

Homework 4 solution template

CMPSCI 370 Spring 2019, UMass Amherst
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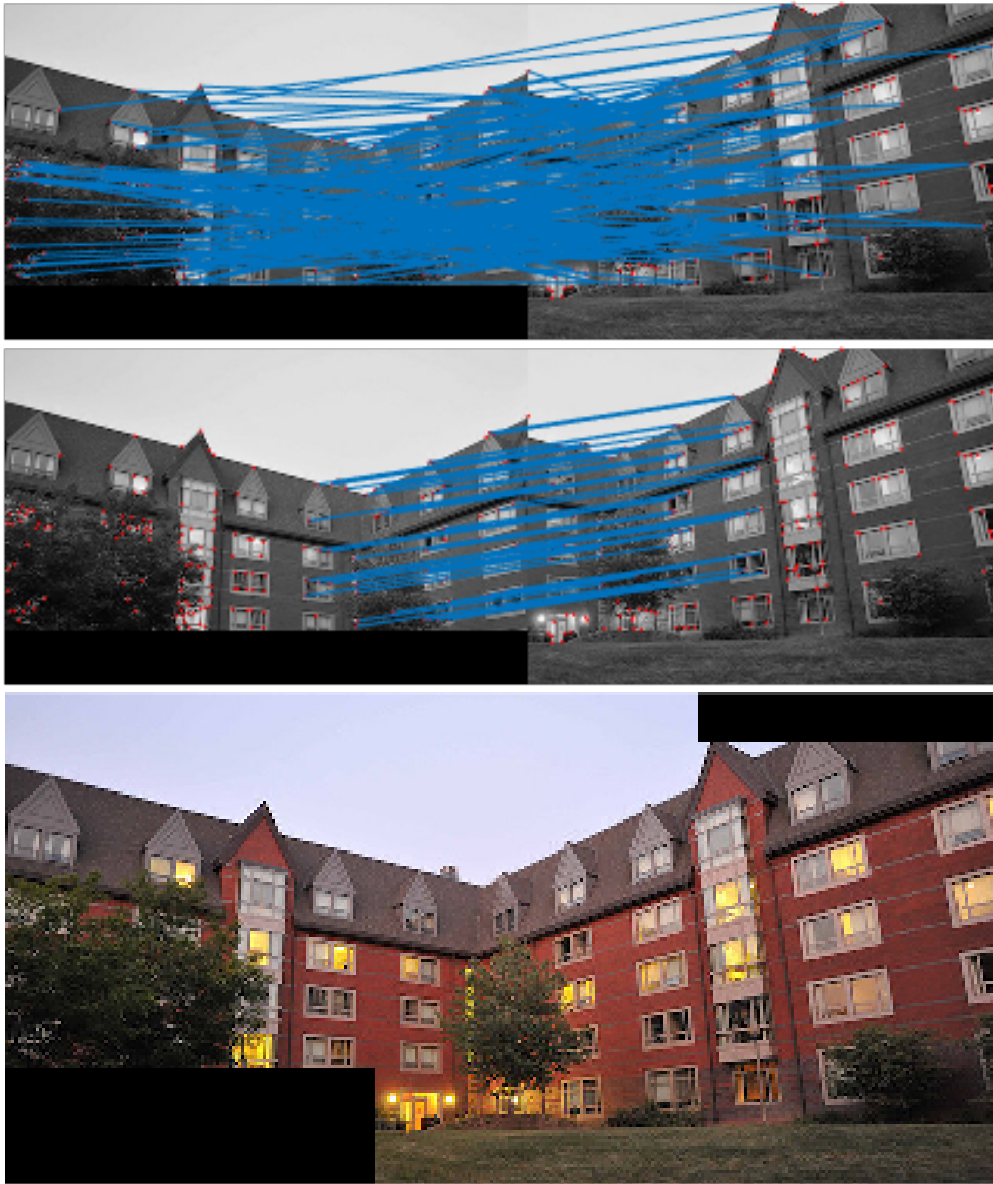
Here is a template that your solutions should roughly follow. Include outputs as figures, and code should be included in the end.

1 Scale Invariant Feature Transform

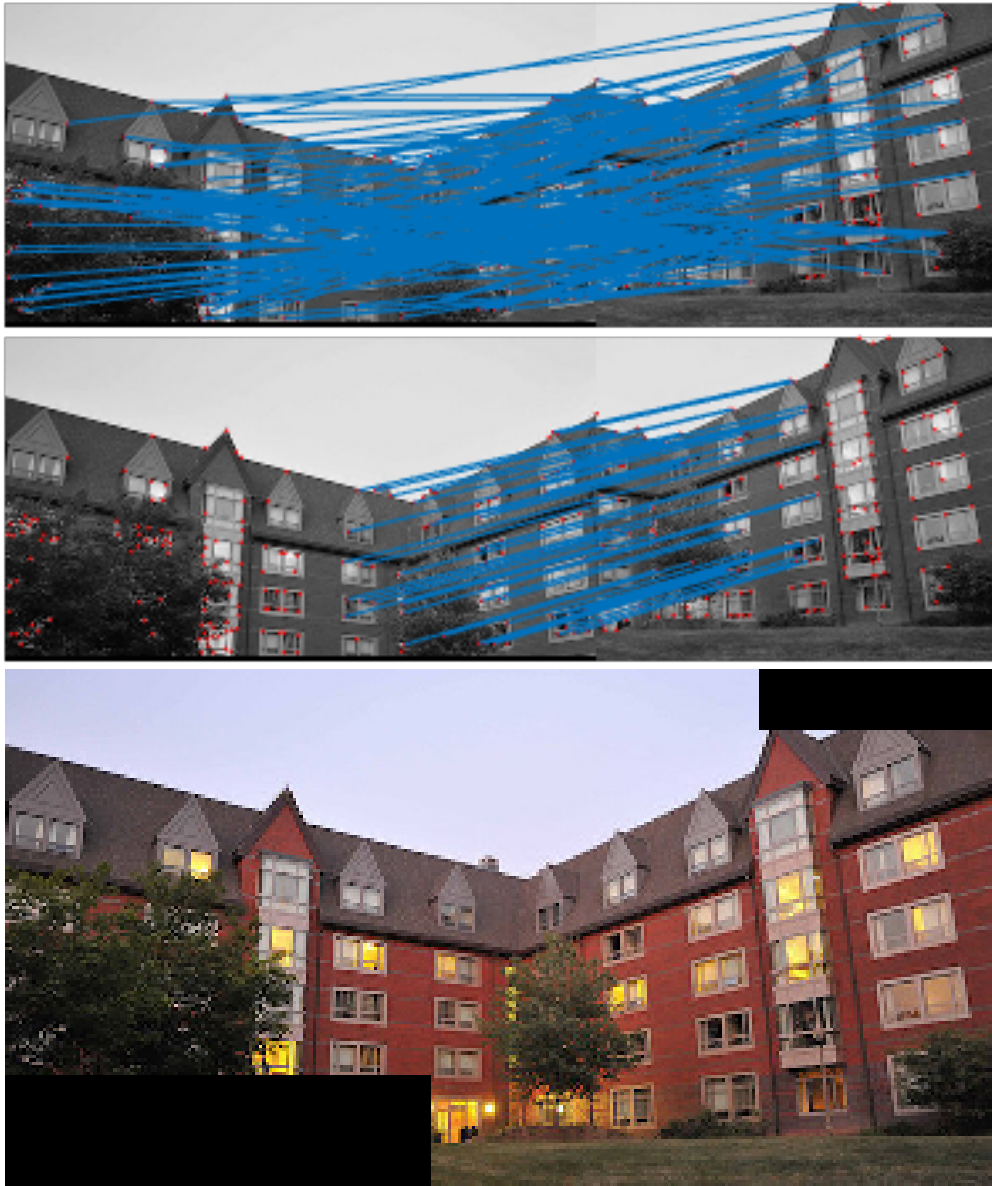
- What are the advantages of blob detection over the Harris corner detection? *[Solution:*
Blob detection is invariant to scaling by calibrating the detector responses over scales.
End solution]
- How is rotation invariance achieved in SIFT features? *[Solution:*
During computation of SIFT the orientation of gradients is assigned relative to the dominant orientation direction within the patch. This makes SIFT rotationally invariant.
End solution]
- When can matching patches using sum-of-squared-differences between the vector of pixel values fail? List two scenarios when the pixel values can change significantly. *[Solution:*
Changes in lighting; Small changes in position, orientation, scale; Shape deformations.
End solution]
- List two ways how the SIFT descriptor provides robustness during feature matching? *[Solution:*
(1) Gradient computation offers robustness to changes in lighting, (2) Orientation binning offers robustness to changes in orientation, (3) Spatial binning offers robustness to changes in position, scale, and deformations, (4) Dominant orientation assignment offers invariance to rotation.
End solution]

2 Image Stitching

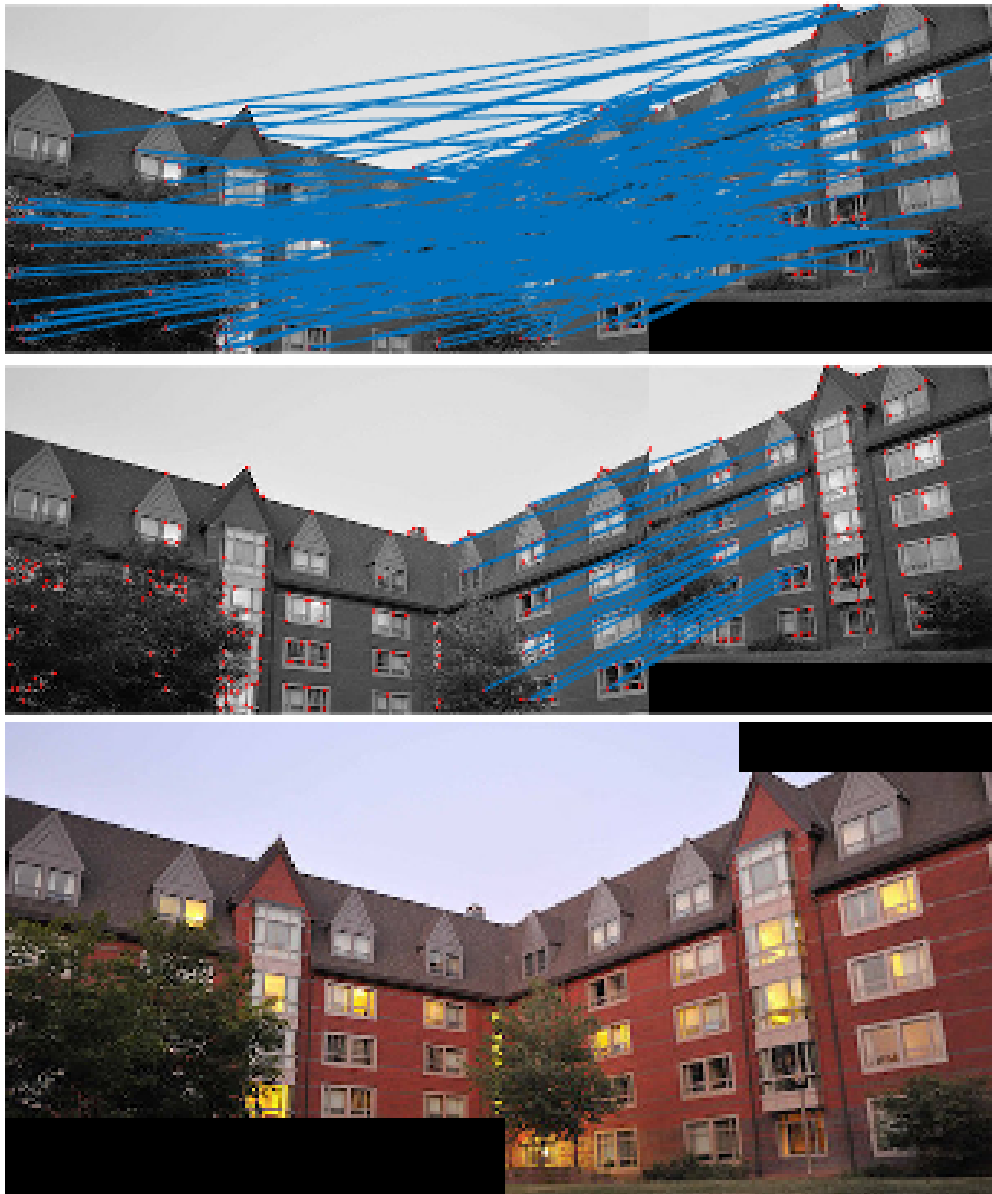
- Outputs for `umass_building_right1.jpg`



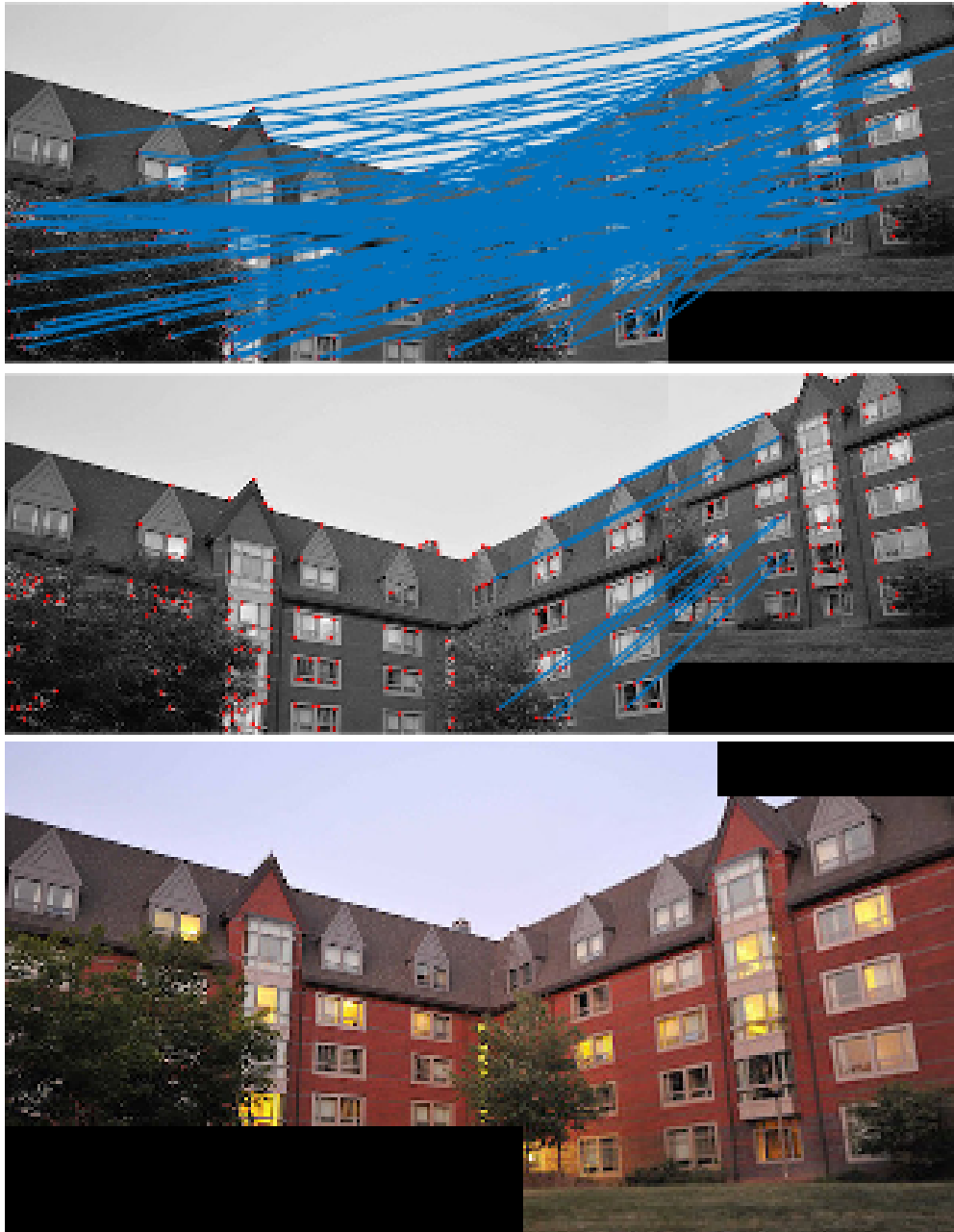
- Outputs for `umass_building_right2.jpg`



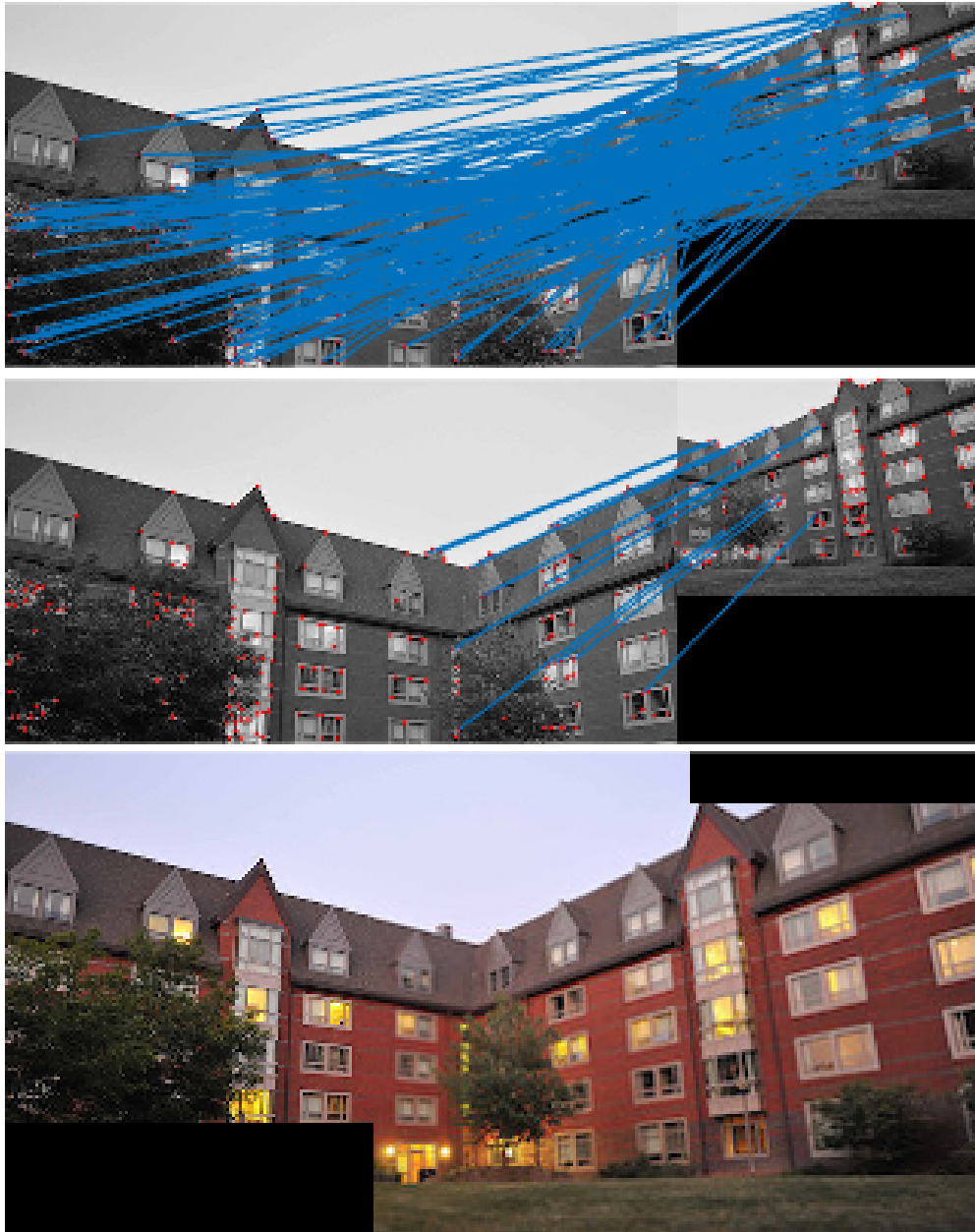
- Outputs for `umass_building_right3.jpg`



- Outputs for `umass_building_right4.jpg`



- Outputs for `umass_building_right5.jpg`



- Estimated transformations and number of inliers

im2	tx	ty	s	#inliers
umass_building_right1.jpg	-241	-32	1	
umass_building_right2.jpg	-229	-33	0.9	
umass_building_right3.jpg	-243	-25	0.8	
umass_building_right4.jpg	-228	-24	0.7	
umass_building_right5.jpg	-122	-17	0.5	

Table 1: Estimated transformation.

3 Solution code

Include the source code for your solutions as seen below (only the files you implemented are necessary). In latex the command `verbatiminput{alignChannels.m}` allows you to include the code verbatim as seen below. Regardless of how you do this the main requirement is that the included code is readable (use proper formatting, variable names, etc.) A screenshot of your code works to provided you include a link to source files.

3.a extractFeatures.m

3.b computeMatches.m

3.c ransac.m