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A Study of Various Programming Approaches for Designing Deep Learning Model with their Salient Features

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Abstract-- It is type of machine learning based on artificial neural networks in which multiple layers of processing are used to extract progressively higher level features from data. the prototype will use a combination of deep learning, natural language processing, and dynamic network analysis to detect and examine the cross-platform spread of disinformation. Deep learning is a subset of machine learning, which is essentially a neural network with three or more layers. These neural networks attempt to simulate the behavior of the human brain—albeit far from matching its ability—allowing it to “learn” from large amounts of data. Machine learning tools are algorithmic applications of artificial intelligence that give systems the ability to learn and improve without ample human input; similar concepts are data mining and predictive modeling. They allow software to become more accurate in predicting outcomes without being explicitly programmed. Deep Learning With Python using various step which contain import the required libraries, Load the dataset, Check the total number of training and testing samples. Build the model. Loss and Optimization Tensor Flow is an open-sourced end-to-end platform, a library for multiple machine learning tasks, while Keras is a high-level neural network library that runs on top of TensorFlow. Both provide high-level APIs used for easily building and training models, but Keras is more user-friendly because it's built-in Python .

Indexterms-- Python, MATLAB, Java, Deep Learning Kit. Keras.

I.INTRODUCTION

Deep learning neural networks, or artificial neural networks, attempts to mimic the human brain through a combination of data inputs, weights, and bias. These elements work together to accurately recognize, classify, and describe objects within the data.

Deep neural networks consist of multiple layers of interconnected nodes, each building upon the previous layer to refine and optimize the prediction or categorization..

This progression of computations through the network is called forward propagation. The input and output layers of a deep neural network are called visible.

The above describes the simplest type of deep neural network in the simplest terms. However, deep learning algorithms are incredibly complex, and there are different

types of neural networks to address specific problems or datasets.

If deep learning is a subset of machine learning, how do they differ? Deep learning distinguishes itself from classical machine learning by the type of data that it works with and the methods in which it learns.

Machine learning algorithms leverage structured, labeled data to make predictions—meaning that specific features are defined from the input data for the model and organized into tables. This doesn't necessarily mean that it doesn't use unstructured data; it just means that if it does, it generally goes through some pre-processing to organize it into a structured format.

Deep learning eliminates some of data pre-processing that is typically involved with machine learning. These algorithms can ingest and process unstructured data, like text and images, and it automates feature extraction, removing some of the dependency on human experts. For example, let's say that we had a set of photos of different pets, and we wanted to categorize by “cat”, “dog”, “hamster”, et cetera. Deep learning algorithms can determine which features (e.g. ears) are most important to distinguish each animal from another. In machine learning, this hierarchy of features is established manually by a human expert.

Then, through the processes of gradient descent and back propagation, the deep learning algorithm adjusts and fits itself for accuracy, allowing it to make predictions about a new photo of an animal with increased precision.

Machine learning and deep learning models are capable of different types of learning as well, which are usually categorized as supervised learning, unsupervised learning, and reinforcement learning. Supervised learning utilizes labeled datasets to categorize or make predictions; this requires some kind of human intervention to label input data correctly. In contrast, unsupervised learning doesn't require labeled datasets, and instead, it detects patterns in the data, clustering them by any distinguishing characteristics.

Reinforcement learning is a process in which a model learns to become more accurate for performing an action in an environment based on feedback in order to maximize the reward.-1 shows different algorithms comparison and conclusion that was cumulatively done by different authors in past years.



Deep Learning Kit supports Convolutional Neural Networks too. Its vision is to support other deep learning tools like Torch and Tensor Flow.

PYTHON:

It is no longer surprising to hear that Python is one of the most popular languages among Developers and in the Data Science community. While there are numerous reasons behind Python's popularity, it is primarily because of two core reasons.

Python has a very simple syntax – almost equivalent to the mathematical syntax – and hence, it can be easily understood and learned.

Second, it offers extensive coverage (libraries, tools, etc.) for scientific computing and Data Science.

Scikit-Learn:

Scikit-Learn is an open-source tool designed for Data Science and Machine Learning. It is extensively used by Developers, ML Engineers, and Data Scientists for data mining and data analysis. One of the greatest features of Scikit-Learn is its remarkable speed in performing different benchmarks on toy datasets.

Keras:

Keras is an open-source, high-level neural network library written in Python. It is highly suited for ML and Deep Learning. Keras is based on four core principles – user-friendliness, modularity, easy extensibility, and working with Python. It allows you to express neural networks in the easiest way possible. Since Keras is written in Python, it can run on top of popular neural network frameworks like Tensor Flow, CNTK, and Theano.

SciPy:

SciPy is an open-source Python-based library ecosystem used for scientific and technical computing. It is extensively used in the field of Mathematics, Science, and Engineering. SciPy leverages other Python packages, including NumPy, IPython, or Pandas, to create libraries for common math and science-oriented programming tasks. It is an excellent tool for manipulating numbers on a computer and generate visualized results as well. And disease related to them. Each data set has different number of records and these are utilized to demonstrate the effectiveness of the proposed work.

MATLAB:

MATLAB lets you build deep learning models with minimal code. With MATLAB, you can quickly import pretrained models and visualize and debug intermediate results as you adjust training parameters. Perform Deep

Learning Without Being an Expert. You can use MATLAB to learn and gain expertise in the area of deep learning.

MATLAB lets you develop neural networks without being an expert. Get started quickly, create and visualize neural network models, integrate them into your existing applications, and deploy them to servers, enterprise systems, clusters, clouds, and embedded devices.

MATLAB provides the tools you need to transform your ideas into algorithms, including: Thousands of core mathematical, engineering, and scientific functions. Application-specific algorithms in domains such as signal and image processing, control design, computational finance, and computational biology.

Let us select the block that we want to build a OR gate. We need two constant blocks to act as inputs, a logic operator block and a display block. Select the constant block, we need two constant block, a logical operator and a constant. With logical operator you can use AND, OR, NAND, NOR, XOR, NXOR and NOT gates. Data file:

The app lets you explore supervised machine learning interactively using various regression models.

1. Automatically train a selection of models to help you choose the best model. ...
2. Explore your data, select features, and visualize results. ...
3. Export models to the workspace to make predictions with new data.

JAVA:

Deep learning as the name suggests us written in Java and is compatible with Java Virtual Machine language, such as Kotlin, Scala etc. It is an open-source distributed deep learning library which has an advantage of the latest distributed computing frameworks such as Apache Spark and Hadoop.

Now, you can create a Trainer to train your model. The trainer is the main class to orchestrate the training process. Usually, they will be opened using a try-with-resources and closed after training is over.

Here first we will define layers in `_init_` followed by executing the forward pass of the model in the call.

1. `import tensorflow as tf.`
2. `class MyModel(tf.keras.Model):`
3. `def __init__(self):`
4. `super(MyModel, self).__init__()`
5. `self.dense1 = tf.keras.layers.Dense(4, acti).`

The three models – object model, dynamic model and functional model are closely related to one another.

Java and Python both come with a wide range of built-in libraries and tools that can be used for the application of



machine learning techniques, which means that both of these languages are an excellent choice for machine learning

Java is generally faster and more efficient than Python because it is a compiled language. As an interpreted language, Python has simpler, more concise syntax than Java. It can perform the same function as Java in fewer lines of code.

As far as web and software development goes, Python, followed by Java, JavaScript, and C++, are among the most popular programming languages in today's market. Whether you're looking to improve your coding skills or start a career in technology, learning a coding language can bring many benefits.

Python is a popular choice for artificial intelligence (AI) development due to its simplicity, readability and versatility. It has a vast collection of libraries and frameworks for machine learning, natural language processing and data analysis, including TensorFlow, Keras, PyTorch, Scikit-learn and NLTK.

They facilitate polymorphism and encapsulation, but still, most people prefer Java. This article discusses why despite being the most popular programming language, Python can only partially overtake or replace Java. Java has a straightforward syntax, and Its instructions are simple to create, run, decode, and debug.

Python. Python is the ideal coding language used for machine learning, NLP, and neural network connections. Python can be used even if you are new to AI development since it is flexible and comes with pre-existing libraries like Pandas, SciPy, and nltk. Python language is lauded for its simple syntax and minimal codes.

PyTorch:

PyTorch is an open-source machine learning library that is widely used for deep learning tasks. It was developed by Facebook's artificial intelligence research group and is based on the Torch library. PyTorch's dynamic computational graph system, flexibility, and easy-to-use interface make it a popular choice among researchers and practitioners. Its features include:

- Dynamic computational graph system
- Support for tensor computation with GPUs
- Easy-to-use interface and extensive documentation.

Vertex AI:

Vertex AI is a cloud-based machine learning platform developed by Google. It allows developers and data scientists to build, deploy, and manage large-scale machine

learning models. Vertex AI supports various popular machine learning frameworks and tools, including TensorFlow, PyTorch, and scikit-learn. Its features and tools are designed to streamline the machine learning workflow and help users achieve faster and more accurate results. Its features include:

AutoML tools for automated model selection and hyper parameter tuning

Integration with other Google Cloud services for seamless data management and deployment

Model monitoring and explain ability tools to help ensure model fairness and reliability.

This tools provides an overview of six of the most popular deep learning frameworks: TensorFlow, Keras, PyTorch, Caffe, Theano, and Deeplearning4j. Over the past few years, three of these deep learning frameworks - Tensorflow, Keras, and PyTorch - have gained momentum because of their ease of use, extensive usage in academic research, and commercial code and extensibility. In this article, We'll also compare and contrast TensorFlow and PyTorch.

Apache Mahout is an open-source machine learning library designed to provide scalable and efficient implementations of machine learning algorithms. It includes a range of algorithms for clustering, classification, and collaborative filtering, among others. Some of the key features of Apache Mahout are:

- *Scalability:* Mahout can efficiently handle large datasets and can scale up to handle big data with the help of Apache Hadoop. Flexibility supports multiple programming languages.

Extensibility provides a framework for building custom algorithms and integrating with other tools and libraries.

WEKA:

Weka is a popular open-source machine learning tool that provides a collection of algorithms for data preprocessing, classification, regression, clustering, and visualization. It is widely used in academic and industrial settings and supports a variety of file formats. Some of the key features of Weka are:

- *User-friendly interface:* Weka provides a graphical user interface that allows users to easily explore and analyze data. Extensibility is Weka allows users to develop and integrate their own algorithms and extensions into the tool.

- Comprehensive documentation and support: Weka has a large community of users and developers, and provides extensive documentation, tutorials, and forums for support.

II. LITERATURE SURVEY

Deep learning represents a fundamental shift in the manner by which machines learn patterns from data by automatically extracting salient features for a given computational task as opposed to relying upon human intuition.

A literature review surveys books, scholarly articles, and any other sources relevant to a particular issue, area of research, or theory, and by so doing, provides a description, summary, and critical evaluation of these works in relation to the research problem being investigated.

Here is the list of top 10 most popular deep learning algorithms:

- Convolutional Neural Networks (CNNs)
- Long Short Term Memory Networks (LSTMs)
- Recurrent Neural Networks (RNNs)
- Generative Adversarial Networks (GANs)
- Radial Basis Function Networks (RBFNs)
- Multilayer Perceptrons (MLPs)
- Self Organizing Maps (SOMs)

A literature review surveys books, scholarly articles, and any other sources relevant to a particular issue, area of research, or theory, and by so doing, provides a description, summary, and critical evaluation of these works in relation to the research problem being investigated.

Over the years, numerous types of literature reviews have emerged, but the four main types are traditional or narrative, systematic, meta-analysis and meta-synthesis.

Literature reviews also must contain at least three basic elements: an introduction or background information section; the body of the review containing the discussion of sources; and, finally, a conclusion and/or recommendations section to end the paper.

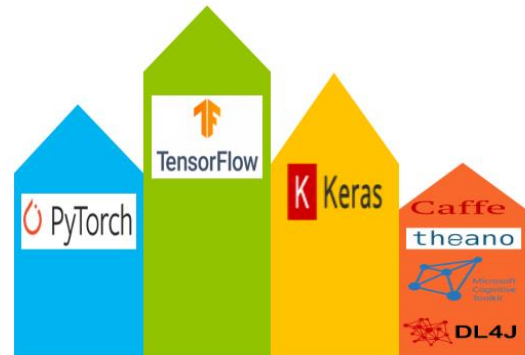
In relation to your own study, the literature review can help in four ways. It can: 1 bring clarity and focus to your research problem; 2 improve your research methodology; 3 broaden your knowledge base in your research area; and 4 contextualise your findings. The literature review involves a paradox.

A literature review is a survey of scholarly sources (such as books, journal articles, and theses) related to a specific topic or research question. It is often written as part of a thesis, dissertation, or research paper, in order to situate your work in relation to existing knowledge.

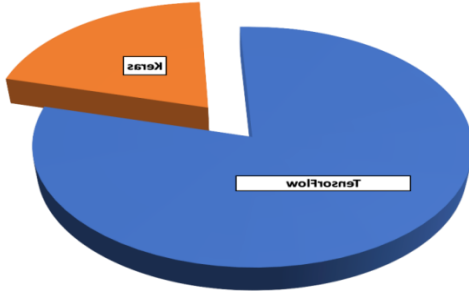
Deep learning (DL) is an important machine learning field that has achieved considerable success in many research areas. In the last decade, the state-of-the-art studies on many research areas such as computer vision, object recognition, speech recognition, and natural language processing were especially led to the awakening of the artificial intelligence from deep sleep. Nowadays, many researchers try to find solutions to many problems in various fields under the light of DL methods. In this study, it is presented important knowledge to guide about DL models and challenging topics that can be used in DL for researcher.

Comparison various Deep Learning Tools:

Deep learning has gained immense popularity recently, and the various deep learning architectures make the field all the more widespread. To support the implementation of each of these architectures for different use cases, several frameworks are available. While each of these frameworks comes with its pros and cons, picking the right deep learning framework based on your individual workload is an essential first step every developer, deep learning practitioner, or data scientist must take.



Keras and TensorFlow are often wrongly assumed as competitive frameworks. Keras is a high-level API for developing neural network models and does not handle low-level computations. For these low-level computations, Keras relied on other back-end engines such as Theano, Tensorflow, and CNTK. However, as per the latest release of Keras, Keras will mainly focus on its integration with the TensorFlow core API while continuing to support fixes for Theano/CNTK.



III.CONCLUSION

Most of the AI we know today operates on a principle of deep learning: a machine is given a set of data and a desired output, and from that it produces its own algorithm to solve it. The system then repeats, perpetuating itself. Both Machine learning and Deep learning analyze the data and learn from it, but only deep learning tries to copy the activities of the human brain when it has to make the conclusion.

Deep learning uses artificial neural networks to perform sophisticated computations on large amounts of data. It is a type of machine learning that works based on the structure and function of the human brain. Deep learning algorithms train machines by learning.

The first and main goal of deep learning is to improve with each new piece of data. This includes being able to adapt its underlying structure to accurately assess data. Once that network is thoroughly built using the test data, it allows for greater personalization using customer analytics.

When there is lack of domain understanding for feature introspection, Deep Learning techniques outshines others as you have to worry less about feature engineering. Deep Learning really shines when it comes to complex problems such as image classification, natural language processing, and speech recognition

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