1. Classify the cats and dogs dataset available from Kaggle (www.kaggle.com/c/dogs-vs-cats/data) using a convolutional neural network. Since the test dataset provided by Kaggle does not contain labels, use the Kaggle train set as your complete dataset. Split this dataset randomly, with 80% of the data used for training and the rest for testing. Take the program in the class webpage as starting point.

2. Evaluate the segmentation program presented in the class webpage using different images (5 to 8 would be fine) and identify weaknesses. Then modify the program to improve its results. Possible improvements include, but are not limited to:
   a. Merge all regions that are too small to adjacent regions.
   b. Allow for diagonal connections (i.e. considering pixels $I[i,j]$ and $I[i+1,j+1]$ to be neighbors)
   c. Determine the similarity threshold automatically.
   d. Use a different color space to try to deal with shadows.
   e. Find ways to speed up processing by eliminating redundant code and/or loops.

3. Evaluate the tracking program presented in the class webpage and identify weaknesses. Then modify the program to improve its results. Possible improvements include, but are not limited to:
   a. Improve the matching metric using other features, perhaps gradients.
   b. Improve the matching process using machine learning.
   c. Improve the (admittedly ugly) process to capture the initial pattern.
   d. Identify when the pattern is not found in the image.
   e. Allow the pattern to change dynamically.

As usual, write a report including (at least) the following items:
1. Problem description.
3. Experimental results. Describe quality of results and running times. Use tables and/or plots to illustrate this.
4. Discussion of results. Do the algorithms work as expected? Why or why not?
5. Conclusions. Describe what you learned, what was challenging, what was interesting, what was boring, etc.
6. Appendix: Source code