CIFAR-100: Object Recognition

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OBJECTIVE

To create a Convolutional Neural Network model which will correctly recognize and classify colored images of objects into one of the 100 available classes

CURRENT STATE-OF-ART

Method: EfficientNet-B7
Name of Paper: EfficientNet: Rethinking Model Scaling for Convolutional Neural Networks (2019)
Link: https://arxiv.org/pdf/1905.11946v3.pdf
About: The research revolves around understanding the reasons that are preventing ConvNet from achieving better accuracy and efficiency. The researchers studied ConvNet scaling and identified that careful balancing of network width, depth and resolution is an important part of achieving better accuracy but is missing in ConvNet. In order to address this issue, a simple and highly effective compound scaling method has been proposed which enables easy scaling up of a baseline ConvNet to any target resource constraints. The effectiveness of this method has been demonstrated in the scaling up of MobileNet and ResNet and then a new baseline network called EffectiveNet has been designed which provided accuracy better than ConvNet.

APPROACH

I will be building a Convolutional Neural Network for object recognition as it works well in extracting important features and providing good accuracy. To achieve this task, I will be using the TensorFlow library.

Initial Steps:

After the initial research, I worked on exploring the different files and components of the CIFAR-100 dataset. This helped me understand that in order to build a Convolutional Neural Network, I need to transform my images into a new shape. My next step involved visualizing random images with their labels (class and superclass) to understand how the data actually looks like.

Future Steps:

CIFAR-100 has a limited number of images, 600 per superclass, so in order to make better predictions, I am planning to perform image augmentation to artificially expand the size of the training dataset. My other plans involve the use of the max-pooling technique to downsample the input images, the Exponential Linear Unit as the activation function for the hidden layers, and the Softmax activation function for the output layer. In order to prevent overfitting, I am planning to use the dropout technique.

DATASET

Name: CIFAR-100
About: CIFAR-100 consists of 32 × 32 pixel images (50000 training and 10000 testing) in 100 classes (20 superclasses and 5 classes in each superclass) collected by Alex Krizhevsky, Vinod Nair, and Geoffrey Hinton.
Source: https://www.cs.toronto.edu/~kriz/cifar.html
Version: CIFAR-100 Python Version

PROGRESS TIMELINE

Task	**Plan to accomplish by**
Researching and understanding the dataset	June 12, 2020
Exploring the dataset by performing initial pre-processing	June 15, 2020
Understanding Convolutional Neural Network and Tensor Flow	July 5, 2020
Pre-processing of the dataset	July 10, 2020
Building initial Convolutional Neural Network	July 14, 2020
Improving the network to get better accuracy and predictions	July 23, 2020
Finalizing the model	July 26, 2020
Testing the model by providing my own set of images*	July 30, 2020
Deliverables	August 12, 2020

DELIVERABLES

1. Final model with code, result, design (images and graphs) which can predict the class and superclass of any new image provided the user*
2. Project paper
3. Project presentation

CONCERN AND FALLBACK: Building a Convolutional Neural Network on a large dataset is a challenge and CIFAR-100 is a wide dataset with 100 classes, so if the hardware platform at my disposal turns out to be a roadblock then I have plans of using CIFAR-10 in place of CIFAR-100.

*Exploring the option to test my model by providing my own set of images (belonging to one of the given class).