DE GRUYTER

Special Issue:

Optimizing Deep Neural Networks for High-Performance Computing in Image Processing

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DESCRIPTION

Image processing is crucial in various fields such as medical imaging, computer vision and multimedia applications. On the other hand, Deep neural networks (DNNs) have shown remarkable success in solving complex image processing tasks but they demand significant computational resources. This creates a challenge for deploying them on resource-constrained systems or achieving real-time performance. Therefore, focusing on optimizing DNNs for high-performance computing (HPC) in image processing is essential. Model compression and quantization along with exploring hardware accelerators like GPUs, FPGAs, and ASICs have emerged as recent advancement in optimizing DNNs for HPC in image processing. This technique focusses on reducing the size and computational complexity of deep learning models. Further, these specialized hardware architectures leverage parallelism and data-level parallelism in deep learning algorithms, resulting in significant speed improvements. By removing redundant parameters representing weights with lower precision and transferring knowledge from larger models to smaller one's compression techniques can make models more efficient without significant loss in performance.

However, research in this area faces challenges. Balancing model compression and accuracy is crucial since compression techniques can introduce performance trade-offs. Besides, deploying optimized models on heterogeneous computing platforms requires addressing issues related to hardware compatibility, memory management and software frameworks. Techniques like model parallelism and data parallelism need to be explored to fully utilize HPC in image processing. Moreover, further research is needed to develop novel optimization algorithms, compression techniques and hardware architectures tailored specifically for image processing tasks. The aim of this proposed SI is to develop techniques and algorithms that improve the efficiency and speed of DNNs while maintaining their accuracy. It also aims to make deep learning models more practical and accessible for a wide range of applications. We encourage researchers to explore novel techniques, algorithms and architectures that enhance the efficiency, speed, and accuracy of DNNs while catering to the unique requirements of image processing applications.

The following topics are welcome but not restricted to:

- Techniques for compressing deep neural networks in image processing while maintaining accuracy.
- Quantization methods to reduce the computational complexity of DNNs for image processing tasks.
- Exploring GPUs, FPGAs, and ASICs as hardware accelerators for optimized image processing.
- Efficient parallel computing techniques, such as model parallelism and data parallelism, for DNN training and inference in image processing.
- Algorithms for optimizing distributed deep learning systems in image processing.
- Edge computing solutions for efficient DNN inference in image processing applications.
- Hybrid architectures combining deep learning models with traditional image processing techniques.
- Real-time object detection and tracking using high-performance DNNs in computer vision.
- Efficient algorithms for image segmentation using DNNs in multimedia applications.
- Adapting deep learning models for low-power embedded systems in image processing.
- Resource-efficient training methods for large-scale image datasets using HPC techniques.
- Optimization frameworks and tools for automating the optimization of DNNs for image processing on HPC platforms.

IMPORTANT DATE

Final Paper Submission Deadline: 29.02.2024

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We are looking forward to your submission!

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