Scope of this Dataset

This dataset was created to study Mars' seasonal frost cycle and its role in the planet's climate and surface evolution over the past ~2 billion years. Scientists are interested in identifying low-latitude frosted microclimates and their impact on climate, and future exploration of Mars will partially depend on finding potential habitable environments and resources for human explorers.

Previous studies of Mars' seasonal frost cycle were limited by a trade-off between coverage and spatial resolution, as scientists were forced to take either a global perspective using coarse observations or a local perspective focused on higher-resolution observations. To overcome this limitation, data science techniques could be useful to identify frost at a global scale with both high-resolution visible and coarse resolution thermal datasets. Toward that goal, models are needed to help identify frost in large-scale, high-resolution imagery. The dataset provided here is meant to address that need. It contains high resolution visible data (from HiRISE on MRO) with frost labels, which can be used to train machine learning models for frost identification in large datasets.

Contents

Datasheets for Dataset
Please see the Datasheet for Dataset PDF for a complete description of this dataset's contents and creation process.

Labeling Guide
The instructions used to annotated the image data are contained in the Labeling Guide PDF file.

Code Examples
Data preparation examples are shown in the Jupyter notebook contained in this directory.

Data
Images (png files) and labels (json files) are organized in the data directory by "subframes." Subframes are individual 5120x5120 pixel images which are crops of the original HiRISE images (often on the order of 50k x 10k pixels). Individual subframes were annotated by the contributors and then sliced into 299x299 "tiles." Each tile has an associated label for use in training ML algorithms

Updates
About 200 additional subframes were added in Nov., 2023 that reflect additional annotations.

** Data Directory Tree**
```
data
├── ESP_017506_2450_0_5120_0_5120
│   ├── labels
│   │   └── background
│   │       ├── ESP_017506_2450_2990_3588_4186_4784.json
│   │       ├── ...
│   │       └── ESP_017506_2450_4186_4784_4186_4784.json
│   └── tiles
│       └── background
│           ├── ESP_017506_2450_2990_3588_4186_4784.png
│           ├── ...
│           └── ESP_017506_2450_4186_4784_4186_4784.png
...
└── ESP_069365_2440_10240_15360_10240_15360
    ├── labels
    │   └── frost
    │       ├── ESP_069365_2440_10240_10838_10838_11436.json
    │       ├── ...
    │       └── ESP_069365_2440_11436_12034_10838_11436.json
    └── tiles
        └── frost
            ├── ESP_069365_2440_10240_10838_10838_11436.png
            ├── ...
            └── ESP_069365_2440_11436_12034_10838_11436.png
```