CS 594 - **Scientific Computing for Engineers**

Homework #1
January 11, 2012
Due: January 25, 2012

I would like you to implement a version of the following mathematical operations:

- the 2-norm of a vector,

$$\| x \|_2 = \sqrt{x^T x} = \sqrt{\sum_{i=1}^{n} x_i * x_i}$$

- matrix - vector multiplication,

$$y = y + A * x$$

$$y_i = y_i + \sum_{j=1}^{n} A_{i,j} * x_j, \text{for } i = 1,...,n$$

- matrix multiplication

$$C = C + A * B$$

$$C_{i,j} = C_{i,j} + \sum_{k=1}^{n} A_{i,k} * B_{k,j}, \text{for } i, j = 1,...,n.$$

The point of this assignment is not to write software, but to look at the performance for each of your implementations and try to explain why you are getting the performance you see and what you could do to increase the performance. You should produce a software implementation for each and run some experiments on various systems, in particular use processors from battlecat, grig, and mordor clusters. I would like to see a report and analysis of your results, perhaps some plots of your performance data for n between say 10 and 1000. Please verify and convince me that you are computing the correct results in each case. Let me know what computers you used and how you are getting the performance results as well.

Our TA will have a set of timer you can use to measure the execution time of your programs. See the course webpage for details.

You can find out information on various processors at:
 http://www.cpu-world.com/CPUs/index.html
http://www.cpu-world.com/sspec/index.html