Lab 2: Color and Contrast
Due Friday, January 23, at the beginning of the class

Primary Goal: Learn how to threshold images and evaluate the detection results.
Secondary Goal: Learn how to format data tables in a report.

Download and unzip the Activity 2 folder. In this folder, there is an image **tissue.bmp**.
This is an image of a human tissue slide under a microscope, enhanced with purple
marking dye. The *dark purple* cells indicate the presence of micropapillary urothelial
carcinoma, a type of bladder cancer. Your job is to detect the cancer cells.

I suggest you follow the same basic steps as in Activity 2.
1. First display the image to obtain a reference color 3-tuple for a cancer cell.
2. Threshold the RGB color image using the **thresh.m** progam in Activity 2.
3. Enhance the resulting detection mask using Matlab binary image operations such
   as imfill, bwareaopen, watershed, etc.
Be sure to document your threshold values and any binary image operations that you
performed.

The cancer cells were hand-labeled by an oncologist in the ground truth image
tissue_truth.bmp. You should compare your result to the ground truth by computing the
following 5 statistics:
       1. True Positive count (TP)   2. True Negative count (TN)
       3. False Positive count (FP)   4. False Negative count (FN)
       5. Matthews' Correlation Coefficient (MCC)

Disclaimer: Be aware that this image is considerably harder to process than the M&Ms
image used in Activity 2. As long as your results are reasonably close to mine, I will be
happy. Do your best, but don't go too crazy.

What to Include in Your Report
1. *[10 points]* Describe the procedure you used to produce your detection mask.
   You must describe your threshold parameters and any binary image operations
   you performed. Your text should reference your figure and data table.
2. *[5 points]* Create a figure labeled **Figure 1** that shows:
   a. The detection mask you produced by color thresholding.
   b. The mask after you performed binary image operations.
   You should arrange these 2 images in an appropriate subplot. Be sure to include a
   caption on your figure and a title on each image.
3. *[5 points]* Create a data table that displays the 5 statistics you used to evaluate
   your detection results. Label your table **Table 1** and include a caption.

Extra Credit *[+2 points]* Demonstrate that you can improve your detection results using
histogram equalization and/or HSV thresholding. Show the images and statistics for both
your RGB thresholding attempt and your improved version.