**ECE Capstone program**
**Spring 2018**
**Project Abstract & Info**

Please provide the following information to be shared with on capstone information exchange platform:

**1. Project number**: 49

**2. Project title (as will appear on the poster)**:
ICEBERG Image Processing Pipelines

**3. Team members**: Ash Kondapalli, Raj Patel, Jake Lewandowski, Alex Dewey

**4. Adviser(s) name(s)**: Shantenu Jha, Matteo Turilli

**5. Up to 5 keywords that will help to classify the project scope**:
Scalability, Extensibility, THREE MORE NEEDED

**6. Project abstract (up to 250 words) to be shared with judges**:

Currently, there exists petabytes of high resolution aerial view images of Antarctica, the Arctic, and Greenland available for study to the research institutions of the US. The members of Project ICEBERG have begun using this resource for various applications in the fields of biology, climatology, and geology by developing software to automate the processing of these images. In order to fully take advantage of the vast amount of data that has been provided, we began to develop high-performance computing pipelines for some of these applications.

Half of our group focused on a Pytorch machine learning algorithm used to scan these photos for seal populations. By using the PSC-Bridges HPC of the Pittsburgh Supercomputing Center, we were able to efficiently expand the rate of the algorithm's testing and validation capabilities, as well as provide a larger platform for neural network training. Our code was written in Python, utilizing Rutgers RADICAL's own RADICAL-Cybertools, libraries designed to aid in the structure and design of large, scalable applications aimed to be used in HPC and distributed computing systems.

The other half focused on an algorithm that delineates glacial streams from other water features in images of the Greenland Ice Sheet. The RADICAL Cybertools Ensemble Toolkit was integrated to model the code as a Pipeline, with Stages and Tasks to represent the delineation process, and this code was run on the SuperMIC LSU supercomputer to provide a more efficient platform for the delineation process.

-Petabytes of high resolution images of Antarctica, The Arctic, Greenland (ALSO MIGHT BE OTHER PLACES)

-Several machine learning & automated image detection algorithms in development from researchers

Project Scope: Provide a HPC pipeline for as much of what has currently been developed as we can, keeping extensibility and reusability particularly in mind

-Many use cases being worked on such as....

-Jake and Alex worked on seal use case

    -pytorch machine learning algorithm had been developed

    -using PSC Bridges HPC

-Ash and Raj worked on stream delineation

    -given C# to perform stream delineation in images

    -working with SuperMIC Supercomputer

-Our project consisted of a lot of testing in order establish an optimal parallelization technique

    -Incorporated RADICAL Cybertools