Task 06 – Fourier Transform

Take a real-valued rank 2 matrix 1000x1000 filled with a gaussian random variable with mean one and standard deviation one, and call this matrix A.

1) Perform a FFT c2c (complex-to-complex) and call this new matrix C
2) Reconstruct matrix A by inverse_c2c Fourier transform, what is the mean and median absolute and relative error? [report values with square root of the mean/median square errors]
3) Perform a FFT r2c (real-to-complex) and call this new matrix R
4) Reconstruct matrix A by inverse_c2r Fourier transform, what is the mean and median absolute and relative error? [report values with square root of the mean/median square errors]
5) Are you reaching machine precision in point 2 and 4? If not, try to comment on why
6) What is the value of C[0,0] or R[0,0]? Can you guess its meaning?
7) [BONUS] Reduce the dimension of A to 6x6. Try to obtain matrix C from matrix R.