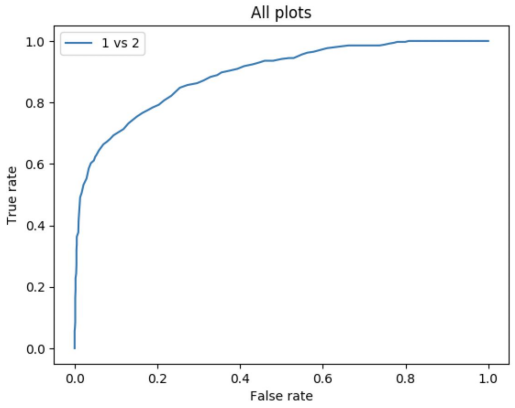
CS 5670 HW2 Report

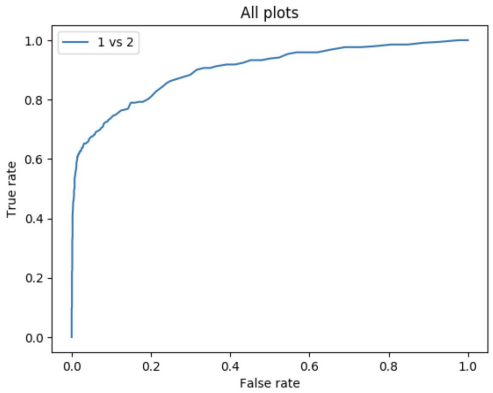
Marika Cusick, Renee Zacharowicz

4 Possible Configurations for Yosemite Photographs

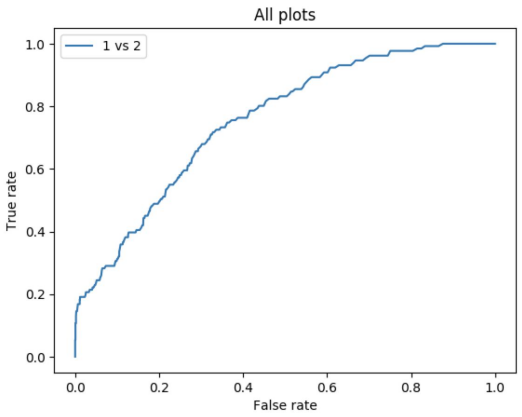
Configuration	Average AUC
Simple Descriptor + SSD	0.892
Simple Descriptor + Ratio	0.900
MOPS Descriptor + SSD	0.754
MOPS Descriptor + Ratio	0.895

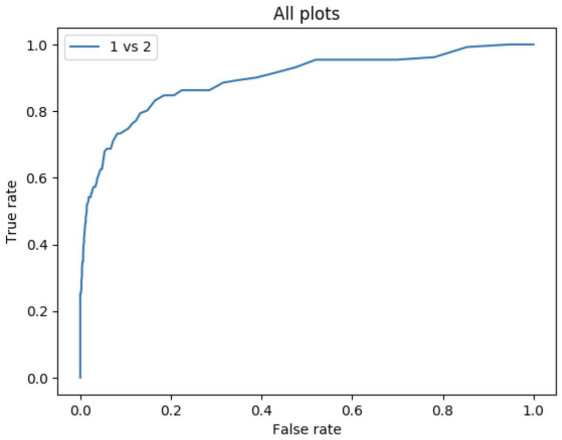
Simple Descriptors (SSD, Ratio) ROC Curves





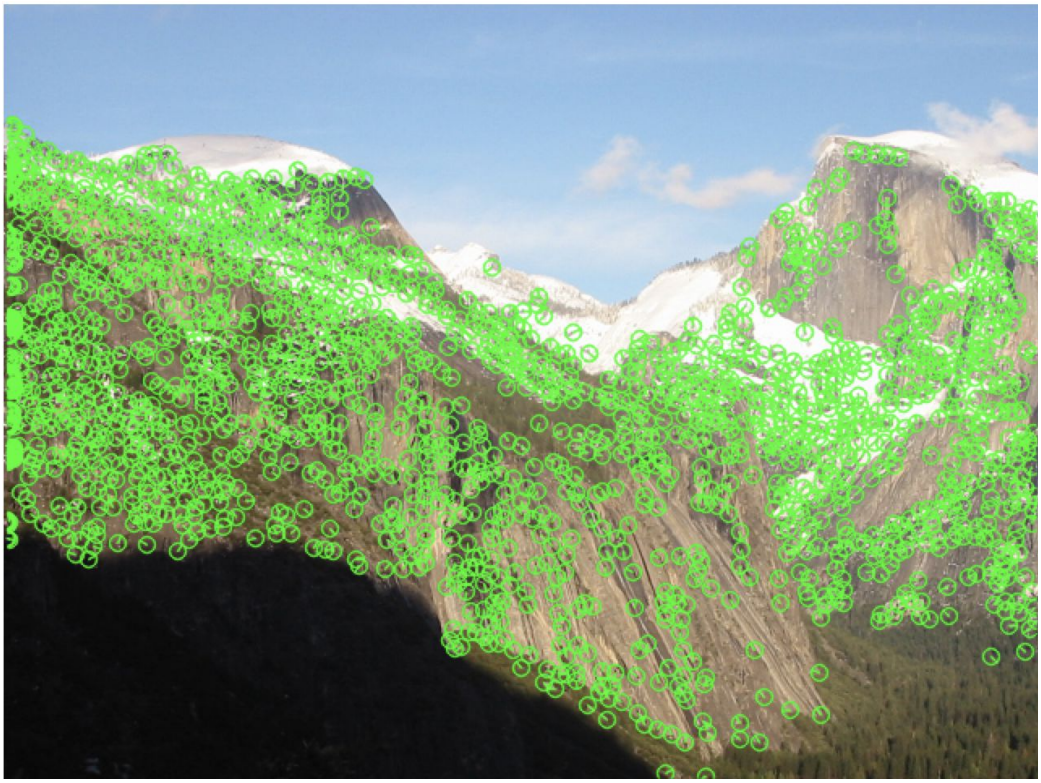
MOPS Descriptors (SSD, Ratio) ROC Curves





Analysis + Conclusions:
Based on the AUC results, it seems that the MOPS descriptor with SSD distance significantly underperforms in comparison to the other configurations. The remaining three configurations, (Simple, SSD), (Simple, Ratio), and (MOPS, Ratio) all performed relatively similarly. Out of the three, the Simple Descriptor with Ratio distance had the highest AUC by a small margin. We also noticed that the Ratio distance was more effective in matching features in comparison to SSD distance.

Harris Image of Yosemite:

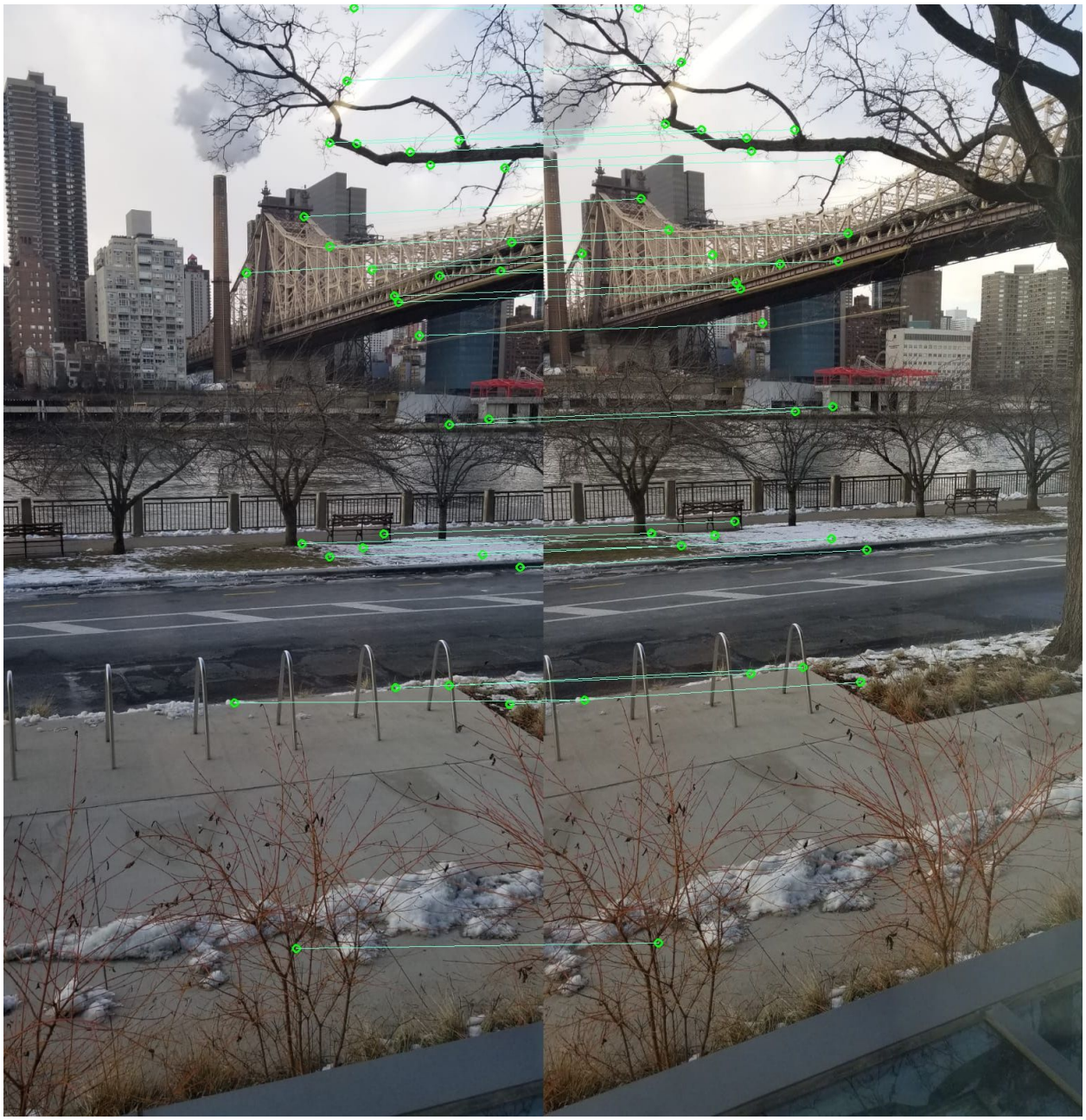


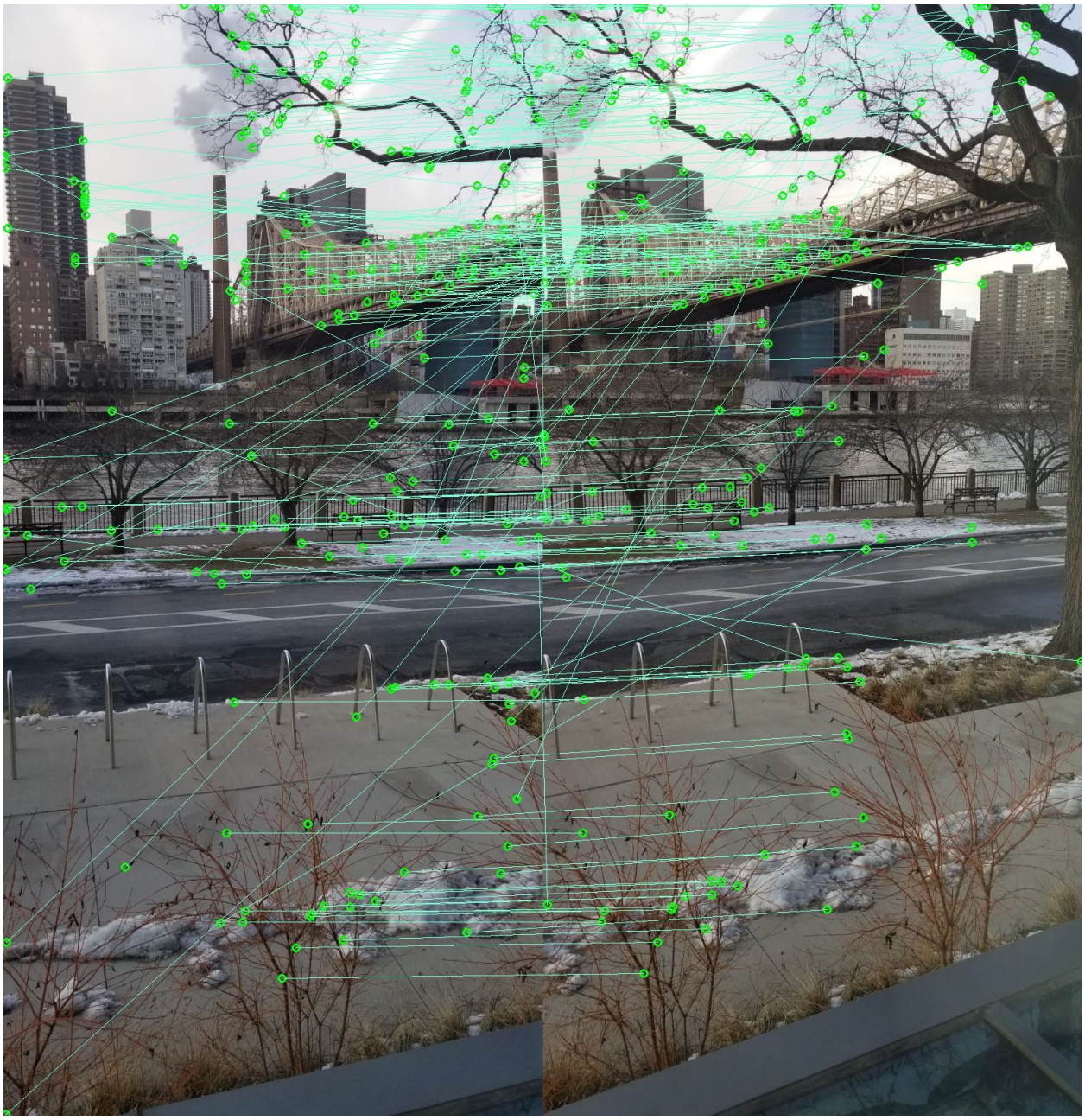
The Harris Corner Detection algorithm is able to detect a large majority of the features on the Yosemite mountain. However, the detection algorithm was not able to capture some of the critical points towards the top and bottom of the mountain. On the bottom left-hand side of the image, there is a dark area, and the feature detector did not capture a single feature there. Similarly, on the bottom right-hand of the image, there seems to be a forest, but the Harris Detector did not capture any of these trees as features. Finally, at the top of the mountain, there appears to be some snow, but these were not identified as features. Although we believe it would have been difficult for the algorithm to capture the features within the dark area, we believe that it should have captured the trees in the forest and the snow.

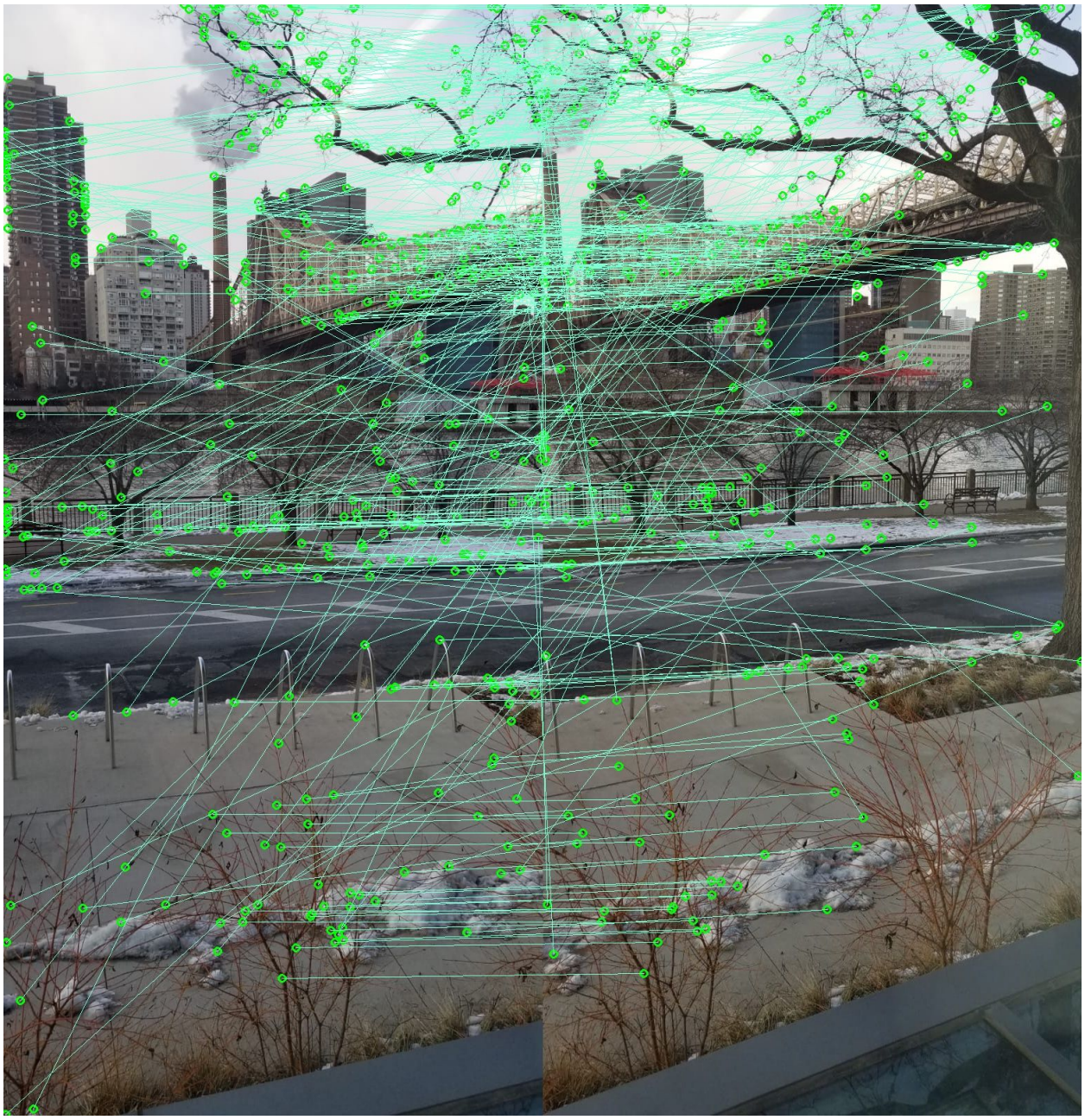
Our Own Image

With a threshold of 10^-2, MOPS detects the following keypoint features:

At a low percent Matches, MOPS detects a few keypoint features. As the threshold of suppressed matches decreases, more false positives are detected. See MOPS performance with Ratio distance matching and progression of 1.0 to 8.0 to 14.0, below:







MOPS Explanation (MOPS paper)

Adaptive non-maximal suppression limits the number of keypoints used in feature matching (to reduce overhead computational matching costs) while seeking to match interest points which are spatially well-distributed. MOPS incorporates non-maximum suppression to detect desired number of keypoints. Distributed radii output neighborhood maxima, conditioned on its passing a set threshold. As radii decrease incrementally, more neighborhoods are introduced and keypoints get added to the queue in order of descending maxima. The process terminates when the desired set size is reached.