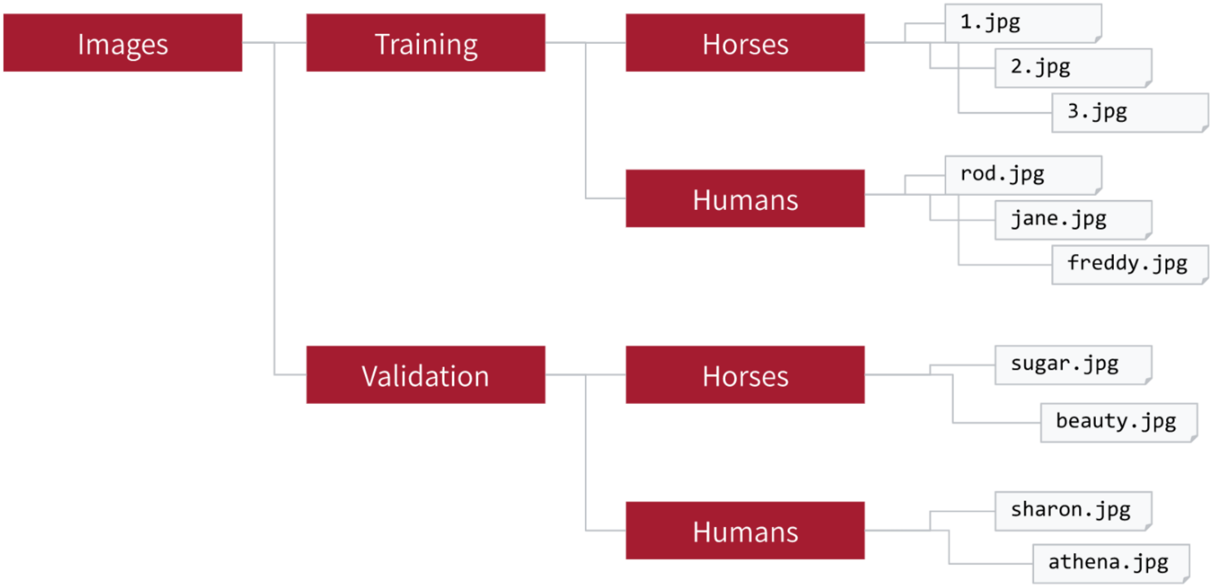
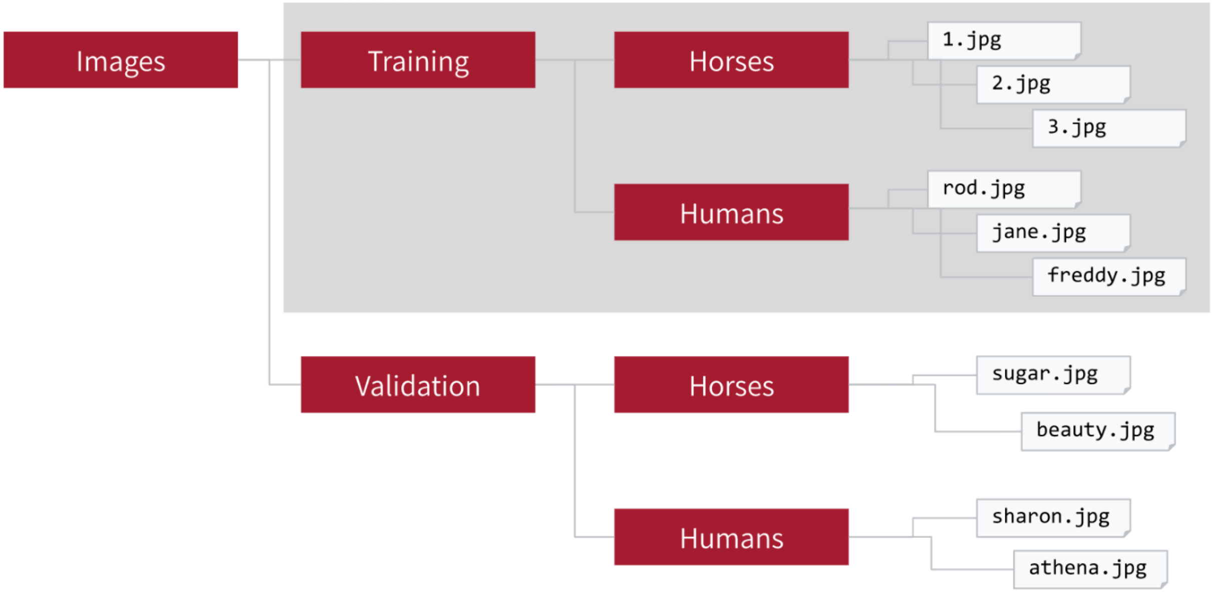
TFDS for Image Data

If we download a ZIP file containing images, and if the images are sorted into subdirectories, we can use a generator to automatically label the images based on their directories.

So, for example, for the horses-or-humans dataset, if you download both the training and validation zip files, you'd end up with a structure like this:



Within your 'Images' directory, if you unzip the training files into a 'training' folder, it would have subdirectories for 'Horses and Humans'.



By pointing an ImageDataGenerator at this subdirectory, it would automatically label images in the ‘Horses’ directory as horses, and similarly the images in the Humans directory would be labeled as such.

All of this requires the images to be sorted into named subdirectories, downloaded, and unzipped into the same structure. It works well for training, but it isn’t the *only* way of flowing data into a neural network. Also, this is just one way of representing image data -- there are many -- and these often need some domain-specific knowledge of the data (at the very least the structure of a zip like this, but it’s often more complicated) to get into a form that we can train a neural network with.

TensorFlow Datasets

A common way to flow data into your network for training is TensorFlow Datasets.

The goal behind TensorFlow Datasets (TFDS) is to expose datasets in a way that’s easy to consume, where all the preprocessing steps of acquiring the data and getting it into TensorFlow-friendly APIs is done for you.

```
data = tf.keras.datasets.fashion_mnist

(training_images, training_labels), (test_images, test_labels) = data.load_data()
```

TensorFlow Datasets builds on this idea, but greatly expands not only the number of datasets available but the diversity of dataset types. The list of available datasets is always growing including pictures, text, audio, video and more. Check out the link to see some of the datasets.

TensorFlow Datasets is a separate install from TensorFlow, so be sure to install it before trying out any samples! If you are using Google Colab, it's already preinstalled. If you need to install it, you can do so with a pip command:

```
pip install tensorflow-datasets
```

Once it's installed, we can use it to get access to a dataset with *tfds.load* by passing the name of the desired dataset. For example, if we want to use Fashion MNIST, we can use the below code:

```
import tensorflow as tf

import tensorflow_datasets as tfds

mnist_data = tfds.load("fashion_mnist")

for item in mnist_data:

    print(item)
```

Two very important concepts to learn with TensorFlow Datasets are the ***Splits API*** -- that provides the flexibility of splitting data into Training, Testing, Validation sets, and ***Mapping Functions***, which allow us to do things like Augmentation. So, for example, we saw how to do Image Augmentation on a generator, but if we're no longer using generators we'll need an alternative! TFDS makes it simple with the mapping functions.

Here's code as an example:

```
def augmentimages(image, label):
    image = tf.cast(image, tf.float32)
    image = (image/255)
    image = tf.image.random_flip_left_right(image)
return image, label

data = tfds.load('horses_or_humans', split='train', as_supervised=True)
train = data.map(augmentimages)
```

In this case, *tfds.load* is used to get the horses or humans dataset. It's pre-split into a 'train' subset with the training data. Once we load the data, we can call it's 'map' method. To the method we pass a function such as 'AugmentImages', from where we can perform image augmentation.

There's a lot to learn with TFDS, and it's a really powerful API. Visit: https://www.tensorflow.org/datasets to go deeper!