Strong Scaling and Weak Scaling Results

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1 Shared-Memory Parallel Algorithms for Fully Dynamic Maintenance of 2-Connected Components

Reference: *C. A. Haryan, G. Ramakrishna, K. Kothapalli and D. S. Banerjee, "Shared-Memory Parallel Algorithms for Fully Dynamic Maintenance of 2-Connected Components," 2022 IEEE International Parallel and Distributed Processing Symposium (IPDPS), 2022, pp. 1195-1205, doi: 10.1109/IPDPS53621.2022.00119.*

Strong Scaling

- **Application**: Fully Dynamic Maintenance of 2 connected components
- **Number of cores**: 128
- **Kind of scaling**: Linear
- **Speedup**: 4

Weak Scaling

- **Application**: Fully Dynamic Maintenance of 2 connected components
- **Methodology**: decrease batch size while keeping the number of threads fixed.
- **Number of cores**: 128
- **Comments**: Incrementalbatch exhibits good weak-scaling property as its run time decreases proportionately as the batch size decreases while keeping the number of threads fixed.

2 AxoNN: An asynchronous, message-driven parallel framework for extreme-scale deep learning

Reference: *S. Singh and A. Bhatele, "AxoNN: An asynchronous, message-driven parallel framework for extreme-scale deep learning," 2022 IEEE International Parallel and Distributed Processing Symposium (IPDPS), 2022, pp. 606-616, doi: 10.1109/IPDPS53621.2022.00065.*

Strong Scaling

- **Application**: Message driven parallel framework for exteme-scale deep learning
- **Number of cores**: 384 GPU
- **Kind of scaling**: Linear
- **Speedup**: 4

Weak Scaling

- **Application**: Message driven parallel framework for exteme-scale deep learning
- **Methodology**: optimal number of GPU for the data size
- **Number of cores**: 384 GPU
- **Comments**: Data parallelism is embarrassingly parallel, this ends up substantially improving AxoNN's performance

3 High-Performance Parallel Graph Coloring with Strong Guarantees on Work, Depth, and Quality

Reference: *M. Besta, A. Carigiet, K. Janda, Z. Vonarburg-Shmaria, L. Gianinazzi and T. Hoefler, "High-Performance Parallel Graph Coloring with Strong Guarantees on Work, Depth, and Quality," SC20: International Conference for High Performance Computing, Networking, Storage and Analysis, 2020, pp. 1-17, doi: 10.1109/SC41405.2020.00103.*

Strong Scaling

- **Application**: Graph coloring
- **Number of cores**: 32
- **Kind of scaling**: Linear
- **Speedup**: 1.7

Weak Scaling

- **Application**: Graph coloring
- **Methodology**: Kronecker graphs of the increasing sizes by varying the number of edges/vertex
- **Number of cores**: 32
- **Comments**: From the weak scaling graph we can tell that the application has bad weak scaling since the time increases with increases in problem size and threads due to memory bottleneck

4 Distributed-Memory Parallel Symmetric Nonnegative Matrix Factorization

Reference: *S. Eswar, K. Hayashi, G. Ballard, R. Kannan, R. Vuduc and H. Park, "Distributed-Memory Parallel Symmetric Nonnegative Matrix Factorization," SC20: International Conference for High Performance Computing, Networking, Storage and Analysis, 2020, pp. 1-14, doi: 10.1109/SC41405.2020.00078.*

Strong Scaling

- **Application**: Distributed-memory parallel symmetric non-negative matrix factorization
- **Number of cores**: 4096
- **Kind of scaling**: Linear at low data size, slightly super linear for large data
- **Speedup**: 4505.6

Weak Scaling

- **Application**: Distributed-memory parallel symmetric non-negative matrix factorization
- **Methodology**: Matrix dimensions are increased proportionally to the square root of the number of nodes as we scale up
- **Number of cores**: 4096
- **Comments**: It is expected that the computation will be bottlenecked by matrix multiplication call which is confirmed by the observation on results of weak scaling

5 A Parallel Framework for Constraint-Based Bayesian Network Learning via Markov Blanket Discovery

Reference: *A. Srivastava, S. P. Chockalingam and S. Aluru, "A Parallel Framework for Constraint-Based Bayesian Network Learning via Markov Blanket Discovery," SC20: International Conference for High Performance Computing, Networking, Storage and Analysis, 2020, pp. 1-15, doi: 10.1109/SC41405.2020.00011.*

Strong Scaling

- **Application**: Constraint-based Bayesian Network Learning
- **Number of cores**: 1024
- **Kind of scaling**: Linear
- **Speedup**: 845

Weak Scaling

- **Application**: Constraint-based Bayesian Network Learning
- **Methodology**: Approximately same work load per core
- **Number of cores**: 1024
- **Comments**: Degradation in scaling efficiency is due to communication overhead being the limiting factor for weak scaling