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Experiment - 8

Understanding various deep learning frame works

Deep Learning is a sub-branch of Machine Learning. The unique aspect of Deep Learning is the accuracy and efficiency it brings to the table – when trained with a vast amount of data, Deep Learning systems can match (and even exceed) the cognitive powers of the human brain.

A deep learning framework is an interface, library or a tool which allows us to build deep learning models more easily and quickly, without getting into the details of underlying algorithms. They provide a clear and concise way for defining models using a collection of pre-built and optimized components.

Different deep learning frameworks are :-

1. TensorFlow

Google's open-source platform TensorFlow is perhaps the most popular tool for Machine Learning and Deep Learning. TensorFlow is JavaScript-based and comes equipped with a wide range of tools and community resources that facilitate easy training and deploying ML/DL models. While the core tool allows you to build and deploy models on browsers, you can use TensorFlow Lite to deploy models on mobile or embedded devices. Also, if you wish to train, build, and deploy ML/DL models in large production environments, TensorFlow Extended serves the purpose.

Advantages :-

a) TensorFlow is best suited for developing DL models and experimenting with Deep Learning architectures.

b) It is used for data integration functions, including inputting graphs, SQL tables, and images together.

Disadvantages:-

a) TensorFlow APIs in languages other than Python are not necessarily backward-compatible and are not covered by the API stability promises that apply to the Python API.

2. Keras :-

It is a Cross-platform neural network library is written in Python. Keras is a high-level API built on top of Tensorflow. Keras is the most used deep learning framework in Kaggle. Keras best runs on GPUs and TPUs. Keras models can easily be deployed to the web, iOS and Android. Keras is known for its fast computation, user-friendliness and ease of access. Keras has an active community and thus under constant development.

Advantages :-

a) It is excellent for beginners who have just started their journey in this field. It allows for easy learning and prototyping simple concepts.

b) Keras is scalable and you can take advantage of the processing power of distributed environments or machines with multiple GPUs.

c) AutoKeras is like AutoML for deep learning and takes the guesswork out of the hyperparameter tuning and architecture search process for certain tasks.

Disadvantages :-

a) Keras is a little slower than some of the other frameworks.

3. PyTorch :-

PyTorch is an open-source Deep Learning framework developed by Facebook. It is based on the Torch library and was designed with one primary aim – to expedite the entire process from research prototyping to production deployment. What's interesting about PyTorch is that it has a C++ frontend atop a Python interface.

While the frontend serves as the core ground for model development, the “torch.distributed” backend promotes scalable distributed training and performance optimization in both research and production.

Advantages :-

a) It is excellent for training, building, deploying small projects and prototypes.

b) It is extensively used for Deep Learning applications like natural language processing and computer vision.

c) PyTorch offers flexibility when it comes to creating your own neural network architectures for research.

d) PyTorch has a large ecosystem of additional frameworks built on top of it, such as Skorch, which provides full Scikit-learn compatibility for your Torch models.

Disadvantages :-

a) The API is not as simple as Keras and a little tougher to use.

4. MXNet :-

Apache MXNet is a deep learning library created by the Apache Software Foundation. It supports many different languages and is supported by several cloud providers such as Amazon Web Services (AWS) and Microsoft Azure. Amazon also chose MXNet as the top deep learning framework at AWS.

MXNet is written in multiple languages – C++, Python, Java, Scala, Julia, R, Javascript, Perl, Go and Wolfram Language. It is known for its fast model training.

Advantages:-

a) It supports multiple GPUs along with fast context switching and optimized computation.

b) It supports both imperative and symbolic programming, thereby allowing developers to choose their desired programming approach to building deep learning models.

c) MXNet offers multi-GPU and distributed training like Keras and PyTorch.

Disadvantages :-

a) The MXNet API is still more complicated than that of Keras.

b) MXNet is similar to PyTorch in terms of syntax but lacks some of the functions that are present in PyTorch.