```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from PIL import Image
from glob import glob

from sklearn.model_selection import train_test_split
from sklearn import metrics

import cv2
import gc
import os

import tensorflow as tf
from tensorflow import keras
from keras import layers
from tensorflow.keras.preprocessing.image import ImageDataGenerator

import warnings
warnings.filterwarnings('ignore')
```

```
from google.colab import drive
drive.mount("/content/drive")
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.m
```

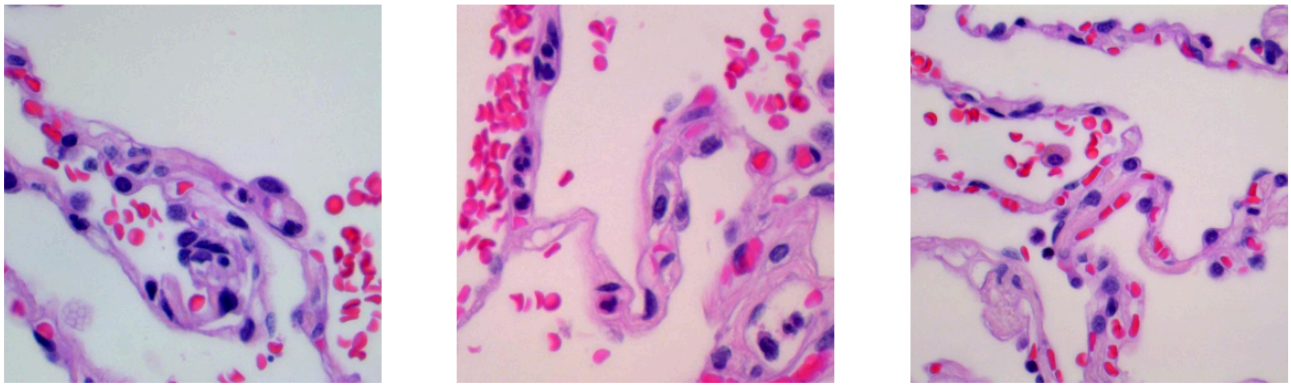
```
from zipfile import ZipFile

data_path = '/content/drive/MyDrive/Dataset/lung_and_colon_histopathological_images.zip'

with ZipFile(data_path,'r') as zip:
  zip.extractall()
  print('The data set has been extracted.')
```

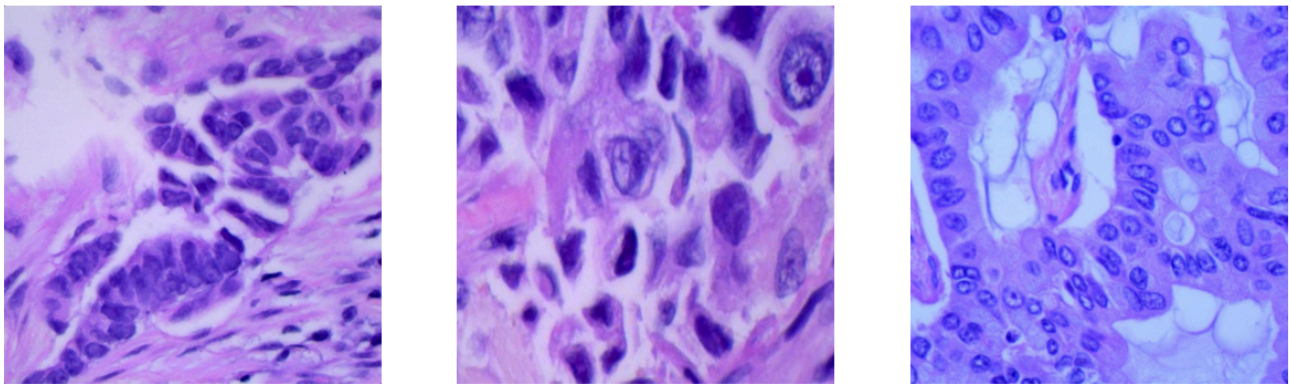
```
The data set has been extracted.
```

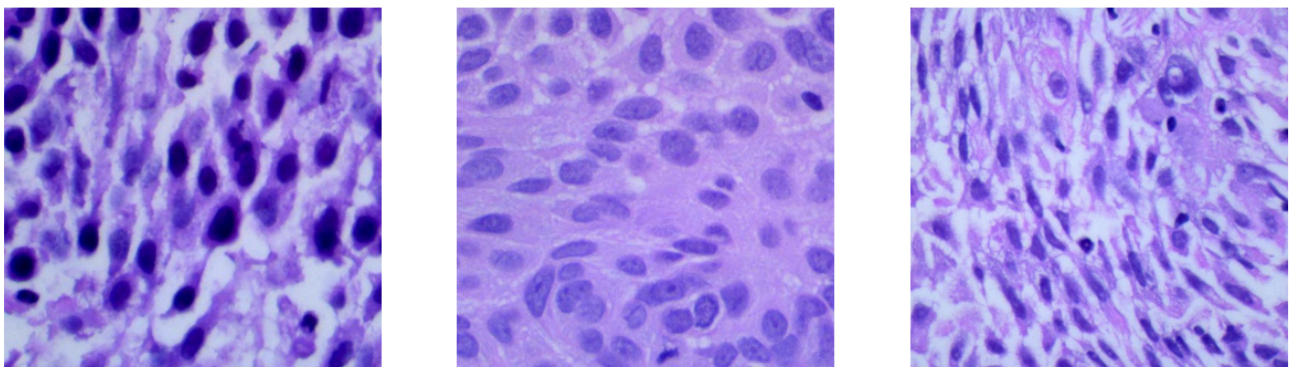
```
path = '/content/lung_colon_image_set/lung_image_sets'
classes = os.listdir(path)
classes
```

```
['lung_n', 'lung_aca', 'lung_scc']
```

```
path = '/content/lung_colon_image_set/lung_image_sets'

for i in classes:
    image_dir = f'{path}/{i}'
    images = os.listdir(image_dir)

    fig, ax = plt.subplots(1, 3, figsize= (15,5))
    fig.suptitle(f'Images for {i} Categroy ....', fontsize=20)

    for j in range(3):
        k = np.random.randint(0, len(images))
        img = np.array(Image.open(f'{path}/{i}/{images[k]}'))
        ax[j].imshow(img)
        ax[j].axis('off')
    plt.show()
```







```
IMG_SIZE = 128
SPLIT = 0.2
EPOCHS = 10
BATCH_SIZE = 64


X = []
Y = []

for i, cat in enumerate(classes):
  images = glob(f'{path}/{cat}/*.jpeg')

  for image in images:
    img = cv2.imread(image)

    X.append(cv2.resize(img, (IMG_SIZE, IMG_SIZE)))
    Y.append(i)

X = np.asarray(X)
one_hot_encoded_Y = pd.get_dummies(Y).values


X_train, X_val, Y_train, Y_val = train_test_split(X, one_hot_encoded_Y,
                                                  test_size = SPLIT,
                                                  random_state = 2022)
print(X_train.shape, X_val.shape)
```

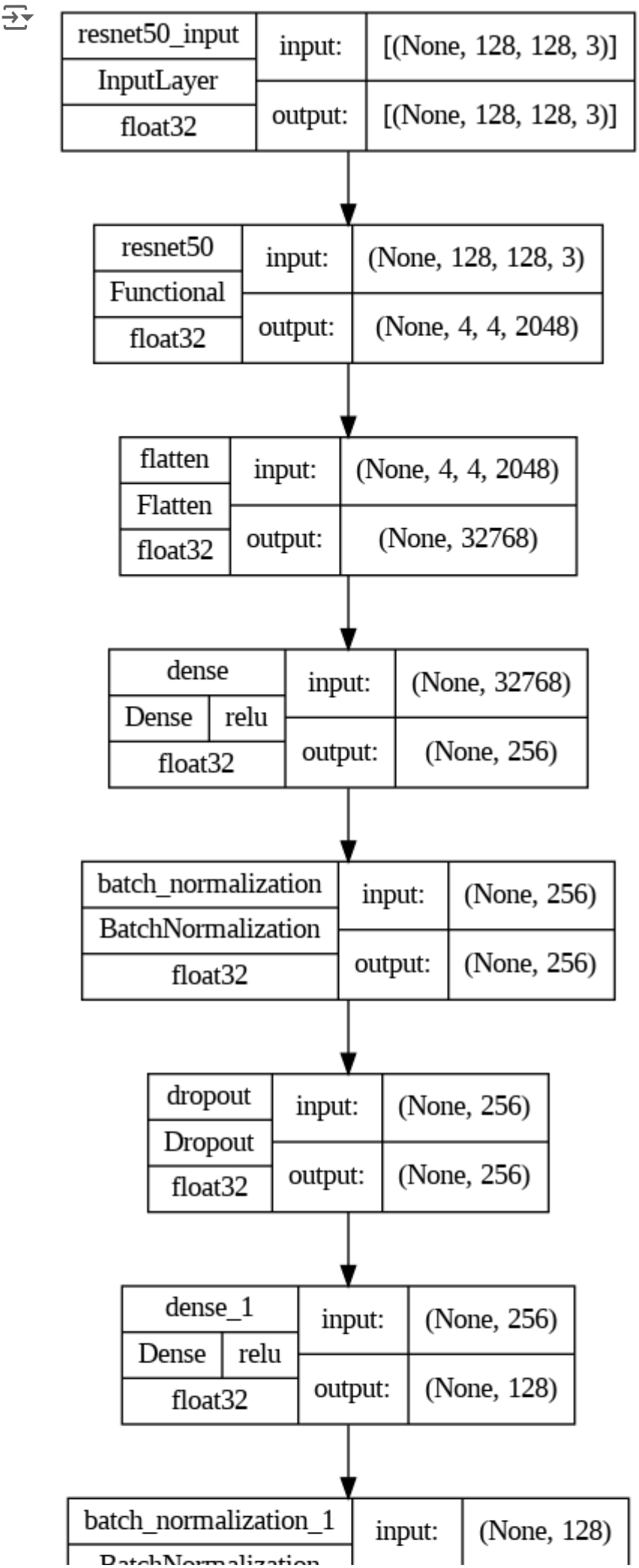
```
(12000, 128, 128, 3) (3000, 128, 128, 3)
```

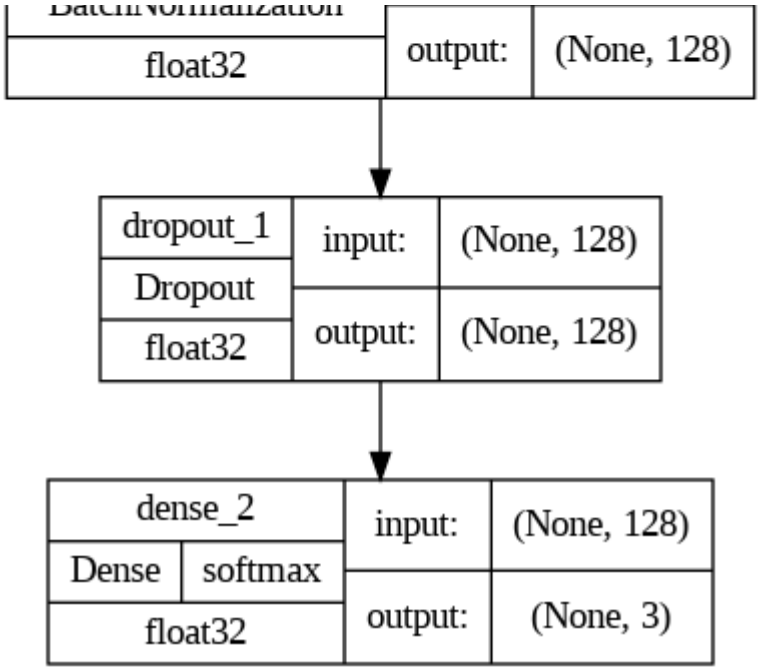
```
from tensorflow.keras.preprocessing.image import ImageDataGenerator


train_datagen = ImageDataGenerator(
    rescale=1./255,
    rotation_range=30,
    width_shift_range=0.2,
    height_shift_range=0.2,
    shear_range=0.2,
    zoom_range=0.2,
    horizontal_flip=True,
    fill_mode='nearest'
)

val_datagen = ImageDataGenerator(rescale=1./255)

train_generator = train_datagen.flow(X_train, Y_train, batch_size=BATCH_SIZE)
val_generator = val_datagen.flow(X_val, Y_val, batch_size=BATCH_SIZE)


base_model = keras.applications.ResNet50(weights='imagenet', include_top=False, input_sha
base_model.trainable = False
```

```
model = keras.models.Sequential([
    base_model,
    layers.Flatten(),
    layers.Dense(256, activation='relu'),
    layers.BatchNormalization(),
    layers.Dropout(0.5),
    layers.Dense(128, activation='relu'),
    layers.BatchNormalization(),
    layers.Dropout(0.5),
    layers.Dense(3, activation='softmax')
])


model.compile(
    optimizer = 'adam',
    loss = 'categorical_crossentropy',
    metrics = ['accuracy'])



model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 resnet50 (Functional)       (None, 4, 4, 2048)        23587712

 flatten (Flatten)           (None, 32768)             0

 dense (Dense)               (None, 256)               8388864

 batch_normalization (Batch  (None, 256)               1024
 Normalization)

 dropout (Dropout)           (None, 256)               0

 dense_1 (Dense)             (None, 128)               32896

 batch_normalization_1 (Bat  (None, 128)               512
 chNormalization)

 dropout_1 (Dropout)         (None, 128)               0

 dense_2 (Dense)             (None, 3)                 387

=================================================================
Total params: 32011395 (122.11 MB)
Trainable params: 8422915 (32.13 MB)
Non-trainable params: 23588480 (89.98 MB)
_________________________________________________________________
```

```
keras.utils.plot_model(model,
                       show_shapes= True,
                       show_dtype = True,
                       show_layer_activations=True)
```


resnet50_input
InputLayer
float32
input:
[(None, 128, 128, 3)]
output:
[(None, 128, 128, 3)]
resnet50
Functional
float32
input:
(None, 128, 128, 3)
output:
(None, 4, 4, 2048)
flatten
Flatten
float32
input:
(None, 4, 4, 2048)
output:
(None, 32768)
dense
Dense
relu
float32
input:
(None, 32768)
output:
(None, 256)
batch_normalization
BatchNormalization
float32
input:
(None, 256)
output:
(None, 256)
dropout
Dropout
float32
input:
(None, 256)
output:
(None, 256)
dense_1
Dense
relu
float32
input:
(None, 256)
output:
(None, 128)
batch_normalization_1
input:
(None, 128)




```
from keras.callbacks import EarlyStopping, ReduceLROnPlateau


class myCallback(tf.keras.callbacks.Callback):
    def on_epoch_end(self, epoch, logs={}):
        if logs.get('val_accuracy') > 0.90:
            print('\n Validation accuracy has reached upto 90% so, stopping furth
            self.model.stop_training = True


es = EarlyStopping(patience=3,
                   monitor='val_accuracy',
                   restore_best_weights=True)

lr = ReduceLROnPlateau(monitor='val_loss',
                       patience=2,
                       factor=0.5,
                       verbose=1)


history = model.fit(X_train, Y_train,
                    validation_data = (X_val, Y_val),
                    batch_size= BATCH_SIZE,
                    epochs = EPOCHS,
                    verbose =1,
                    callbacks = [es, lr, myCallback()])
```

```
Epoch 1/10
188/188 [==============================] - ETA: 0s - loss: 0.2150 - accuracy: 0.9187
 Validation accuracy has reached upto 90% so, stopping further training.
188/188 [==============================] - 29s 95ms/step - loss: 0.2150 - accuracy: 0
```

```
Y_pred = model.predict(X_val)
Y_val = np.argmax(Y_val, axis=1)
Y_pred = np.argmax(Y_pred, axis=1)
```

```
94/94 [==============================] - 5s 39ms/step
```

```
print(metrics.classification_report(Y_val, Y_pred, target_names=classes))
```

```
              precision    recall  f1-score   support

      lung_n       1.00      1.00      1.00       987
    lung_aca       0.95      0.93      0.94       977
    lung_scc       0.93      0.95      0.94      1036

    accuracy                           0.96      3000
   macro avg       0.96      0.96      0.96      3000
weighted avg       0.96      0.96      0.96      3000
```

Result : Overall Accuracy of 96% of all predictions are correct.

Start coding or generate with AI.