MACHINE LEARNING PROJECT PROPOSAL

DEEP NEURAL NETWORKS - CIFAR-10 CLASSIFICATION

Team Members:

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Problem Statement:

The aim of this study is to develop a deep neural network architecture for the purpose of picture classification using the CIFAR-10 datasets, a well acknowledged benchmark in the field of computer vision. The dataset consists of 60,000 color photos with dimensions of 32x32, which are split across 10 distinct classes. Each class is comprised of 6,000 images. The purpose is to properly identify each picture into one of the 10 predefined types, including aircraft, vehicle, bird, cat, deer, dog, frog, horse, ship, or truck.

The training of the deep neural network model will be conducted using the selected training set, followed by validation on a distinct validation set, and finally, assessment on the test set. The main goal is to get a high level of accuracy while also maintaining the model's capacity to efficiently generalize to novel, unseen data. Essential considerations comprise of building a CNN model to perform image classification using Keras, optimize network weights using ADAM optimizer, perform network regularization techniques such as dropouts, evaluate the model and present results using resnet50, confusion matrix and classification reports, perform image augmentation to enhance network generalization capability, save and retrieve train network weights.

What has been done?

There is ongoing research in the field of deep neural to investigate CIFAR-10 classification, advance designs, optimizations, and regularizations. Accuracy has been enhanced by pioneering studies like as AlexNet, VGGNet and DenseNet. Effective model fine-tuning has been achieved via the use of hyper-parameter optimization techniques like grid search and Bayesian optimization. By combining these efforts, deep neural networks' performance and generalization for CIFAR-10 classification are improved, expanding the possibilities for computer vision applications.

Proposed System:

- To create a test harness in order to provide a solid model assessment and set a performance baseline for a classification task.
- To investigate adding features to the baseline model in order to enhance learning and model capability.
- Presenting a completed model, assessing its effectiveness, then using it to forecast new pictures.
- Implementing various machine learning and deep learning techniques to improve the total output efficiency.

- **Milestones (Preliminary Plan)**
  - Importing the libraries and datasets.
  - Visualizing the data.
  - Data preparation.
  - Training the model.
  - Evaluating the model.
  - Improving the model with data augmentation.
  - Model training using the augmented datasets.
- **Algorithms used**
  - Convolution Neural Network.
  - Data augmentation techniques.
  - Regularization techniques such as Dropout.
  - Optimization techniques such as ADAM.
  - Batch normalization.

Datasets:

https://www.kaggle.com/datasets/ibrahimalobaid/the-cifar-10-dataset

References:

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