

## Phys338/Homework #1

Due on Saturday 26/9/2020

- 1) Write a program from scratch to compute the dot product between two  $N$  dimensional random vectors ( $\mathbf{A} = [A_1 A_2 \cdots A_N]$  and  $\mathbf{B} = [B_1 B_2 \cdots B_N]$ ) which is defined as

$$\mathbf{A} \cdot \mathbf{B} = \mathbf{A} \mathbf{B}^T = \sum_{i=1}^N A_i B_i$$

Where  $A_i$  and  $B_i$  are random numbers between 0 and 1.

- 2) Write the number of operations needed to compute the dot product as the size of the vectors  $N$ .
- 3) Compare the time needed for your program to run for  $N = 2^{28}$  with that of matlab (or octave): `N=2^28;A=rand(1,N); B=rand(1,N);tic;C=A*B';toc`

Write the specifications of the computer you are using.

- 4) Extra credit: Plot the number of operations per second as a function of  $N$  using your code and the one you get from matlab. Take  $N$  as powers of (i.e. 1, 2, 4, 8,...). Discuss the differences in performance if any.