Parallel Programming Exercise **06-Nov-17**

- Write a program which takes as input an integer N, constructs two random vectors a and b of length N, and outputs the sum of all entries of the outer product $a * b^T$. That is, if $a = b = [1, 2, 3]^T$, then

$$a * b^T = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 3 & 6 & 9 \end{bmatrix},$$

  and the program would output 36.

- Study the execution time of your program as N varies.
  Is the time proportional to N or N^2?

- Is the memory used by your program proportional to N or N^2?

- Parallelize the computation using OpenMP
  (ignore the initialization of the random vectors).

- Study your program's strong scaling (fix the problem size N and increase the umber of cores used), and weak scaling (fix the amoung of memory used per core constant).

Tips [`http://hpac.rwth-aachen.de/teaching/pp-17/`]
Timers can be found in the code from 18-Oct-17, while the OpenMP examples discussed in class are found in the code from 23-Oct-17 and 30-Oct-17.