Assignment #1 – Spatial Locality

1. (50p) Convert the given matrix multiplication algorithm into cache friendly version to speed up the computations using C programming language. You should use row-major ordering.

```
for(i=0;i<r;i++){
  for(j=0;j<c;j++){
    mul[i][j]=0;
    for(k=0;k<c;k++){
       mul[i][j]+=a[i][k]*b[k][j];
    }
  }
}
```

2. (20p) Show the time required to complete the calculations for matrixes of size from 16×16 to 4196×4196 (show a Figure in your report). **You must perform the tests using both traditional method and your own method.** Perform the experiments for the following configurations.
   a. 512×512
   b. 1024×1024
   c. 2048×2048
   d. 4096×4096
   e. 8192×8192
   f. 16384×16384
   g. 32768×32768

3. (20p) Show the time required to complete the calculations for **the same matrixes** using compiler optimization flags (show a Figure in your report). **You must perform the tests using both traditional method and your own method.**

4. (10p) Provide your source code and report including:
   a. A cover page
   b. Problem & Your solution strategy
   c. Data visualizations (Figures) for the results.
   d. Conclusion