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Machine Learning Model for the Albedo of Moon
Machine Learning for Science

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Abstract

This project shows the dependence of chemical compositions on albedo of two different planets i.e Mars and Mercury. I have trained two different models for Moon and Mercury. I trained XGBRegressor for moon and ANN model for mercury.

Introduction

This project is about the albedo of the moon and mercury. Albedo is a unitless quantity that indicates how well a surface reflects solar energy. It ranges from 0 to 1 which indicates darkness to whiteness. The chemical composition of surface can be predicted based on albedo value.
This project is a regression problem based on predicting chemical elements based on albedo value. It is a **MultiOutput regression** problem.
The problem is divided in two tasks:

- Moon: Predicting albedo image based on elemental composition of planet and dividing given image in two halves horizontally. Training image on left half and predicting right half.
- Mercury: Predicting elemental composition data based on albedo of mercury. The image has some gaps these gaps can be filled either by a median or mean. But according to trend, it is seen median is giving better results with less standard deviation.

	Standard deviation
Mean	122.948
Median	122.291

Methodology

- **Moon**

For Moon albedo I have used XGBRegressor with MulitOutputRegressor. Squared error is the objective function I have used. I have used mean_squared_error as the performance metric to analyze the model.
I have trained model on different ratios. We'll analyze results for Fe, for other chemicals refer pdf:

	Mean Squared Error		
	50-50 (Vertical)	50-50 (Horizontal)	80-20 (Horizontal)
Fe	0.00227	0.002883	0.000954

As observed, 80-20 ratios are giving better results. For results about all chemical compositions refer ipynb or output pdf.

- **Mercury**

For mercury, provided datasets contain gaps. These gaps can be imputed by median values. For mercury XGBRegressor execution time was very long. I have used ANN model for mercury datasets.

For AlSi we got mean_sqaured_error of 0.01585.