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Q.N.1 (a)

The size of the file of ascii format for  $n=4000$  was observed to be 336 MB.

The size of the file of binary format for  $n=4000$  was observed to be 123 MB.

Q.N.1(b)

For  $n=4000$

$$\begin{aligned}\text{Size in the memory for array of size } n*n &= \text{memory of 1 double (8 bytes) } *n*n \\ &= 8*4000*4000 \\ &= 128000000 \text{ bytes} \\ &= 122.0703125 \text{ MB}\end{aligned}$$

To know the distribution of the file sizes, six different values of  $n$  were taken. The summary of the size of memory and disk is presented in table 1.

Table 1. Summary of size of memory and disk

Location	Value of n	Filename	File size Magnitude	Size Unit
Disk	3	array000003_asc.out:	1.92E-04	MB
Memory		array000003_asc.out:	6.87E-05	MB
Disk		array000003_bin.out:	6.87E-05	MB
Memory		array000003_bin.out:	6.87E-05	MB
Disk	10	array000010_asc.out:	2.11E-03	MB
Memory		array000010_asc.out:	7.63E-04	MB
Disk		array000010_bin.out:	7.63E-04	MB
Memory		array000010_bin.out:	7.63E-04	MB
Disk	1000	array001000_asc.out:	2.10E+01	MB
Memory		array001000_asc.out:	7.63E+00	MB
Disk		array001000_bin.out:	7.63E+00	MB
Memory		array001000_bin.out:	7.63E+00	MB

Disk	1500	array001500_asc.out:	4.72E+01	MB
Memory		array001500_asc.out:	1.72E+01	MB
Disk		array001500_bin.out:	1.72E+01	MB
Memory		array001500_bin.out:	1.72E+01	MB
Disk	2000	array002000_asc.out:	8.39E+01	MB
Memory		array002000_asc.out:	3.05E+01	MB
Disk		array002000_bin.out:	3.05E+01	MB
Memory		array002000_bin.out:	3.05E+01	MB
Disk	4000	array004000_asc.out:	3.36E+02	MB
Memory		array004000_asc.out:	1.22E+02	MB
Disk		array004000_bin.out:	1.22E+02	MB
Memory		array004000_bin.out:	1.22E+02	MB

While plotting data presented in table 1, figure 1 shows that the size of the file is nearly same in both memory and disk for binary format while the size of the file is larger for the ascii format while saving it to the disk rather than storing it in a memory.

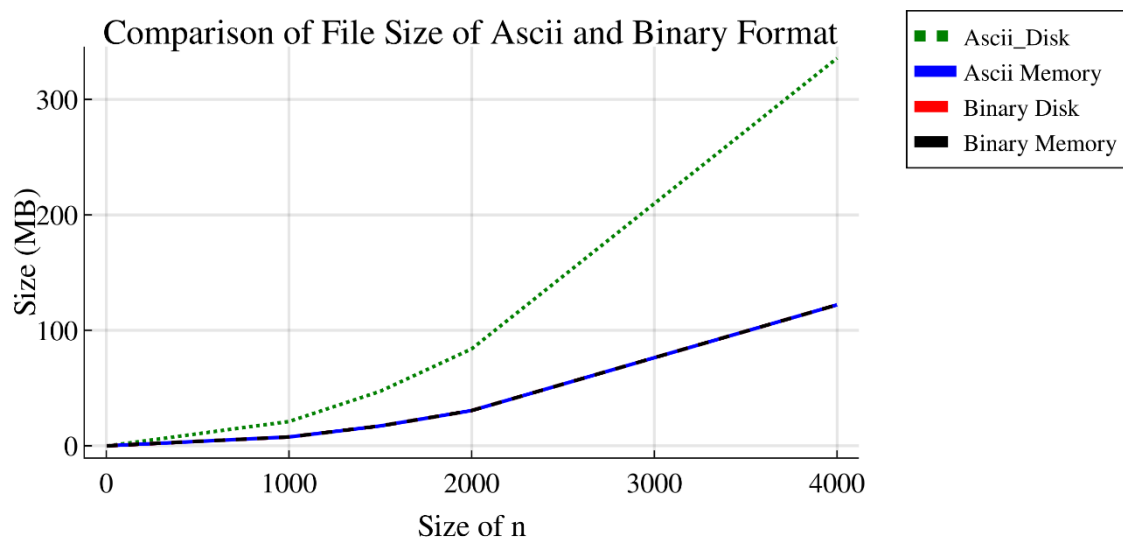


Figure 1. Comparison of File Size of Ascii and Binary Format

An important observation made from figure 1 is that the disk size and memory size of binary formats and memory size of ascii format is nearly same while the disk size of the

memory is triple the size of the disk and memory size of binary format suggesting that for larger files, it should be recommended to use binary format to save the data.

#### Q.N.2

- The input.in takes the size of n that is separated by spaces while the matrix and vectors input files are separated by commas.
- The code calculates eigenvalue only for the first two vectors of size of n to be 3 for a precision of  $1e-15$ . For a lower precision of  $1e-14$  and lower, the eigenvalue is calculated for more vectors too. For the code attached, the precision is set to be  $1e-15$  as the input values is also presented in the same precision.

Precision	Filename	Eigen Value
1e-15	Vec_000003_000001.in	-6
	Vec_000003_000002.in	-6
1e-14	Vec_000003_000001.in	-6
	Vec_000003_000002.in	-6
	Vec_000003_000003.in	-1
	Vec_000005_000001.in	0.268098
	Vec_000005_000003.in	0.986875
1e-13	vec_000003_000001.in	-6.000000
	vec_000003_000002.in	-6.000000
	vec_000003_000003.in	-1.000000
	vec_000005_000001.in	0.268098
	vec_000005_000003.in	0.986875
	vec_000005_000004.in	1.399039
	vec_000050_000002.in	0.479628
	vec_000050_000003.in	1.337887
	vec_000080_000001.in	0.333018
	vec_000080_000003.in	0.939275