Bonus Assignment: Image Classification with CNNs

Objective:

* Implement an image classification model using Convolutional Neural Networks (CNNs) on a dataset of your choice. The goal is to build a CNN model that can accurately classify images into different categories.

Requirements:

Dataset:

* Select an image classification dataset suitable for CNNs, such as CIFAR-10, CIFAR-100, or a custom dataset related to a specific domain of interest.

Tools and Libraries:

* Use a deep learning framework like PyTorch .
* Leverage pre-trained CNN architectures from Hugging Face's Transformers library, such as ResNet, VGG, or EfficientNet.

Tasks:

a. Data Preparation:

* Load and preprocess the image classification dataset.
* Implement data augmentation techniques to increase the diversity of the training set.

b. Model Building:

* Choose a pre-trained CNN architecture suitable for image classification.
* Fine-tune the chosen model on the selected dataset.

c. Training and Evaluation:

* Train the model on the training set.
* Evaluate the model on the testing set using accuracy, precision, and recall metrics.

d. Inference:

* Implement a function to make predictions on new images using the trained CNN model.

e. Analysis:

* Analyze and discuss the model's performance.
* Visualize the learned features using techniques such as activation maximization.
* Explore the impact of different hyperparameters on the model's accuracy.

Report:

* Submit a Jupyter notebook/project containing the code, model architecture, training, evaluation, and report.
* The report should include insights into the challenges faced during the project and potential areas for improvement.

Grading:

The assignment will be graded based on:

* Correct implementation of data preparation, model building, training, and evaluation.
* Quality of the model's performance analysis.
* Clarity and completeness of the code and comments.
* Depth of analysis and reflection in the report.