

# Indian Institute of Technology Tirupati

## Computer System Architecture (CS5202)

Credit: L-T-P-C : 3-1-0-3

### In-Class Activity 1 | 3 Feb 2021 | Total points = 10

**Problem statement:** The objective of this activity is to understand the challenge of performance evaluation. The computer architect needs to carry out a performance evaluation for the architecture that he/she intend to design over the existing architectures. So, the real issue is how to compare any two processor or architecture.

**Task:** Write a code for matrix multiplication implementing the  $O(n^3)$  algorithm to perform  $C = A \times B$ , where matrix  $A_{n \times m}$  will be read from file a.txt and matrix  $B_{m \times l}$  is stored in b.txt and the output matrix  $C$  will be stored back in a file c.txt. The matrix  $A$  and  $B$  must be created using a random number generator.

(you need to write two programs effectively, one to perform the matrix multiplication and other to generate A and B using random number generator. **It is very important** that you write the program by our own, please don't take it from either web or from your friends. The idea behind this activity is to see how different programmers implement the same algorithm differently and how does this impact the performance. And if this is the situation how would someone/architect come up with benchmark programs?)

**Experiment:** The objective of this activity is to figure out how the same algorithm implemented by different programmers varies in performance differently for different computers/processor and in a same computer/processor. Use a Linux based *perf* tool to measure the different parameters of performance namely *cpu execution time* and *elapsed time*. The experiment has to be carried out for different size of matrices for multiple runs at least for 10 different sample points. Then from these sample points the averaging has to be carried out with arithmetic mean (AM) to arrive at a single number based comparison. Further, using this *perf* tool find out a way to calculate the MIPS value for your program.

**Compilation:** The program needs to be written in C and the gcc has to be used with -O1 and -O3 flags. Check with gcc manual the use and role of -O1 and -O3 flags in compiler.

#### Submission procedure:

- Submit both the programs in google classroom by Friday (5th Feb) 2 pm.
- Submit the experimental results and detail of your experiment by Monday (8th Feb) in google classroom.

Contact: post your queries in google classroom or you can call to me (9100861771) or can email to me or to Aditi.