딥러닝 기반 개인화 패션 추천 시스템

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Abstract

People's focus steadily shifted toward fashion as a popular aesthetic expression as their quality of life improved. Humans are inevitably drawn to things that are more aesthetically appealing. This human proclivity has resulted in the evolution of the fashion industry over time. However, too many clothing alternatives on e-commerce platforms have created additional obstacles for clients in recognizing their suitable outfit. Thus, in this paper, we proposed a personalized Fashion Recommender system that generates recommendations for the user based on their previous purchases and history. Our model aims to generate recommendations using an image of a product given as input by the user because many times people find something that they are interested in and tend to look for products that are like that. In the system, we first reduce data dimensionality by component analysis to avoid the curse of dimensionality, and then the final suggestion is generated by neural network. To create the final suggestions, we have employed neural networks to evaluate photos from the H&M dataset and a nearest neighbor backed recommender.

1. Introduction

Humans are inevitably drawn to things that are more aesthetically appealing. This human proclivity has resulted in the evolution of the fashion industry over time. With the development of recommender systems in a variety of disciplines, retail firms are investing in cutting-edge technology to better their bottom line. Fashion has been around for millennia and will continue to be popular in future. Women are more associated with fashion and style, and they have a bigger product base to deal with, making choice more complex. It has become a significant component of life for modern families since a person is frequently assessed based on his or her appearance. Furthermore, garment suppliers want their clients to explore their whole product range in order to select what they like most, which is not attainable by just walking into a clothing store. With the fast advancement of Internet technology, intelligent clothing in the fashion retail business has gained prominence. Authors in [1] initially used 3D technology to model and build a virtual shop. Customers' accessories changed according to their choices in [2], which proposed 3D technology an interactive virtual fitting system that encouraged consumers to select suitable outfits. Customers are frustrated by the online store's lack of recommendation tactics, resulting in an arduous search. The authors in [3] Recognized apparel identical to the outfit photographs in the frontal view. The author in [4] has recommended the garments to the clients based on their prior shopping behavior. Thus, suggestion systems in virtual stores assist clients in finding appropriate and relevant clothing while also allowing the fashion retail business to earn from sales. In this research, we offer a revolutionary customized Fashion Recommender system based on user preferences as well as their previous history and experiences. More precisely, we concentrate on fashion aspects and create a framework that takes a single image as input and produces a top -5 ranked list of related clothing choices. The remainder of the paper is divided into the sections listed below. Section 2 analyzes the associated work of the Fashion Recommender system, Section 3 examines the suggested framework, and Section 4 gives the summary and conclusion of the proposed work.

2. Related work

The concept of recommendation technology was first established in the online internet age in the mid-1990s [5]. Some other authors in [6] Proposed CRESA that integrated visual characteristics, textual qualities, and the user's visual attention to create a clothing profile and produce suggestions. Authors in [7] Generated suggestions using photos from fashion publications. Multiple picture elements, such as fabric, collar, sleeves, and so on, were retrieved to understand the contents and generate suggestions [8]. Authors in [9] investigate intelligent clothing recommender systems based on fashion and aesthetic concepts in order to fulfill the unique demands of different users. Authors in [10] used, user ratings and clothes to develop outfit suggestions. Authors in [11] used the history of clothing and accessories, as well as meteorological variables, to create recommendations.

Recommender systems are classified into two types depending on how they propose products: collaborative filtering and content-based filtering recommender systems. The first technique is based on previous user-item interactions, i.e., user past item rating history, whereas the

latter is based on user profiles and item descriptions. Recently, a Neural Collaborative filtering framework based on Deep Learning that generalizes the matrix factorization technique has been widely employed in Collaborative Filtering Recommender systems. Purchase histories, customer feedbacks, product attributes, temporal information, and other variables are all considered by modern recommendation algorithms. However, one important element that is overlooked by present ranking and recommendation techniques is the visual appearance of the things to be examined. Few integrated visual information into user opinions and developed a scalable factorization methodology on huge, real-world datasets. Some of them provided a full review of Deep Learning-based Recommendation Systems.

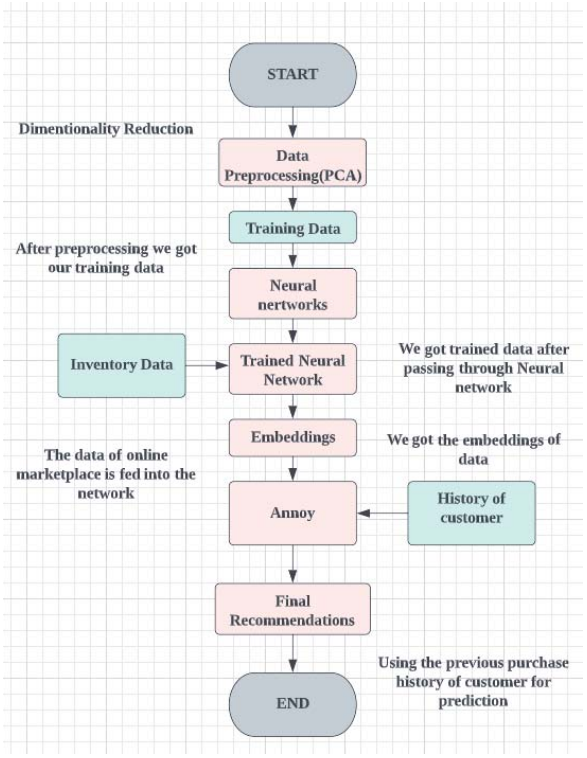
Convolutional Neural Networks-based Computer Vision tasks such as object identification, classification, and segmentation were used to create product suggestions. The majority of ecommerce websites rely on keyword mapping and a knowledge database to provide suggestions. However, this was ineffective because product descriptions differed from buyer to seller. Due to their significant degree of subjectivity, general recommender systems performed poorly in recommending fashion articles. Thus, our technique makes use of item image data and demonstrates that it is fair to rely on visual attributes to provide item suggestions that are extremely attractive and comparable to the user's interests and preferences. The suggested technique also addresses the cold start problem of typical collaborative filtering-based recommender systems.

3. Proposed methodology

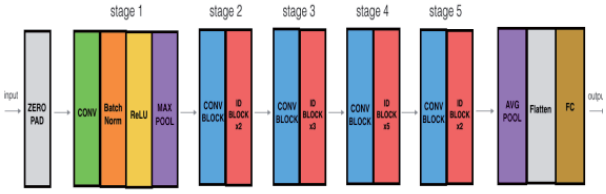
In this study, we offer a model that makes use of a Convolutional Neural Network and a Nearest Neighbor backed recommender. As seen in figure 1, Initially, data is preprocessed using PCA, then neural networks are trained, an inventory is chosen for producing recommendations, and a database for the items in inventory is constructed. The closest neighbor algorithm is used to locate the most relevant goods based on prior history and data to produce recommendations.

3.1. Training neural network

After the data has been pre-processed, the neural networks are trained using fastai and ResNet50 transfer learning. In order to fine tune the network model to suit the present issue, more extra layers are added in the last layers, which replace the architecture and weights from ResNet50. The ResNet50 design is depicted in figure 2.



(Figure 1) Flow chart diagram of proposed model



(Figure 2) ResNet50 architecture

3.2. Getting inventory

A database is created containing photos from H & M's inventory as well as some information. The inventory is then fed into neural networks, which categorize and construct embedding, with the output being utilized to provide recommendations. An example set of inventory data is shown in figure 3.

(Figure 3) Sample inventory data

3.3. Recommendation generation

The library Annoy, i.e., Approximate Nearest Neighbors Oh Yeah, from Spotify is used in our suggested strategy to create suggestions. This enables us to locate the closest neighbors based on the customer's history. The measure of similarity utilized in this study is the Cosine Similarity measure. The top 5 suggestions are pulled from the database and shown with their images.

4. Results and experiments

To address the limitations of the tiny Fashion dataset, the notion of transfer learning is employed. As a result, we used the Deep-Fashion dataset, which contains 289,222 garment photos, to pre-train the classification models. On the dataset used, the networks are trained and verified. As shown in table 1, the training results reveal that the model is quite accurate, with minimal error, loss, and an excellent F-score.

<Table 1> Performance of the proposed approach for different epochs

Epoch	Training loss	Validation loss	ACC	F-beta
0	0.0300	0.0293	0.96	0.349
1	0.0298	0.0284	0.97	0.373
2	0.0279	0.0274	0.98	0.400
3	0.0267	0.0271	0.98	0.405

Random clothing photographs from the internet and manually shot images in the actual world serve as the test set for evaluation. These photos, which are diverse in nature, are used to test the suggested system. We may conclude from the simulation of the experiment results that this strategy is resilient and successful, despite relying solely on consumer purchase history.

5. Conclusion

The research focused on providing a unique framework for fashion recommendation that is data-driven, aesthetically connected, and simple effective recommendation systems for producing fashion product pictures in this research. The suggested method consists of two stages. Initially, our suggested solution extracts picture features using a CNN classifier, for example, by enabling consumers to upload any random fashion image from any Ecommerce website and then creating comparable images to the uploaded image depending on the attributes and texture of the input image. Such research must continue in order to enhance suggestion accuracy and the entire experience of fashion discovery for both direct and indirect customers.

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