SPRINTS PROJECT REPORT

This report was made to deliver the aspects of our project.

CONTENT OF THE REPORT

ABOUT OUR PROJECT

This project was originally made to analyze the data, use data augmentation if needed, and build suitable deep learning models that can recognize 6 categories of natural images.

DATA DESCRIPTION

The dataset provided contains natural images of size 150x150 for 6 categories (buildings, forest, glacier, mountain, sea, and street). The training set contains 6 folders, around 2300 for each category. The testing set contains 3050 images. The goal is to build a model that can recognize the category of each image in the testing set.

We used the training set to split it into train and validation data to train our model and we used the testing set to do the final predictions which was added to the final submission excel sheet.

CODE IN STEPS

1 Import Libraries

2 Get the train and test data

3 Define the image sizes and number of batches

4 Assign each image to its label in the training set

5 Put images and labels in an array

6 Plot some figures from the images array

7 Define the model

8 Optimize the model

9 Fit the model

10 Read the empty submit file

11 Add the images in the test set in a list directory

12 Apply the model on the test data to get predictions

13 Get the image IDs from the array

14 Call the locations of the Names and Labels

15 Append each of the image ID and Prediction to the Submit file

16 Save the submit file as an output csv file

ResNet-50

It is a convolutional neural network that is 50 layers deep. ResNet, short for Residual Networks is a classic neural network used as a backbone for many computer vision tasks. The fundamental breakthrough with ResNet was it allowed us to train extremely deep neural networks with 150+layers.

Sequential

Keras Sequential is a linear stack of layers. It is a way of creating deep learning models where an instance of the Sequential class is created and model layers are created and added to it. The Sequential model is great for developing deep learning models in most situations, but it also has some limitations.

VGG16

VGG-16 is a convolutional neural network that is 16 layers deep. You can load a pretrained version of the network trained on more than a million images from the ImageNet database . The pretrained network can classify images into 1000 object categories

VGG19

VGG-19 is an improvement of the model VGG-16. It is a convolution neural network model with 19 layers. It is built by stacking convolutions together but the model's depth is limited because of an issue called diminishing gradient. This issue makes deep convolution networks difficult to train.

MODELS EXPLANATION

ResNet-50

We achieved 91.99% accuracy on predictions using the pre-trained ResNet-50 Model.
We enhanced its performance by adding layers and using 'adam' optimizer with a learning rate of 0.0001.

VGG19

The second highest achieved accuracy on predictions using the pre-trained VGG19 Model was 91% .
We enhanced its performance by activating the layers with 'relu' and 'softmax', increasing the number of ephocs, and also by setting the learning rate to 0.0001 .

Sequential

The third highest achieved accuracy on predictions using the pre-trained keras Sequential Model was 77.7% .
We enhanced its performance by activating the layers with 'relu', increasing the number of epochs, and also by adding layers like Conv2D, MaxPooling2D, Dense, and dropout layer to avoid overfitting .

VGG16

The pre-trained VGG16 model achieved the lowest accuracy although its training (up to 99%) and validation (up to 91%) accuracies were very high , the prediction was 22.2% .

THE PROBLEMS

Data Loading Problem

We faced a problem at the beginning of our work which was loading data correctly. We were using keras built in functions to load the data which was not suitable with our labelled dataset. After a lot of research, we reached to a suitable idea for loading them which helped us define our own function. Which resulted in a drastic change in the accuracy of our prediction (From 16% to 77%) in Sequential model. Then, we used this method in the rest of models which helped us get an accuracy of 91.99% using ResNet-50 model.

Prediction function in PyTorch

We had a problem in creating a prediction function in PyTorch so, we used TensorFlow and Keras instead.

SUMMARY

According to our work, we found out that ResNet-50 and VGG19 were the best models to use and with more optimization, they will achieve better results.
For the VGG16 model, the results were not satisfying.
For the Keras Sequential model, its results was medium well as it was expected because it is a basic model.

OUR TEAM

Mohab Yousry

Worked on:

1) Models
  - ResNet-50
  - Sequential
  - VGG19
  - VGG16
  - Inception
2) Report

Mennatullah Magdy

Worked on:

1) Models
  - Sequential
  - VGG19
  - VGG16
  - Inception
  - EfficientNet
  - AlexNet
2) Report

Rana Elkobrosy

Worked on:

Models
  - Sequential
  - DenseNet

Sarah Hisham

Worked on:

1) Models
  - Sequential
2) Report

Hazem Hesham

Worked on:

Models
  - AlexNet
  - GoogleNet

Team 15

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RESOURCES

Multiclass Image Classification with CNN
https://www.kaggle.com/code/andls555/multiclass-image-classification-with-cnn

Convolutional Neural Network (CNN)
https://www.tensorflow.org/tutorials/images/cnn

VGG Very Deep Convolutional Networks (VGGNet)
https://viso.ai/deep-learning/vgg-very-deep-convolutional-networks/

Top 4 Pre-Trained Models for Image Classification
https://www.analyticsvidhya.com/blog/2020/08/top-4-pre-trained-models-for-image-classification-with-python-code/

How to use a pre-trained model (VGG) for image classification
https://towardsdatascience.com/how-to-use-a-pre-trained-model-vgg-for-image-classification-8dd7c4a4a517

Reduce Memory Usage
https://www.kaggle.com/code/rinnqd/reduce-memory-usage/notebook

Image Classification using CNN from Scratch in Pytorch
https://youtu.be/9OHlgDjaE2I

How to load Dataset in Google Colab
https://youtu.be/r8_O7O8kgJY

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RESOURCES

Implementing AlexNet With Keras
https://analyticsindiamag.com/hands-on-guide-to-implementing-alexnet-with-keras-for-multi-class-image-classification/

The Idea Loading the Data
https://www.kaggle.com/code/msripooja/dog-images-classification-using-keras-alexnet/notebook

Transfer Learning Using Keras(ResNet-50)
https://www.youtube.com/watch?v=JcU72smpLJk&feature=youtu.be

Transfer Learning With Keras Resnet-50
Transfer Learning With Keras(Resnet-50) (chroniclesofai.com)