Group: **Neural fusion**

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Brief Overview: In this reflective report, we will delve into my experience of

* Implementing a CNN using PyTorch
* Building a Convolutional Neural Network
* Comparing Residual Layers in Deep Neural Networks

This was done across three lab sessions. The primary objective was to gain practical insights into building and training CNN models for image classification tasks. Were we focused on comparing the performance of residual layers in deep neural networks for image classification tasks using the Fashion-MNIST dataset. It highlights our learning experience, results, and discussion on the effectiveness of residual layers in improving model performance. Also, developing and enhancing a Convolutional Neural Network (CNN).

The objective is to deepen my understanding of CNN architectures, optimize model performance, and effectively understanding the (process and outcomes) I/O in deep leaning as it relates to computer vision.

Activity Overview:

The lab comprised several key activities:

* Introduction of a real-world example: Exploring the Materials in Context Database (MINC) from Cornell University, providing a dataset of real-world material images.
* Loading the dataset: Utilizing the MINC-2500 dataset, consisting of images from various classes such as Brick, Carpet, Food, Mirror, Sky, and Water.
* Designing the model architecture: Constructing a CNN architecture using PyTorch, including convolutional layers, max-pooling layers, and fully connected layers.
* Defining the loss function, optimizer, and evaluation metric: Specifying CrossEntropyLoss as the loss function and utilizing the Stochastic Gradient Descent (SGD) optimizer.
* Training the model: Iteratively training the CNN model for multiple epochs while monitoring training and validation metrics such as loss and accuracy.
* Evaluating the model: Assessing the performance of the trained model on the test dataset to compute its accuracy.

Challenges Faced:

Throughout the lab, challenges were encountered, including:

* Understanding the concept of convolutional neural networks and their architectural components.
* Debugging errors related to tensor shapes during model training and evaluation, particularly with large datasets.
* Optimizing hyperparameters such as learning rate and batch size for efficient model training and convergence.

Interconnection and Progression:

In Lab 1, we are introduced to fundamental concepts in working with image data within deep learning frameworks, fostering engagement through its structured approach and interactive elements. Building on this foundation, Lab 2 delves into the development and optimization of Convolutional Neural Networks (CNNs), emphasizing the significance of understanding CNN architectures for effective image classification. Lab 3 we were exposed to PyTorch's built-in CNN architectures, tailored models and evaluate their performance in diverse real-world scenarios. Lastly, Lab 4 sheds light on the pivotal role of residual layers in enhancing deep neural network performance, particularly in image classification tasks, underscoring the importance of advanced techniques for optimizing model accuracy and efficiency.

Key Learnings:

The experience yielded valuable insights:

* Practical implementation of CNNs using PyTorch deepened understanding of neural network architectures and their applications in image processing tasks.
* Hands-on experience with data preprocessing techniques enhanced proficiency in preparing datasets for model training.
* Experimentation with different model architectures and hyperparameters emphasized the importance of model selection and optimization for performance improvement.

Conclusion:

In conclusion, the labs provided invaluable insights into implementing CNNs using PyTorch and the effectiveness of residual layers in deep neural networks.

The experience not only exposed us but also underscored the importance of collaborative learning and the need for further exploration in advanced neural network architectures. Moving forward I need to improve my understanding of deep learning and computer vision.