# Lunar Vision: Crater & Boulder Detection Challenge

### Problem Statement

The Moon's surface is a historical archive of impacts—its craters and boulders reveal stories of cosmic events spanning billions of years. Automating the detection of these features is critical for navigation, hazard mapping, and scientific exploration in upcoming lunar missions.

### Your challenge:

Develop an AI/ML model—preferably a CNN-based solution—to automatically detect and localize craters and boulders of various shapes and sizes from high-resolution lunar surface imagery. The model should output bounding boxes around the detected features.

### Objectives

Build and train a CNN-based object detection model capable of detecting both craters and boulders in lunar images.

Ensure detection works on varying scales, lighting conditions, and terrain complexities.

**BONUS-** Implement a user-friendly interface where users can upload a lunar image and get bounding box outputs instantly.

Evaluate the accuracy, generalization, and performance of the model on unseen images.

### Submissions Should Include

1. Trained AI/ML model.
2. Codebase (GitHub repo or zip with training + inference pipeline).
3. Sample results (bounding box outputs on test images. The images will be uploaded 3 days prior to the deadline).
4. UI/Web interface (optional but recommended for bonus points).
5. Documentation (README with instructions as to how to run the uploaded code along with info about the files uploaded, dataset info, model details, and design decisions).
6. **Report** (max 5 slides/pages explaining your approach, challenges faced, and creativity).

### Creativity & Bonus Points

We're looking for more than just accuracy! Get extra credit for:

1. UI/UX Bonus: Implement a "Upload a lunar image and get boxes instantly" interface. Could be a Gradio app, Streamlit demo, or a clean web frontend.

2. Innovative Techniques: Use of attention mechanisms, self-supervised pretraining, or edge-aware models.
3. Explainability Features: Include saliency maps or explainable AI components.
4. Real-world Utility Additions: Show how this tool can assist in mission planning or rover navigation.

**Evaluation:-**

1. Model Performance (50%)
2. Code Quality & Documentation (20%)
3. Innovation & Design (15%)
4. User Interface (Bonus 10%)
5. Explainability & Utility (Bonus 5%)

To evaluate the model performance we will upload the test dataset 3 days prior to the deadline.

**Time- 2 weeks**
**Team of 1-3 people.**

**Dataset:** Dataset

Sample output-