Tutorial. Nov 18, 2024 1:30-5 pm

Distributed Deep Learning on GPU-based Clusters

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Welcome!

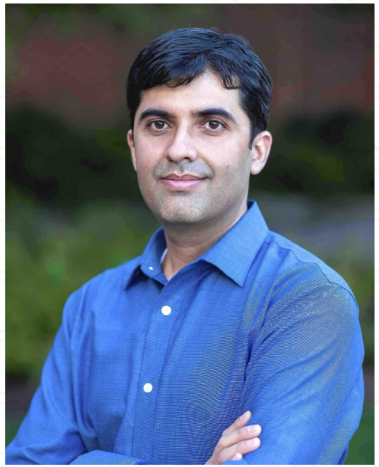
Are you interested in training/fine-tuning or using deep learning models for inference on a networked cluster of GPUs?

- If the answer is yes, you have come to the right tutorial.

Tutorial attendees will learn …

- Different forms of parallelism for deep learning
- Setting up a training (fine-tuning) job on GPGPUs
- Different parallel deep learning frameworks and how to use them
- Using a model in inference mode on multiple GPGPUs

Tutorial organizers



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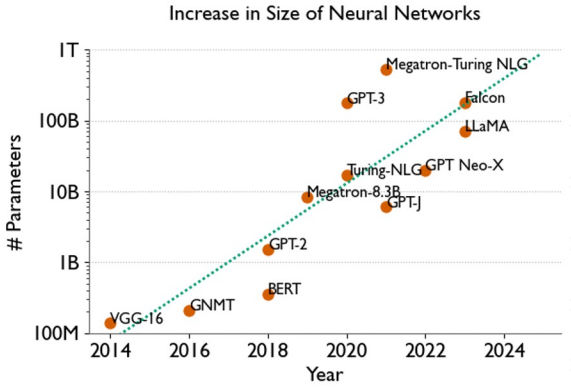
Deep learning

- An area of machine learning that uses artificial neural networks to learn complex functions
  - Often from high-dimensional data: text, images, audio, …
- Widespread use in computer vision, natural language processing, etc.

Parallel / distributed training

- Many opportunities for exploiting parallelism
- Iterative process of training (epochs)
- Many iterations per epoch (mini-batches)
- Many layers in DNNs



Framework	Type of Parallelism	Largest Accelerator Count	Largest Trained Network (No. of Parameters)
FlexFlow	Hybrid	64 GPUs	24M*
PipeDream**	Inter-Layer	16 GPUs	138M
DDP**	Data	256 GPUs	345M
GPipe	Inter-Layer	8 GPUs	557M
MeshTensorFlow	Intra-Layer	512-core TPUv2	4.9B
Megatron**	Intra-Layer	512 GPUs	8.3B
TorchGPipe**	Inter-Layer	8 GPUs	15.8B
KARMA	Data	2048 GPUs	17B
LBANN**	Data	3072 CPUs	78.6B
ZeRO**	Data	400 GPUs	100B
ZeRO-Infinity	Data	512 GPUs	32T
AxoNN	Inter-Layer	384 GPUs	100B

Materials and Accounts

- Tutorial link: https://github.com/axonn-ai/distrib-dl-tutorial

- Accounts: https://forms.gle/UGgD95hxjSozstdp7
- ssh <username>@login.zaratan.umd.edu

PSSG

SC24 Atlanta, GA | hpc creates.

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