HPC Lab Week 6

Exploring HPC libraries for Linear Algebra

Objective of this lab is to explore performance of different libraries in performing matrix operations and come up with a comparative study.

1. Create two random matrices of size N*N and perform matrix multiplication between them.

Implement the above task using the following libraries.

1. Serial Implementation
2. Data Parallel Implementation
3. Numpy
4. Scipy
5. Pandas
6. Sympy
7. Numba (for speeding up numpy using Cuda)
8. Linalg (https://pypi.org/project/linalg/)
9. Pymatrix (https://pypi.org/project/pymatrix/)
10. Tensorflow (Cuda based tensor library)
11. PyCuda
12. Pymc

To do:

1. Perform matrix multiplication with large sizes of N and compare the running time of all implementation. Find which libraries crash at large N.
2. Compare time performance with different datatypes such as uint8, int32, float 32, float 64 etc.
3. Summarize the conclusions of this comparative study.
4. (Optional) Explore other libraries which can speed up existing implementations or libraries.
5. (Optional) Explore job scheduling libraries such as Ray, Dask, Joblib in Python to perform scientific computations