FASHION RECOMMENDATION SYSTEM

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INTRODUCTION

The fashion recommendation system is a little different from the other techniques; it shouldn't be primarily based on the preferences and prior behavior of the customer. When developing a fashion recommendation system model, numerous external aspects must also be considered, including festivals, climate, pandemics like COVID-19, and many more. Considerations for this model should also be made for aspects like public perception, the most recent fashion, and dress rules.

People are more drawn to the fashion that is more in trend because of the rising living standards. People feel drawn toward appealing things. Additionally, it has become more challenging for customers to identify their outfit because of the growing selection brought on by the growth of e-commerce websites. Therefore, I suggest utilizing CNN and Neural Network Embedding in this project because many clothing brands have a vast selection of apparel and accessories online. CNN is used to choose an inventory for making recommendations and to develop a database for the products in the catalog.

Dataset Used

The dataset that I will be using for this project is from the following website:

https://aimagelab.ing.unimore.it/imagelab2021/researchactivity.asp?idAttivita=18

Convolutional Neural Networks

We must first classify the images to suggest similar fashion images to an input image. Deep convolutional neural networks are used for this. High level representations of the image content are extracted using this method. The CNN "learns" how to extract features from the image's raw pixel data and decides what the item is. A pre-trained ResNet-50 model is employed for this project.

ResNet-50

The residual block structure is one of ResNet's defining features. This includes identity shortcut connections that, in essence, omit training for one or more layers. I downloaded weights that had been pretrained using the ImageNet dataset and imported

the ResNet-50 model into the Keras package (ImageNet is a large visual database designed for use in visual object recognition software research).

Here is a snapshot of the ResNet Python code:

```
im = Image.open(image_path)
width, height = im.size
# Pre-Trained Model
base_model = ResNet50(weights='imagenet',
                      include_top=False,
                      input_shape = (197, 197, 3))
base_model.trainable = False

# Add Layer Embedding
model = models.Sequential([
    base_model,
    GlobalMaxPooling2D()
])

model.summary()
```

```
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
resnet50 (Model)             (None, 7, 7, 2048)        23587712
_________________________________________________________________
global_max_pooling2d_1 (Glob (None, 2048)              0
=================================================================
Total params: 23,587,712
Trainable params: 0
Non-trainable params: 23,587,712
_________________________________________________________________
```

Neural Network Embedding

Low-dimensional, learnt continuous vector representations of discrete variables are known as neural network embeddings. Because they may make categorical variables less dimensional and accurately reflect categories in the converted space, neural network embeddings are helpful. Neural network embeddings serve three main objectives:

1. Finding the embedding space's nearest neighbors. Based on user interests or cluster categories, they can be utilized to provide suggestions.
2. A supervised task's input for a machine learning model.
3. For categorization and concept visualization.

The input fashion photographs can be reduced in dimension, and then vectorized. The distance between several photos can then be determined using cosine similarity. The closest images to an input image can be found once we have determined the separation between each image.

IMPLEMENTATION

Training the neural networks

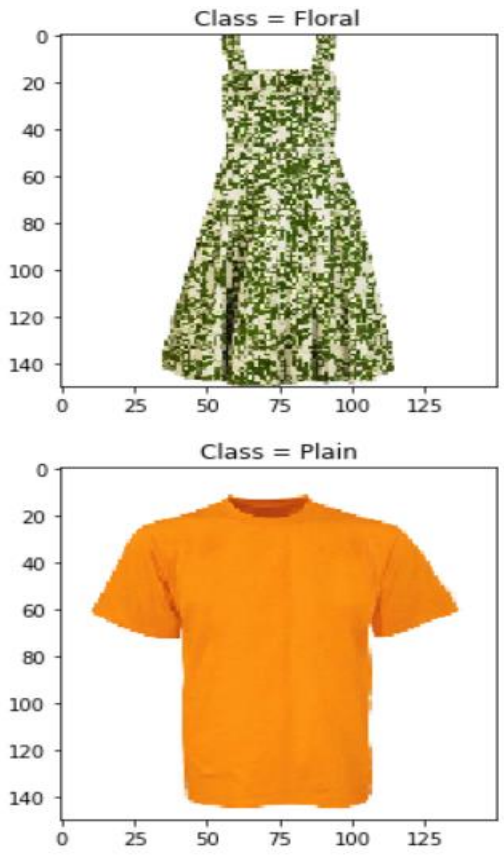
The neural networks are trained using transfer learning from ResNet50 after the data has been pre-processed. In order to fine-tune the network model to address the current issue, more layers are included in the final layers that replace the architecture and weights from ResNet50.

Approach

7500 images of apparel will be analyzed using an artificial intelligence model to extract information including categories such as pattern, fabric and style. Then employ a different model that will cluster photographs of clothing that are identical. Consequently, the recommendation algorithm will locate the most comparable images when a user selects a clothes image.

Getting the inventory

The images are from the Image Lab Fashion product Images Dataset. After the inventory has been classified and embeddings have been produced, the result is used to produce suggestions. An example set of inventory data is displayed in the figure.

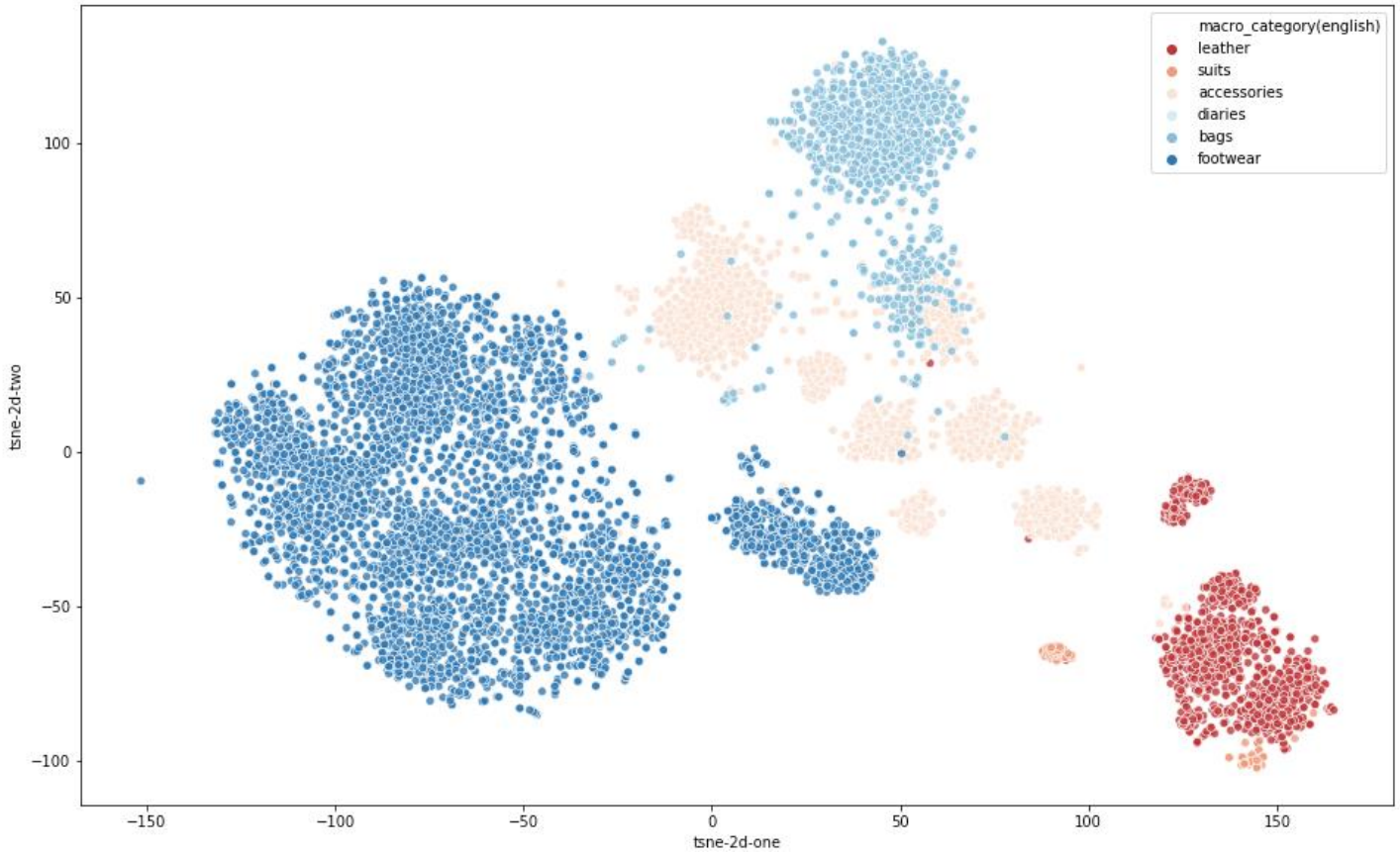


RECOMMENDATION GENERATION

Results

My suggested strategy is to use neural network embeddings to generate recommendations since it enables us to locate the closest neighbors in the embedding space, which may be used to generate suggestions based on user interests and cluster categories.

I pre-trained the classification model on the dataset, which consists of 60,000 garment photos, but I took 7500 fashion images, and then I embedded them down to 2 dimensions to plot them on the graph. This method is known as transfer learning. The basic justification for dimension reduction is that there is a lower dimensional vector representation that can still capture group variance. The embeddings should depict related images that are close to one another but in less dimensions so that we can see the entities. The model exhibits excellent accuracy during training, with minimal error, loss, and good f-score.



CONCLUSION

In this project, I have introduced an innovative framework for data-driven, visually connected, and straightforward effective recommendation algorithms for creating fashion product photos. A recommendation system is, to put it simply, an Artificial Intelligence algorithm that uses Big Data to offer more products to customers based on a range of factors. Recommendation systems can increase sales by increasing the number of products per order and improving the consumer experience. The suggested method employs a two-stage process. My suggested method begins by employing a CNN classifier to extract the image's attributes. For instance, I could let consumers upload any random fashion image from any e-commerce website, and then create images that are like the uploaded image depending on the features and texture of the input image.

References

1. Koehrsen, Will. “Neural Network Embeddings Explained.” *Medium*, 2 Oct. 2018, towardsdatascience.com/neural-network-embeddings-explained-4d028e6f0526.
2. Petit, Michel. “Introduction À La Section 3.” *ASp*, no. 15–18, OpenEdition, Dec. 1997. *Crossref*, https://doi.org/10.4000/asp.3014.