Ethan
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Convolutional neural network based technique for flower classification

Department of Computing Science, Oxford Brookes University
Supervised by Dr. Happy Nkanta Monday

Abstract

Image recognition is an important application in machine deep learning, which aims to make it easier for people to quickly recognize picture content through software. Among them, this project uses convolutional neural network to carry out deep learning of flower images. The convolutional neural network VGG16 is used to train and recognize images.

Introduction

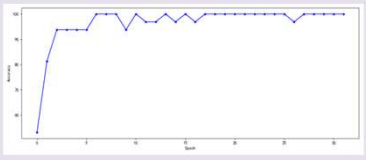
- The flowers are complex in appearance, and there are many varieties. So it's hard for the average person to easily identify a flower species outside.[1]
- According to current technology, the easiest way to identify a flower is to use [2] deep machine learning based on convolutional neural networks.
- Convolutional neural networks [3] have many advantages. Among them, high efficiency, high accuracy, automatic extraction of object features [4] and labor cost saving are the main advantages of convolutional neural networks.
- You can get a good model simply by training the model with large data sets.[5]

Methods

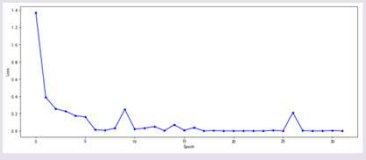
	Hardware	Software
configuration	GPU: NVIDIA GeForce RTX 3070 Ti Laptop GPU CPU: 12th Gen Intel(R) Core(TM) i7-12700H 2.70 GHz	IDE: PyCharm Community Edition 2022.2.4 Language: Python 3.8 Deep learning framework: Pytorch 1.7.1 torchvision 0.8.2

The first step of the project is to analyze the project, by analyzing the actual function of the project, as well as the audience. And make a general plan for the whole project. The second step is to collect the data set needed for model training later. The data sets will be divided into three categories, namely training sets, verification sets, and test sets. The third step is to use the VGG16 pre-training model to complete the project, and then use the collected training set to train the convolutional neural network model. Then test the data of the verification set to get the optimal value. The last step is to construct the project model completely by using the test set data and the optimal identification accuracy and optimize and adjust according to the actual requirements or situations.

Result

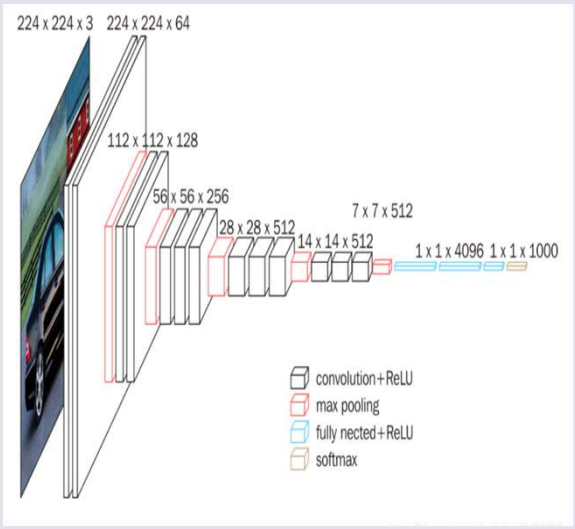


Accuracy



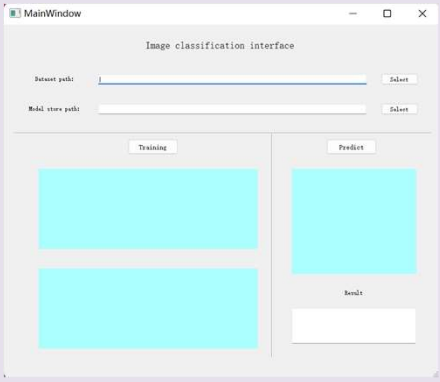
Loss

Model design



For VGG16 model. There are 13 convolutional layers and 5 pooling layers. The optimizer is the SGD stochastic gradient descent method. The Epoch is set to 32 and set the batch size value to 32. Since the project is modelled through the GPU, set the batch size to a power of two for better performance. For the learning rate, the project set a value of 1e-3, or 0.001.

GUI



Interface

Test Result

Reference

Hiary, H., Saadeh, H., Saadeh, M., & Yaqub, M. (2018). Flower classification using deep convolutional neural networks. *IET Computer Vision*, *12*(6), 855–862. https://doi.org/10.1049/iet-cvi.2017.0155

Le, T. L., Hai, V., Yagi, Y., Thanh, T., Nguyen, N., Le, V. T., Vu, H., & Pantuwong, N. (2016). *Flower species identification using deep convolutional neural networks Vietnam-Belgium project View project Entire shape acquisition View project Flower species identification using deep convolutional neural networks*. https://www.researchgate.net/publication/308322586