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PROGRESS REPORT

A Machine Learning and Visual Diagnosis System for Clothing Style Recognition

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The Adressed Problem

Clothing is a significant element that reflects individuals' personal expression and carries various meanings within society. However, the complexity and diversity of clothing styles make it challenging for retailers and online shopping platforms to provide suitable recommendations to customers. Today, companies aiming to keep up with the fast-paced changes in the fashion industry and better serve consumers are in search of a quick and effective system capable of accurately recognizing clothing styles. Performing this recognition manually is difficult, especially when trying to keep pace with rapidly changing trends on a vast dataset that includes hundreds or even thousands of clothing items.

The primary objective of this project is to develop a system that can automatically recognize clothing styles. This system can be utilized in various applications, such as offering users recommendations tailored to their clothing preferences, analyzing fashion trends, and optimizing inventory management in the retail sector. However, to achieve this goal, it is necessary to first develop an accurate, fast, and generalizable recognition system on a broad and diverse clothing dataset.

The main challenges that our project focuses on are as follows:

- Diversity: It is influenced by a variety of factors such as clothing styles, cultures, seasons, and special events. Therefore, the clothing style recognition system should be designed to encompass a wide range of diversity.

- Speed: Online shopping platforms and clothing brands require a fast recognition system to provide users with quick and instant suggestions. This project aims to enhance the capability to offer real-time solutions.

- Generalizability: The developed system should be effective in different geographic regions, cultures, and demographic groups. A generalizable model can better serve diverse user groups.

Related Work

The literature review was conducted with a focus on similar studies in the field of clothing style recognition. In previous research, various methods were commonly observed to be used for determining clothing styles. Particularly, some studies were found to provide visual suggestions using traditional classification methods such as Support Vector Machines (SVM) to identify clothing styles. However, it has been revealed that these methods often face difficulties in achieving sufficient speed and accuracy.

In studies using deep learning models like AlexNet, it was observed that the learning process of the model was slow, and the generalizability on large datasets was low. While studies employing deep learning techniques such as Convolutional Neural Networks (CNN) and Faster R-CNN exist, it has been noted that these methods are not entirely satisfactory in balancing speed and accuracy.

The literature review indicated that similar projects often focus on limited diversity datasets rather than extensive datasets containing various clothing styles. This suggests limited generalizability and low adaptability to real-world applications.

Upon examining similar projects, it was observed that in a project like clothing style recognition, Mask R-CNN yields faster and more accurate results compared to previous methods. This approach is designed to achieve higher precision and speed in determining clothing styles.

Employed Methodology

1. One or more of the datasets, including Clothing Co-Parsing (CCP) Dataset [5], DeepFashion2 Dataset [6], Large-scale Fashion (DeepFashion) Database [7], and Clothing dataset (full, high resolution) [8], will be chosen.
2. The Mask R-CNN model will be used as a suitable model for the project. When constructing the Mask R-CNN architecture, the 50 or 101 layer architecture of the ResNet network is employed.

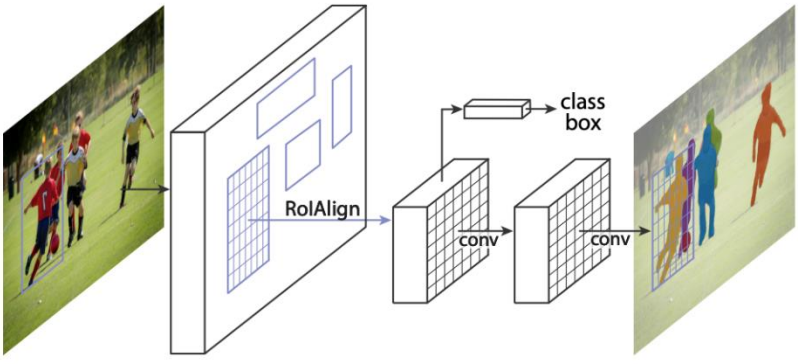
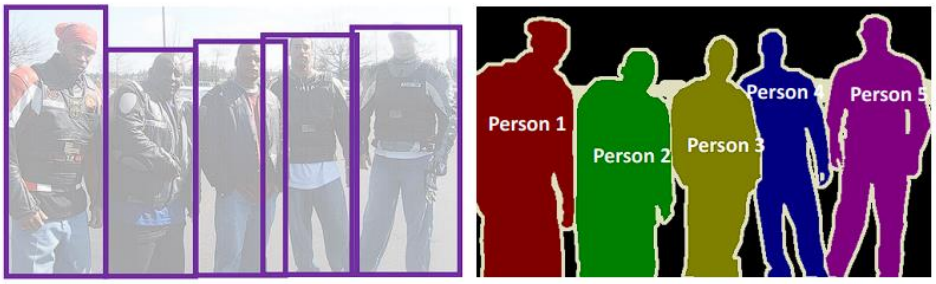


Figure 1 - The Mask R-CNN Framework for Instance Segmentation

Mask R-CNN is designed for the task of instance segmentation.Instance segmentation is used to identify different objects in an image and determine the precise contour of each object at the pixel level. It provides a robust solution, especially in cases where there are complex and densely populated object scenes. For example, it can handle situations where multiple objects are close to each other, overlapped, or grouped together.



Object Detection **Instance Segmentation**

Figure 2 – Instance Segmentation

3. Clothing labels will be grouped to determine the style, as exemplified in Table 1. [11]

Gothic Style	corset, ruffled skirt, lace blouse, leather jacket, leather skirt, thick-heeled tall leather boots, fishnet stockings, black T-shirt...
Vintage Style	flared trousers, padded shirt, padded jacket, polka-dot dress...

Table 1 - Grouping Styles and Clothing

4. The analyzed clothing will be listed, and they will be noted in the table of the style categories they belong to. After all the clothes are noted in the tables corresponding to their respective styles, the style with the most filled-in entries in the table will be selected. For example, if the majority of the clothes in the visual in Table 2 are in the Minimalist Style category, the style for that visual will be named Minimalist.

Appropriate Styles	1st	2nd	3rd
Gothic Style	Black T-shirt	Denim Jeans	
Minimalist Style	Black T-shirt	White Shirt	Denim Jeans

Table 2 - Style and Clothing Matching

5. The obtained results will be visualized, thus allowing the observation of the project's success.

Experimental Evaluation and Any Preliminary Results

There is no experimental evaluation and preliminary results regarding the work as application studies have not yet begun.

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