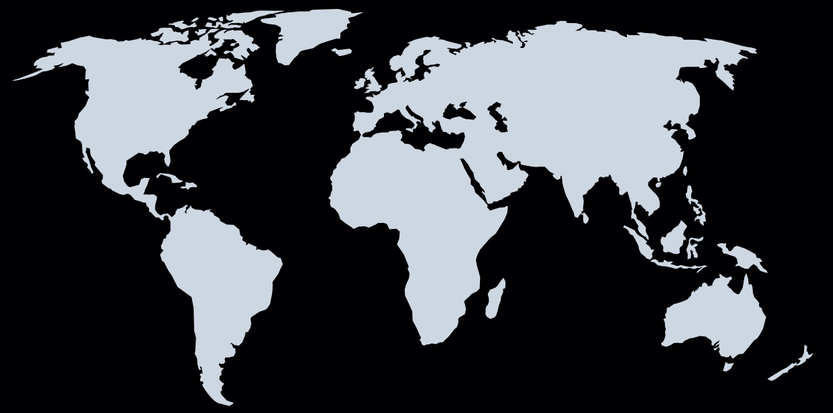
CHANDRAYAAN 2
THE MOON MAPPING CHALLENGE

Challenge 1

This abstract describes a task that aims to use AI/ML technology to convert low-resolution TMC-2 terrain images, with a resolution of up to 5/10 meters, into high-resolution images with a resolution of 30 cm. The dataset available for this project consists of about 8000 TMC-2 images. The goal is to develop a model that can effectively enhance the resolution of these images and provide more detailed and accurate terrain information



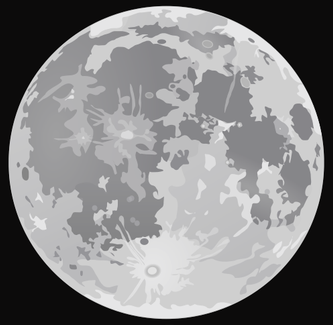
Challenge 2

This challenge describes to generate a global lunar atlas (digital) with the help of the AI/ML
model, based on the medium / low resolution data available of overlapping TMC-2 & OHRC Images.

Dataset

- The raw dataset provided by ISRO contain about 8000+ TMC Images & approx 90 OHRC Images of the moon.
- The data from both these payloads are of very good quality and available in public domain through Indian Space Science Data Centre (ISSDC) of ISRO.
- .tif images were viewed through Snap.
- OHRC Images were viewed in PDS4 Viewer by deriving XML Files.

Model: ESRGAN



ESRGAN uses a generative adversarial network (GAN) architecture to generate high-resolution images from low-resolution input images. The generator network is trained to map low-resolution images to high-resolution images,
while the discriminator network is trained to differentiate between real high-resolution images and generated high-resolution images.

Why ESRGAN?

In terms of specifications, ESRGAN can be trained on a variety of computer vision tasks and image types, and can be fine-tuned for specific applications as needed. The model is typically implemented using TensorFlow or PyTorch, and can be trained on GPUs for faster training times. ESRGAN works fine on remote sensing images, thermal imaging etc.

Process

Data Processing:

In the data processing task, an image of size 17000X5000 pixels was reduced into multiple smaller images of size 400X400 pixels. The goal was to divide the original large image into smaller, more manageable pieces for further analysis or manipulation.

Fine Tuning :-

Fine-tuning is a process of training a pre-trained deep learning model on a new task or on a new dataset, with the aim of adapting it to the specific requirements of the new task or dataset. This process is done by allowing some or all of the model's parameters to be modified in the training process. The pre-trained model provides a strong initial weight configuration, allowing for faster convergence and improved performance compared to training from scratch on the new task.

How to Fine Tune our model?

In our problem statement, TMC data was utilized to fine-tune(re-training) a model for mapping OHRC. By using TMC data the model was able to improve its accuracy leading to better performance and more effective use of the data.

Task 2 Process

Breaking image in continuous tiles:-

Breaking an image into continuous tiles means to divide the image into smaller, rectangular pieces that can be rearranged to form the complete image. This technique is often used in computer graphics for texture mapping, and in web development for creating responsive designs. We can use Python to divide the image into smaller pieces and save each piece as a separate image file. Then we can use these tiles to create a mosaic, or to create an animation by changing the order of the tiles.

Mosaic Continuous Tiles :-

Mosaicing continuous tiles involves arranging multiple, smaller image tiles into a single, larger image.This technique is commonly used in computer graphics, geospatial imaging, and web development. In geospatial imaging, mosaicking is often used to create large, seamless images from satellite or aerial imagery by stitching together smaller image tiles taken from multiple sources.

SPHEROIDAL ELLIPSOIDAL PROJECTION:-

Spheroidal Ellipsoidal Projection is a type of map projection used in cartography to represent the surface of a sphere or an ellipsoid on a flat surface. It is a type of conformal projection, meaning that it preserves angles and shapes, but not areas. This projection is often used in the construction of topographic and bathymetric maps, as well as in navigation and geodetic survey applications.

THANK YOU!