Computer Science Department
CS672 – Introduction to Deep Learning (CRN: 72900)
Fall 2022

Project #3 / Due 19-Dec-2022

Build a Deep Learning model (based on Neural Networks) that provides reliable and improved accuracy of an **Image Recognition Classifier** based on **Convolution Neural Networks** (CNNs).

For comparing and contrasting, device two CNNs models:

1. A Keras Sequential model with multiple Convolution and MaxPooling layers, and
2. Make use of a pre-trained model

Establish a **'base' model** by creating a 'home-grown' image classifier, for example:

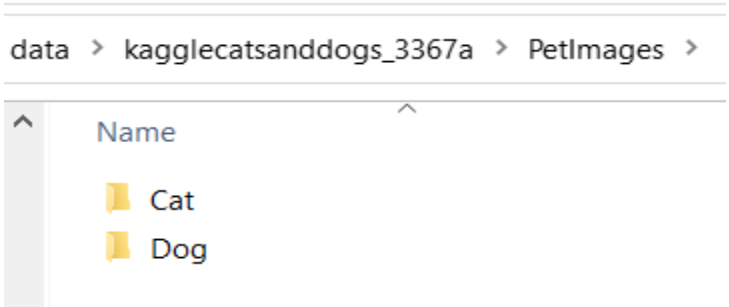
```
model = tf.keras.models.Sequential([
    tf.keras.layers.Conv2D(32, (3,3), activation='relu', input_shape=(150, 150, 3)),
    tf.keras.layers.MaxPooling2D(2, 2),
    tf.keras.layers.Conv2D(64, (3,3), activation='relu'),
    tf.keras.layers.MaxPooling2D(2,2),
    tf.keras.layers.Conv2D(128, (3,3), activation='relu'),
    tf.keras.layers.MaxPooling2D(2,2),
    tf.keras.layers.Conv2D(128, (3,3), activation='relu'),
    tf.keras.layers.MaxPooling2D(2,2),
    tf.keras.layers.Flatten(),
    tf.keras.layers.Dense(512, activation='relu'),
    tf.keras.layers.Dense(1, activation='sigmoid')
])
```

For the second, **pre-trained** CNNs model, use the very powerful image recognition classifier **InceptionV3** model. Download the pre-trained model (**inception_v3_weights.h5**) from the Classes portal.

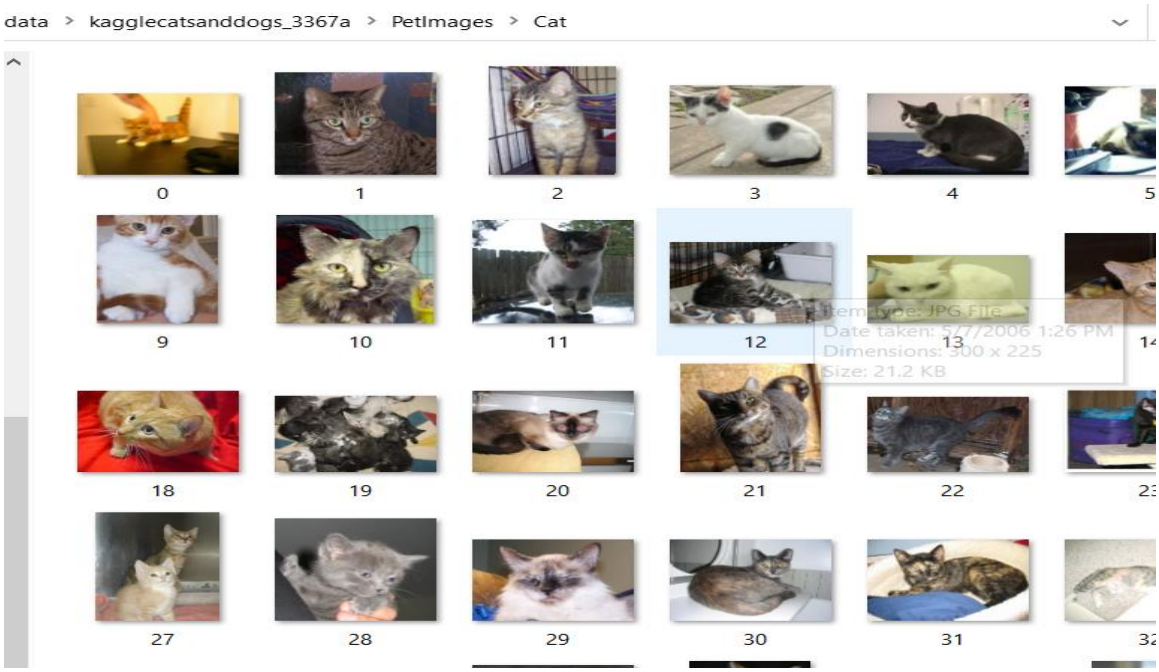
Note: H5 is a file format to store structured data, it's not a model by itself. Keras saves models in this format as it can easily store the weights and model configuration in a single file.

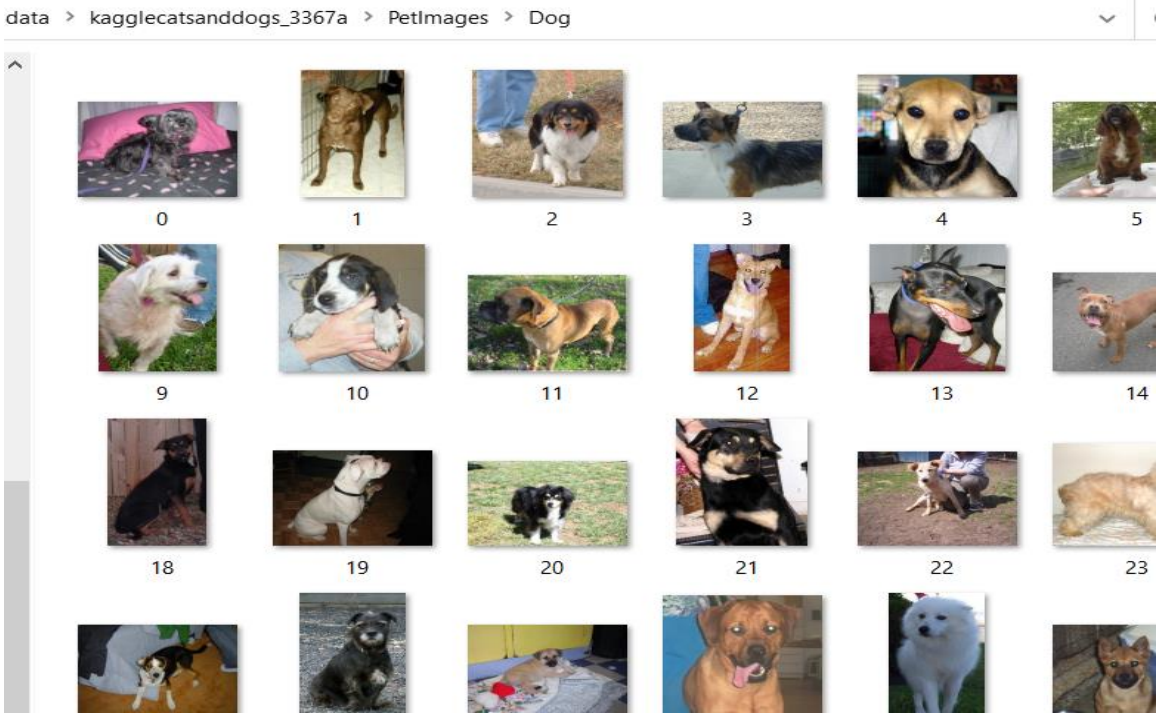
Both of these models should be trained and validated on the 'Kaggle Cats and Dogs Dataset'.
Download the data using this link:
https://www.microsoft.com/en-us/download/confirmation.aspx?id=54765

The directory structure of the training and validation datasets should look like the following:



Where ‘Cat’ and ‘Dog’ folders should have 1000s of images:





Details about the IncerptionV3 pre-trained model and configuring new layers/weights will be discussed during the lecture.