

## Automatic classification of floor-fractured craters using machine learning algorithms

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**Abstract:** Lunar floor fractured craters (FFC) are a particular class of craters characterized by shallow plate like floors characterized by fractures of various depth and orientation like radial, concentric or polygonal and exhibit additional interior features like moats, ridges, pits of mare material and dark holed pits (Schultz 1976). Floor fractured craters are classified into six sub-classes based on their morphologies (Schultz 1976) and (Jozwiak, Head, and Wilson 2015) producing a catalog of 164 floor fractured craters and their distribution. This study is an attempt to explore the potential of machine learning algorithms in automatically estimating the class of a FFC from the attributes derived from its DEM namely crater's diameter, presence and orientation of fractures in crater's floor, presence of moats, convexity of floor and presence of wall terraces. Attributes like diameter, fractures and their orientation, convexity and wall terraces were automatically through in-house developed software whereas presence/absence of moats were observed through manual inspection. The eight dimensional dataset was prepared for 150 FFCs and machine learning algorithms of classification were trained on it. The accuracy was tested on different classifiers like SVM (using linear), SVM (using radial basis function), KNN (K- nearest neighbor), Decision tree and Random forest. Maximum accuracy of 68% percent was obtained through SVM classifier which is fairly good looking at small size of dataset

### References:

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- [2] Jozwiak, Lauren M., James W. Head, and Lionel Wilson. 2015. "Lunar Floor-Fractured Craters as Magmatic Intrusions: Geometry, Modes of Emplacement, Associated Tectonic and Volcanic Features, and implications for Gravity Anomalies." *Icarus* 248: 424–47. <http://dx.doi.org/10.1016/j.icarus.2014.10.052>.