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Fashion Stylist

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ABSTRACT

This disclosure describes the use of computer vision techniques to analyze pictures that depict a user wearing clothes from their wardrobe. Based on the analysis, a library of the user's clothing collection is automatically generated and the user's preferred styles are identified. Suggestions of new combinations of clothing items and clothing items to buy are provided to the user. Further, items that the user doesn't wear often are identified for disposal.

KEYWORDS

- Computer vision
- Object recognition
- Machine learning
- Collaborative filtering
- Recommender system
- Fashion
- Clothing
- Shopping

BACKGROUND

Users have personal preferences regarding style, color, brand, etc. of clothing. Users also have a collection of items they already own. When shopping for new clothes online or in physical stores, a user may not remember what they already own or may get suggestions for items that do not match their personal preferences. Further, users may own clothing items that they don't wear often and that take up space in their closets.

DESCRIPTION

Fig. 1: User takes pictures of self in various outfits

Per techniques of this disclosure, a user uses a camera, e.g., a smartphone, smart mirror, or other camera, to take pictures of themselves in various outfits. The resultant images are analyzed using computer vision techniques. For example, object recognition and segmentation techniques can be used recognize individual items that are worn by an individual in a picture, e.g., top wear, bottom wear, accessories, etc. and parameters such as color, print, design, texture, material, etc. for each item. Object recognition can be performed using any suitable technique, e.g., algorithms that detect items based on detecting shape and geometry, algorithms that match portions of an image with images of known items, machine learning models trained for object recognition, etc. Further, landmark detection of key points on clothes, e.g., corners of neckline, hemline or cuff can be used. Combinations of these and other techniques can be used to detect items and item properties.

User input, e.g., to select particular areas of an image or to specify properties of an item can also be used together with such techniques. Still further, a user can be shown example

images that depict various styles and outfits and be asked to select the styles they like. User preferences are determined based on the selections provided by the user.

Based on the analysis, articles of clothing that the user is wearing in each picture are identified. A library is thus generated that includes information regarding the clothing items in a user's collection.

Bottom wear	Top wear
Blue jeans (boot cut)	Black turtleneck
Red skirt	Red t-shirt
Khakis	White shirt
...	...

Table 1: Library of user's clothing

Further, based on the analysis, the types of clothes the user likes are identified. e.g., wears skirts, jeans, t-shirts; does not wear yellow, etc. The user's style is determined based on how the user combines clothing articles and from user input regarding styles they like. For example, a substantial proportion of pictures that depict the user wearing jeans paired with a polo neck t-shirt can indicate the user likes this combination; images that depict the user wearing scarves tied in different styles may be indicative that the user loves wearing scarves; etc.

Based on the library and the information regarding user preferences, new combinations of items from the user's collection are determined and suggested to the user. For example, the library can store a record of different combinations that the user has worn. Parameters of these outfits may then be identified, e.g., bottom wear <skirt, red, knee length, flared> combined with <turtleneck, black, woolen>, etc. Other items that match at least a subset of the respective

parameters can then be identified and combinations of such items can be suggested as outfits. For example, the library is queried to obtain a suggestion to pair “yellow knee length skirt” with a “navy blue sweater.”

Standard database query techniques can be used to perform such queries. A threshold level of match in styles can be used in the comparison. For example, if there are four recorded parameters for bottom wear (type, color, length, cut) for a particular style, an item may be deemed as matching the style when at least three out of four parameters match what the user wore previously. Alternatively, or in addition, machine learning based techniques, collaborative filtering techniques, etc. can be used to identify additional combinations of items in the user’s library.

The suggestions of outfits (e.g., clothing items, accessories, etc.) that match well with the user’s current context are provided to the user. The context can include information such as weather, fashion trends, the user’s calendar (e.g., office party, ski trip, hiking trip), etc.

For example, a software application on the user’s smartphone or other device (e.g., smart mirror, home camera, assistant device, etc.) can implement the described techniques. The user may be prompted to record their daily outfit (or at other frequencies) using such an application. For each item, data can be recorded indicating the number of times the item is worn, date/time of use and context of use, etc. Alternatively, or in addition, a client app can be combined with server-side software to maintain the user’s library. Based on such data, suggestions to sell items that the user doesn’t wear often can also be provided.

User feedback can be used to improve the suggestions provided. If the user chooses to wear a suggested combination, the combination can be added to the user’s library and used as a

positive example, e.g., to show more such combinations in the future. If the user rejects a suggestion, the combination can be marked as a negative example. Parameters (e.g., type, length, color, cut, etc.) may be assigned respective weights based on such feedback when selecting other combinations to suggest to the user. If a machine learning based recommender is used to generate suggestions, such user feedback can be used as training data to refine the machine learning model.

While the foregoing discussion refers to an individual user's style and wardrobe, with user permission, the user's library and outfit combinations can be anonymized and compared with those of other users to identify others that have a similar style of dressing. For example, this may be useful when an individual user provides only a small sample of images. In this instance, combinations and shopping suggestions can be provided to a user based on what other users that have a similar sense of style wear. Techniques such as collaborative filtering can be used to identify items for such suggestion.

CONCLUSION

This disclosure describes the use of computer vision techniques to analyze pictures that depict a user wearing clothes from their wardrobe. Based on the analysis, a library of the user's clothing collection is automatically generated and the user's preferred styles are identified. Suggestions of new combinations of clothing items and clothing items to buy are provided to the user. Further, items that the user doesn't wear often are identified for disposal.