

CRISMIS

Nidhi Hegde

Google Summer of Code '20 | CERN-HSF

Mentors:

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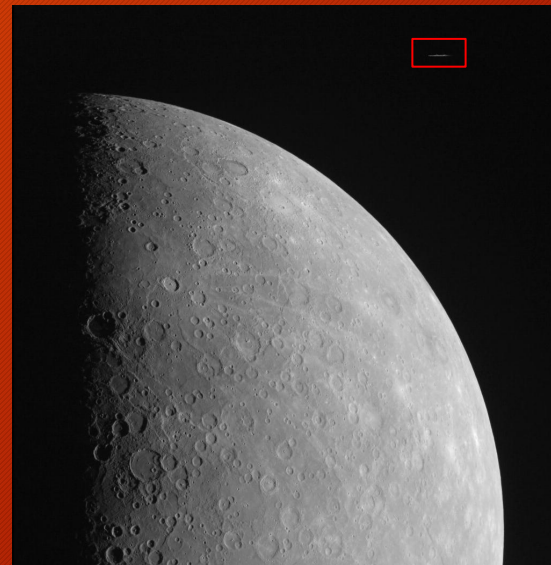
Sergei Gleyzer | *University of Alabama*

About Me

- Hi, I'm Nidhi Hegde, a third-year computer science undergraduate at Indian Institute of Technology Kanpur.
- This is my first time contributing to CERN, as well as in GSoC.

Introduction & Motivation

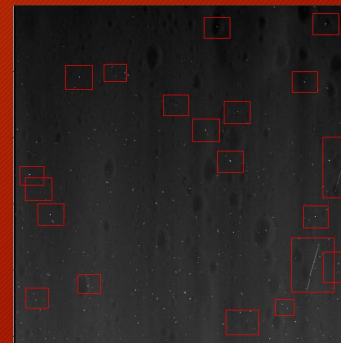
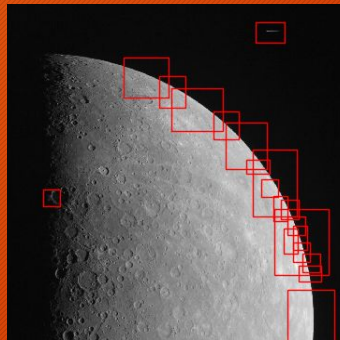
- CCD-based cameras are used extensively in exploration satellites and space telescopes for imaging the surfaces of celestial bodies, and deep-space objects such as stars, extrasolar systems, and galaxies.
- These sensors are often subjected to constant irradiation by galactic cosmic rays. The interaction of these ionizing radiations with optical sensors leads to confusion and loss of imaging pixels (an 'artifact').
- Identification of these artifacts can help in effective filtering of data.
- Besides, identifying cosmic-ray events in images, and classifying their nature and frequency opens a new path for studying cosmic-ray events throughout the solar system.
- CRISMIS is an open-source, deep-learning based tool to identify cosmic-ray artifacts in CCD imaging data products.



Solution Approach

STEP 1

- We developed a model to identify the regions of interest in any CCD image.
- A region of interest may be defined as any portion of the image containing either a cosmic ray, or features like stars and craters, which can potentially be confused with a cosmic ray.



Solution Approach

STEP 2

- We built a classifier upon these proposed regions to separate the true positives within the heap.
- The classification was done into one of the following categories : Spots (dot-like events), Streaks (line-like events), Multiple (Mixed events), Craters and Empty space, where the last 2 categories are the false categories.



SPOTS



STREAKS



MIXED

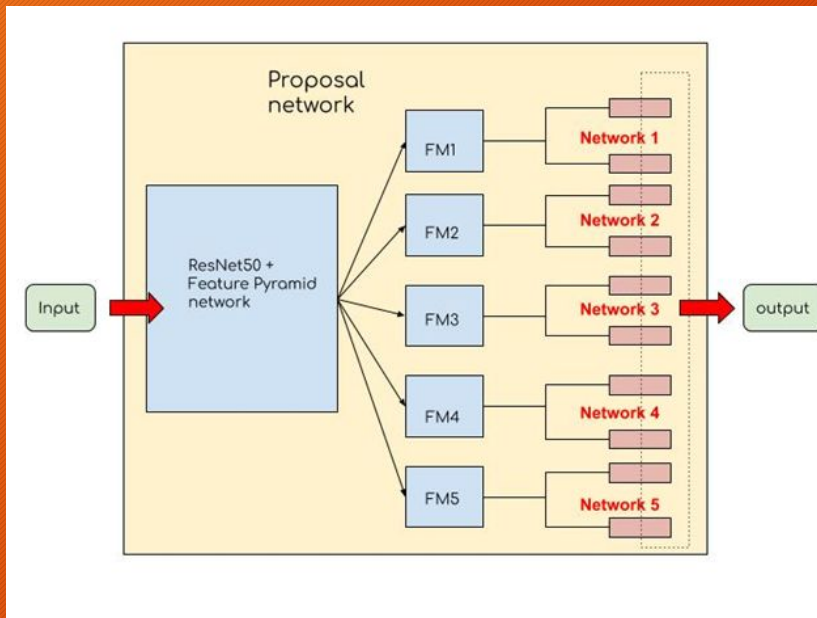


CRATERS

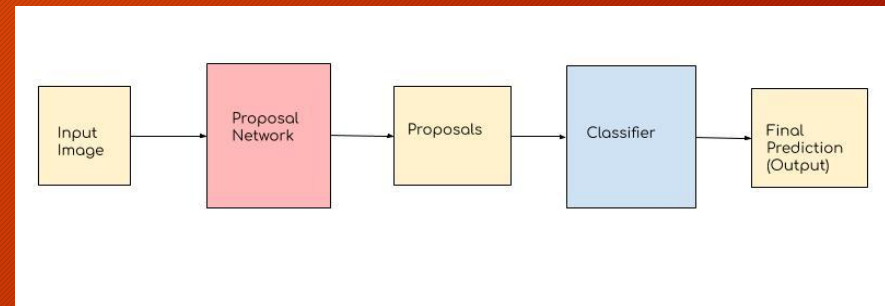


SPACE

Architecture of the Network



Proposal Network

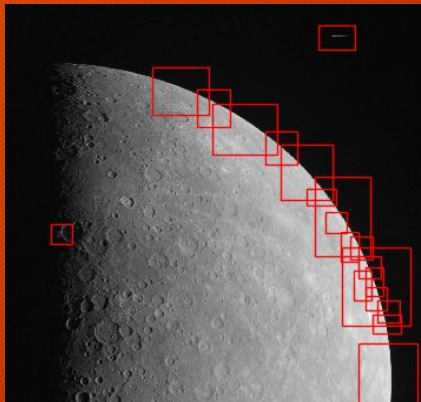


Predictions

Input Image



After Stage 1



After Stage 2

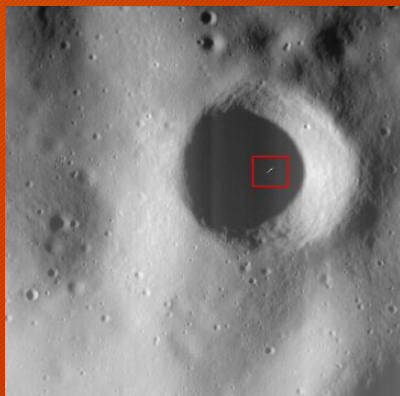


Predictions

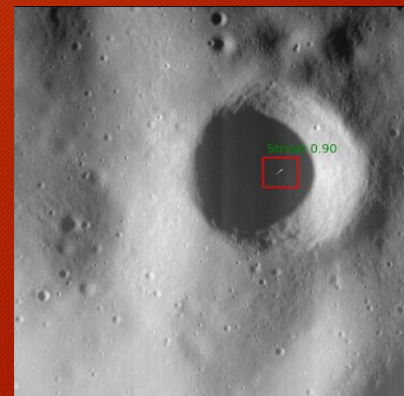
Input Image



After Stage 1



After Stage 2



To summarize...

Present Work

- Utilities for easy retrieval of data from the MESSENGER archive
- A developer-friendly training module to motivate future contributions and extend the application over other datasets.
- A command-line based tool to automatically detect the presence of a cosmic ray and classify it into the corresponding category

What we plan next?

- Provide a functionality for the detailed analysis of specific dates in the archive
- Extend the tool to a web-based interface for public use

Visit the Link below for more info...

<https://github.com/nidhihegde001/CRISMIS>