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Project 1

Computer Vision
March 2, 2020

Problem 1.1:

Here below are the screenshots of the four required scenarios:

All of them use **Threshold** of $10^x, x = -1.5$, and **Percent Matches** of 25.1.

Please refer to Figure 1 - Figure 4 for details where:

Figure1 - Detector: Simple, Matcher: Ratio Test

Figure2 - Detector: Simple, Matcher: SSD

Figure3 - Detector: MOPS, Matcher: Ratio Test

Figure4 - Detector: MOPS, Matcher: SSD

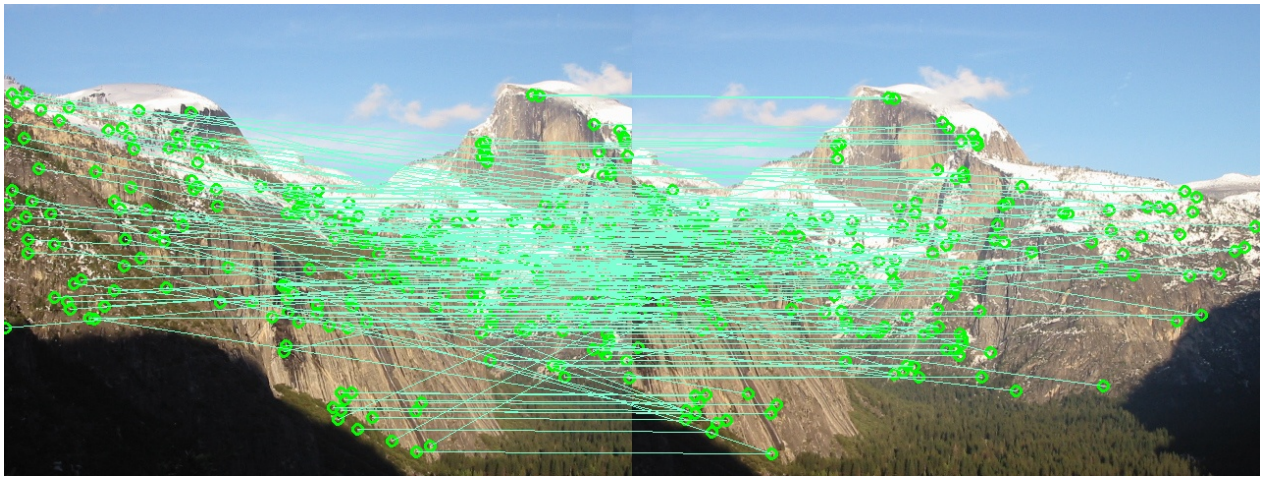

Figure 1: Simple with Ratio Test

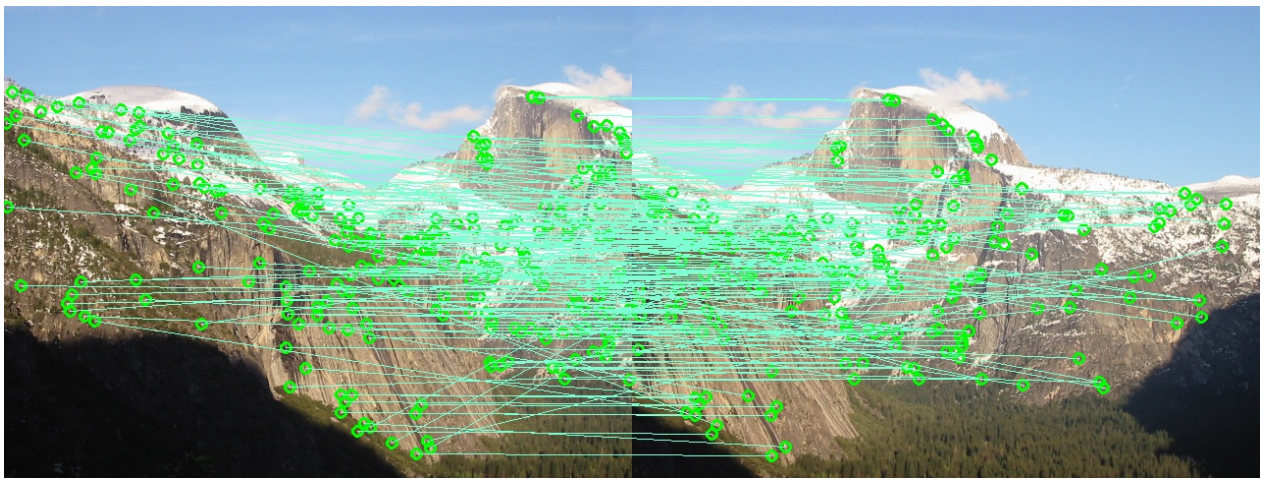

Figure 2: Simple with SSD

Problem 1.2:

Project 1

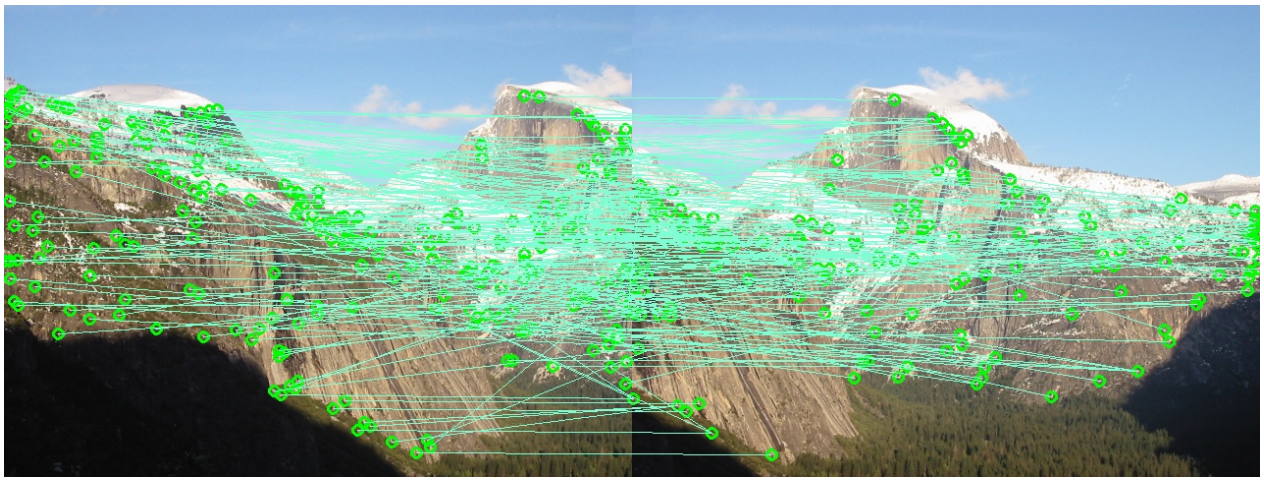

Figure 3: MOPS with Ratio Test

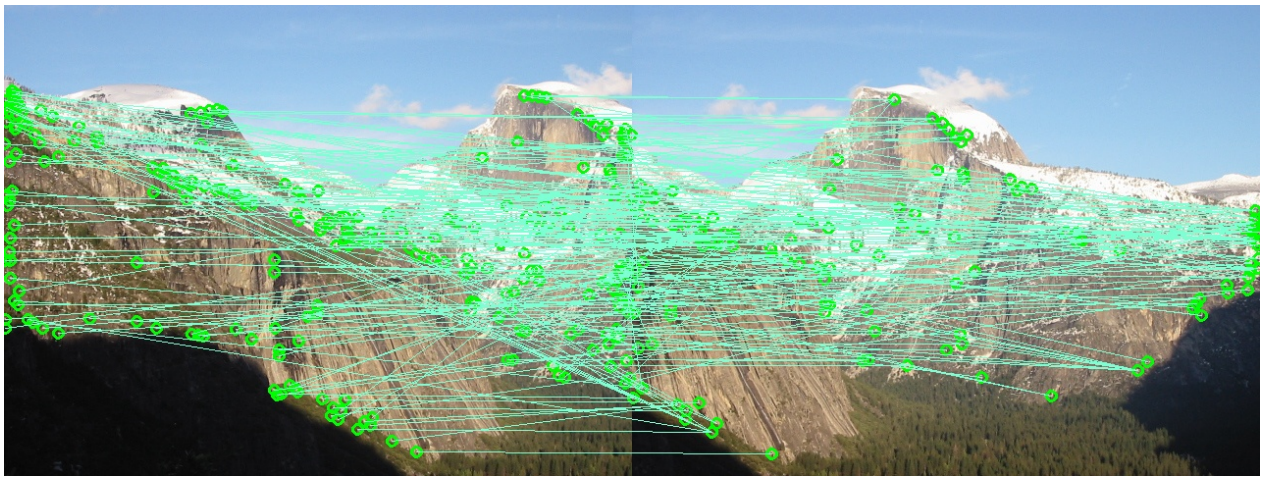

Figure 4: MOPS with SSD

The corresponding ROC Curves are shown below in Figure 5 - 8: All of them are using the threashold of $10^x, x = -1.5$

Figure5 - Detector: Simple, Matcher: Ratio Test - AUC = 0.90593

Figure6 - Detector: Simple, Matcher: SSD - AUC = 0.90281

Figure7 - Detector: MOPS, Matcher: Ratio Test - AUC = 0.93879

Figure8 - Detector: MOPS, Matcher: SSD - AUC = 0.83850

The AUC is the area below the ROC Curve, and be comparing the AUC scores for those four graphs, I can conclude that Figure7 with MOPS and Ratio Test has the highest AUC score, which means that the method shown in Figure7 is the best one.

Problem 2:

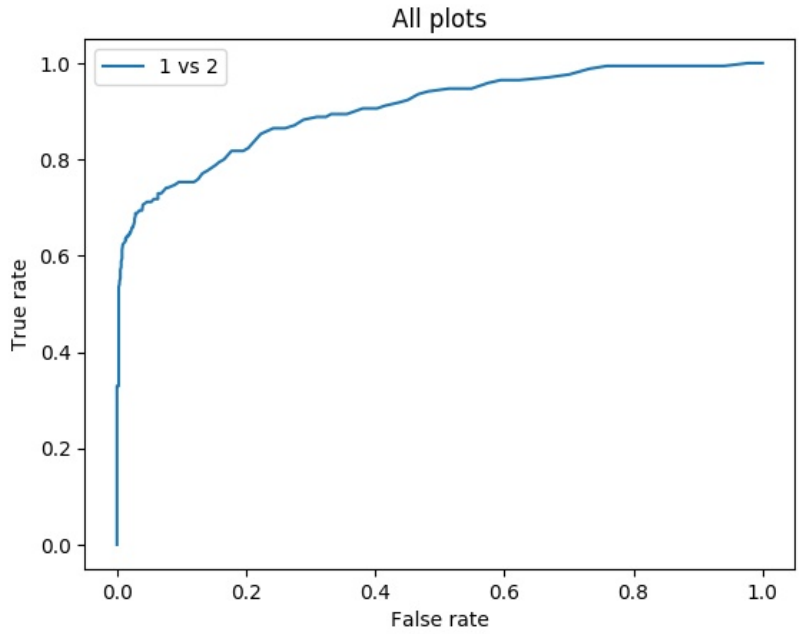

Figure 5: Simple with Ratio Test - AUC = 0.90593

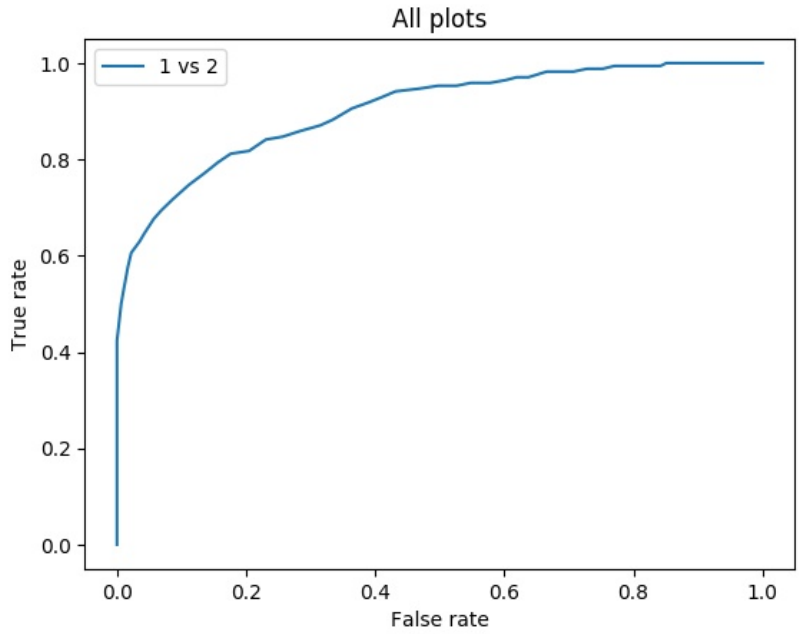

Figure 6: Simple with SSD - AUC = 0.90281

Keypoint Detection of **yosemite/yosemite1.jpg** is shown in **Figure9** below with **Harris** and **Threashold** of $10^x, x = -1.3$.

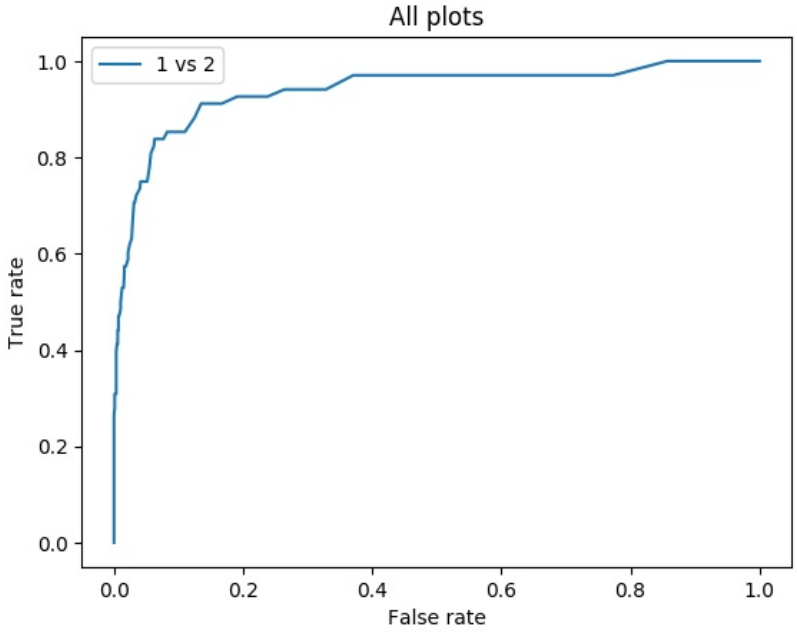

Figure 7: MOPS with Ratio Test - AUC = 0.93879

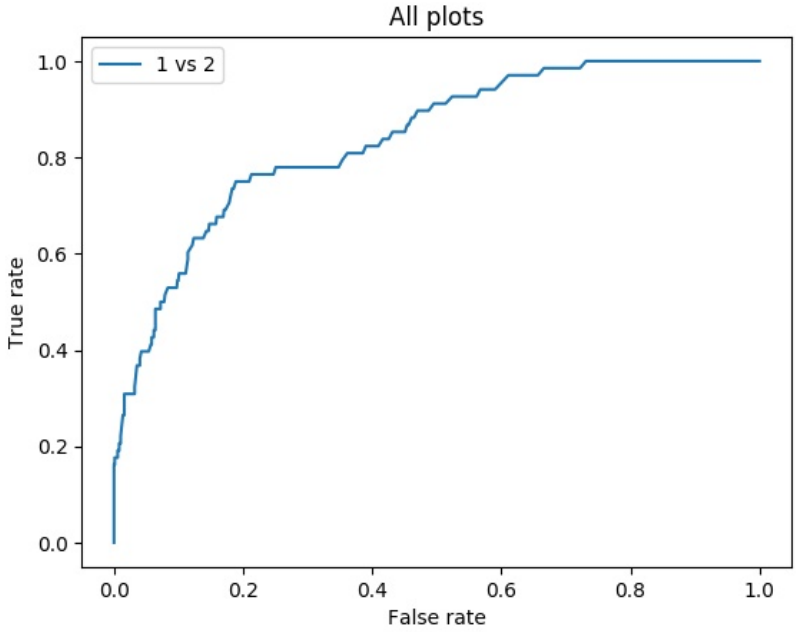

Figure 8: MOPS with SSD - AUC = 0.83850

The type of highlighted image regions are shown as the corners of the image detected by Harris Detector; whereas, the regions that are not highlighted are either edges or flat points

of this image.

As shown in **Figure10**, the top point of the mountain on the top right of the image is certainly a corner point that should have been detected. However, with the current settings, it didn't get caught.

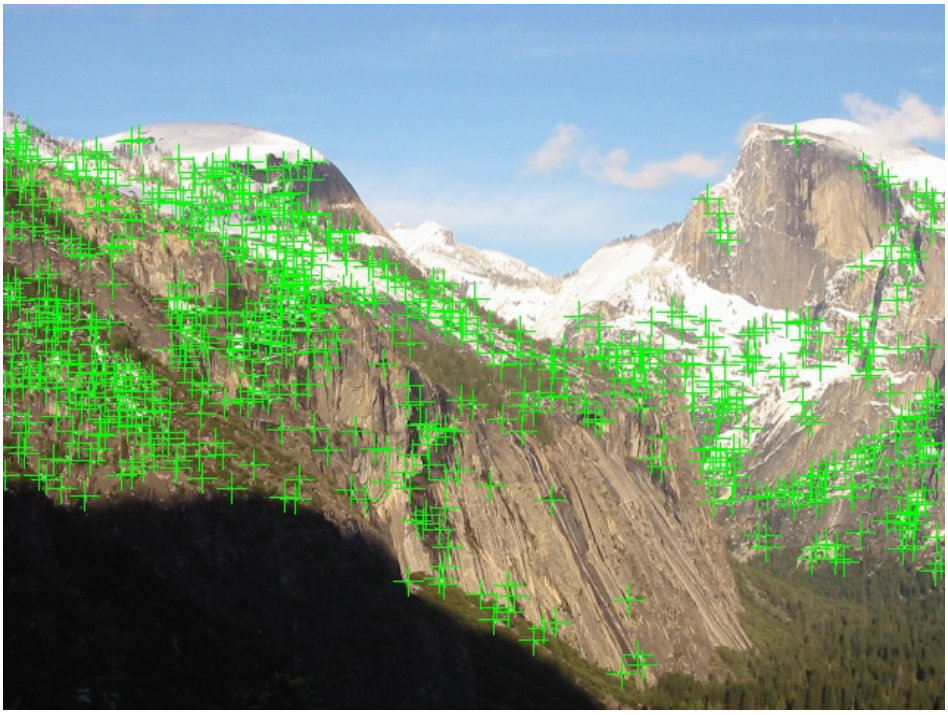

Figure 9: Harris - Keypoint Detector

Problem 3:

Please check out **Figure11** for the performance of inputting our own pictures into the feature detector system with **MOPS + Ratio distance**.

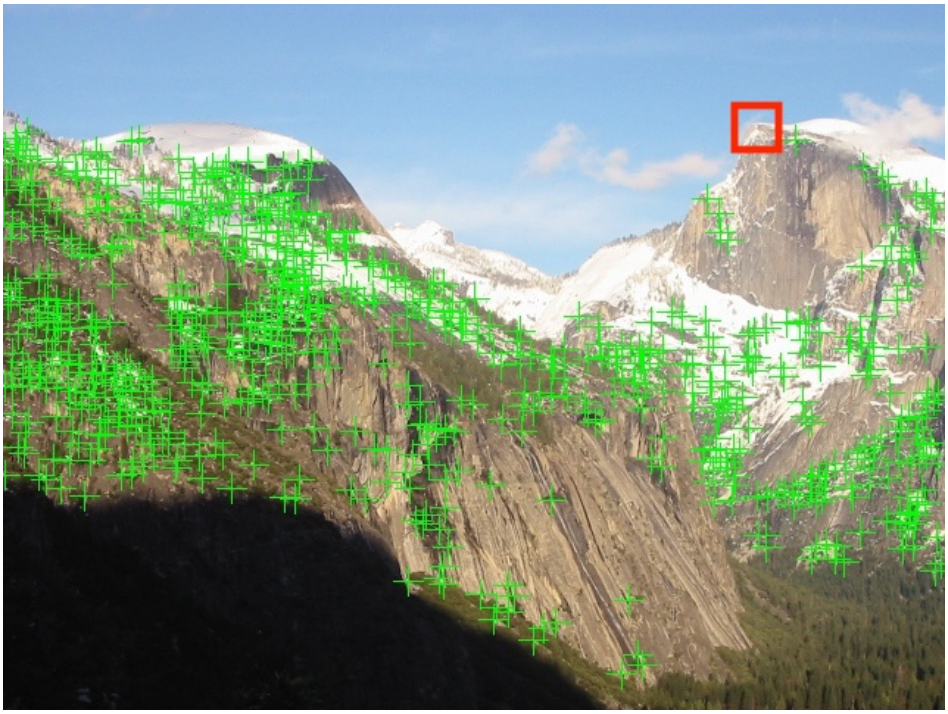

Figure 10: Sample potential

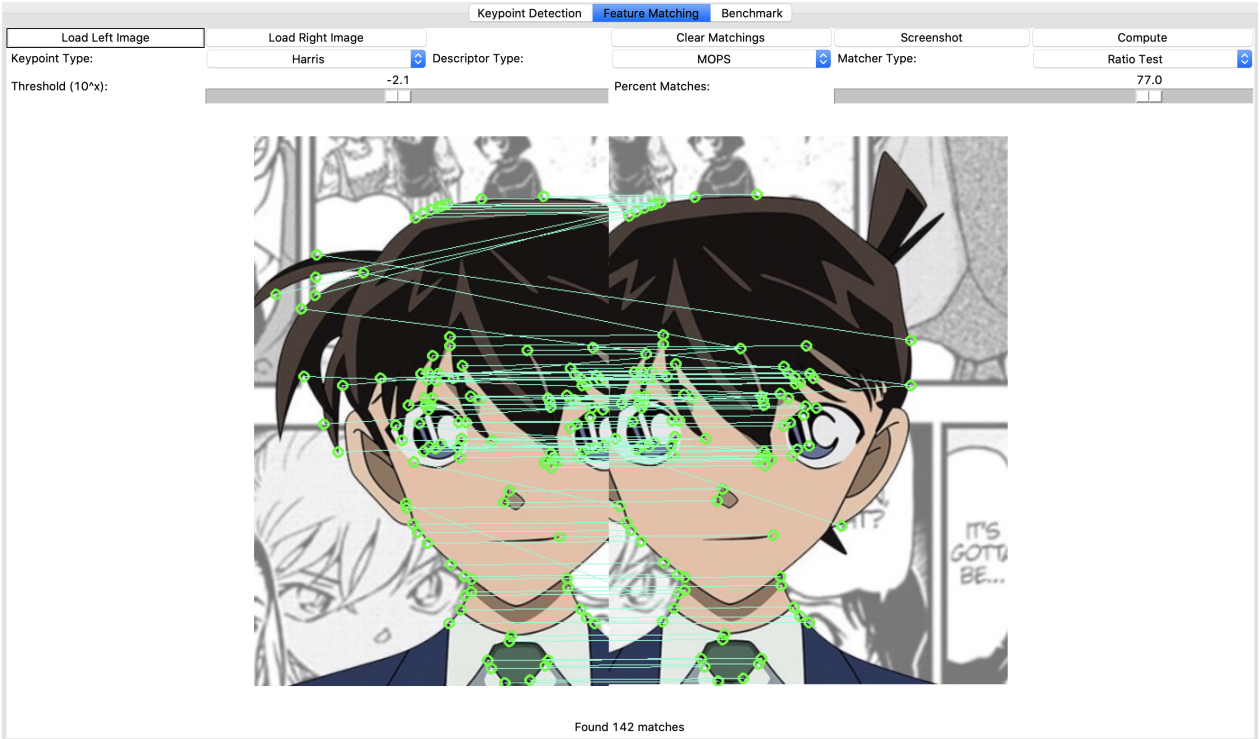

Figure 11: Own Picture Example