

Why Deep Learning Frameworks Require a GPU?

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In brief

Deep Learning is a subfield of machine learning that attempts to mimic the human brain. Like the human brain has neurons that transmit information and learn things, deep learning has a similar structure and learns through an iterative process.

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Deep learning is a neural network with three or more layers. These neural networks seek to imitate the activity of the human brain by enabling it to learn from enormous quantities of data, although they fall far short of replicating it. While a single-layer neural network may produce approximate predictions, more hidden layers can improve and tune for accuracy.

A deep learning model will help you perform the categorization tasks from text, sound, pictures, etc. Using labeled data and multilayer neural network topologies, deep learning models can achieve maximum accuracy.

Deep learning has numerous applications in transportation, mobile, television, communication devices, health, medicine, etc. As a result, it has gotten a lot of press recently, and for a good cause.

Deep Learning is an Iterative Process

Deep learning implementation goes through an iterative cycle. To understand the analogy of deep learning as an iterative process, consider a baby learning to walk. The learning process for the baby takes place as standing, walking, falling, standing, walking, balancing, falling, and so on.

Like this, a deep learning model makes a random prediction at first. It calculates the loss. Then, those losses are backpropagated throughout the network such that weights and biases are adjusted to give better results on the next run.

In this way, it keeps on making mistakes but learns from them every time. One other thing that distinguishes deep learning from classical machine learning is that deep learning learns features from the inputs themselves. In classical machine learning techniques, feature extraction is a very important step that is absent in deep learning.

This is also why deep learning requires a large amount of data to extract features and learn from them to make better predictions. Overall, each step is visited time and again, and deep learning is thus an iterative process.

The above statements suggest that deep learning requires more data, a longer training time, and correspondingly a larger computation power. This is the reason why deep learning frameworks need a GPU.

What Are GPUs?

A graphics processing unit (GPU) is a specialized processor created to speed up the rendering of visuals. In addition, GPUs can handle a large amount of data at once, making them ideal for machine learning, video editing, and gaming. As a result, GPUs are an essential component of contemporary computing.

Computational science and AI are being transformed by GPU computing and high-performance networking. For example, GPU developments have played a significant role in the current growth of deep learning.

Benefits of Using GPUs

There are various frameworks like Tensorflow, Pytorch, etc., that can work on deep learning algorithms. However, while working with these frameworks, GPUs can perform significantly faster than the same performance. This is because while a CPU can do only a handful of operations at once, the multiple GPU cores can perform thousands of operations at once.

A task requiring a couple of hours to train on a CPU may only require 10-20 minutes to train on a GPU. GPUs save a lot of computation time, so they are very popular for deep learning applications.

Deep learning algorithms are not interpretable. With multiple layers, large quantities of neurons, and thousands of parameters to learn, it is hard to imagine how information gets propagated between layers on the network. So, they learn things in a way that is beyond human imagination. Therefore, deep learning frameworks require GPUs for optimal training and learning processes.

Hidden Costs

On the other hand, the cost of GPUs is indeed very high. It is expensive to set up your GPU server. But, various companies provide cloud GPU use for deep learning. Such companies include mainly Amazon AWS, Microsoft Azure, and Google GCP. There are plenty more. Also, a number of services like Google Colab and Kaggle are free of cost.

Although they have their limitations, they are helpful when working in deep learning applications free of cost. GPUs optimize the iterative training processes of deep learning applications, so deep learning frameworks require a GPU.

References

1. techradar.com - news / computing-components - <https://www.techradar.com/news/computing-components/graphics-cards/how-gpus-are-made-1000923>
2. developer.nvidia.com - deep-learning-frameworks - <https://developer.nvidia.com/deep-learning-frameworks>