Project 1 Assignment
Due 22 February 2015

Background: A bio-meteorologist is studying the effect of climate on evapotranspiration rates of broadleaf forests in the across the southeast United States. One of the key parameters needed for this study is an estimate of forest leaf area index for several forest locations. The researcher has sent out his graduate student sample several locations using a leaf litter trap. From each leaf litter trap (set1, set2, set3, set4, set5), the graduate student dried all the leaves, documented the number of leaves collected, area of each leaf, and total weight of the leaves in the trap. The area of each leaf was scanned by a flatbed scanner at 100 dpi and area was calculated by an image processing program.

Problem: Using the data provided (set1.csv, set2.csv, set3.csv, set4.csv, set5.csv, leaf_collection.csv) develop a mathematical model that predicts the total single-sided leaf area of a collection set based on the total weight of the collection set.

Project Goals or "what do I need to do to get a good grade on this?": You will need to write a research paper that convincingly describes the problem, data, and development and testing of the mathematical model. The purpose of this project is for you to learn how to use real-world data, develop a mathematical model, and learn how to communicate your results.

Additional Instructions:

1. Write a paper describing the problem and your solution. Paper format is described below.
2. Limit your model construction method to methods described in Chapters 1 and 2 of our text book (First Course in Mathematical Modeling, by Giordano *et al.*)
3. Identify your assumptions about your model
4. Describe the variables used in the model and why you chose the model method
5. Use one set collection to verify and test your model.
6. Describe the limitations and possible types of error of the model
7. Provide graphs or plots illustrating the effectiveness of your model
8. Provide recommendations for future refinement of the model or data collection

Other Technical Considerations:

1. How may stem weight influence the accuracy of the measurements?
2. How could leaf variation influence the effectiveness of the mathematical model?

Paper Format: The research paper will need to be written in 12 pt font and double spaced format. The paper will have the following elements:

- Title
- Author and Author's Institution (yours will be "Mathematics Department, Mississippi College, Clinton, MS, USA")
- Abstract
- Paper Sections (numbered by Roman numbers)
  I Introduction
  II Methodology
  III Data and Analysis
  IV Results
  V Conclusions

References (use a consistent format)

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File Formats:
set1-5.csv: comma separated data for each data collection. The first column is the name of the scanned image of the leaf and the second column is the squared area of the leaf (in pixels)

leaf_collection.csv: comma separated data that summarizes all the data sets (1-5). Columns are: leaf_collection set name, number of leaves, total weight of the collection (grams), and total squared area of the leaves (in square inches). Double check and see if the calculations are correct from individual leaf area in square pixels to total squared inches.

Academic Dishonesty: I expect that all work you produce for this project will be your own original work. If you plagiarize or collaborate with any material for your mathematical model and written work, it will result in a failure of this project.