

Automated mapping of Arctic permafrost tundra using sub-meter resolution satellite imagery

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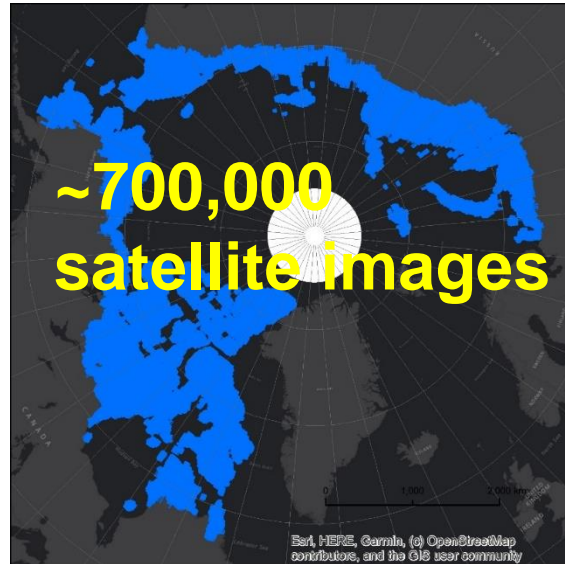
Supported by



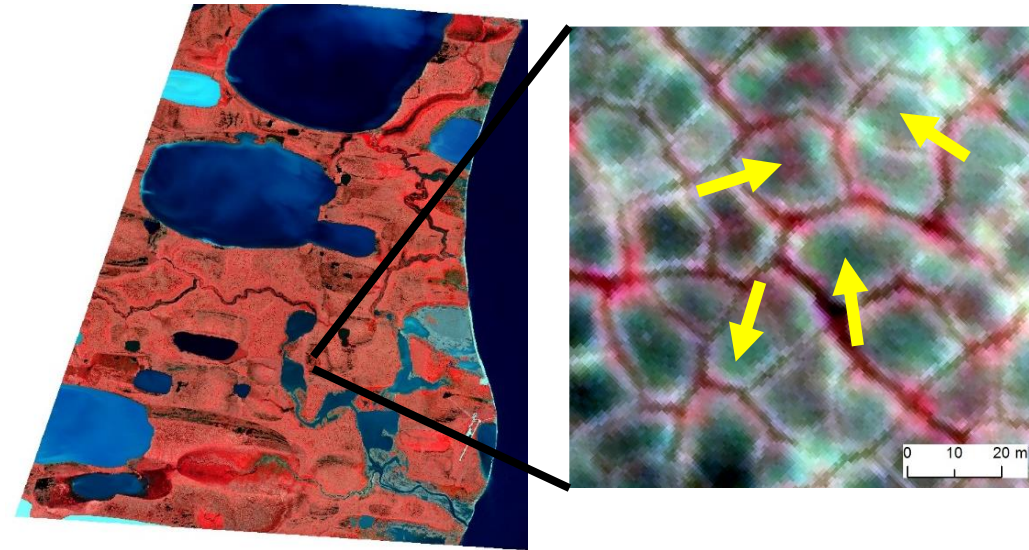
How monitor Pan-Arctic scale permafrost disturbances?)



‘Big’ commercial satellite imagery to rescue

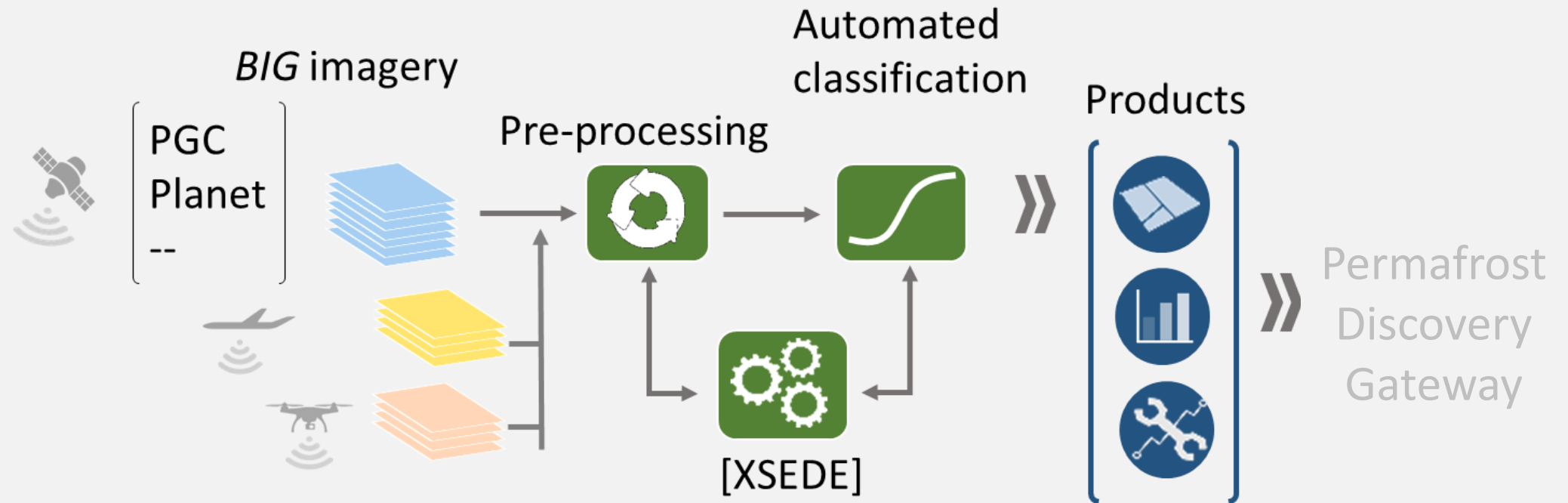


WorldView-2 commercial satellite image
[0.5m resolution, July 2016]



- Entire Arctic (above 60°N) has been imaged by DigitalGlobe Inc. commercial satellites in 0.5m resolution four times in the last 6 years.
- ~ **2 petabytes of imagery**
(*> 1 million images*)
- Image data is freely available for NSF-Funded researchers via Polar Geospatial Center (PGC), University of Minnesota

Mapping application for Arctic Permafrost Land Environment - **MAPLE**



PGC – Polar Geospatial Center
XSEDE – eXtreme Science and Engineering
Development Environment
Longhorn – Frontera/Texas Advanced
Computing Center

Want to run in different computational
Setups such as Frontera(GPU/Longhorn),
CPU Clusters, Kubernetes

Polar Geospatial Center (PGC)

[email to point-of-contact at PGC]

Satellite image data request from User

- Scene Ids
- AOI (shapefile, kml,..)
- -----

Image attributes

- cloud cover
- bands
- sensor
- bit depth
- pansharpening
- product level (ortho)
- stereo/mono
- ----

PGC does Pre-processing and transfer

Bridges Pylon

XSEDE

Bridges GPU-AI



User account

Image data

Analysis

Codes

Intermediate Image tiles

Intermediate Shapefiles

Final Maps

XSEDE Job Submission by User

Model runs

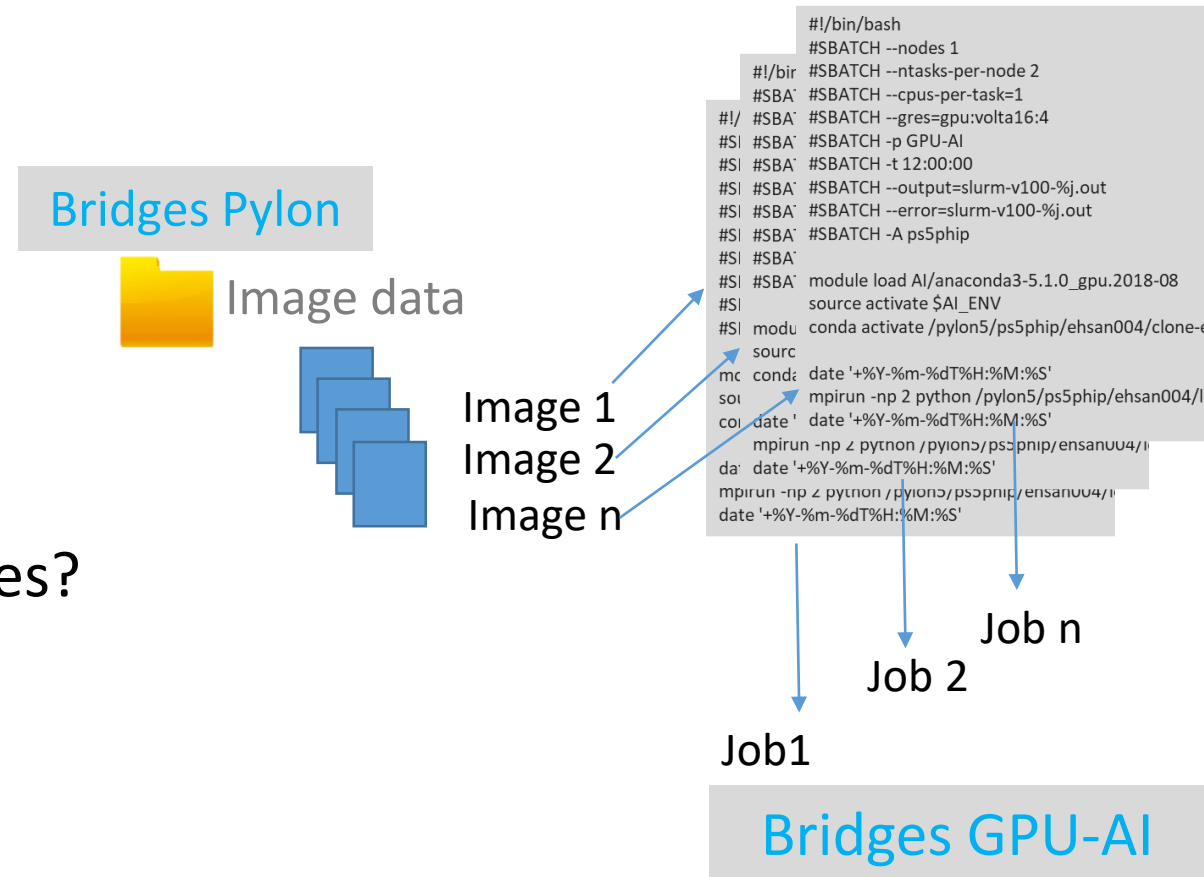
Challenges, Bottlenecks, Wish list

Processing of large volumes of jobs on XSEDE

- manual submission
- bash script
- job tracking/management is manual
- submit each image as an individual job
- submit one large job for multiple images?

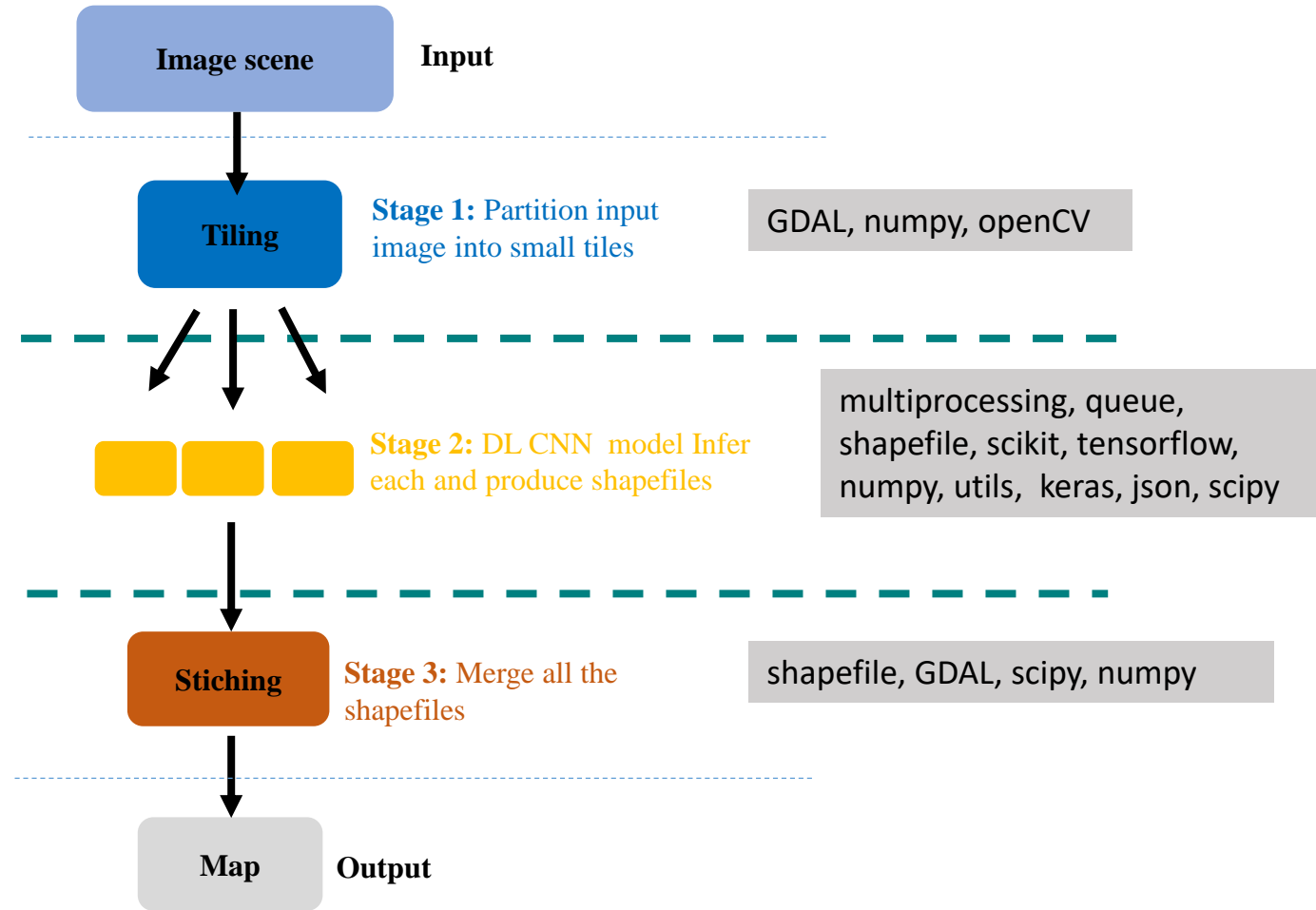
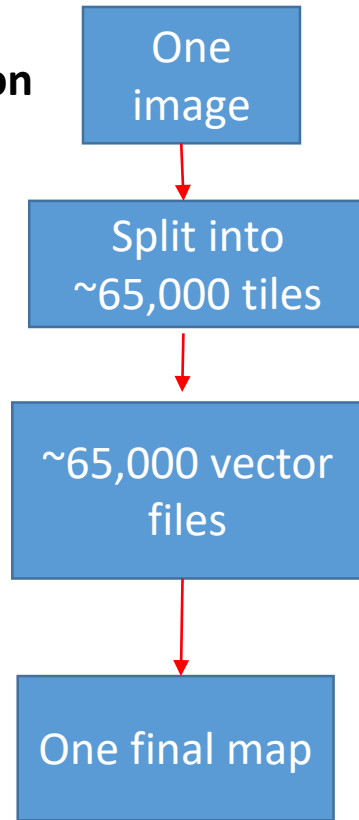
We are hoping to use PARSL to

- automate job submission
- track and manage jobs
- save the results.

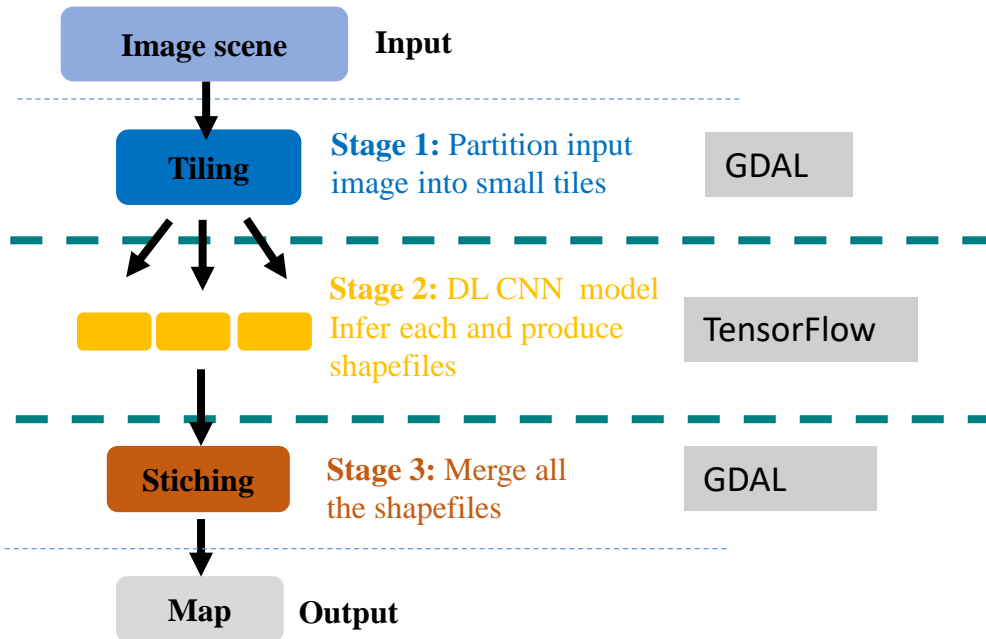


Challenges, Bottlenecks, Wish list

Workflow optimization



Extra Challenges in the Workflow.



- In some servers there is a conflict between these two. Automated workflow failed in these servers.
- Used two Conda environments for preprocessing and classifications.
- Used two Executors for two steps.
- Could not use object serialization to pass data
- Used Files to pass data between python Apps.

Acknowledgements for PARSL implementation.

- Daniel S. Katz
- Kyle Chard
- Yadu Babuji