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Clothing image recognition based on deep learning.
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Abstract
With the rapid development of the information age, the proportion of image information in the field of clothing is increasing. In the field of clothing, body shape recognition, clothing style design, and sample design are mostly completed by clothing designers and clothing researchers. It is important to automate the clothing classification and inventory process. The project will develop a deep learning method to automatically identify and classify clothing with high accuracy, ultimately reducing human intervention.

Introduction
In 1943, psychologist Warren McCulloch and mathematical logician Walter Pitts proposed and proposed the concept of artificial neural networks and the mathematical model of artificial neurons in a paper entitled "Logical Calculus of Immediate Thought in Neural Activity," which ushered in an era of artificial neural network research. *[2]* ImageNet is one of the most influential competitions in the field of computer vision today. Its training and testing samples are taken from Internet images. The Alexnet model used in this project is an Alexnet network structure model proposed by the great god Alex on the image classification challenge on Imagenet and won the championship in 2012

METHOD

The first step is to identify the problem and determine the best classification algorithm to address the shortcomings of clothing image classification. [1] The second step is to collect data sets suitable for training deep learning networks. The third step is to divide the dataset into training sets, validation sets, and test sets in a certain proportion to ensure the best training parameters and results. The fourth step is to extract features using the AlexNet model. [3] AlexNet consists of five convolutional layers and three fully connected layers. During model training, new data will be appropriately added to prevent over fitting. The final step is to optimize the training model to achieve higher prediction accuracy.
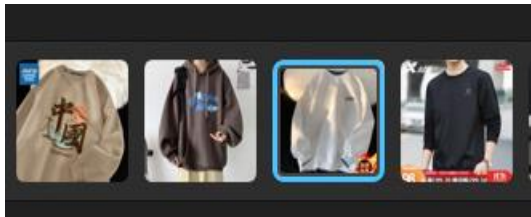
Dataset：

Figure 1: Dataset

Figure 2: image

Alexnet model diagram：

- Input : Image input
- Conv : Convolutional layer
- Conv
- Pool : Max-pooling layer
- Conv
- Pool
- FC : Full connectivity layer
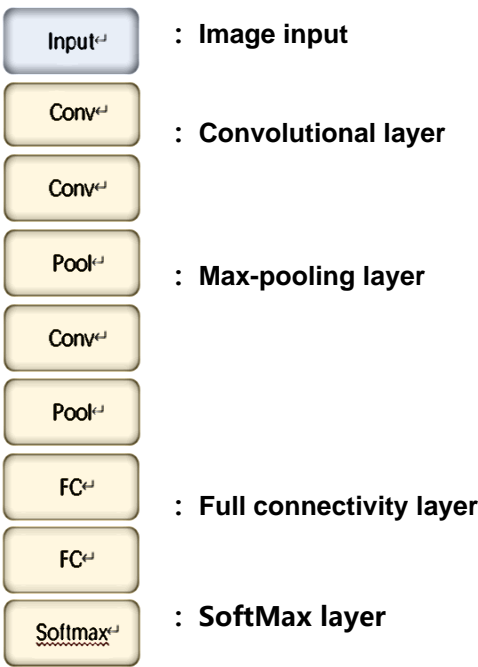- FC
- Softmax : SoftMax layer

Figure 3: Alexnet model
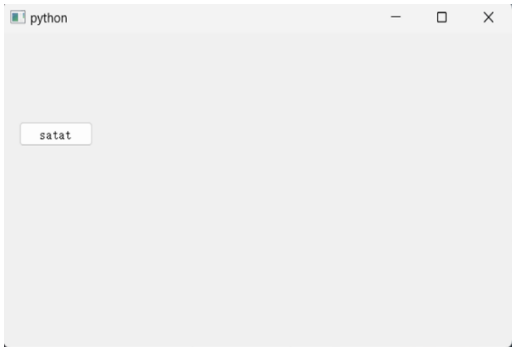
GUI for the model：

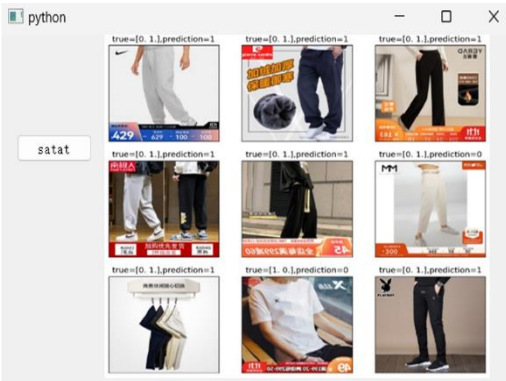Figure 4: Interactive interface

Figure 5: result

Use a softmax function (or logical function) to convert the real value predicted by the model into a probability that belongs to the first category．
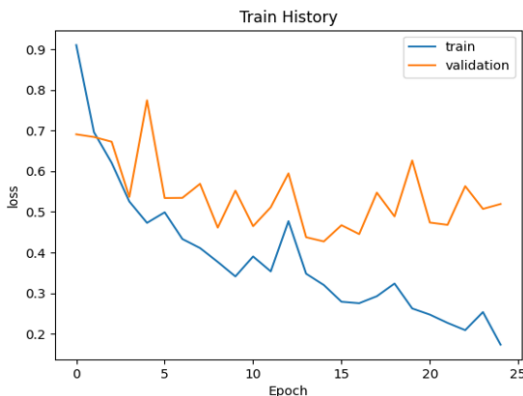
Fitting curve of training：

Figure 6: Loss curve.

$$H(t,y) = -\sum_{i=1}^{n} t_i \log y_i$$

Figure 7: Loss calculation formula.

"N is the number of categories, t is the real label, and the output of the model is y. The smaller the cross entropy, the closer the predicted result of the model is to the real result.".
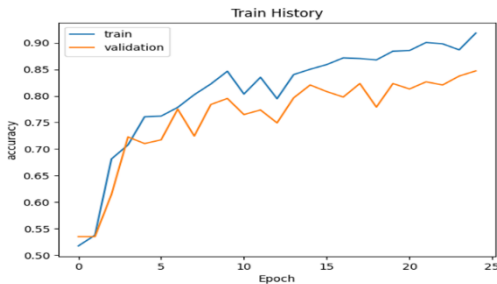

Figure 8: Accuracy curve.

The accuracy rate is calculated by dividing the number of correctly predicted samples by the total number of samples. In this training, the accuracy of the model reached 0.9688.

Conclusion
In this project, we successfully constructed the Alexnet model and completed the classification of clothes and pants based on in-depth learning. This project can also achieve the best training effect by continuously adjusting training parameters.

Reference
[1] Liu Yongmei, Hong Wenting, Tong Weiqing Application of image recognition technology in textile and clothing research [J] 2021(2019-4):19-24

[2] Xie Yongjie, Zhi Hening Overview of Research on Image Recognition Technology Based on Machine Vision [J] Scientific and Technological Innovation, 2018, (07): 74-75

[3]KOPACZKA M,HAM H,SIMONIS K,et al.Automated enhancement and detection ofstripe defects in large circular we-ft knitted fabrics[C].IEEE International Conference on Emerging Technologies & Factory Automation,2016