SYNAPS HACKATHONE

By CodeMystics

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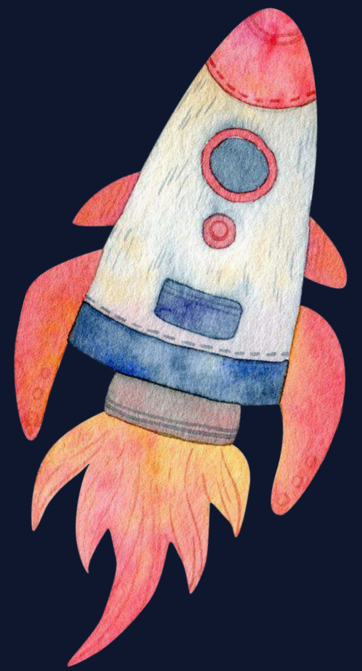


Problem Statement

“Rock classification on Lunar Surface”

Despite technological strides, the lunar environment's challenges hinder traditional rock classification methods. The absence of a continuous human presence necessitates the development of automated systems for efficient and accurate lunar rock identification, critical for advancing lunar exploration and scientific understanding.

Introduction

Rock classification on the lunar surface involves categorizing rocks by composition, texture, and origin. Common types include basalt (solidified lava), anorthosite (plagioclase feldspar-rich), breccia (fragments cemented by impacts), regolith (loose surface material), impact melt rocks (glassy textures from impacts), high-Ti basalt (titanium-rich), KREEP basalt (potassium-rich), and mare basalt (volcanic plains). This classification aids in understanding lunar geology using data from remote sensing and sample analysis.

Project Goals

- Understanding Lunar Surface Properties
- Characterizing Rock Size Distributions
- Enhancing Lunar Exploration
- Improving Sample Analysis Techniques

Technology used:

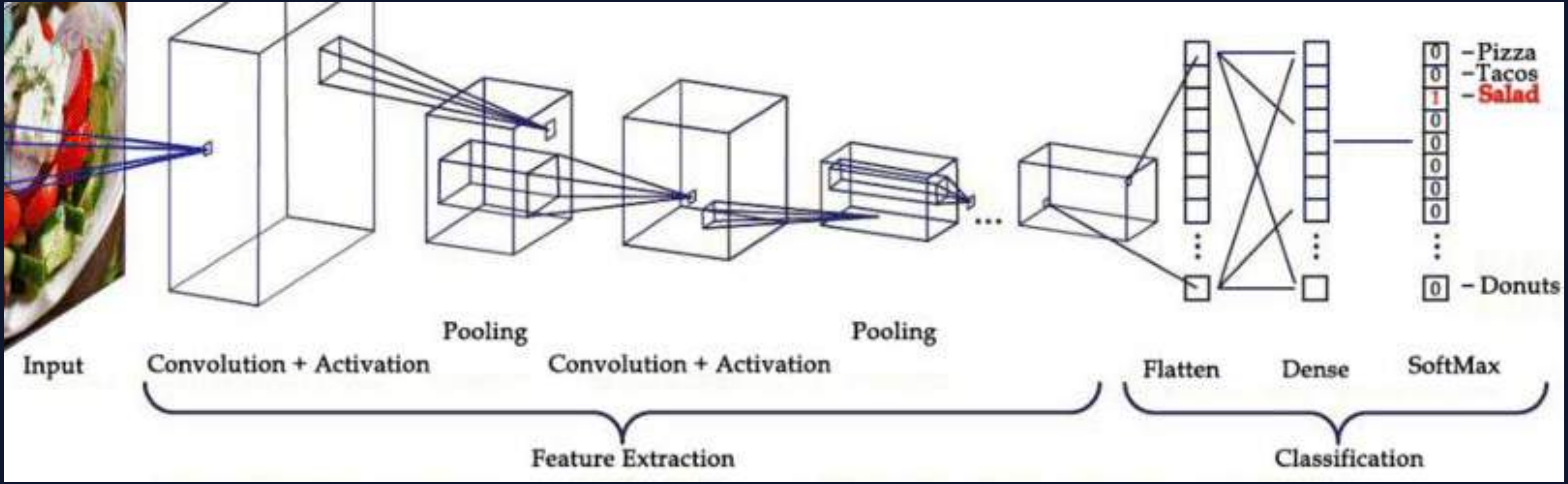
- OpenCV
- Deep Learning
- Convolutional Neural Network

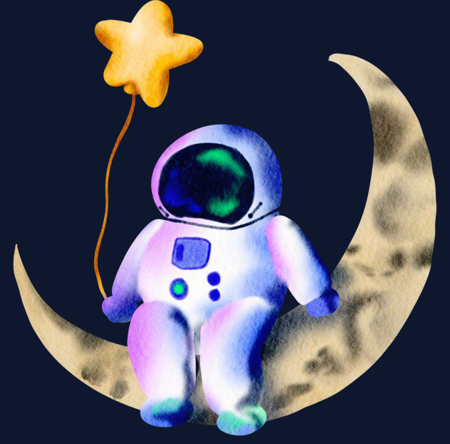
We use **OpenCV** to deal with images and **Deep Learning** to build a model with **Convolutional Neural Network** which is used to predictf lunar rock belongs to class **Small** or **Large**.

CNN

1. Feature Extraction
2. Classification Accuracy
3. Scalability
4. Generalization

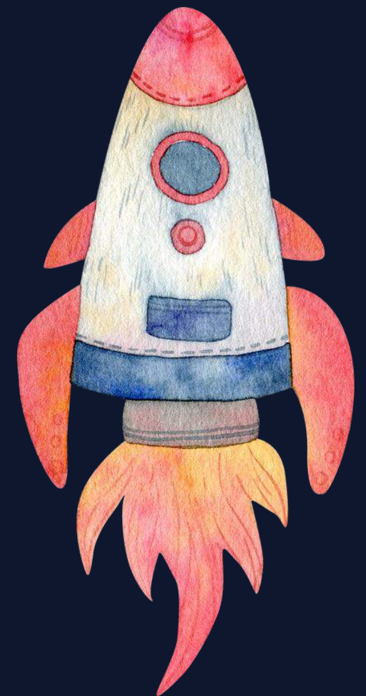
CNN Architecture



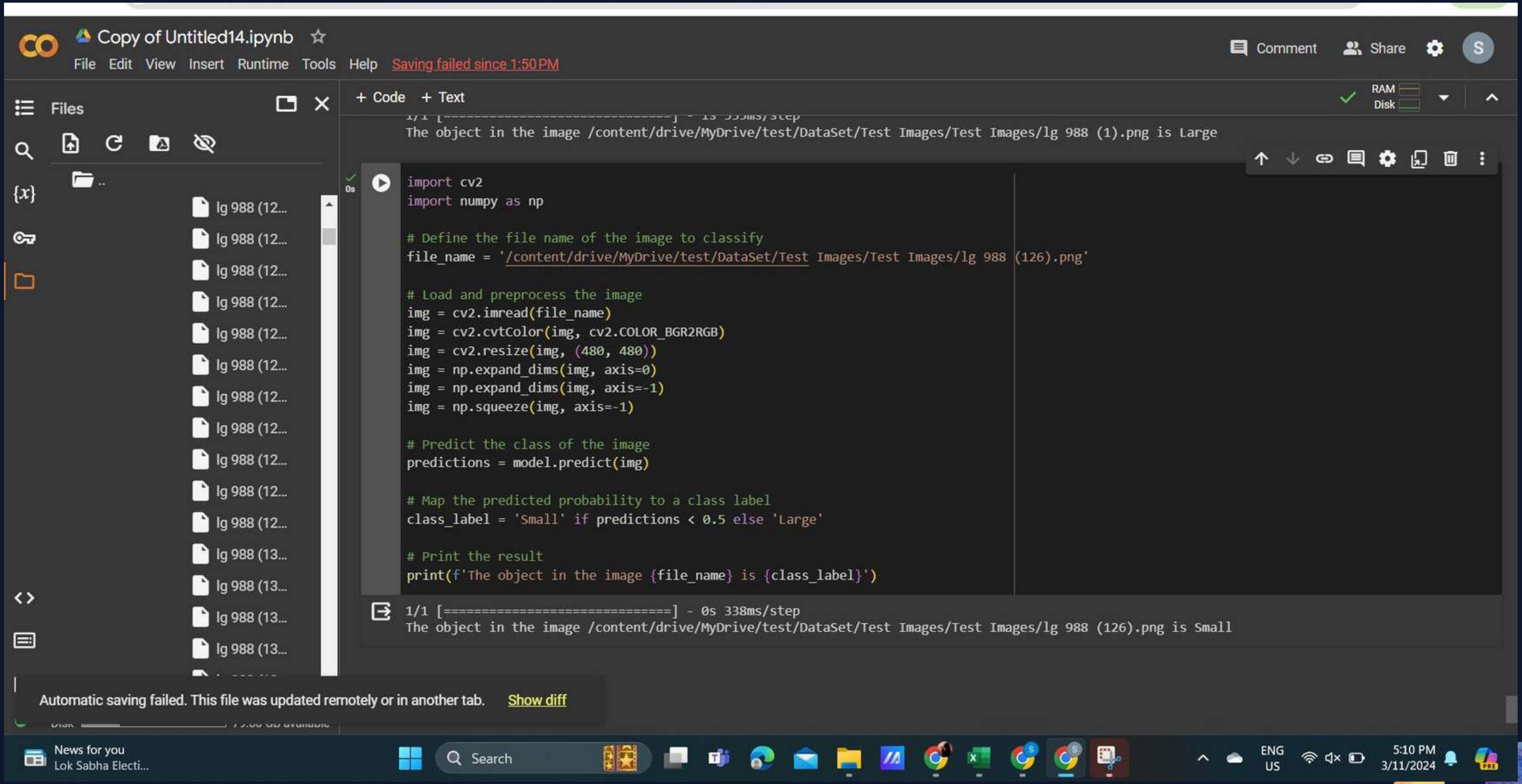


Building Conv2d Model:

- kernel_size — (3,3)
- Activation — ‘relu’
- Activation at output — ‘sigmoid’
- kernel_regularizer — regularizers.l2(0.01)
- max pool_size — (2,2)
- Dropout — 0.3
- loss — ‘binary_crossentropy’
- Optimizer — ‘adam’



Result



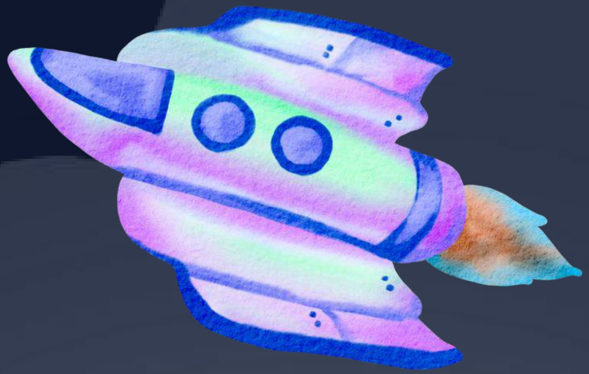
Copy of Untitled14.ipynb
File Edit View Insert Runtime Tools Help Saving failed since 1:50 PM
Comment
Share
Files
+ Code + Text
RAM
Disk
The object in the image /content/drive/MyDrive/test/DataSet/Test Images/Test Images/lg 988 (1).png is Large
import cv2
import numpy as np
# Define the file name of the image to classify
file_name = '/content/drive/MyDrive/test/DataSet/Test Images/Test Images/lg 988 (126).png'
# Load and preprocess the image
img = cv2.imread(file_name)
img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
img = cv2.resize(img, (480, 480))
img = np.expand_dims(img, axis=0)
img = np.expand_dims(img, axis=-1)
img = np.squeeze(img, axis=-1)
# Predict the class of the image
predictions = model.predict(img)
# Map the predicted probability to a class label
class_label = 'Small' if predictions < 0.5 else 'Large'
# Print the result
print(f'The object in the image {file_name} is {class_label}')
1/1 [==============================] - 0s 338ms/step
The object in the image /content/drive/MyDrive/test/DataSet/Test Images/Test Images/lg 988 (126).png is Small
Automatic saving failed. This file was updated remotely or in another tab. Show diff
News for you
Lok Sabha Electi...
Search
ENG
US
5:10 PM
3/11/2024

Result

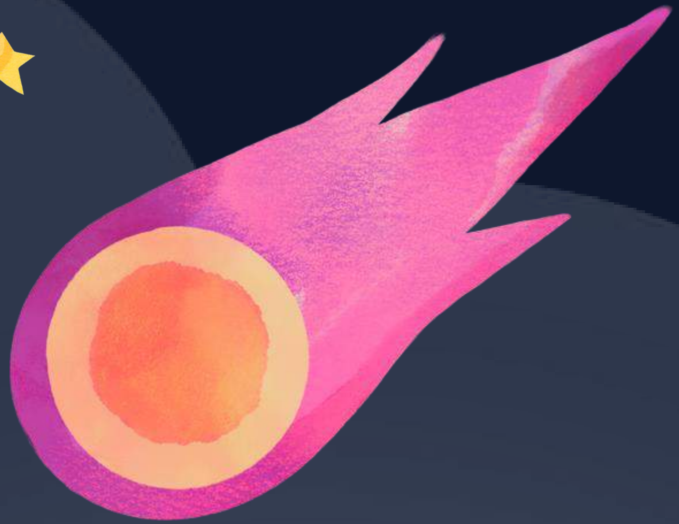
```
import warnings
warnings.filterwarnings('ignore')

results = model.fit_generator(train_img_gen, epochs = 20, steps_per_epoch = 100, callbacks = callback_2)
```

```
Epoch 1/20
100/100 [==============================] - ETA: 0s - loss: 1.4433 - accuracy: 0.7481 WARNING:tensorflow:Can save best model onl
WARNING:tensorflow:Early stopping conditioned on metric `train_loss` which is not available. Available metrics are: loss,accura
100/100 [==============================] - 2907s 29s/step - loss: 1.4433 - accuracy: 0.7481
Epoch 2/20
 60/100 [=================>............] - ETA: 20:30 - loss: 0.7078 - accuracy: 0.9177
```

Accuracy :0.9177



Conclusion



Rock classification on the lunar surface serves as a crucial tool for deciphering the Moon's geological narrative and informing future exploration efforts. By scrutinizing diverse rock types, scientists glean insights into lunar history, impact events, and potential resources, driving advancements in lunar science and exploration.

Thank you!