CS410 – Technology Review

Features of TensorFlow and its uses in Real World Applications

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Abstract

This paper is a review of TensorFlow in NLP. Why TensorFlow is used in most of the NLP tasks and why is it preferred over other machine learning libraries. What makes TensorFlow a popular Deep learning framework and what are its various features that makes it unique than other open-source libraries in the world. We shall also see some of TensorFlow's real-world applications that makes it an interesting tool in machine learning framework.

Introduction

We studied in our TIS course about text data including all data in the form of natural language text. We produce and consume a large amount of text data every day and this explosive growth of data makes it impossible for people to understand and process all the information in a timely manner. Hence, we need a powerful tool like Natural Language Processing that helps us in understanding and processing the huge volumes of unstructured data. Deep Learning which is known for its remarkable performance in various challenging tasks such as image classification, text generation and speech recognition is widely used for many NLP tasks. TensorFlow is one of the popular deep learning frameworks and it offers various tools to work with the huge amount of unstructured data.

Created by Google Brain Team, TensorFlow is an open-source library for numerical computation and large-scale machine learning. It uses Python to provide front-end API for building applications with the framework, while executing those applications in high performance C++. Google's TensorFlow is known to ease the process of acquiring data, training models, serving predictions, and refining future results*.

Features of TensorFlow

TensorFlow has some very interesting features to offer. Let's review the various features by addressing some pros and cons that will help us in understanding the tool better. While addressing the pros and cons we shall also compare TensorFlow with other DL frameworks like Keras and PyTorch. TensorFlow is the best option when you are doing some work around deep learning and for NLP as it has lot of inbuilt functionality for this. Since TensorFlow is an **open-source** library, it is very easy to use. With adequate tutorials one can easily set it up fast and get started quickly. Google created TensorFlow and hence it has a **large community** which means that if users are stuck with some issue/problem, they can just resolve it by browsing online. Also, it has a supportive community that is key for sharing ideas and find the quick and best solutions. TensorFlow has a tool call TensorBoard that makes the training and debugging process easier when compared to other DL platforms. Multiple GPU and TPU are seamlessly supported that will bring a lot of performance gain for enterprise solutions while keeping the **flexibility**. This is possible as the tool has a well-defined **abstraction**. It has a vast set of library functions for all kinds of tasks -Text, Images, Tabular, Video etc. It can easily be integrated with other frameworks like Keras that makes it easier to write a machine learning model.

While it has so many pros, it also has come cons. Sometimes the error messages from TensorFlow can be quite difficult to understand. It is less intuitive when compared to PyTorch as the model is static. It would be more functional if it were dynamic like PyTorch. There is no proper documentation to understand TF graph performance optimization. There are no tutorials or documentation to learn what goes behind the scenes in each layer. Not very intuitive for non-programming engineers and too many lines of code for some actions make it difficult to understand. Writing models with TensorFlow can be difficult when compared to Keras. Also, building neural networks is time consuming when compared to Keras. It is not easy for new developers to understand when compared to other libraries.

So, these were some of the pros and cons of TensorFlow that gives us an understanding of its performance when compared to other libraries. As they release new versions of TensorFlow, there are chances that most of the problems are addressed.

Now let's have a look at some of the TensorFlow real world applications and its contribution to the society.

TensorFlow Real-World Applications

TensorFlow is implemented in a variety of tasks. One of the most popular applications of TensorFlow has been its usage in Image Recognition. It is used by Mobile companies, social media, and many other telecom houses for facial recognition or image search. Another field where it is significantly used is in Voice Recognition. Google assistant, Siri, Alexa, and many other automatic speech recognitions is trained using TensorFlow. It is also used for Video/motion Detection. For example- airport security checks, gaming controls etc.

Text based applications like text messages, reactions, comments, tweets, stock results are all processed using TensorFlow for analysis purpose. Also, Google uses it for translation purposes. It uses its neural networks to translate one language into another language using TF library. Looking for patterns in images by processing them is made possible by using the computer vision algorithm – DeepDream. TensorFlow is used in implementing RankBrain, an AI system part of the core Google algorithm that is used to sort search results.

TensorFlow Time Series algorithms are used for analyzing time series data to extract meaningful statistics. This is extremely important for companies like Amazon, Google, Facebook, Netflix, etc., that analyze customer activity and use that data to compare it to millions of other users to determine what the customer might like to purchase or watch. This kind of contribution in the field of AI has helped many companies to execute such tasks efficiently. This algorithm is also used in other fields like Security, IoT, Finance, Accounting, Predictive Analysis, etc.

Conclusion

TensorFlow is a great option if you are working around machine learning. It is a great library for numerical and graphical computation of data for creating DL networks. It is most widely used library for various applications like Google Search, Google Translate, Google Photos many more. Although it can be difficult for beginners as the learning of the tool takes some time, it has various benefits as mentioned above. This tool has certain compatibility issues with other Python packages. Despite many disadvantages, this library is continuously being used in various fields and applications.

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