Project: Deep Learning for Image Classification

Description:

For your final project in the Deep Learning course, you will have the opportunity to apply deep learning techniques to a challenging image classification task. This project will allow you to demonstrate your understanding of deep neural networks, convolutional neural networks (CNNs), and transfer learning for image classification.

Project Tasks:

1. Dataset Selection:

- Select an image dataset suitable for multi-class classification. It can be a publicly available dataset or a custom dataset related to a specific domain of interest.
- Ensure the dataset is sufficiently large and diverse to provide a challenging problem for classification.

2. Data Preprocessing:

- Perform necessary data preprocessing steps on the image dataset.
- Apply techniques such as resizing, normalization, and augmentation to enhance the quality and diversity of the training data.
- Split the dataset into training and testing sets.

3. Building a CNN Model:

- Design and implement a convolutional neural network (CNN) architecture for image classification.
- Experiment with different network architectures, varying the number of layers, filter sizes, and activation functions.
- Utilize techniques such as batch normalization and dropout for regularization.

4. Transfer Learning:

- Explore transfer learning by utilizing pre-trained CNN models such as VGG16, ResNet, or Inception.
- Fine-tune the pre-trained models on your image dataset and evaluate their performance.
- Compare the results with the performance of your custom-built CNN model.

5. Model Evaluation:

- Train and evaluate your CNN model(s) on the testing dataset.
- Utilize appropriate evaluation metrics such as accuracy, precision, recall, and F1 score.
- Analyze and interpret the results to gain insights into the model's performance.

6. Project Report and Presentation:

- Prepare a project report documenting your work, including the dataset description, data preprocessing steps, CNN architecture, transfer learning approach, evaluation results, and analysis of the findings.
- Create a presentation to showcase your project outcomes, methodologies, and key insights.
- Discuss any challenges encountered during the project and potential areas for further improvement.

Your project will be evaluated based on the clarity and organization of your report and presentation, the quality of your code, the effectiveness of your CNN model(s), and your ability to explain the rationale behind your decisions.

This project allows you to explore deep learning techniques for image classification and apply them to a real-world problem. It provides an opportunity to demonstrate your understanding of CNN architectures, transfer learning, and model evaluation. Enjoy the process of training powerful models and unraveling insights from image data!

Best of luck with your Deep Learning project!

Hand-in:

One well-commented notebook (.ipynb-file) with all the relevant steps included. It should include markdown, describing the steps and choices, all the code, as well as the names of any team member(s). 1-2 team members per notebook!