L02 Exploring Deep Learning Tools A No-Code Introduction to TensorFlow and Keras

This lab gave me hands-on experience with deep learning using the pre-trained VGG16 model. The introduction provided good insight into what was to be covered in the lab: an explanation of how deep learning models work and how they apply to image classification. The VGG16 model, which is one of the most famous architectures trained on the ImageNet dataset, was used in this session for classifying images based on features it had learned. This hands-on experience helped me solidify my understanding of pre-trained models and their capabilities. First, I loaded the VGG16 model and took some time to study the architecture. Through interaction with the pre-loaded code cell, I was able to observe the structure of the model-very complex indeed-with multiple convolutional layers and fully connected layers. That again drove it home for me: in deep learning, it's all about feature extraction, as every layer helps classify an image. Understanding the architecture helped me more to appreciate the complexity and efficiency of these models in recognizing objects.

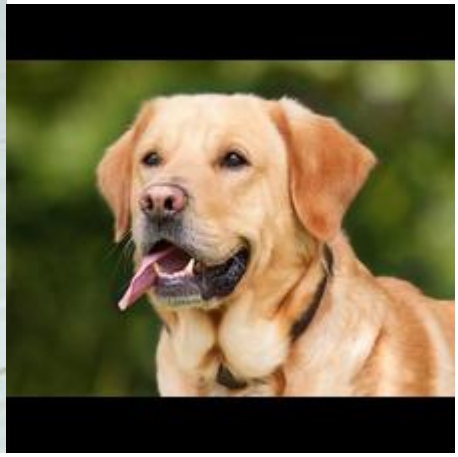
I started by working on data loading and preprocessing. From the read-only code cell, I realized the preparation of images before feeding into the model was very important. Pre-processing of images needed a resize to match the input dimension needed for VGG16 and normalizing the pixel values to be constant. In deep learning, pre-processing is an essential step; if not done right, it may lead to wrong predictions or poor performance of the model.

The most interactive part of the lab was to make some predictions using the VGG16 model.

I have uploaded three images: one of a cat, one of a dog, and one of a deer, and have seen how the model has classified each. The results were quite interesting: the first image, a cat, was misclassified; it had a maximum probability for 'hamper' at 16.16%, followed closely by 'carton' at 15.81% and 'tub' at 5.90%. This reflected its limitation in performing on objects that are not from its major training categories. The second picture was of a dog and was more accurately classified. The top prediction was 'Labrador Retriever' with 42.55%, then 'Golden Retriever' at 27.97%, and finally 'Chesapeake Bay Retriever' with 6.79%. This result showed how VGG16 could get very specific into classifying common dog breeds. The final image was a deer, and it came back classified as a 'gazelle' at 44.69%, secondary 'impala' at 16.38%, and tertiary of 'Mexican hairless' at 9.49%. Fairly close, since a gazelle and impala do bear a resemblance to a deer. Further, this experiment showed me how deep learning models can be sensitive even to minor variations in the test data. It also emphasized again how important data augmentation at training is with regard to the robustness of models and the ability to generalize. The last part of the lab became indeed a time for reflection of insight. It showed how well pre-trained models-

like VGG16-do not achieve perfect performance in image classification but decent. Misclassifications do happen, particularly when models see objects from outside the training distribution or when input images undergo distortion. Another critical insight that this lab emphasized was related to preprocessing, which is crucial for ensuring the accuracy of predictions.

Here are the images that was used within the predictions:



Even though the cat is perfectly fine, I did not expect the model to give all wrong predictions and the rest of them were quite good.

I found this lab very informative for the feedback and assessment. Starting from the loading of the model, making predictions, analyzing the results of the lab - it gave a really good introduction to deep learning. Interactions helped reinforce the theoretical concepts with hands-on practice. In the future, I would like to explore other pre-trained models, experiment with fine-tuning to see if that can further improve classification accuracy on specific datasets.

This submission reflects my engagement with the lab and the observations made during the exercises. Overall, this experience has deepened my understanding of deep learning models and their real-world applications.