Chapter 1
Deep Learning: Algorithms, Techniques, and Applications — A Systematic Survey

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ABSTRACT

Deep learning has become one of the hottest research topics in the machine-learning world, with tremendous success in several sectors. The summary and inductive reasoning procedures of deep learning are mostly used in this study. It begins by outlining the history and present state of deep learning globally. The second part of the chapter explains the fundamental structure, the traits, and a few types of traditional deep learning techniques, including the stacked auto encoder, deep belief network, deep Boltzmann machine, and convolutional neural network. Thirdly, it discusses the most recent advancements and uses of deep learning in a variety of industries, including speech recognition, machine learning, computational linguistics, and healthcare. Finally, it outlines the issues and potential possibilities for deep learning studies in the future.

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INTRODUCTION

Machine learning is becoming increasingly common in recent studies and has already been united into a wide range of applications, namely processing of visual perceptions, analysis of image, audiovisual recommendations, impact of social links, information retrieval, etc. Deep learning, "also recognized as representations learning (Abadi, 2016), is commonly included in these simulations by different machine-learning algorithms." The growth of massively efficient and learning techniques studies has been facilitated by the rapid expansion and accessibility of data as well as the significant advancements in process control. Deep learning significantly outperforms its predecessors and is based on traditional neural networks. To design of multiple-layered learning approaches, it incorporates graph developments with inequalities between neuronal. Some of the new deep learning models were already implemented and significant improvements have been shown throughout numerous applications, like Natural Language Processing (NLP), visual data management, voice recognition and so on (Ossama, 2014, Abel, 2017).

The performance of machine-learning algorithms has historically depended heavily on a consistency of input vectors interpretation. Compared to a standard data visualization, a poor data interpretation sometimes resulting in poorer results. Consequently, for just a long period of time, feature extraction has become a significant research path in machine learning, concentrating on constructing features from the dataset and leading to many studies conducted. In addition, feature extraction is always unique to the environment and involves considerable human work. For example, various types of samples, such as Histogram of Directed Gradients (HOG) (Abel, 2017), Scale Invariant Feature Transform (SIFT), and Bag of Words (BoW), are being investigated and compared in machine vision. When a new function is introduced and works well enough for decades, it will become a standard. Recent incidents, like voice recognition and NLP, also occurred in many other environments.

Relatively speaking, deep learning techniques facilitate faster extraction of information, allowing scientists to extract discriminatory features without limited knowledge of the subject and manual effort (Sami, 2016). These strategies provide a layered data modeling framework where it would be possible to extract the high-level features from upper level of the systems, whereas the lower features are retrieved from bottom layer. Initially, different types of designs are motivated by Artificial Intelligence (AI), which simulated the function of a main brain modalities in the human. Our neurons can derive the description of the data spontaneously through various scenes. The input is the knowledge that the scenario receives from eyes, whereas the confidential images are the result. This review presents an overview of deep learning from various points of view, such as background, obstacles, possibilities, techniques, architectures, implementations, and distributed and cloud-based strategies.

Objectives of the Proposed Survey

This report tries to give an overall picture and communicate scientific knowledge with colleagues, though deep learning is recognized an enormous area of scientific. Whereas other previous report reports concentrated mostly on a specific deep learning scope (Berant, 2013, Leo, 2003), the uniqueness of such a report would be that it emphasizes on numerous perspectives of learning techniques thru the summary of a higher-sensitive documents, the knowledge of a researchers, as well as the scientific advances in neural network-based research and the development.