Parallel and Distributed Processing Project High Performance Computing

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Due: 18-05-2025 2359 Hours
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Part-I: Getting to know the HPC Cluster Part-I is about finding out how the HPC cluster works. Create a map of all the compute nodes in the HPC cluster. Find out the CPU specs (number of cores etc.) of compute nodes. Check nodes that are mostly busy running long simulations. Rank nodes by availability and performance.

Part-II: Laplace Solver Implement Laplace Solver on HPC using MPI. You can test your implementation for correctness by using smaller arrays for comparison against single-threaded implementation. Progressively increase the size of your domain (2-D matrix) and make graphs to compare MPI performance with openmp implementation. For larger arrays, you will have to increase the number of epochs. Additionally, you will have to implement interprocess communication using MPI for sharing array data between neighbouring processes after each epoch. Do mention any performance bottlenecks you encounter.

Note 1: Please submit a report and explain your approach for MPI implementation including figure/graphs, problems faced and resolved/unresolved issues.

Note 2: Appropriately package your code so that the end-user can easily compile and run your code (makefile, cmake, VS build, etc.).

Note 3: HPC is a shared resource and users have a responsibility to use HPC responsibly. Avoid hogging HPC resources for too long by running unnecessarily long simulations. Keep track of RAM usage and don't oversubscribe RAM as this can cause serious slowdowns. Avoid running simulations on the head node afrit.