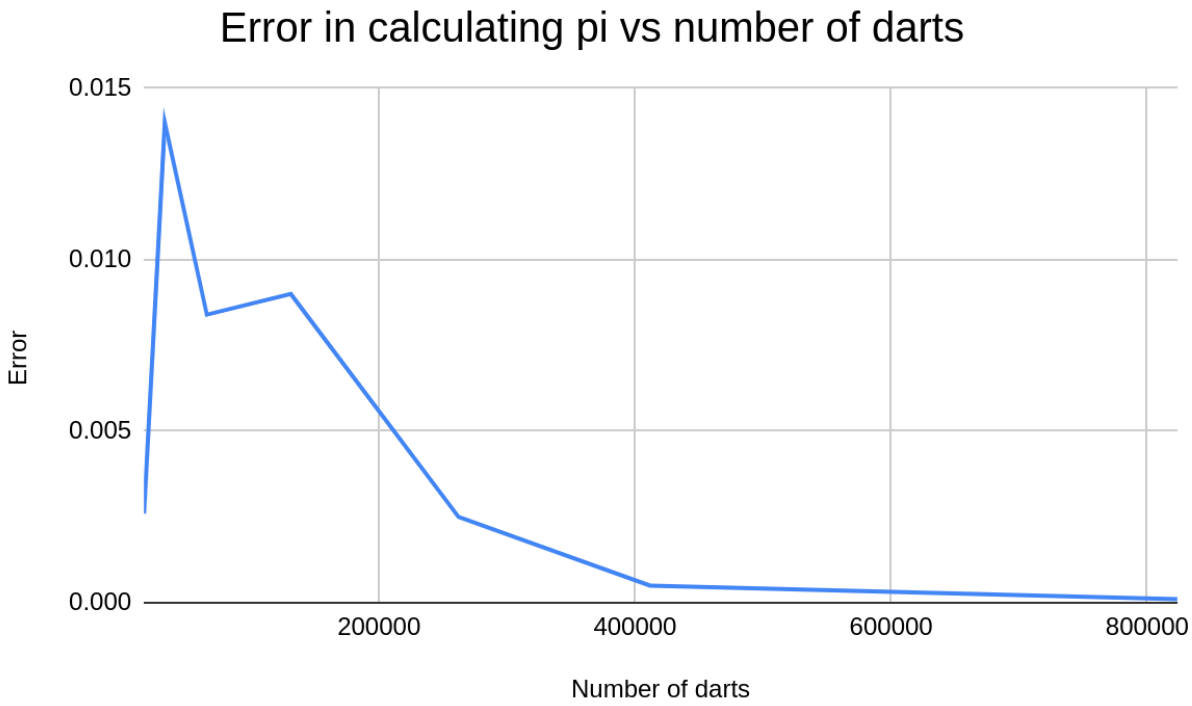
Question 4

The platform used to run experiments for this question is the **Discovery Cluster** using sbatch. More information on the code and how to run is provided in the Readme and in the log file.

The table below shows the trend in error while calculating the value of pi with the increase in the number of darts. The grid size and block size are chosen such that the total number of threads is equal to the total number of darts for maximum concurrency.

Number of darts	Total threads = grid_size * block_size	Total Time elapsed	Time elapsed CUDA kernel	Error
16384	(128, 1, 1) * (128, 1, 1)	2.27	0.00593	0.0026
32768	(256, 1, 1) * (128, 1, 1)	2.28	0.00592	0.014
65536	(256, 1, 1) * (256, 1, 1)	2.28	0.00590	0.0084
131072	(256, 1, 1) * (512, 1, 1)	2.29	0.00591	0.009
262144	(512, 1, 1) * (512, 1, 1)	2.356	0.00593	0.0025
411699	(1024, 1, 1) * (512, 1, 1)	4.1099	0.005910	0.0005
823588	(1024, 1, 1) * (1024, 1, 1)	7.60	0.005901	0.0001



The table below shows the difference in error while using float variables and double variables in calculating the value of pi using darts. There is slight increase in accuracy when we use double variables for larger number of darts.

Number of darts thrown	Error (float variables)	Error (double variables)
10485760	0.00042939	0.00042930
104857600	0.00018301	0.00018297
1048576000	0.00001033	0.00001029