Assignment No. 7

TITLE:
Case Study on recent Deep Learning Applications

PROBLEM STATEMENT:

- Develop a deep learning model to classify images from a diverse dataset into pre-defined categories.
- The model should be able to classify each image into one of several pre-defined categories with a high degree of accuracy.
- The performance of the model should be evaluated using standard metrics, such as accuracy and loss, and the model should be fine-tuned if necessary to improve its performance.
- Finally, the model should be used to predict the class of new images and the results should be compared to the actual class to measure the model's accuracy.

OBJECTIVE:

The goal of the case study is to provide hands-on experience in applying deep learning techniques to real-world problems and to demonstrate the effectiveness of these techniques in image classification tasks. By the end of the case study, participants should have a solid understanding of deep learning concepts, as well as the practical skills required to build, train, and evaluate deep learning models.

THEORY:
Deep learning is a branch of machine learning which is completely based on artificial neural networks, as neural network is going to mimic the human brain so deep learning is also a kind of mimic of human brain. In deep learning, we don't need to explicitly program everything. The concept of deep learning is not new. It has been around for a couple of years now. It's on hype nowadays because earlier we did not have that much processing power and a lot of data. As in the last 20 years, the processing power increases exponentially, deep learning and machine learning came in the picture.

Dataset:

The dataset for this case study is a collection of images from various sources, such as social media and stock photography websites. The images cover a wide range of topics, including animals, landscapes, people, and objects. The dataset contains approximately 10,000 images and is available in a compressed format on the lab server.

Tools:

For this case study, you will be using the following tools:

Python 3.x

TensorFlow 2.x

Keras

NumPy

Matplotlib

Lab Steps:

Data preprocessing:

The first step is to preprocess the data. This involves reading in the images, resizing them to a consistent size, and normalizing their pixel values. You will also need to split the data into training and validation sets.

Building the model:

Next, you will build a deep learning model using Keras. The model should consist of several convolutional layers followed by max-pooling layers, and finally, a few fully connected layers. You will also need to choose an appropriate activation function and loss function.

Training the model:

Once the model is built, you will train it on the training data. This involves specifying the number of epochs and the batch size. You will also need to choose an appropriate optimizer and learning rate.

Evaluating the model:

After the model is trained, you will evaluate its performance on the validation data. You will calculate the accuracy and loss of the model and generate a confusion matrix.

Fine-tuning the model:

If the model's performance is not satisfactory, you will need to fine-tune the model. This involves tweaking the hyperparameters of the model and retraining it on the training data.

Prediction:

Finally, you will use the trained model to predict the class of new images. You will load a few test images and preprocess them in the same way as the training data. You will then pass

these images through the trained model and display the predicted class along with the actual class.

PLATFORM REQUIRED:

Operating System: Windows

Software or Tools: GOOGLE Collab

Conclusion:

In this case study, you have learned how to apply deep learning techniques to real-world problems. You have learned how to preprocess data, build and train deep learning models, evaluate their performance, fine-tune them, and use them to make predictions. You can now apply these techniques to your own projects and continue to explore the exciting field of deep learning.