

SMART INDIA



HACKATHON 2024

ENHANCEMENT OF CHANDRAYAAN 2

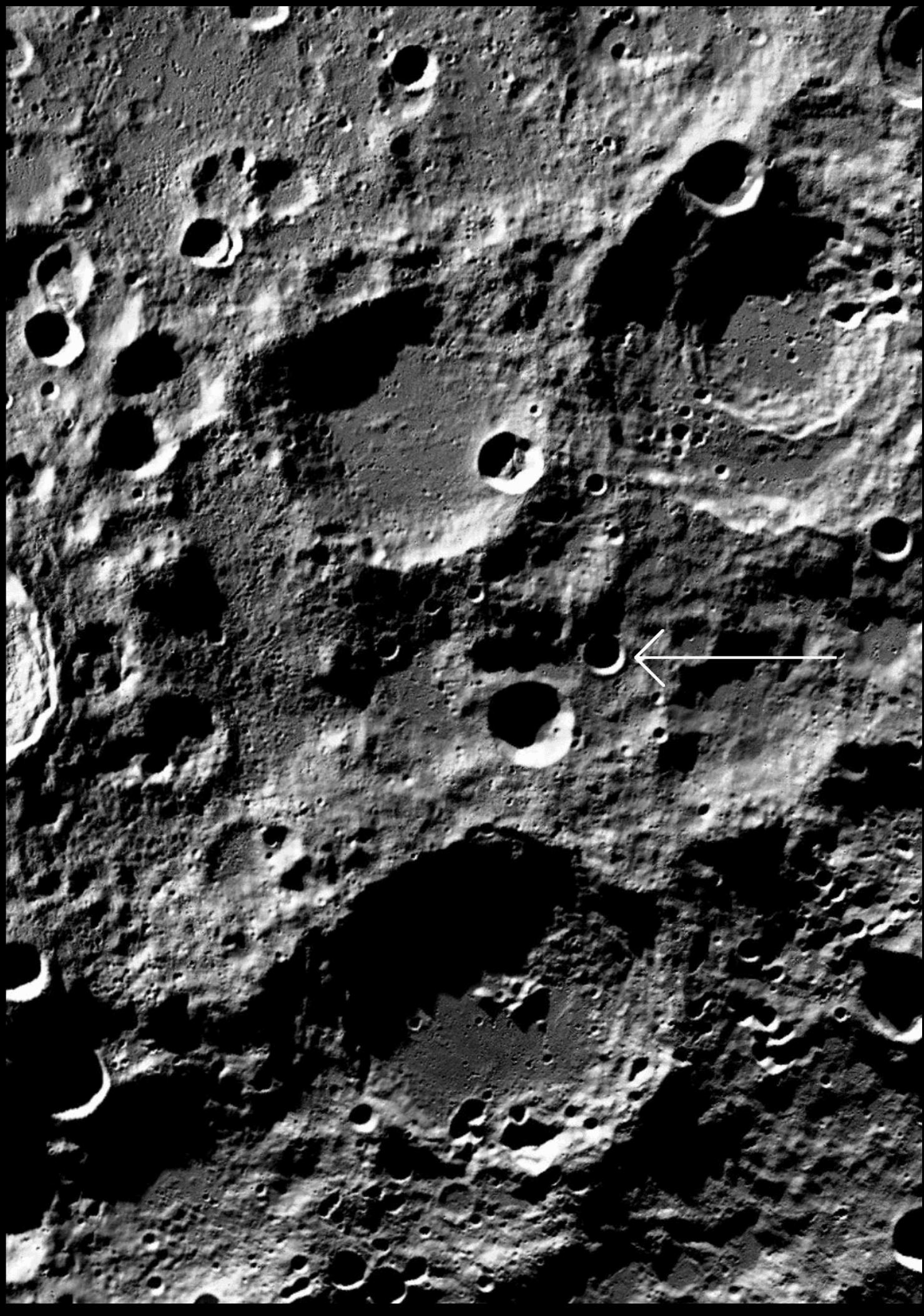
- Problem Statement ID 1732
- Enhancement of Permanently Shadowed Regions (PSR) of Lunar Craters Captured by OHRC of Chandrayaan-2
- SPACE TECHNOLOGY
- PS CATEGORY - SOFTWARE
- TEAM ID -
- TEAM NAME - Innovators' League

Problem Statement: -

- Permanently shadowed regions of lunar craters are poorly illuminated, leading to low signal-to-noise ratio (SNR) in images captured by the OHRC (Orbiter High-Resolution Camera) of Chandrayaan-2.

PROPOSED SOLUTION: -

- Develop an advanced image enhancement technique for improving the SNR of PSR images.
- Focus on enhancing feeble light reflections to generate clearer, usable images.
- This solution is uniquely designed to enhance extremely low-light images from Permanently Shadowed Regions (PSR) of the Moon, creating the first high-quality image map of lunar poles captured by Chandrayaan-2's OHRC.



TECHNICAL APPROACH

Low Light Image Enhancement Techniques:

- Noise reduction algorithms: Median filtering, Gaussian smoothing.
- Signal amplification techniques to enhance weakly reflected light.
- Contrast enhancement using methods like histogram equalization.

Algorithm Development

- Custom algorithm tailored to OHRC image characteristics.
- Iterative process of enhancement and noise suppression.



Technical Feasibility:

- Existing low-light image enhancement techniques can be adapted and extended.
- Feasibility demonstrated in terrestrial low-light imaging applications.

Challenges:

- Unique conditions in PSR regions: minimal illumination, irregular terrain, lunar dust interference.
- Tailoring existing techniques to Chandrayaan-2's specific dataset.

Project Viability:

- Ongoing advancements in image processing make this solution viable.
- Collaboration with ISRO and Chandrayaan-2's data science teams can further improve the solution.

Impact :

- First of its kind PSR image map of lunar poles captured by OHRC.
- High-resolution images will aid in understanding lunar geography, especially in poorly lit areas.
- Key contribution to lunar exploration missions, especially for landing site selection.

Benefits :

- Enhanced image quality for scientific analysis and geomorphological studies.
- More accurate identification of safe landing zones for future missions.
- Opens new avenues for PSR research in other celestial bodies.



Research and References

Key References:

- Research papers and studies on low-light image enhancement algorithms.
- Technical documentation from ISRO on Chandrayaan-2's OHRC data.
- References on PSR studies and lunar exploration.