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Hutton Rock Dataset

Total Number of images: 505

- The number of images in granite class are: 187
- The number of images in basalt class are: 130
- The number of images in coal class are: 85
- The number of images in andesite class are: 103

378 images are used for trining and 127 images are used for testing.

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

```
Mounted at /content/drive
```

```
import tensorflow as tf
print(tf.__version__)

from tensorflow import keras
tf.random.set_seed(42)

import numpy as np
np.random.seed(42)

import matplotlib.pyplot as plt
%matplotlib inline

import glob
import PIL
from PIL import Image
```

```
2.17.1
```

```
from numpy import load

X_train_std = load('/content/drive/MyDrive/DLPROJECT/X_train_std.npy')
X_test_std = load('/content/drive/MyDrive/DLPROJECT/X_test_std.npy')

y_train = load('/content/drive/MyDrive/DLPROJECT/y_train.npy')
y_test = load('/content/drive/MyDrive/DLPROJECT/y_test.npy')
```

```
DenseNet201=keras.applications.DenseNet201(weights='imagenet',
                                           input_shape = (299,299,3),
                                           include_top=False,
)



DenseNet201.trainable = False
for layer in DenseNet201.layers:
  layer.trainabe = False


# Adding classifier

global_pool = keras.layers.GlobalAveragePooling2D()(DenseNet201.output)

Layer_Normalization = keras.layers.BatchNormalization()(global_pool)
Drop_out = keras.layers.Dropout(rate=0.35)(Layer_Normalization)

output_ = keras.layers.Dense(units=4, activation='softmax')(Drop_out)


model2_TL = keras.models.Model(inputs=[DenseNet201.input], outputs=[output_])


model2_TL.summary()
```

conv2_block6_0_bn (BatchNormalization)	(None, 75, 75, 224)	896	conv2_bloc
conv2_block6_0_relu (Activation)	(None, 75, 75, 224)	0	conv2_bloc
conv2_block6_1_conv (Conv2D)	(None, 75, 75, 128)	28,672	conv2_bloc
conv2_block6_1_bn (BatchNormalization)	(None, 75, 75, 128)	512	conv2_bloc
conv2_block6_1_relu (Activation)	(None, 75, 75, 128)	0	conv2_bloc
conv2_block6_2_conv (Conv2D)	(None, 75, 75, 32)	36,864	conv2_bloc
conv2_block6_concat (Concatenate)	(None, 75, 75, 256)	0	conv2_bloc conv2_bloc
pool2_bn (BatchNormalization)	(None, 75, 75, 256)	1,024	conv2_bloc
pool2_relu (Activation)	(None, 75, 75, 256)	0	pool2_bn[0
pool2_conv (Conv2D)	(None, 75, 75, 128)	32,768	pool2_relu
pool2_pool (AveragePooling2D)	(None, 37, 37, 128)	0	pool2_conv
conv3_block1_0_bn (BatchNormalization)	(None, 37, 37, 128)	512	pool2_pool
conv3_block1_0_relu (Activation)	(None, 37, 37, 128)	0	conv3_bloc
conv3_block1_1_conv (Conv2D)	(None, 37, 37, 128)	16,384	conv3_bloc
conv3_block1_1_bn (BatchNormalization)	(None, 37, 37, 128)	512	conv3_bloc
conv3_block1_1_relu (Activation)	(None, 37, 37, 128)	0	conv3_bloc
conv3_block1_2_conv (Conv2D)	(None, 37, 37, 32)	36,864	conv3_bloc
conv3_block1_concat (Concatenate)	(None, 37, 37, 160)	0	pool2_pool conv3_bloc
conv3_block2_0_bn (BatchNormalization)	(None, 37, 37, 160)	640	conv3_bloc
conv3_block2_0_relu (Activation)	(None, 37, 37, 160)	0	conv3_bloc