

Assessment of ABI Image Registration with a Deep Learning Method

Linfred Kingston, Mentor: Dr. Fangfang Yu

Objectives

- Study the effectiveness of SIFT, ORB and CNN for satellite image registration accuracy.

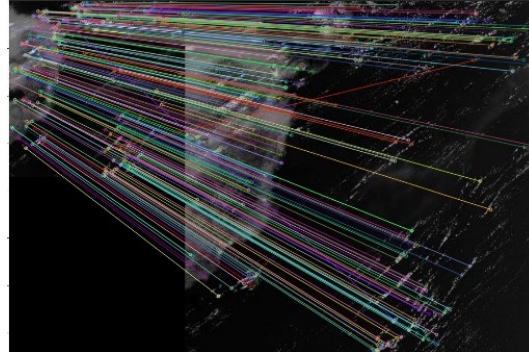


Figure 1: SIFT - VIIRS Satellite Image (M11 & I1 bands)

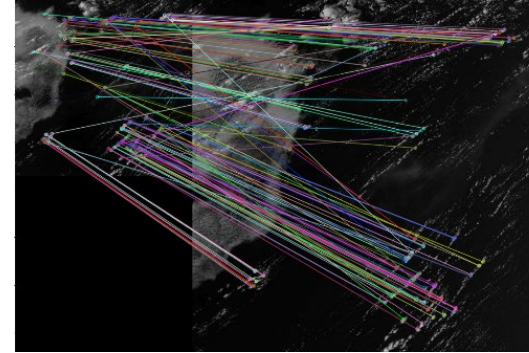


Figure 2: ORB - VIIRS Satellite Image (M11 & I1 bands)

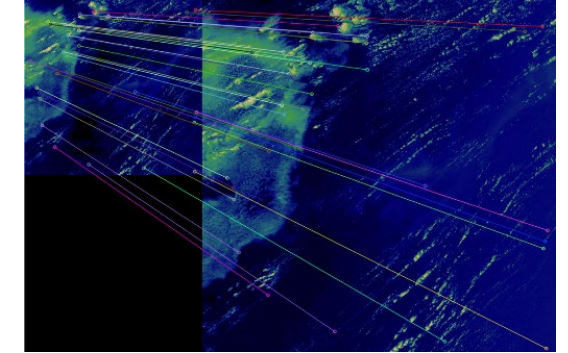


Figure 3: CNN - VIIRS Satellite Image (M11 & I1 bands)

VIIRS Satellite Images - Reference Image Size: 373 x 373, Target Image Size: 746 x 746 (M11 & I1 bands)

| Method | Processing Time (in sec.) | Average Distance Error (in kM) | Standard Dev of distance error (in kM) | # Of Matches |
|--------|---------------------------|--------------------------------|--|--------------|
| SIFT | .455 | 2.12863 | 18.71401 | 291 |
| ORB | .305 | 26.58541 | 56.79253 | 174 |
| CNN | 8.755 | 1.47364 | 1.08963 | 36 |

Results

- SIFT is a fast algorithm that generates a sufficient number of key points
- ORB is the fastest algorithm of the 3 and is able to generate the most key points on average but at the cost of some accuracy
- CNN is the most computationally costly algorithm causing for long processing times. However, CNN generates the most accurate key points as a result.

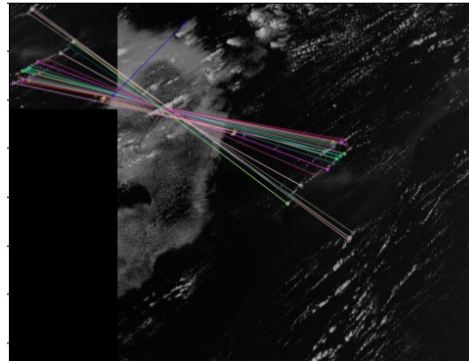


Figure 4: SIFT - ABI/VIIRS Satellite Image (B2 & I1 bands)

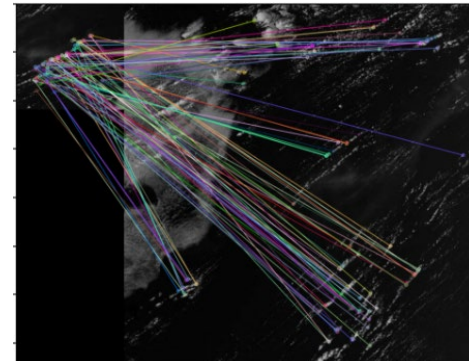


Figure 5: ORB - ABI/VIIRS Satellite Image (B2 & I1 bands)

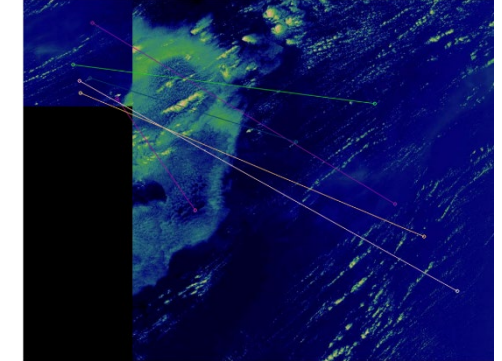


Figure 6: CNN - ABI/VIIRS Satellite Image (B2 & I1 bands)