

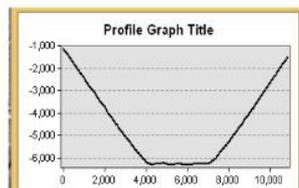
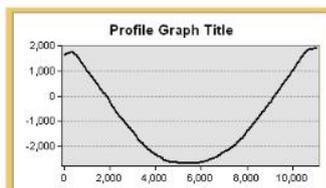
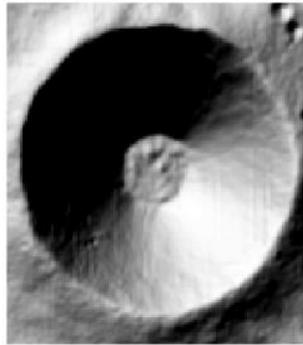
## Differentiating between round and flat floor craters using machine learning

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Craters have been classified as flat-floored or round-floored based on their floor appearance [1]. Flat floor craters generally have a break in the radial profile between the wall and floor which can be used to differentiate between round and flat floored craters [2]. Identification of flat and round floored craters will allow us to extensively study various conditions that led to different morphology of craters. Figure 1 shows examples of flat-floored or round-floored craters with their DEM as well as radial profiles. Although a number of publicly available catalogues of lunar craters exist but to the best of our knowledge, none of these catalogues

provide a clear labelling of craters as flat-floored or round-floored craters. The craters shown in Figure 1 are clear cases of flat-floored or round-floored craters which are easy to differentiate visually but there are a large number of craters which are difficult to visually differentiate between flat-floored or round-floored craters. In this study, we are using machine learning based method for classifying the round and flat floor craters. In this method, features are extracted from DEM images and further used by machine learning-based system for classifying craters. Verification is done through extracting different characteristics of craters as well as visual inspection.

Figure 1: Ortho images of craters with corresponding elevation profiles (Left column corresponds to a round-floor crater located at  $(-22.21^\circ, 258.16^\circ)$ , Right column corresponds to a flat-floor crater located at  $(0.95^\circ, 341.23^\circ)$ )

**References:** [1] Ravine, MA and Grieve, RAF. (1986) *An analysis of morphologic variation in simple lunar craters*, *Journal of Geophysical Research: Solid Earth*, 91(B13), E75--E83. [2] Agarwal, Nikita and Haridas, Athira and Khanna, Nitin and Srivastava, Pradeep and Jain, Vikrant (2019) *Study of morphology and degradation of lunar craters using Chandrayaan-1 data*, *Planetary and Space Science*, 167, 42–53.

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