동물 이미지를 위한 향상된 딥러닝 학습

왕광싱*, 신성윤O, 신광성**, 이현창**
O*군산대학교 컴퓨터정보통신공학부
**원광대학교 디지털콘텐츠공학과
e-mail: s3397220@kunsan.ac.krO, {waver, hclglory}@wku.ac.kr**

An Improved Deep Learning Method for Animal Images

Guangxing Wang*, Seong-Yoon ShinO, Kwang-Weong-Shin**, Hyun-Chang Lee**
OSchool of Com. Inf. & Comm. Eng., Kunsan National University
**Dept. of Digital Contents Eng., Wonkwang University

● 요 약 ●

This paper proposes an improved deep learning method based on small data sets for animal image classification. Firstly, we use a CNN to build a training model for small data sets, and use data augmentation to expand the data samples of the training set. Secondly, using the pre-trained network on large-scale datasets, such as VGG16, the bottleneck features in the small dataset are extracted and to be stored in two NumPy files as new training datasets and test datasets. Finally, training a fully connected network with the new datasets. In this paper, we use Kaggle famous Dogs vs Cats dataset as the experimental dataset, which is a two-category classification dataset.

키워드: Improved deep learning, cNN, animal images

I. Introduction

In recent years, convolutional neural networks (CNNs) technology based on deep learning method [1] has made remarkable achievements in the field of computer vision, mainly applied to face recognition, image classification, natural language processing and so on [2-5]. However, CNNs require sufficient data samples for training to improve prediction accuracy.

II. Related Work

In order to achieve better generalization capabilities, the deep learning model relies in particular on the availability of a large amount of training data. Therefore, since deep learning has become popular in computer vision, a large number of well-marked image datasets have been introduced. However, for small datasets, the sample data used to train the network is limited, and the prediction results are not accurate and over-fitting due to too small data volume. Therefore, data augmentation, regularization, and the Dropout methods are often used to suppress over-fitting of prediction results.1. CART model

III. Proposed Method

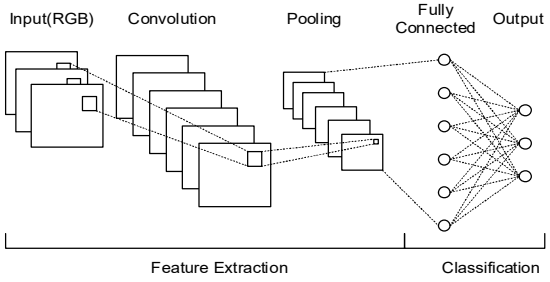

Fig. 1. Convolutional block structure of a CNN (CNN consists of five parts, feature extraction and classification are performed during model training)

The VGG16 model is a CNN model with five convolutional blocks and a fully connected layer, as shown in Fig. 2.

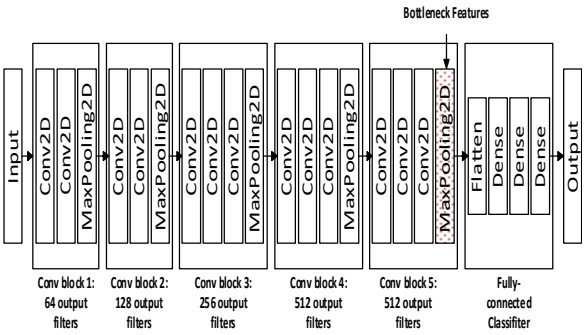

Fig. 2. VGG16 CNN structure diagram

Data augmentation is a method that can effectively suppress overfitting. The method can generate new samples with original image data features by performing operations such as rotation, scaling, shifting, mirroring, etc. within a certain range of values of the original image. Thereby achieving the purpose of increasing the number of data samples in the training set.

IV. Experiments

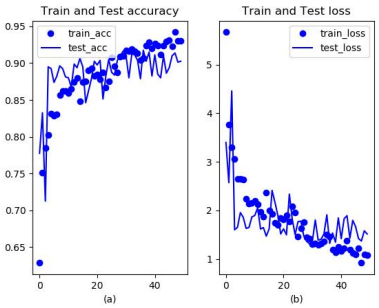

Fig. 3. Improved CNN experiment results:
(a) accuracy statistics for training and prediction,
(b) loss rate statistics for training and testing.

V. Conclusions

This paper presented an improved deep learning method based on small datasets for animal image classification. A two-category experiment was performed in the Kaggle Dogs vs Cats dataset. The Kaggle Dogs vs Cats dataset consists of 25,000 training sets for pictures of dogs and cats with labels, and a 12500 test set for pictures of dogs and cats without labels.

REFERENCES

[1] J. Lemley, S. Bazrafkan, and P. Corcoran, “Deep learning for consumer devices and services: Pushing the limits for machine learning, artificial intelligence, and computer vision,” IEEE Consumer Electronics Magazine, vol. 6, no. 2, pp. 48-56, 2017.

[2] Alex Krizhevsky,Ilya Sutskever,Geoffrey E. Hinton, “ImageNet Classification with Deep Convolutional Neural Networks,” Advances in Neural Information Processing Systems 25, (NIPS 2012), pp.1-9, 2012.

[3] Karen Simonyan, Andrew Zisserman. “Very Deep Convolutional Networks for Large-Scale Image Recognition,” Computer Science, pp. 1-14, 2014.

[4] Christian Szegedy, Wei Liu, Yangqing Jia, Pierre Sermanet, Scott Reed, Dragomir Anguelov, Dumitru Erhan, Vincent Vanhoucke, Andrew Rabinovich, “Going Deeper With Convolutions,” The IEEE Conference on Computer Vision and Pattern Recognition, pp. 1-9, 2015.

[5] Kaiming He, Xiangyu Zhang, Shaoqing Ren, Jian Sun, “Deep Residual Learning for Image Recognition,” The IEEE Conference on Computer Vision and Pattern Recognition (CVPR), pp. 770-778, 2016.