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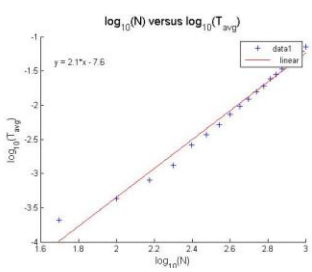
MACM 316 ASSIGNMENT 3: REPORT

- **Number of Trials and Matrix Sizes**

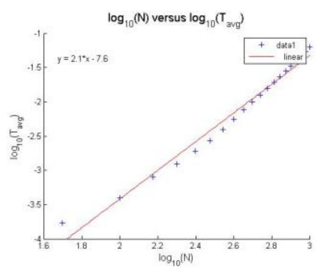
The default matrix sizes N are 50x50 to 1000x1000 by increments of 50x50; total of 20 matrices used in this report. Number of Trials (Ntr) used for computing the mean computation time of Gaussean Elimination is 100 trials.

The range of the size of matrices chosen is to cover a dynamic range of matrices from small to large. The number of trials chosen, in accordance to the range of matrices, is chosen to regulate to minimize the total computation time of the program, yet it retains its robustness, efficiency and accuracy.

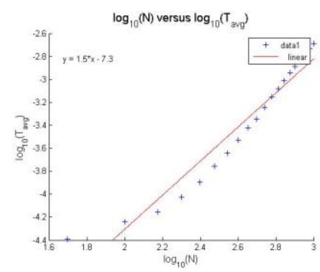
- **Average Mean Time Taken for Gaussean Elimination, Data plot, Linear Fitting**



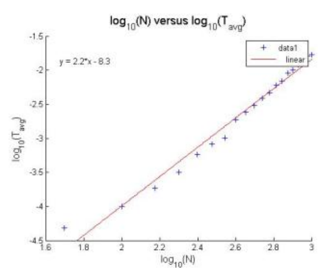
(i) Random
T_{avg} = 2.1N - 7.6



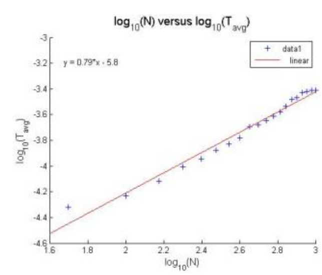
(ii) Random, Diagonally Dominated
T_{avg} = 2.1N - 7.6



(iii) Random, Upper Triangular
T_{avg} = 1.5N - 7.3



(iv) Random, Tridiagonal
T_{avg} = 2.2N - 8.3



(v) Random, Tridiagonal as Sparse Array
T_{avg} = 0.79N - 5.8

- **For Matrices 1, 2, 3, discuss how this relates to theoretical results on 'flop counts' discussed in the lectures.**

For large N in Gaussean Elimination, the FLOP (Floating Point Operations) count is $\frac{2}{3}N^3$as discussed in the lectures. $\frac{2}{3}N^3$ consists of a positive slope, thus for increasingly larger size of N, the flop count will increase accordingly. For example: When N=1000, the flop count is approximately 6.660×10^8 (3-digit chopping arithmetic). Using the above T_{avg} formulas for (i), (ii) and (iii), we get $T_{avg} = 1.160 \times 10^{-2}$, 1.160×10^{-2}, and 5.610×10^{-4} respectively. The number of flop counts is relative to the mean computation time by the following formulas (Let F(N) be the function for number of flops):

(i) and (ii): $F(N) = \frac{2}{3}\left(\frac{T_{avg} + 7.6}{2.1}\right)^3$ (iii): $F(N) = \frac{2}{3}\left(\frac{T_{avg} + 7.3}{1.5}\right)^3$