**SWS3009 Summer Workshop**

**Lab 4 – Answer Book**

**SUBMISSION DEADLINE: SUNDAY 9 JULY 2023, 11.59 PM**

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**QUESTION 1.**

1. Sequential:

- The Sequential model is a linear stack of layers, where each layer is added sequentially on top of the previous one.

- It is suitable for building models that have a simple, sequential structure, such as feed-forward networks.

- It is easy to use and understand, making it a good choice for beginners or when creating models with a straightforward layer-by-layer flow.

- It is limited to a single input and output, and does not support models with shared layers or multiple inputs/outputs.

2. Model:

- The Model class provides a more flexible and advanced way to create models by defining a directed acyclic graph of layers.

- It allows for more complex network architectures, such as models with multiple inputs or outputs, shared layers, skip connections, and residual connections.

- It is suitable for creating models with a custom topology or when building more complex architectures like recurrent neural networks (RNNs) or multi-modal networks.

- The Model class requires more explicit definition of the connections between layers and the specification of input and output tensors.

- It offers additional functionalities like model subclassing, custom forward pass logic, and model-wide operations.

In summary, "Sequential" is used when building simple, linear models with a straightforward layer-by-layer structure. It is easy to use and suitable for most cases where the network topology is simple. On the other hand, "Model" is used when building more complex models with custom architectures, multiple inputs/outputs, shared layers, or when additional customization and flexibility are required. Functional models are the broadest class of models, of which Sequential models are only a special case.

**QUESTION 2.**

1. Overcoming Limited Data: In many real-world scenarios, collecting a large labeled dataset can be challenging and expensive. Limited data may lead to overfitting, where the model memorizes the training examples without learning generalizable features. Data augmentation addresses this issue by creating new samples from the existing data, increasing the effective size of the dataset and providing more diverse examples for the model to learn from.

2. Improved Robustness: Data augmentation enhances the robustness of the model by exposing it to a wider range of variations and distortions commonly found in real-world data. By applying transformations to the images, such as rotation, translation, scaling, flipping, and adding noise, the model becomes more resilient to changes in lighting conditions, perspectives, orientations, and object deformations.

Two other transformation:

1. Zoom Range: This transformation randomly zooms the images within a specified range. It can simulate the effect of objects appearing closer or farther away, adding variability to the dataset.

2. Brightness Range: This transformation adjusts the brightness of the images by randomly scaling the pixel values within a specified range. It helps the model learn to handle varying lighting conditions.

**QUESTION 3.**

Fill in your question 1 answer here.

**QUESTION 4.**

Fill in your question 1 answer here.