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"Deep Learning and High Performance Computing Synergies"

In this talk we will survey existing and prospective work related to the synergies that are emerging between deep learning and high performance computing (HPC). Deep learning has a strong appetite for compute power, making HPC a natural target to train large neural networks. Parallelizing deep neural network as made tremendous progress. For instance training Res-Net50, often used as a benchmark, has been accelerated by almost a 28 000 factor over the course of the 3 last years, using what is called data parallelism. But finer grain parallelization, called model parallelization, is also required and still a challenge today. And compute needs requiring massive parallelization go beyond the direct learning phase to address deep reinforcement learning and auto deep learning for instance. Synergies also emerge between deep learning and traditional numerical simulations domains (physics, biology, chemistry, etc.) in less expected ways. We will survey such research work that look at combining deep learning and traditional numerical simulation solvers for learning surrogate models, physics-inspired neural networks or how automatic differentiation is been used for neural network programming.