Streaming Compression using Deep Neural Networks

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Developed a deep-learning based compression artifact removal for super resolution of streaming data.

## In Situ Compression Artifact Removal

Significance and Impact

Scientific simulations generate large amounts of data. Storing/moving it can be expensive, and lossy compression like JPEG results in compression artifacts (ringing, blocking, etc.). Compressed Sensing is expensive and fails in some cases. Need super resolution of streaming data to maximize storage capacity minimized movement cost.
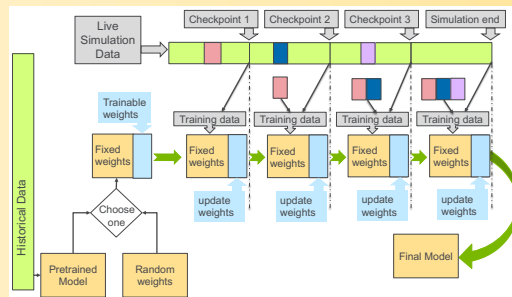

Incremental batch transfer learning for the climate data that represents a scenario in which the neural network model parameters are initialized with weights from a pretrained model

Barotropic instability test   Enlarged region
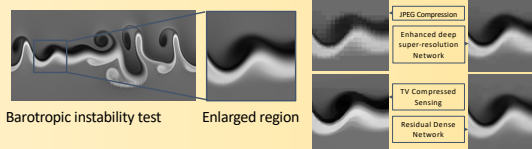
Accurate and Adaptive Mini-Batch Size Parallel Training
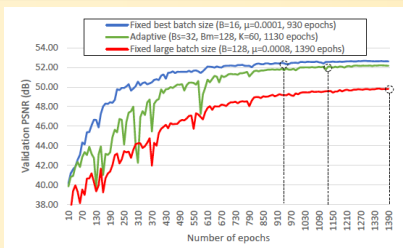
Comparison of learning curves of EDSR training on Phantom dataset between fixed- and adaptive-size methods.
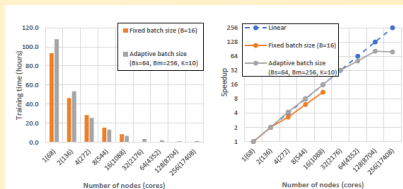
Comparison of end-to-end training time (left) and speedup (right) between fixed- and adaptive-size methods. The performance of the fixed large batch size method is not compared with the others since the accuracy is significantly dropped.

Significance and Impact

Training deep Convolutional Neural Networks is a computationally intensive task, requiring efficient parallelization to shorten the execution time. We have developed an adaptive batch size training strategy that starts the training with a small mini-batch size and gradually increases the batch size till the maximum allowable parallelism is reached.

Future Plans

Compression of Streaming Scientific Data from HPC
- Develop methods to preserve QoI that are important to scientific simulations
- Develop new training methods that provide additional scaling

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