

## Biomedical Imaging Informatics Practical #1

### Instructions:

This group assignment is expected to **require 2-6 hours to complete**. Please plan accordingly.

**Due Date:** TBD  
**Submission Files:** the signed HONOR CODE page (see HONOR CODE page), and one zipped program folder file (i.e., containing all code files)  
**Email Address:** [8813grading@lists.gatech.edu](mailto:8813grading@lists.gatech.edu)  
**Email Protocol:** In your email subject line, please follow the following protocol  
**BMED8813 your last name, your first name, PRACTICAL #1**

### **Programming File Protocol:**

- (1) Your submission will be one zipped folder file. The folder should contain all of the necessary files (i.e., the main program file, possible additional function files, and necessary test data files) to run your code and show the results.
- (2) The folder should be named: <your last name>\_<your first name initial>  
For example, if your family name is Wang, and your first name initial is M, the zipped folder file will be: **Wang\_M.zip**
- (3) In your folder, the main file should be named as: <your last name>\_<your first name initial>\_main.m (or .pl)  
For example, if your family name is Wang, and your first name initial is M, the file should be named **Wang\_M\_Main.m (or .pl)**.
- (4) Please write well-commented code, and include any explanations you think will help the instructor understand your program. If your program does not work completely, comments might help you get partial credit. However, you will get **NO CREDIT** if your program generates errors, generates warnings, or outputs “junk”.

If you have problems, please contact the instructor at [8813grading@lists.gatech.edu](mailto:8813grading@lists.gatech.edu) with the proper email subject line as instructed in the syllabus.

## HONOR CODE

The conditions of this examination are subject to the Georgia Institute of Technology Academic Honor Code.

I pledge that the work in this exam represents my own, original work. I have NOT communicated with anyone (other than my group members) about the contents of this exam, nor participated in or observed any conduct prohibited by the Honor Code.

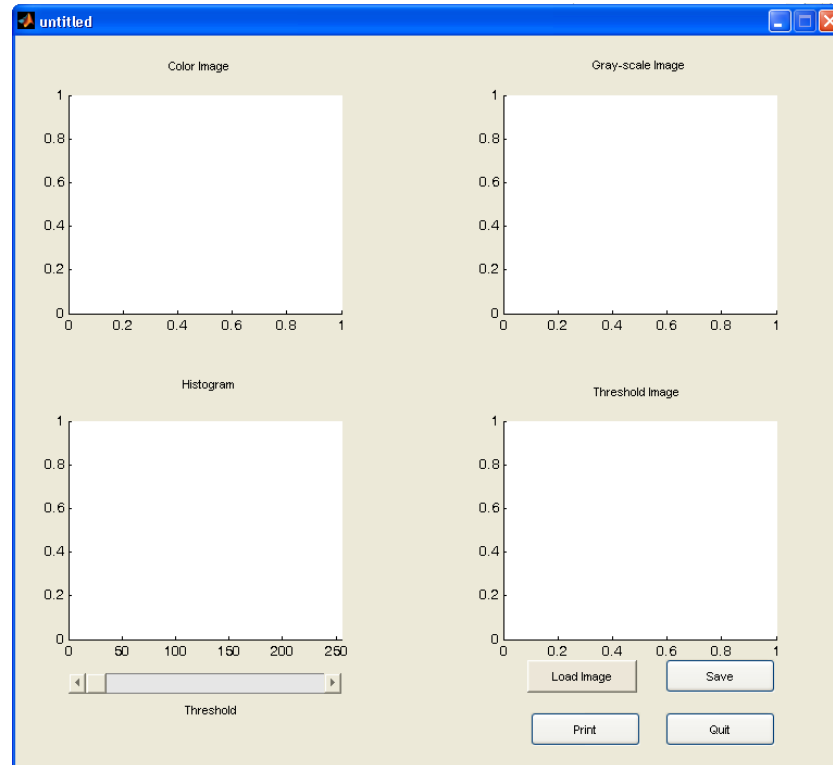
Student Signature \_\_\_\_\_

**NOTE:** Please print out this page, sign the page, scan the signed page, and submit with your programming code.

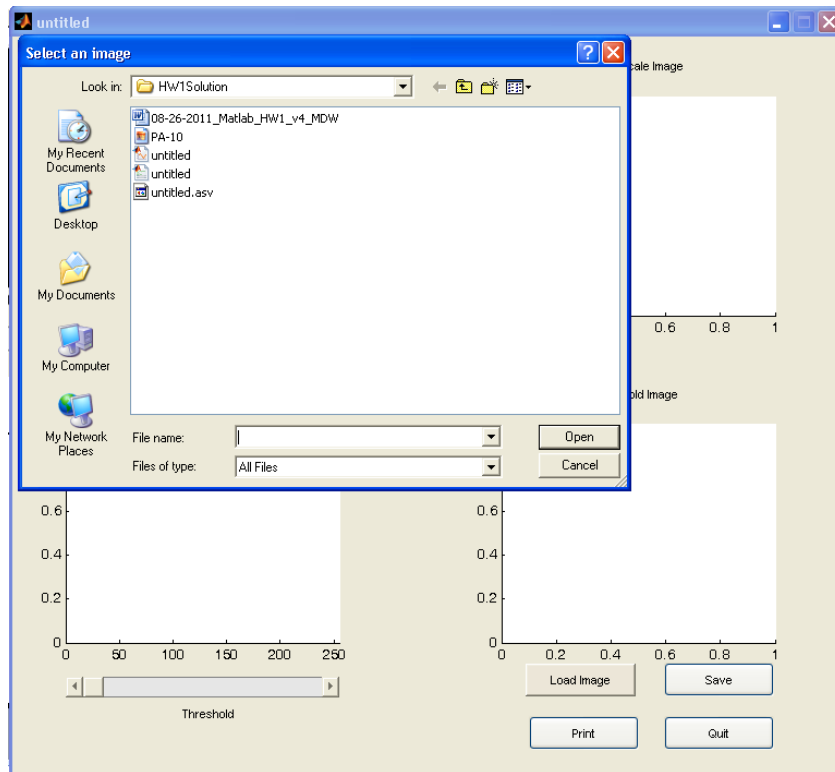
If you have a problem finding a scanner to scan in the page, please type in the above HONOR CODE statement in your email message body and sign with your name.

**Any assignment without the HONOR CODE PAGE will be void to ZERO grade by default.**

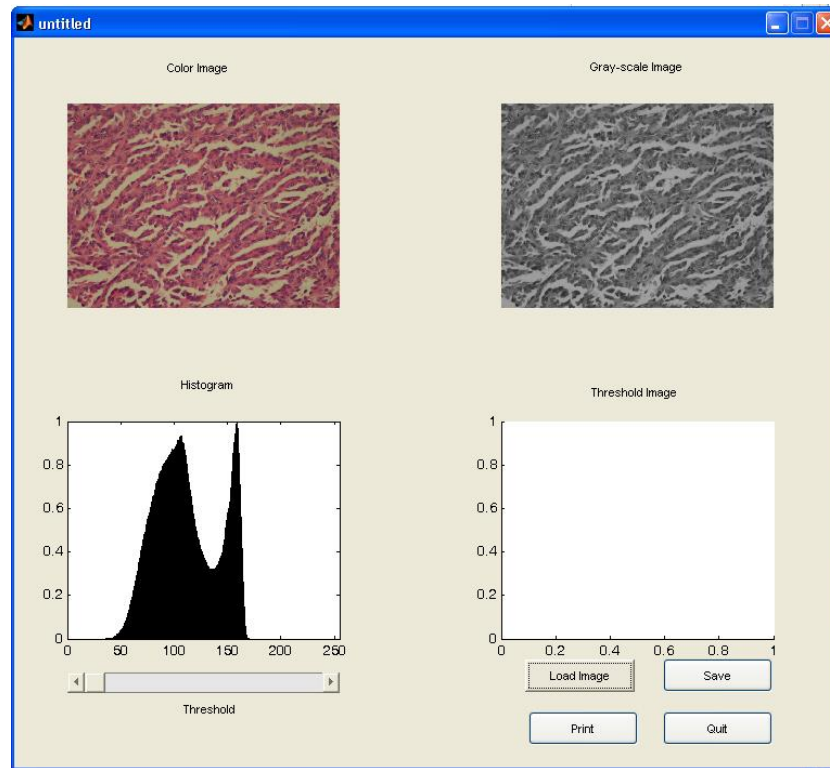
1. **(50 Points)** In this assignment, students will develop a Graphical User Interface (GUI) for interactively segmenting cancer histopathological images based on grayscale intensity. The assignment is divided into the following five parts:
  - a. **(5 Points)** Create a GUI in MATLAB with four axes, a "threshold" slider, a "Load Image" push button, a "Quit" push button, a "Print" push button, and a "Save" push button. A screenshot of the GUI is shown below. (Hint: students can use the GUIDE function for generating the GUI)



- b. **(5 Points)** The "Load Image" button, on execution, should open a pop-up window for selecting an image. (Hint: students can use the "uigetfile" function)



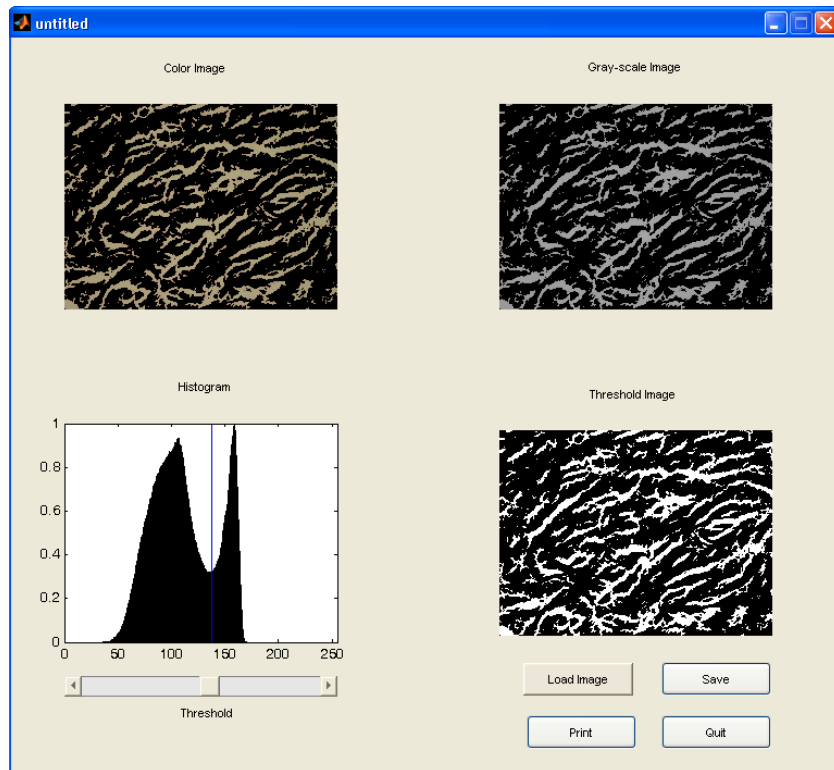
- c. **(10 Points)** After selecting an image from the pop-up window, you should conduct basic processing, and then display “the selected image”, “its grayscale converted image”, and “the grayscale image intensity distribution histogram” in the GUI in the order of “top left”, “top right”, and “bottom left” boxes, respectively, as shown below. (Hint: On the grayscale intensity histogram, the x-axis represents grayscale values (0-255), and the y-axis represents how frequently any particular grayscale intensity occurs in the image)



- d. (15 Points) When the user moves the threshold slider, you are expected to show the following four things:
- A vertical line should appear on the histogram indicating the threshold.
  - The bottom right window should display the binary image obtained by thresholding the grayscale image at the threshold selected by the histogram.
  - The top left window should show the masked color image.
  - The top right window should show the masked gray scale image.

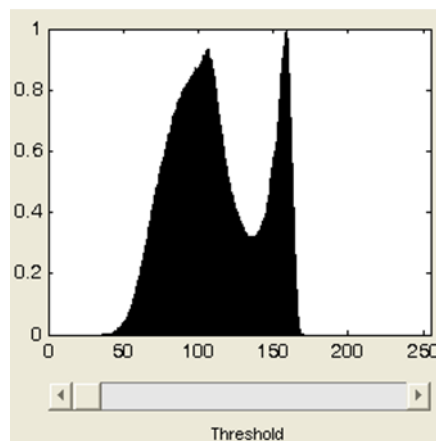
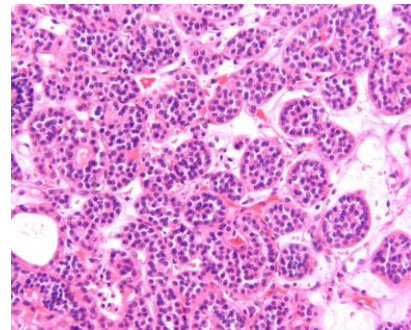
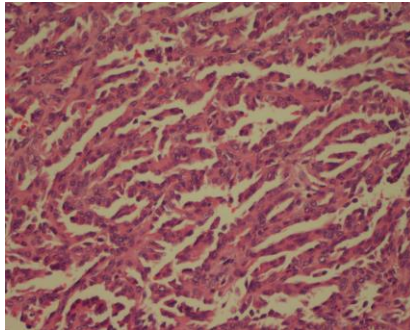
As the user moves the slider, all windows should update. The masked color and grayscale images can be obtained by making all background (value-0) regions in the binary image as background in color and grayscale images.

A snapshot of the GUI, while moving the threshold slider, is shown below.

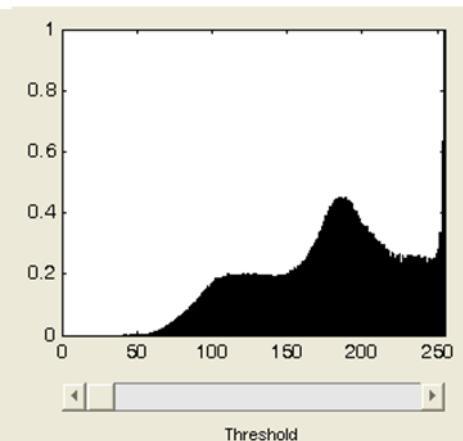


- e. **(5 Points)** The “Print” button should print the figure and the “Save” button, on execution, should save all of the images, the histogram, and the threshold value as \*.mat files (masked color image, masked grayscale image, threshold image, histogram array, threshold value).

- f. (10 Points) Please compare the histogram of Image\_01, versus the histogram of Image\_02, and make comments about what the grayscale histogram represents in a cancer histopathological image (see figure below).



Image\_01



Image\_02