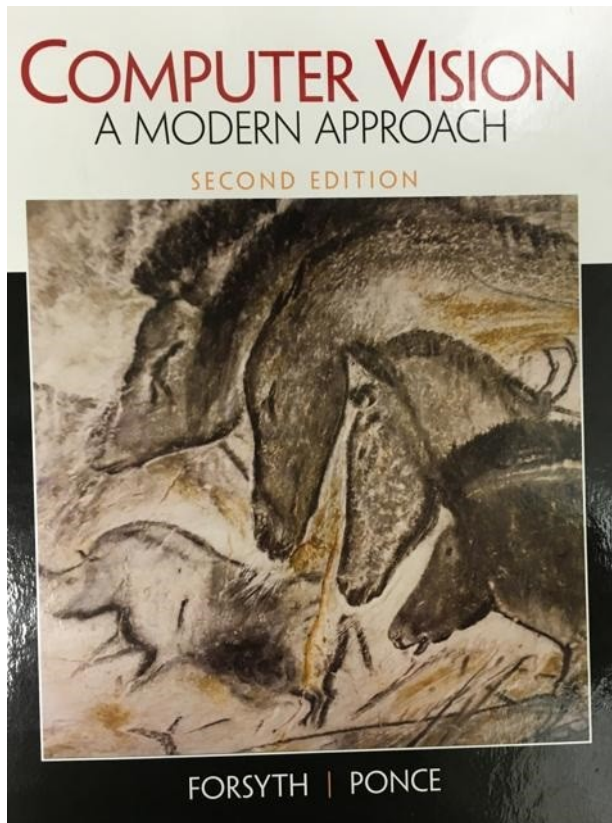


Homework 3  
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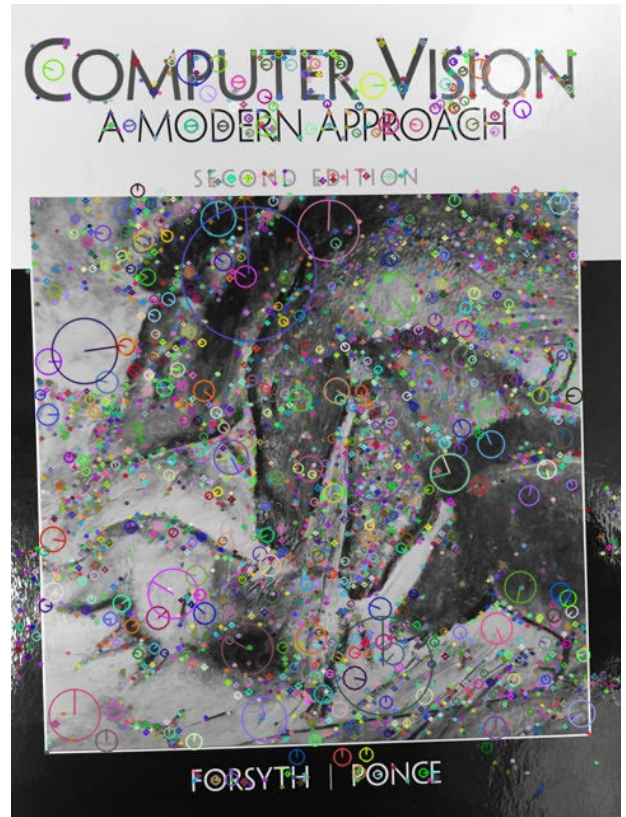
Dixith Reddy Gomari  
USC-ID: 3098766483  
[gomari@usc.edu](mailto:gomari@usc.edu)

**SIFT Features:**

A) For image 1:



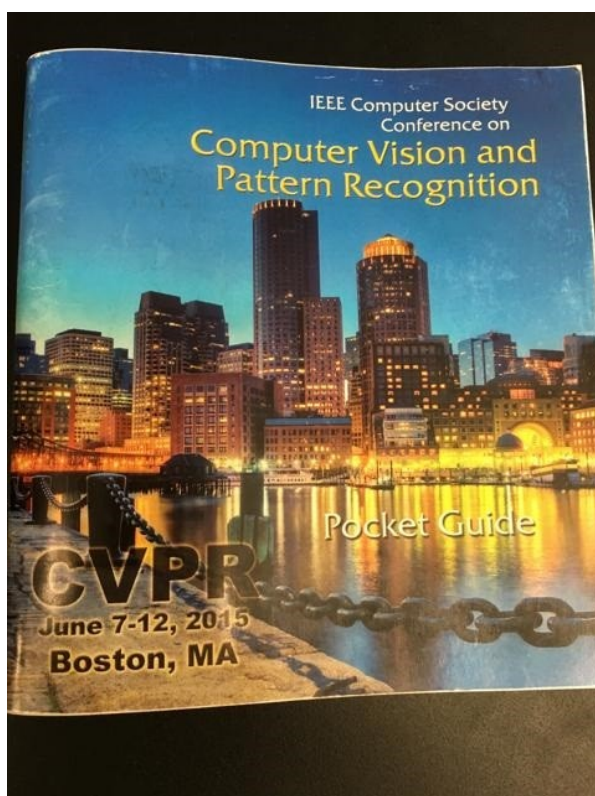
Original Image



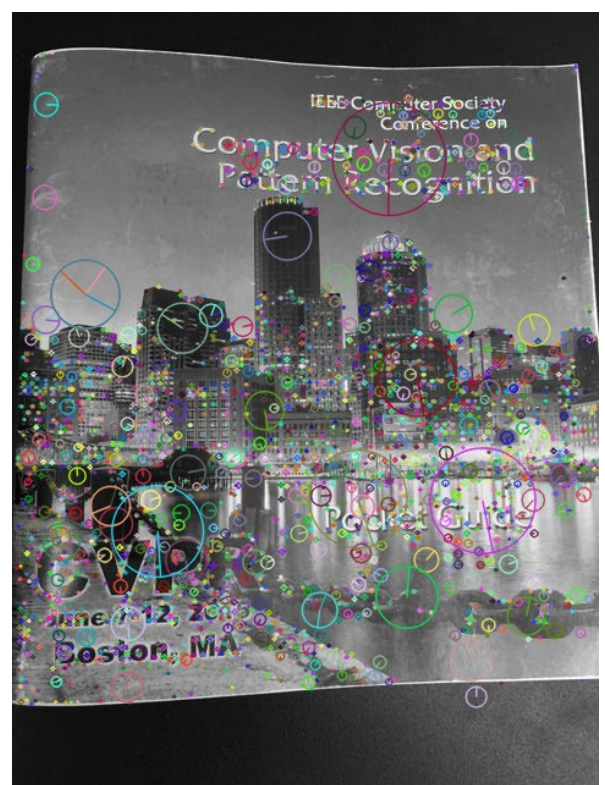
SIFT features

No of Key features in Query Image: 3248

B) For image 2:



Original Image

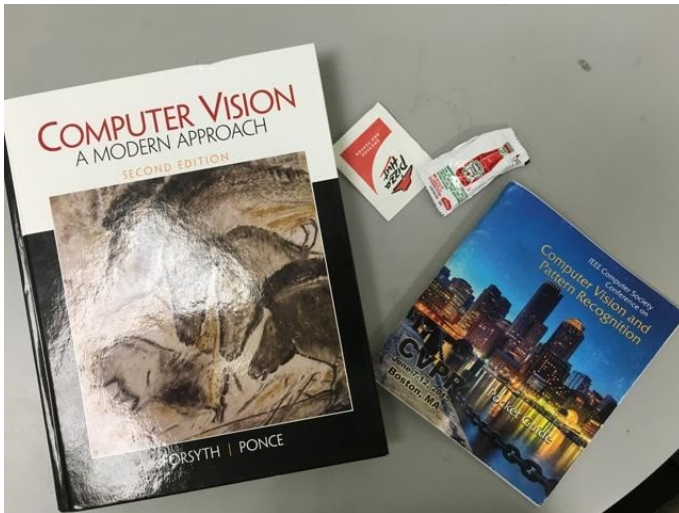


SIFT features



No of Key features in Query Image: 2807

C) For image 3:



Original Image



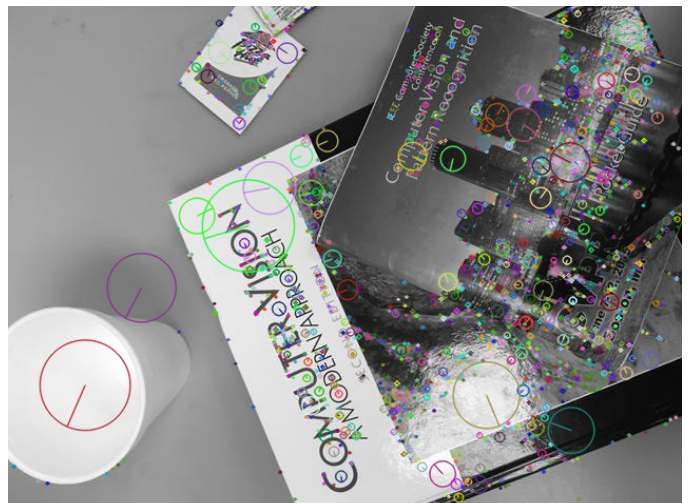
SIFT features

No of Key features in Train Image: 1726

D) For image 4:



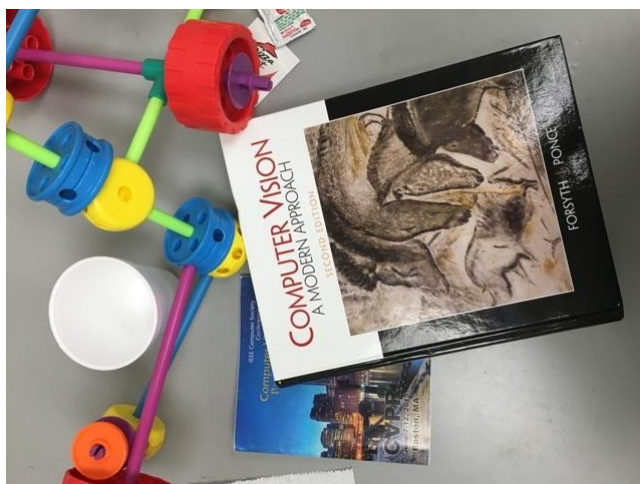
Original Image



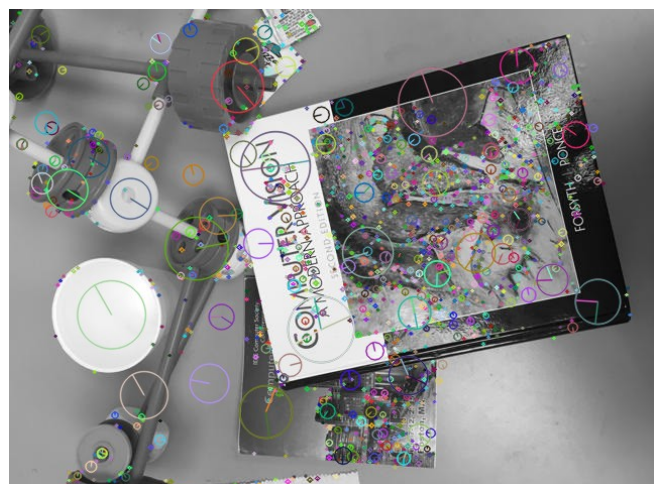
SIFT features

No of Key features in Train Image: 1626

E) For image 5:



Original Image



SIFT features

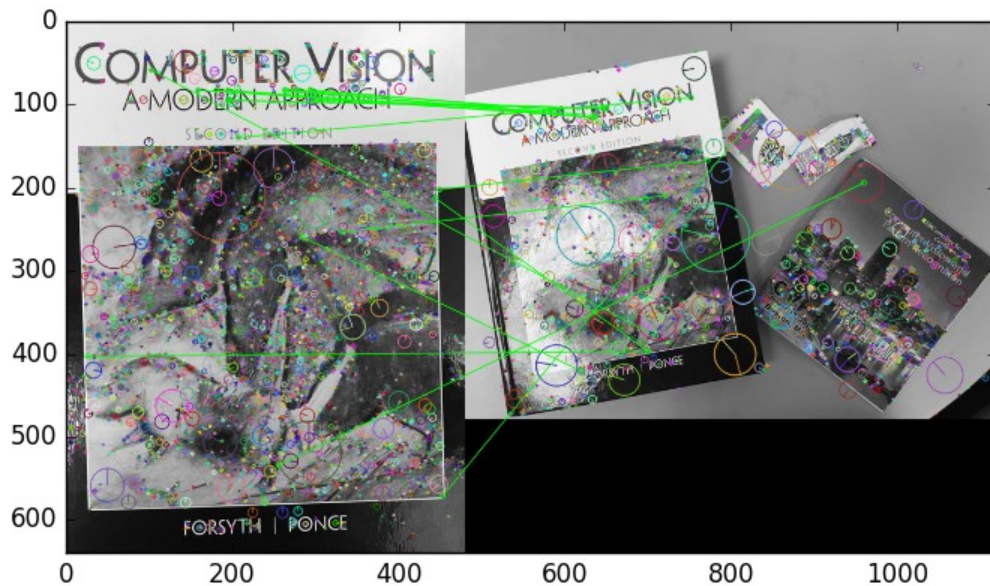
No of Key features in Train Image: 1654



I) For images 1 and 3

No of matching features between images for a lowe's ratio of 0.7: 417

Top 20 matches before RANSAC



```
Homography Matrix
[[ 5.41332772e-01  7.33078022e-02  2.22413774e+01]
 [-1.02278174e-01  5.33980690e-01  9.96462346e+01]
 [-5.07081676e-05 -5.40987073e-05  1.00000000e+00]]
```

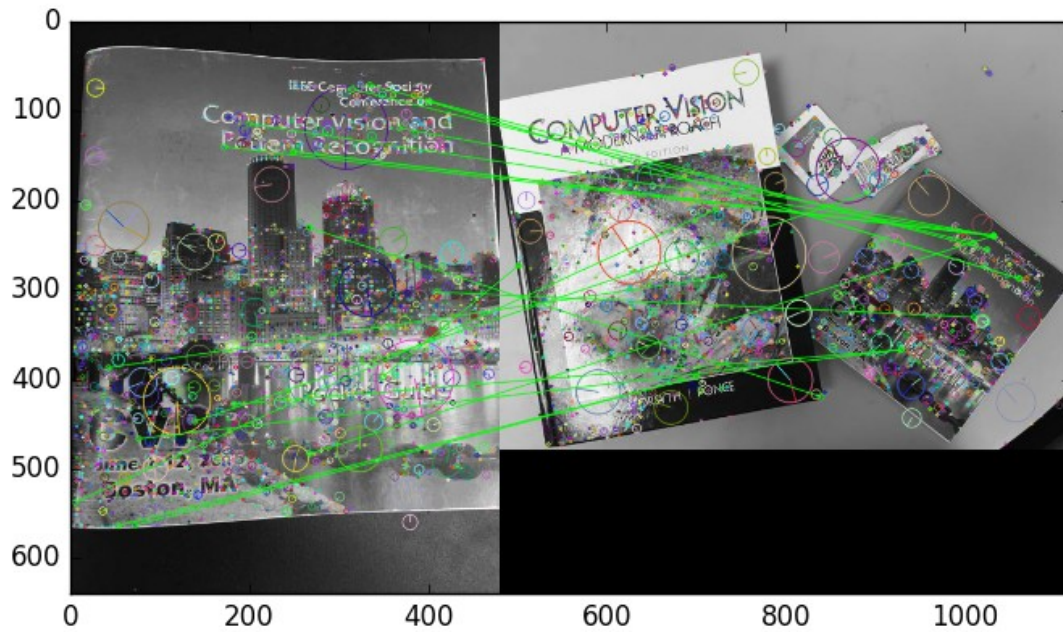
Top 10 matches after RANSAC



II) For images 2 and 3

No of matching features between images for a Lowe's ratio of 0.7: 197

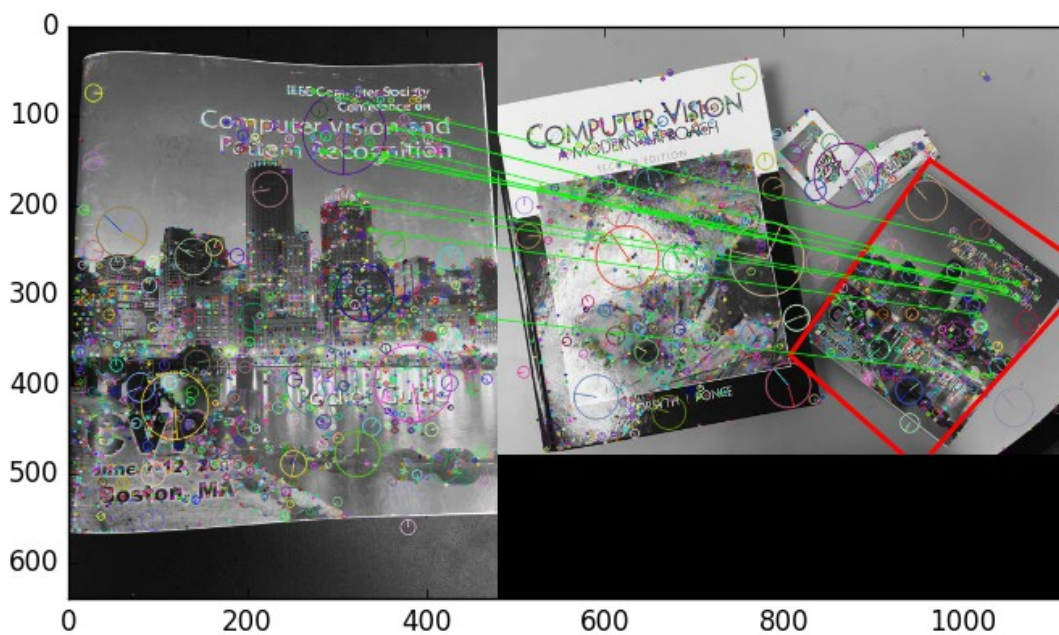
Top 20 matches before RANSAC



Homography Matrix

```
[ [ 2.55797278e-01  -1.63233410e-01  4.82745457e+02 ]  
  [ 2.11291642e-01  4.31671001e-01  1.50221551e+02 ]  
  [ -1.90093918e-04  2.46177574e-04  1.00000000e+00 ] ]
```

Top 10 matches after RANSAC

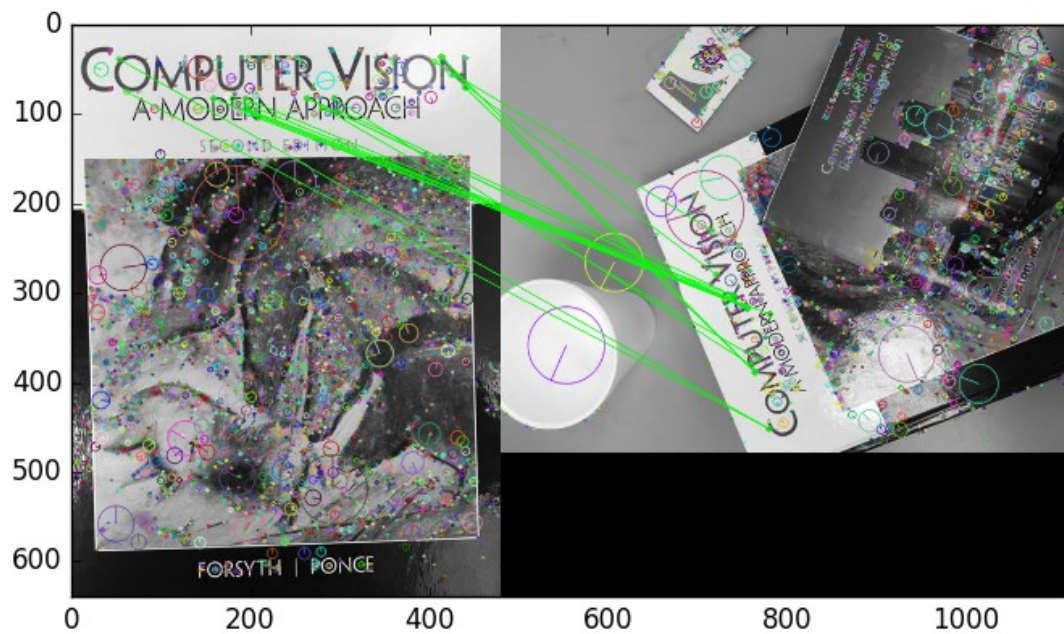




III) For images 1 and 4

No of matching features between images for a Lowe's ratio of 0.7: 235

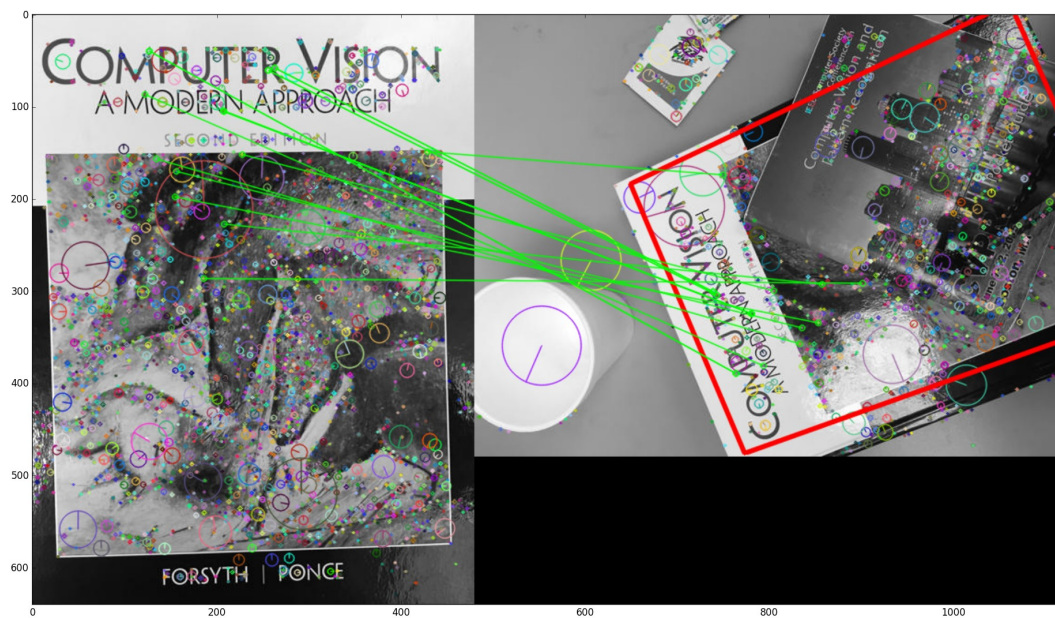
Top 20 matches before RANSAC



Homography Matrix

[	-2.54099607e-01	5.31955844e-01	2.93122713e+02]
[	-6.05605649e-01	-3.08871098e-01	4.76698769e+02]
[	2.51877522e-05	-2.07035544e-04	1.00000000e+00]

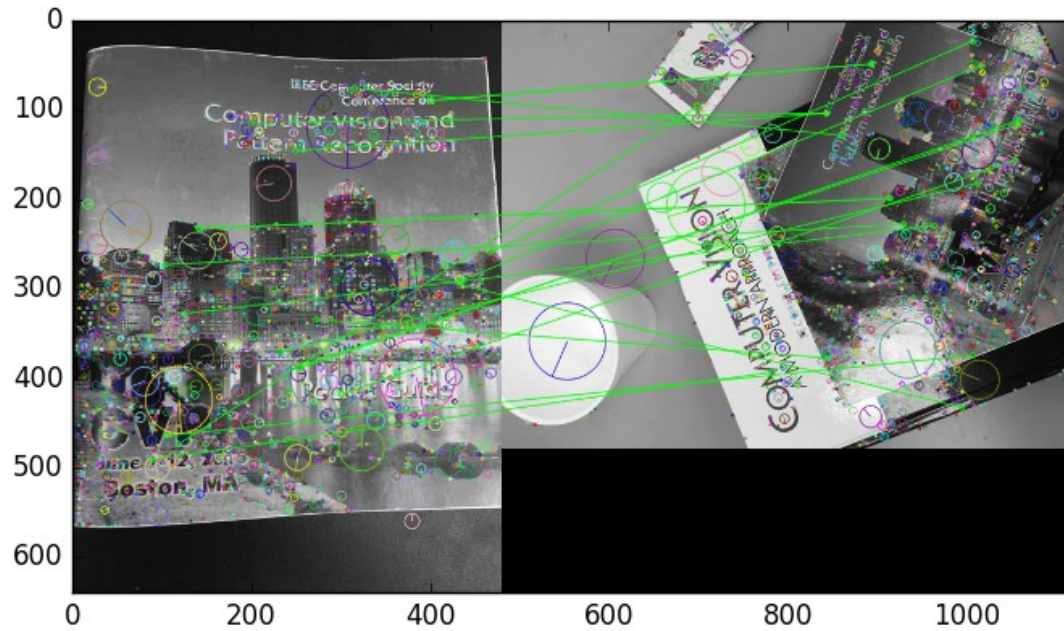
Top 10 matches after RANSAC



IV) For images 2 and 4

No of matching features between images for a lowe's ratio of 0.7: 210

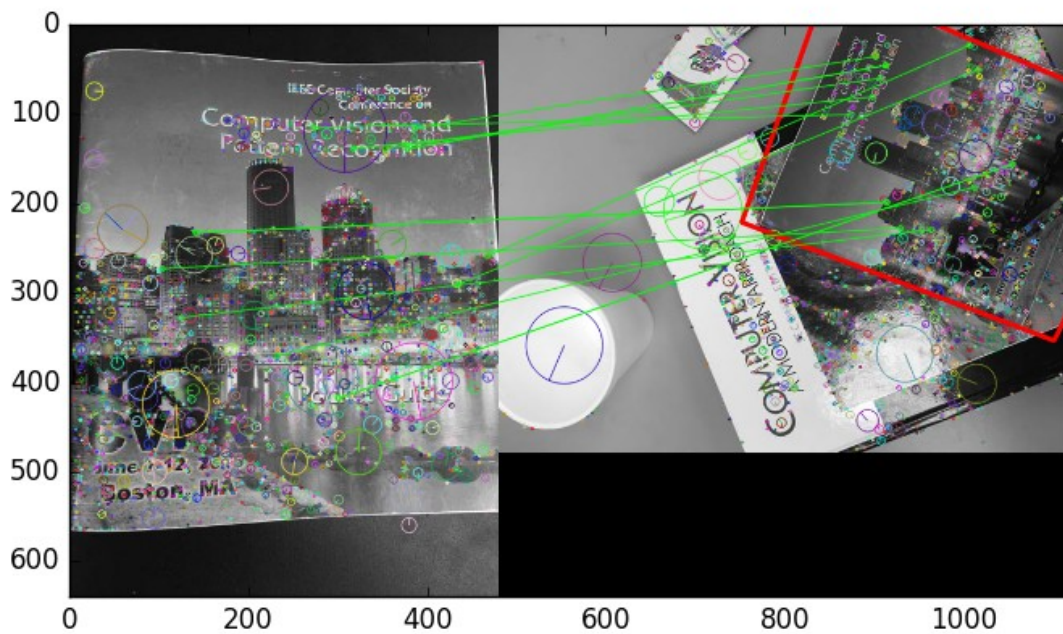
Top 20 matches before RANSAC



Homography Matrix

```
[[ 1.35462630e-01  6.04100361e-01  2.71174332e+02]
 [ -5.61512127e-01  2.40361571e-01  2.22494675e+02]
 [ -1.85061679e-04  9.33966279e-05  1.00000000e+00]]
```

Top 10 matches after RANSAC

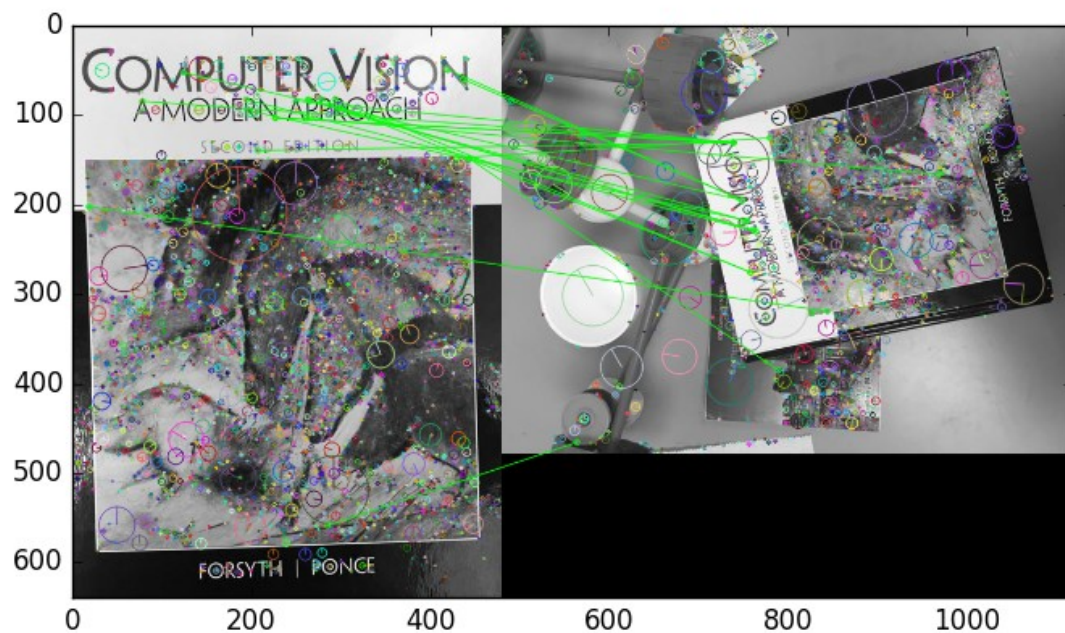




V) For Images 1 and 5

No of matching features between images for a lowe's ratio of 0.7: 564

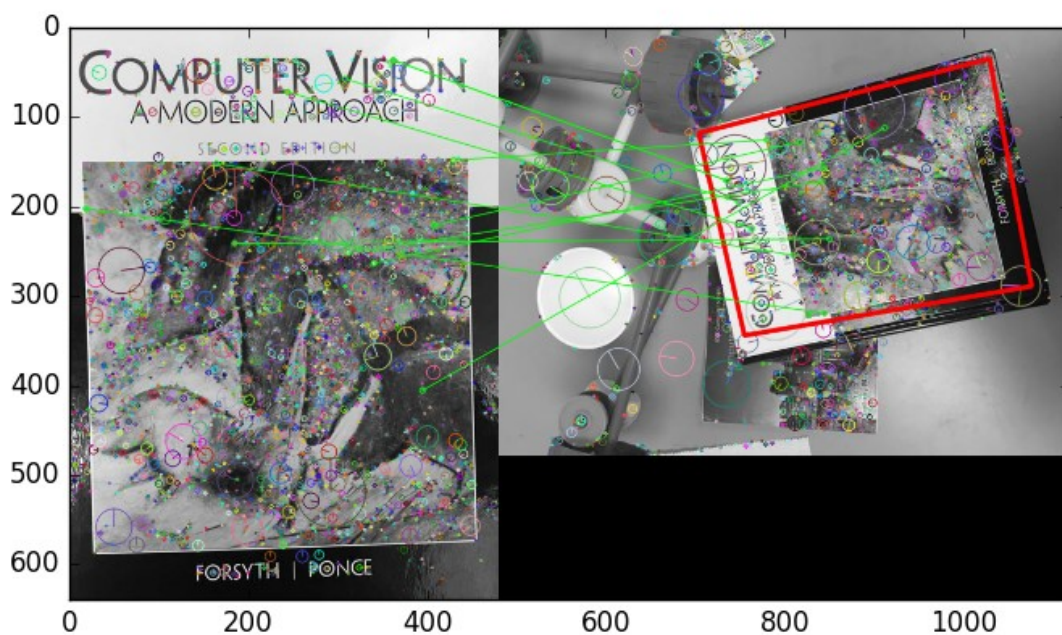
Top 20 matches before RANSAC



Homography Matrix

```
[ [ -1.17522333e-01  4.07663921e-01  2.74407895e+02 ]  
  [ -4.76946724e-01 -1.32897688e-01  3.45352981e+02 ]  
  [ -5.18191746e-05 -1.60221518e-04  1.00000000e+00 ] ]
```

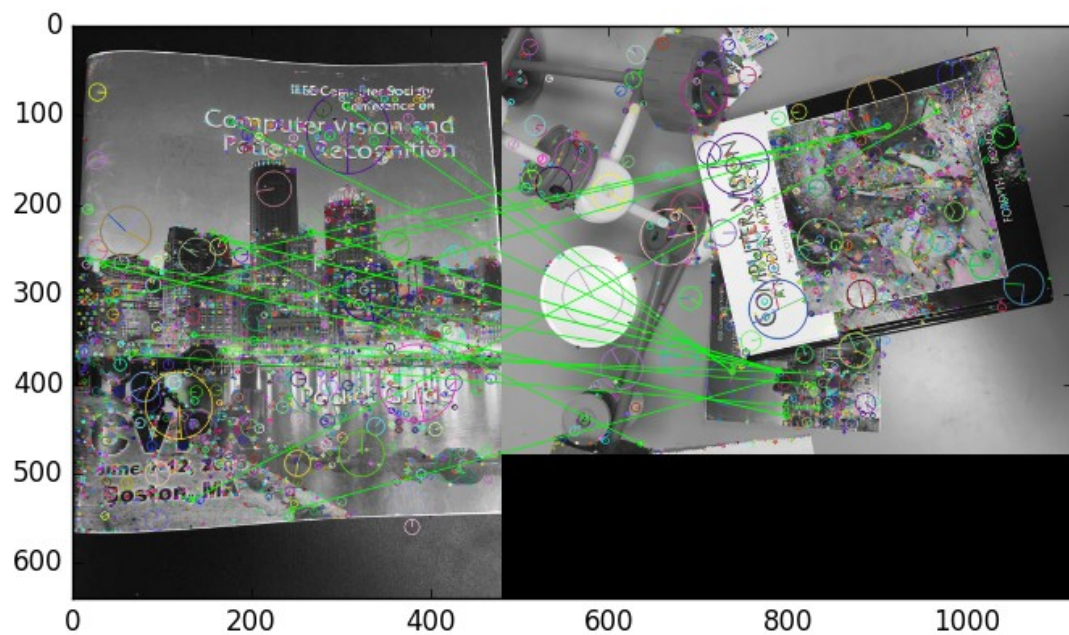
Top 10 matches after RANSAC



VI) For images 2 and 5

No of matching features between images for a lowe's ratio of 0.7: 47

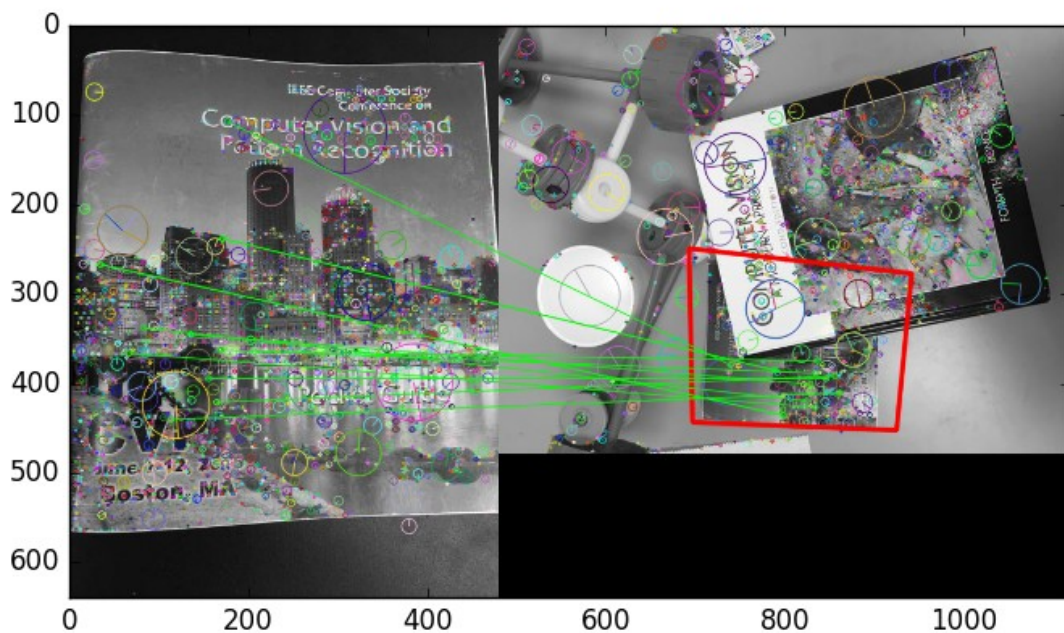
Top 20 matches before RANSAC



Homography Matrix

```
[ [ -5.06151763e-02  4.21499779e-01  2.16789648e+02 ]  
[ -4.54663549e-01  8.16931379e-02  4.44576153e+02 ]  
[ -1.97582610e-04  1.48376487e-04  1.00000000e+00 ] ]
```

Top 10 matches after RANSAC





**Discussion:**

- The above results the SIFT features and image matching based on the key point descriptors of the images.
- I have initiated a SIFT detector and computed the key points and descriptors of the images that I am supposed to match.
- Created a brute force matcher object to detect the matches based on the knn matcher.
- Extracted better matches based on the Lowe's ratio test i.e, good matches if the ratio is less than 0.7.
- Applied RANSAC and then repeated the process to extract better matches.
- SIFT works really well on these images, as the query images were very distinct in the train images.
- Since matching with SIFT feature points, there might be a lot of mismatches. The RANSAC algorithm can be used to remove the mismatches by finding the transformation matrix of the feature points.

**Conclusion:**

- Even though SIFT works very well in this case, SIFT fails to work in badly patterned images, where it is difficult to extract the key points to match.
- If the data space contains a lot of mismatches, RANSAC fails to find the right transformation matrix.
- RANSAC failure can be removed by doing some preprocessing before carrying out RANSAC, like eliminating the features not belonging to the target area.