Statistical Analysis of Genetic Data
Math 155, Spring 2008
Jo Hardin
Project i: Magic Tool

Due Thursday, Feb 7
Go to the MAGIC Tool website:
website: `http://www.bio.davidson.edu/projects/magic/magic.html`
Note: lab/ideas taken from MAGIC Tool website, courtesy of Laurie Heyer

# 1 Additional Instructions

- Go through the MAGIC Tool User guide pgs 5-16.
- Between steps #1 and #2, download the `Sample_Files.zip` from the MAGIC Tool website (**Download small sample files**)
- Put the contents of `Sample_Files.zip` into a folder on the hard drive of the computer.
- Click on "Update Project" (step #2 in the User guide)
- You will be creating expression ratios for 4 grids (1 array)
- Play around with the seeded region growing, but don't try to create the expression file with "seeded region growing" marked because it'll take too long. (And here we're just practicing.)
- Experiment with the segmentation. You can create a few different expression files if you want (with different segmentation parameters).
- Notice that if you click on "Create Raw Data File" you'll get a tab-delimited file that looks like the data we've downloaded from SMD.
- **Take home:** to do the homework assignment you should have (save these in your userspace or on your flash drive):
  1. The expression file
  2. The raw data file
  3. An MA plot

# 2 HW #2

1. Take a stand on background subtraction: should we do it? Why or why not?

2. Why do you think we take logs of the ratios before analyzing the data? Why do we use base 2 instead of base $e$ (as is typically done in statistics)?

3. The grid you analyzed was for timepoint zero. How many of the spots had a gene expression "change" of at least a factor of 2? What does that tell you about analyzing microarray data? Do any of the genes "change" by at least a factor of 4? Explain.

4. Create an MA plot. (Build Expression File → Segmentation → scroll down to "MA Plot.") What are on the x and y axes? What information does the plot give you about this particular data?

5. What is saturation, and why is it a problem?

6. In the image that I passed out, there seems to be some systematic pattern to the spots. What is it? Why would it be that way? Are we glad about it? What else might we do to address the same issue?

7. Which segmentation method (from MAGIC Tool or from your reading) do you think is best? Why?

8. MAGIC Tool offers you the option of Average Signal or Total Signal to use in the expression ratio. What are advantages and disadvantages of each? Would you suggest a third option to use in the expression ratio? Explain.

9. For what reasons would you flag a spot? Be as specific as possible.