Cirillo et al., 2023). This is achieved by extracting features from different image regions and combining them to create a more comprehensive representation of the clothing item (Fabela et al., 2017). Fine-grained classification focuses on distinguishing between highly similar categories or subcategories by capturing subtle differences in the features of clothing items (Devi & Rajasekaran, 2023). This is achieved using a multi-label classification approach, where each clothing item is assigned multiple labels that capture its different characteristics (Jeba et al., 2023). The proposed framework is assessed on a dataset of 44,424 images with ten attributes: major category, subcategory, gender, article type, and season (Jain et al., 2022).

The contribution of this paper includes (1) a fine-grained deep feature expansion framework for fashion and apparel classification using transfer learning, (2) an expansion of the feature space of pre-trained models and an increase in the discriminative power of the learned features, and (3) several potential applications, including online shopping, fashion trend analysis, and personal styling (Li et al., 2020). This paper presents a Python implementation of the proposed framework using a ResNet50 pre-trained on ImageNet (Kanyimama, 2023). The implementation includes a custom residual block and two output layers for predicting the major category and subcategory of the clothing item. The classifier's training involves using the categorical cross-entropy loss, and the optimization is achieved using the Adam optimizer (Kumar et al., 2022). The model achieved an accuracy of 90% on the evaluation dataset (Gaayathri et al., 2023). Fashion and apparel classification is an important task in computer vision, and this paper proposes a fine-grained deep feature expansion framework using transfer learning to improve classification performance (Lodha et al., 2023). The proposed framework has the potential to advance the state-of-the-art in fashion and apparel classification and has several practical applications.

LITERATURE SURVEY

Deep convolutional neural networks (CNNs) have been proposed by Simonyan and Zisserman (2015) for application in large-scale image recognition tasks, including object classification. They introduced the VGG architecture, which comprises fully linked layers after a sequence of convolutional and pool-