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ELG7186 Learning-based Computer Vision
“Optimal Transportation Selection based on CNN”

Architecture Selection and Literature Review

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Problem Definition

Transportations have many types, such as car, bus, train, etc. So, it's essential to classify the image and detect the type of the transportation to make it easy to decide the best transportation to use.

Literature Review

Implementation of CNN for Plant Leaf Classification [1]

Problem Definition

Image classification of medicinal plants using convolutional neural network.

Introduction and claims

The authors in this study aimed to detect medicinal plants by building a classification model for medical experts or even normal people which can be used through mobile phone cameras. this study implemented an image classification with a deep learning model for planet leaves which people can use to determine the different types of medicinal plants. The study has focused on 5 types of medical plants to be recognized.

Method

The authors have used CNN architecture. In the training process, three layers were used: The convolutional layer, the Pooling layer and the Fully connected layer. In the convolutional layer, all data features are reduced to get the most important features in every layer. The convolutional layer complexity was then optimized through three parameters depth, stride and zero padding. In the pooling layer, they used average pooling and max pooling with 2x2 size and stride equal to 2. In the fully connected layer, they added several hidden layers like the activation function, loss function and an output layer. Finally, dropout was used to prevent overfitting.

Results

The data has been tested on 500 images "100 for every class". The training and validation stages were used through 28x28 pixel images with 5 and 7 layers. That resulted an accuracy of 86%, F1-score of 23%, precision of 22% and recall of 24%. They have found that the accuracy increases with adding more hidden layers.

A simple and effective method for image classification [2]

Problem

Image classification of handwriting using deep neural networks and pre-trained models.

Introduction

CNN is a feed forward neural network that consists of convolutional layers, pooling layers and full connecting layers. The deep neural networks (DNNs) specifically the trained model LetNet-5 recognized the hand-written well, moreover the AlexNet model has a deeper and wider architecture than LetNet-5 architecture. There are many applications of models, such as VGGNet, which is more complex than AlexNet, Network In Network (NIN) which is based on the multilayer perceptron model, Google Inception Net, which contains 22 layers deep network, and ResNet model which contains 152 layers.

Methodology:

The authors used a complicated convolutional neural network (CNN) for image classification problem, the model consists of two combined models, CNN model and the ELM model. The CNN model used for feature extraction and the ELM model used to classify the images with the softmax activation function. The CNN model

consists of 2 convolutional layers, the first has 6 nodes, and the second has 12 nodes. The ELM model assigned the parameters randomly. This model is efficient in small and medium sized images.

Results

This experiment applied on cifar-10 dataset, used 50000 images for training and 10000 images for testing and compared with another 4 datasets, using MATLAB, the accuracy increased and the running time decreased, this way is efficient in image classification and easy to implement.

Image Classification using Convolutional Neural Networks [3]

Problem

Image classification using convolutional neural network.

Introduction and claims

The authors defined image classification as a task of extracting information from images and claimed that it could be achieved by labeling the pixels of the images in different classes, nevertheless, CNNs do not require the features to be hand-engineered. It was mentioned that many research works have been done to give the computer the same capability as humans for understanding features from images, but they focused only on the low-level feature of the images.

methods

The MNIST dataset was used which consists of 28x28 gray-scaled images, the first layer in their system architecture comprised 32 filters each of size 3x3 to be applied on the images and produce 32 feature maps of size 26x26, in the second layer they applied 64 filters each filter of size 3x3 and produce 64 feature maps of size 24x24. The third layer is a Max pooling layer which was used to down sample the images to 12x12 by using a 2x2 subsampling window. in layer 4 they built a fully connected layer with 128 neurons and a sigmoid function. RELU activation function was used with 128 Batch size and 5 epochs for training.

Results

As a result of their work, they have reached 98.42% in terms of Accuracy.

Future work

They considered classifying the colored images as future work.

Solution

Use the Deep convolutional neural networks to classify the images of 10 different transportations, every class have 50 images with size of 64 * 64, every class has been split into 30 images for training, 10 images for testing and 10 images for validation.

The CNN baseline model architecture consists of 5 layers, the first layer is the input layer, then the convolutional layer with number of 64 neurons, the third and fourth convolutional layer with 128 neurons, then the flatten layer to feed the results into a DNN, finally, the output layer with softmax activation function with data augmentation to be applied. The RelU activation function will be used for the previous layers, the MaxPooling layer will be added. Some additional models are to be used if performance improvement is needed. The accuracy score and loss will be used for evaluating the model.

References

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