Assignment 1

1. ‘openblas' is used in the program.

2. (1) ’S’ means single, ‘D’ means double, ‘C’ means complex, ‘Z’ means double complex.
   (2) ‘SSPR2’ is to calculate $\mathbf{A} \leftarrow \mathbf{A} + \alpha\mathbf{x}\mathbf{y}^T + \alpha\mathbf{y}\mathbf{x}^T$, which alpha is a scalar, A is a symmetric matrix, x & y are vector, and, yT xT are the transpose of vector x and y.
   ‘ZGERC’ is to calculate $\mathbf{A} \leftarrow \mathbf{A}+\alpha\mathbf{x}\mathbf{y}^H$, which **A** is an m by n matrix , alpha is a scalar, **x** is a vector of length m, y^H is the conjugate transpose of vector **y** of length n.
   ‘DGBSVX’ is to compute the solution of AX=B, which A can be $\mathbf{A}^T$ or $\mathbf{A}^H$, and B is matrix, X is the solution.
   ‘CHEEVR’ is to compute the eigenvalues and the eigenvectors of a matrix.

3. To check the correctness of the calculation, we can use both lapack function and numpy function, then check if the answer is equal.

4. To use block matrix operation to evaluate Ax = b, we can evaluate x = (A–1)b. Then partitioning A–1 into smaller block matrix. We can partitioning it every 2 rows and 2 columns. Then we can get a 2 * 2 partitioning A–1 matrix.
We can accelerate the compute speed because if there are some O or I matrix, it will be more convenient to calculate it.

5. Strassen Matrix–Matrix Multiplication algorithm is using the block matrix operation to calculate, and the matrix should be 2^n *2^n. By partitioning the matrix, it can reduce the calculate time, and reduce the time complexity.
But by this method, the matrix should be 2^n * 2^n. Although we can extend the matrix to fit it, if the matrix is too big, still can’t increase the efficiency a lot.