Q1.1.1 - FAST

For a given point, it looks at a circle of 16 points around it. If there exists a set of n contiguous points in the circle which are either all brighter than the points intensity plus a threshold, or darker than the intensity minus the threshold, the point it a corner. Skimage allows you to adjust this n and the threshold.

Q1.1.2 - BRIEF

BRIEF is able to find binary strings directly without finding descriptors, which makes it fast and have lower memory usage than other feature descriptors. It compares the same set of smoothed pixels for each patch that it describes. If the smoothed pixels intensity is larger than the original points, then the descriptor is a 1 if not it is a 0.

### Q1.1.3 – Hamming and Nearest Neighbor

Hamming distance between two strings of equal length is the number of positions at which the corresponding symbols are different. Nearest neighbor classifies an object by finding its nearest neighbor in feature space. BREIF is able to use XOR and bit count to calculate hamming distance to find an objects class based off of nearest neighbors. These instructions are very fast.
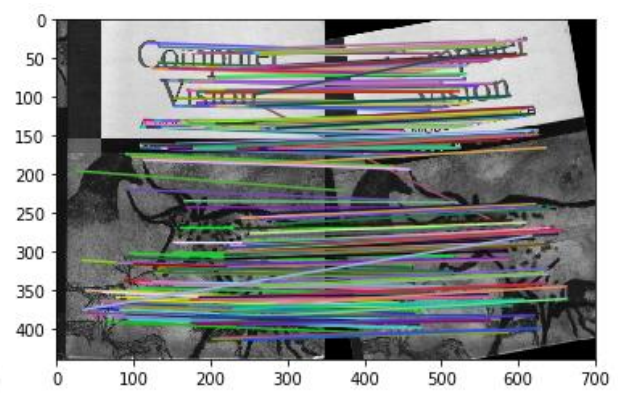
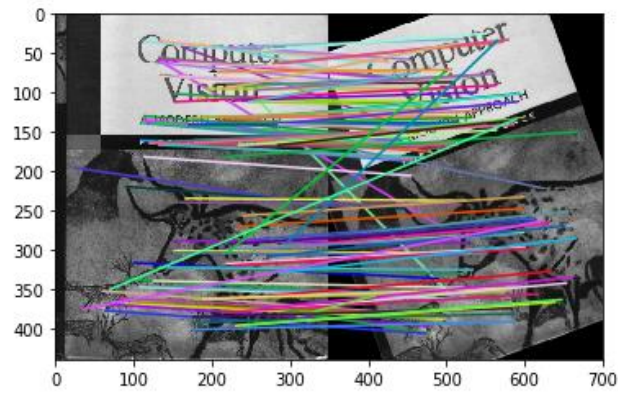### Q1.1.4 – Feature Matching

Matched points
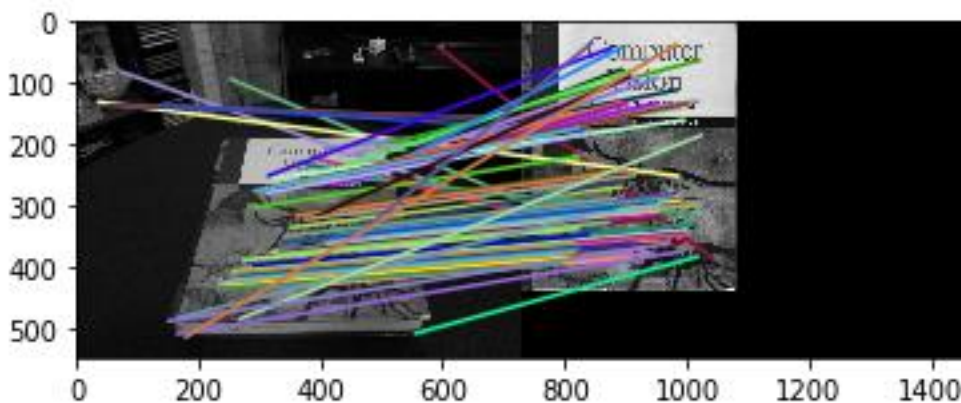
Q1.1.5 – Rotations
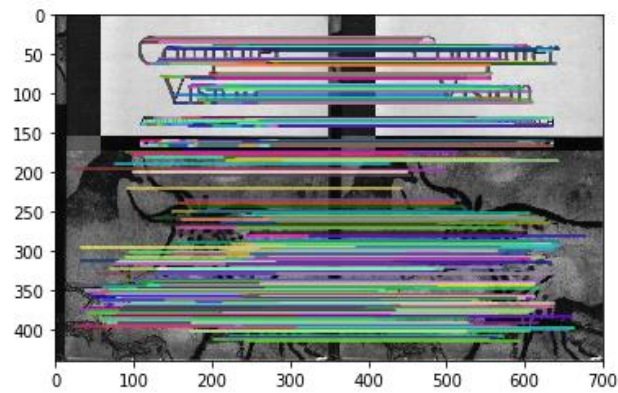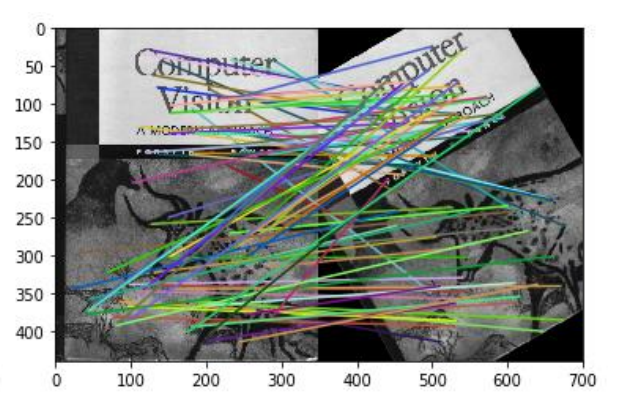

Rotation: 0 Degrees

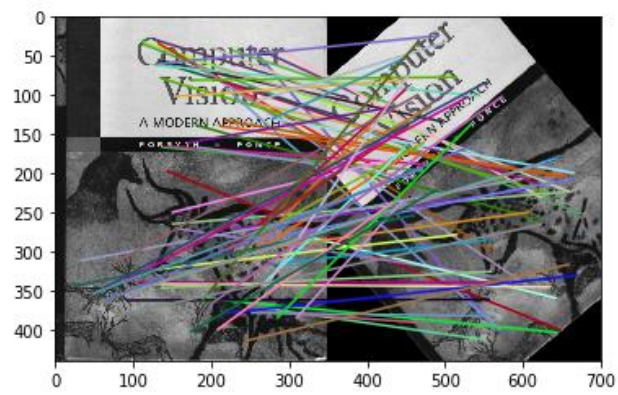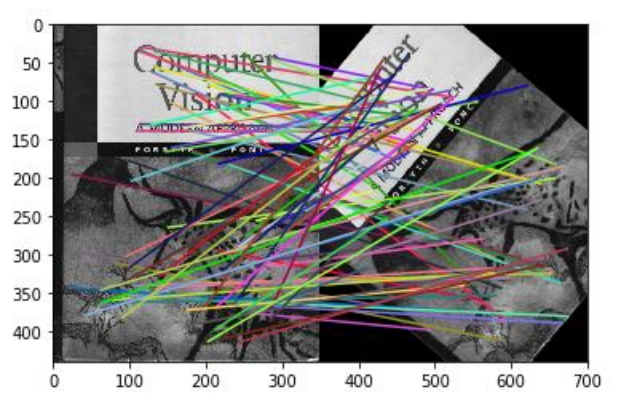Rotation: 10 Degrees

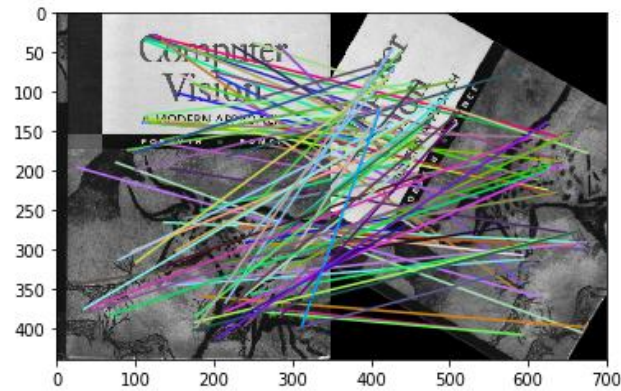Rotation: 20 Degrees

Rotation: 30 Degrees
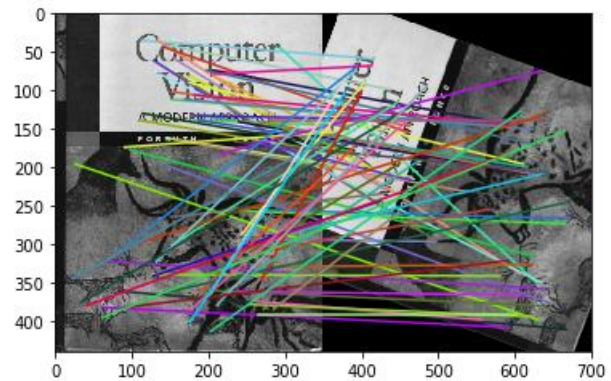

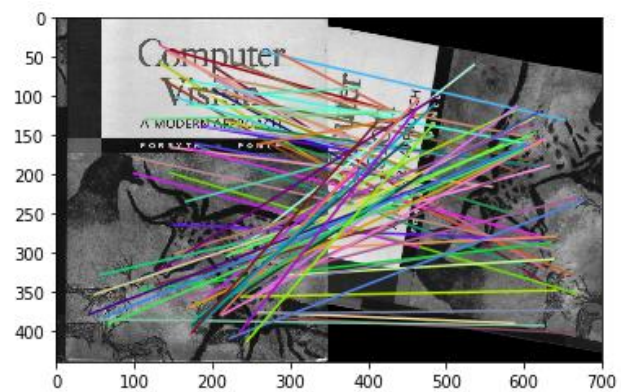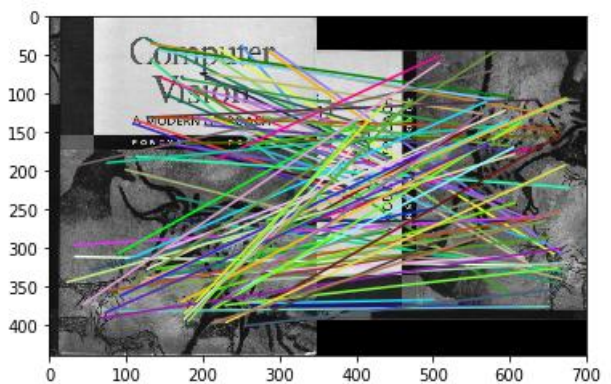Rotation: 40 Degrees

Rotation: 50 Degrees

Rotation: 60 Degrees

Rotation: 70 Degrees

Rotation: 80 Degrees

Rotation: 90 Degrees

Brief doesn't work well with rotation since the descriptor is purely based off of intensity differences. One idea to become rotationally invariant would be to save the orientation angle of the gradients at the random points picked, similar to SIFT.

Q1.2.4 – Harry Potter Warping