I.C.E.B.E.R.G.

Imagery Cyberinfrastructure and Extensible Building Blocks to Enhance Research in the Geosciences

RUTGERS
THE STATE UNIVERSITY OF NEW JERSEY

Jake Lewandowski, Alex Dewey, Ash Kondapalli and Raj Patel

{jel203, x, x, x}@scarletmail.rutgers.edu

Shantenu Jha and Matteo Turilli

Goal

- The goal of ICEBERG is actual quite simple. Our focus is to help uncover the Arctic for scientific research. The implementation is the challenging part. With access to satellite images, from the National Science Foundation, and allocation on the Bridges supercomputer, hosted at the Pittsburgh Supercomputing Center, along with the SuperMIC supercomputer at LSU, we are capable of processing these images. Using parallelization techniques, processing a large set of images, efficiently, to identify biological life and geology in the Arctic can be realized.

Motivations and Objectives

- Motivations
  - With global warming becoming an increasing concern in the world, helping scientists study the Arctic as much as possible is prevalent in understanding what the future holds.
  - As there are thousands and thousands of Arctic images that must be analyzed, providing an efficient, scalable method to process these images is essential
- Objectives
  - Identify seals from satellite images of the Arctic to study: migration patterns, population dynamics and abundance of life.
  - Delineate glacial streams from lakes, slush, and other water features in images of the Greenland Ice Sheet

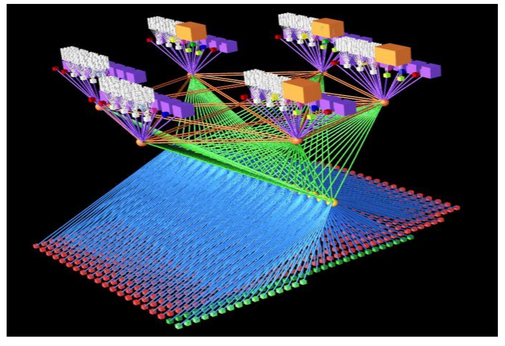
Research Challenges

- Learning how to access and run jobs on a supercomputer
- Integrating RADICAL Cybertools (Pilot, Ensemble Toolkit) to create a pipeline to process images
- Optimizing parallelization techniques to process images in the most efficient manner
- Training a neural network to identify images

Supercomputing

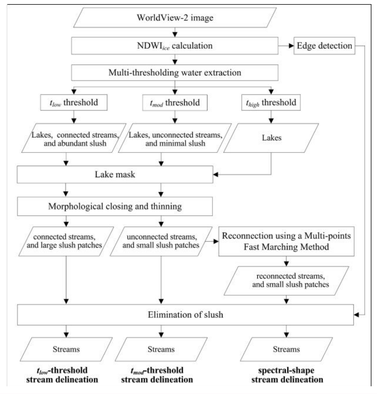
Explanation

- A supercomputer is a computer with a high level of performance compared to a general-purpose computer.
- The following diagram provides a model of the Bridges supercomputer Architecture



Methodology

- Workflow representing the different stages of the stream delineation model



- Diagram explaining the PST (Pipeline, Stage, Task) Model

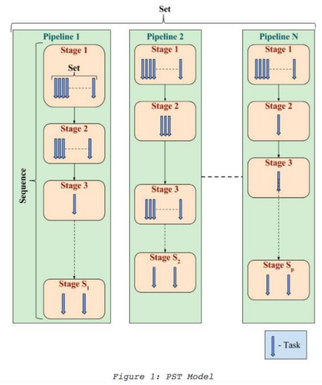
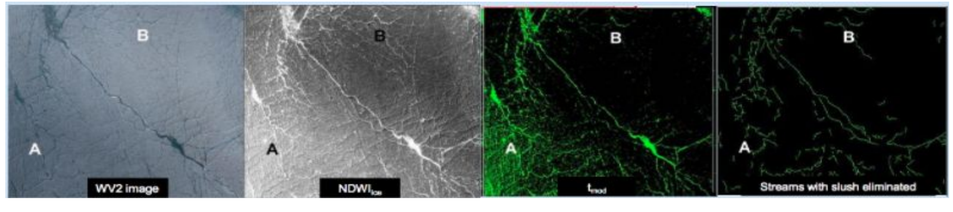


Figure 1: PST Model

Future Goals

- Achieve a successful run of out entire code on the Bridges/SuperMIC Supercomputer
- Test different ratios to optimize amount of images processed in a singe run and time frame.
- The following sequence of images shows the progression of the image from its original form to the delineated image



- These goals will be achieved within the next week or two. We are extremely excited to see what we can accomplish.

Acknowledgement

We would like to thank the Pittsburgh Supercomputing Center, National Science Foundation, Heather Lynch and Bento from Stony Brook, and, of course, Professors Jha and Turilli.

References

[1]https://www.psc.edu/resources/computing/bridges
[2] https://portal.xsede.org/lsu-supermic
[3]https://radical-cybertools.github.io/