# Exploring Satellite Image Registration with AI

By: Jacob Lin

Mentor: Dr. Fangfang Yu

cisess
Cooperative Institute for Satellite Earth System Studies

## Research Goal:

- Use artificial intelligence algorithms to identify matched key points in paired images produced by different satellite instruments

## Procedure:

- Retrieve images by Advanced Baseline Imager (ABI) and the Geostationary Lightning Mapper (GLM) on the GOES-16 and GOES-18 satellite
- Resize images
- Use SuperPoint to generate key points within the images
- Use SuperGlue to match the key points of images
- Pair images
- Assess the quality of matches using homography
- Use distance formula to calculate error

## Results:

- Key points are crucial to establish the geometric calibration of the satellite instruments
- Experimented with many key point generation and matching methods, SuperGlue and SuperPoint were the best for this work
- The average mode of the error 7.7 is pixels apart for ABI assessment
- SuperGlue and SuperPoint are reasonable for this study
- This work provided a strong basis for future studies

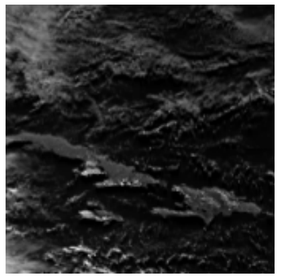

*Figure 2,* Image generated by the GLM instrument

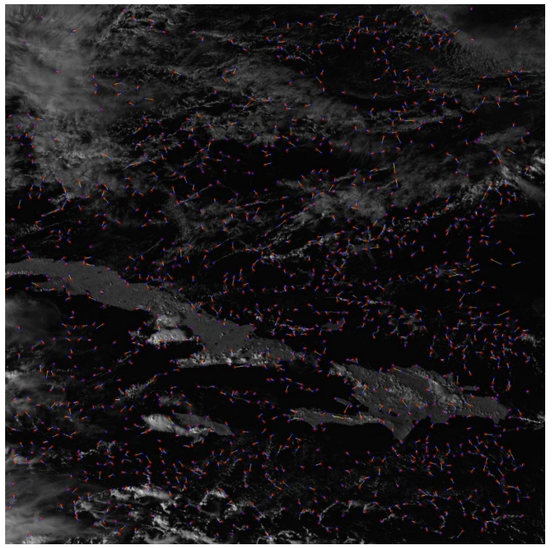

*Figure 1,* Image generated by the ABI instrument, red dots are the key points generated by SuperPoint, blue dots are predicted points

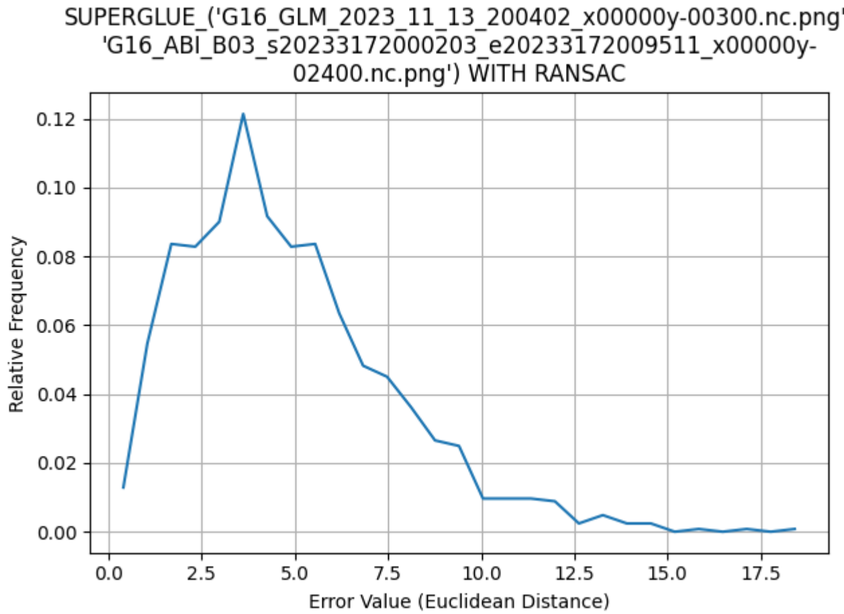


*Figure 3,* Image of the relative histogram which shows the error value (in pixels) between the predicted and actual key point during the homography assessment for ABI image.