

# CSC791 Spatial-Temporal Data Mining Project Report

Wei Fu, George Matthew, Qiang Zhang

**Abstract**—Crater detection has been one fundamental task in planetary science, which has drawn great attention from fields of data mining and image processing. In this project, typical spatial data mining algorithms for crater detection are discussed, implemented and analyzed. Based on the results of different algorithms, potential improvements are proposed.

## I. INTRODUCTION

Craters are key structures formed by the collisions of meteoroids, asteroid or comet with planetary surface. To investigate past and future geological information, crater detection methods or tools with high precision are demanded. Manual inspection of images is one mainly used method. However, due to the increasing huge amount of craters needed to be identified in very high resolution planetary images as well as other reasons, this widely used method seems outdated but automatic detection is the only practical solution to such tasks. Several reasons [?] are for this:

- The lighting conditions result in different qualities of the images, which would affect the detection.
- Some geographical features, like volcanos, have similar morphological characteristics as craters.
- crater rims are frequently eroded due their formation millions of years ago.

## II. PROBLEM DEFINITION

The automatic detection algorithms should solve the above challenges. Specifically, two problems are to address: (1) based on the candidates of craters, how to classify them accurately into crater and non-crater classes? (2) given a training dataset including crater and non-crater examples, how to make the algorithm applicable to detect the craters in other data sets.

## STATE-OF-THE-ART

Salamunicar[?] provided an extensive review of previous work on crater detection algorithms, which can be divided into two categories: supervised-learning and unsupervised-learning methods. The unsupervised approaches identify crater rims in an image as circular or elliptical features

## ALGORITHMS

## EXPERIMENTAL RESULTS

*A. Dataset description*

*B. Analysis*

## SUMMARY