```
import pandas as pd
# TensorFlow and tf.keras
import tensorflow as tf

# Helper libraries
import numpy as np
import matplotlib.pyplot as plt
import shutil

print(tf.__version__)
```

```
2.12.0
```

```
!ls drive/MyDrive/data_ml
```

```
charts.zip
```

```
1
```

```
!rm -rf /content/charts
```

```
!unzip drive/MyDrive/data_ml/charts.zip
```

```
Archive:  drive/MyDrive/data_ml/charts.zip
   creating: charts/
   creating: charts/test/
  inflating: charts/test/0.png
  inflating: charts/test/1.png
  inflating: charts/test/10.png
  inflating: charts/test/11.png
 extracting: charts/test/12.png
 extracting: charts/test/13.png
  inflating: charts/test/14.png
  inflating: charts/test/15.png
  inflating: charts/test/16.png
  inflating: charts/test/17.png
  inflating: charts/test/18.png
  inflating: charts/test/19.png
  inflating: charts/test/2.png
  inflating: charts/test/20.png
  inflating: charts/test/21.png
  inflating: charts/test/22.png
  inflating: charts/test/23.png
  inflating: charts/test/24.png
  inflating: charts/test/25.png
  inflating: charts/test/26.png
  inflating: charts/test/27.png
  inflating: charts/test/28.png
  inflating: charts/test/29.png
  inflating: charts/test/3.png
  inflating: charts/test/30.png
  inflating: charts/test/31.png
  inflating: charts/test/32.png
```

✓ 0s completed at 12:14 AM

```
  inflating: charts/test/34.png
  inflating: charts/test/35.png
  inflating: charts/test/36.png
  inflating: charts/test/37.png
  inflating: charts/test/38.png
  inflating: charts/test/39.png
  inflating: charts/test/4.png
 extracting: charts/test/40.png
 extracting: charts/test/41.png
  inflating: charts/test/42.png
  inflating: charts/test/43.png
  inflating: charts/test/44.png
  inflating: charts/test/45.png
  inflating: charts/test/46.png
  inflating: charts/test/47.png
 extracting: charts/test/48.png
  inflating: charts/test/49.png
  inflating: charts/test/5.png
  inflating: charts/test/6.png
  inflating: charts/test/7.png
  inflating: charts/test/8.png
  inflating: charts/test/9.png
   creating: charts/train_val/
  inflating: charts/train_val.csv
  inflating: charts/train_val/0.png
  inflating: charts/train_val/1.png
  inflating: charts/train_val/10.png
```

```
!ls charts
```

```
test  train_val  train_val.csv
```

```
import os
import pandas as pd

data_dir = 'charts/train_val/'
label_df = pd.read_csv('/content/charts/train_val.csv')

# Create a dictionary mapping image index to its corresponding label
label_dict = dict(zip(label_df['image_index'], label_df['type']))

# Get a list of all files in the data_dir directory
file_list = os.listdir(data_dir)

# Initialize an empty list for labels
label_list = []

# Get the label list for each file
for file in file_list:
    image_index = int(file.split('.')[0])  # Extract image index from filename
    label = label_dict.get(image_index, None)  # Get label from the dictionary
    label_list.append(label)  # Add label to the list
```

```
label_df.type
```

```
- dtype
```

```
0      vbar_categorical
1      vbar_categorical
2      vbar_categorical
3      vbar_categorical
4      vbar_categorical
             ...
995          dot_line
996          dot_line
997          dot_line
998          dot_line
999          dot_line
Name: type, Length: 1000, dtype: object
```

```
images[0]
```

```
'10.png'
```

```
label_dict[41]
```

```
'vbar_categorical'
```

```
def get_label(filenm):
  return filenm.split('.png')[0]

images=os.listdir('/content/charts/train_val/')
path = '/content/charts/train_val/'
n_path = '/content/images'

for image in images:
  if os.path.exists(os.path.join(path,image)):
    #print(os.path.join(path,get_label(image)))
    #print(image)
    lebel=label_dict[int(get_label(image))]
    if not os.path.exists(os.path.join(n_path,lebel)):
      os.makedirs(os.path.join(n_path,lebel))
    shutil.copy(os.path.join(path,image),os.path.join(n_path, lebel,image))

```

```
#!rm -rf /content/images
```

```
import pandas as pd
from sklearn.preprocessing import LabelEncoder
```

```
import pathlib
data_dir = pathlib.Path('/content/images').with_suffix('')
```

```
batch_size = 32
img_height = 128
img_width = 128
```

```
train_ds = tf.keras.utils.image_dataset_from_directory(
  data_dir,
  color_mode='grayscale',
  seed=123,
  image_size=(img_height, img_width),
  batch_size=batch_size,
  validation_split=0.2,
  subset="training")
```

```
Found 1000 files belonging to 5 classes.
Using 800 files for training.
```

```
validation_data = tf.keras.utils.image_dataset_from_directory(
  data_dir,
  color_mode='grayscale',
  seed=123,
  image_size=(img_height, img_width),
  batch_size=batch_size,
  validation_split=0.2,
  subset="validation")
```

```
Found 1000 files belonging to 5 classes.
Using 200 files for validation.
```

```
normalization_layer = tf.keras.layers.Rescaling(1./255)
```

```
AUTOTUNE = tf.data.AUTOTUNE

train_ds = train_ds.cache().prefetch(buffer_size=AUTOTUNE)
val_ds = val_ds.cache().prefetch(buffer_size=AUTOTUNE)
```

```
num_classes = 5

model = tf.keras.Sequential([
  tf.keras.layers.Rescaling(1./255),
  tf.keras.layers.Conv2D(32, 3, activation='relu'),
  tf.keras.layers.MaxPooling2D(),
  tf.keras.layers.Flatten(),
  tf.keras.layers.Dense(128, activation='relu'),
  tf.keras.layers.Dense(num_classes)
])
```

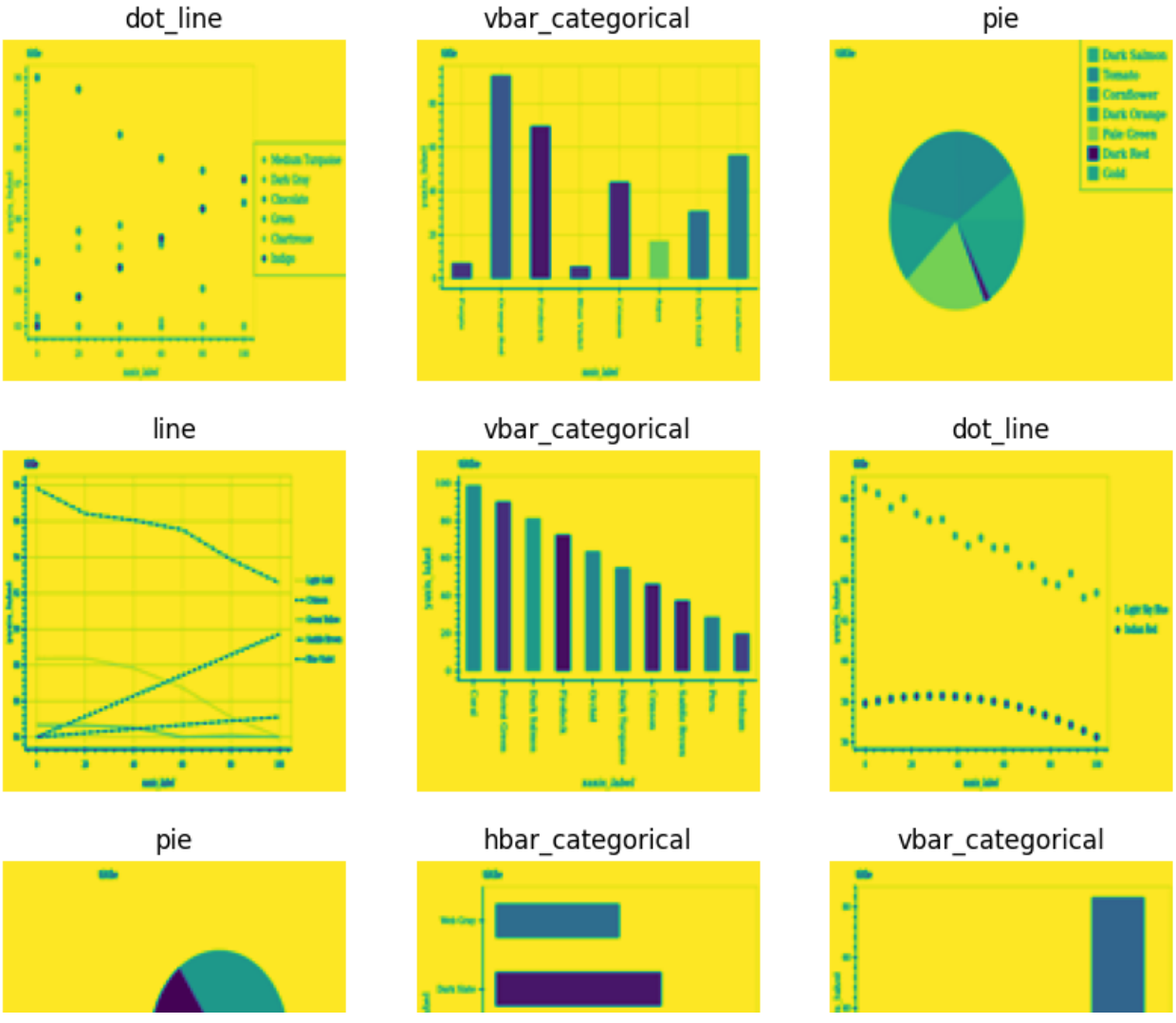
```
model.compile(
  optimizer='adam',
  loss=tf.keras.losses.SparseCategoricalCrossentropy(from_logits=True),
  metrics=['accuracy'])
```

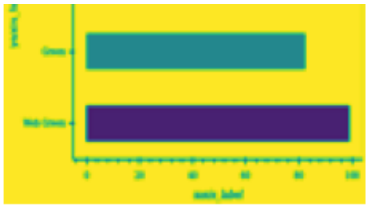
```
model.fit(
  train_ds,
```

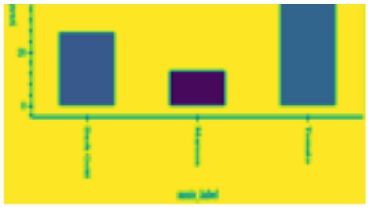
```
3   validation_data=val_ds,
4   epochs=5
5 )
```

```
Epoch 1/5
25/25 [==============================] - 17s 639ms/step - loss: 4.5470 - accuracy:
Epoch 2/5
25/25 [==============================] - 17s 700ms/step - loss: 0.9047 - accuracy:
Epoch 3/5
25/25 [==============================] - 15s 621ms/step - loss: 0.5021 - accuracy:
Epoch 4/5
25/25 [==============================] - 15s 616ms/step - loss: 0.3394 - accuracy:
Epoch 5/5
25/25 [==============================] - 16s 626ms/step - loss: 0.2673 - accuracy:
<keras.callbacks.History at 0x7f44855e19c0>
```

```
1 import matplotlib.pyplot as plt
2
3 plt.figure(figsize=(10, 10))
4 for images, labels in train_ds.take(1):
5   for i in range(9):
6     ax = plt.subplot(3, 3, i + 1)
7     plt.imshow(images[i].numpy().astype("uint8"))
8     plt.title(class_names[labels[i]])
9     plt.axis("off")
```







```
def get_label(filenm):
  return filenm.split('.png')[0]

images=os.listdir('/content/charts/test/')
path = '/content/charts/test/'
n_path = '/content/images_test'

for image in images:
  if os.path.exists(os.path.join(path,image)):
    #print(os.path.join(path,get_label(image)))
    #print(image)
    lebel=label_dict[int(get_label(image))]
    print(lebel,' ',get_label(image))

    if not os.path.exists(os.path.join(n_path,lebel)):
      os.makedirs(os.path.join(n_path,lebel))
    shutil.copy(os.path.join(path,image),os.path.join(n_path, lebel,image))

```

```
vbar_categorical   10
vbar_categorical   32
vbar_categorical   28
vbar_categorical   27
vbar_categorical   7
vbar_categorical   1
vbar_categorical   14
vbar_categorical   22
vbar_categorical   41
vbar_categorical   33
vbar_categorical   18
vbar_categorical   29
vbar_categorical   5
vbar_categorical   48
vbar_categorical   36
vbar_categorical   3
vbar_categorical   15
vbar_categorical   16
vbar_categorical   39
vbar_categorical   4
vbar_categorical   30
```

```
    vbar_categorical   23
    vbar_categorical   17
    vbar_categorical   43
    vbar_categorical   11
    vbar_categorical   47
    vbar_categorical   9
    vbar_categorical   37
    vbar_categorical   24
    vbar_categorical   2
    vbar_categorical   40
    vbar_categorical   38
    vbar_categorical   20
    vbar_categorical   34
    vbar_categorical   8
    vbar_categorical   13
    vbar_categorical   26
    vbar_categorical   31
    vbar_categorical   35
    vbar_categorical   25
    vbar_categorical   0
    vbar_categorical   6
    vbar_categorical   21
    vbar_categorical   46
    vbar_categorical   45
    vbar_categorical   19
    vbar_categorical   49
    vbar_categorical   12
    vbar_categorical   42
    vbar_categorical   44
```

```
data_dir_test = pathlib.Path('/content/images_test').with_suffix('')
```

```
data_dir_test = tf.keras.utils.image_dataset_from_directory(
  data_dir_test,
  color_mode='grayscale',
  seed=123,
  image_size=(img_height, img_width),
  batch_size=batch_size,
)
```

```
    Found 50 files belonging to 1 classes.
```

```
test_loss, test_acc = model.evaluate(data_dir_test, verbose=2)

print('\nTest accuracy:', test_acc)
```

```
    2/2 - 0s - loss: 4.5264 - accuracy: 0.0600 - 248ms/epoch - 124ms/step

    Test accuracy: 0.05999999865889549
```

```
# Referance:
# https://www.tensorflow.org/guide/data#decoding_image_data_and_resizing_it
# https://stackoverflow.com/questions/71047609/what-is-the-best-way-of-converting-a-l
# https://colab.research.google.com/github/tensorflow/docs/blob/master/site/en/tutori
```