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ABSTRACT

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A Survey on Deep Leaning Architectures and Its Applications

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Background:
Deep learning is a set of algorithms in machine learning that attempt to learn in multiple levels, corresponding to different levels of abstraction. It typically uses artificial neural networks. The levels in these learned statistical models correspond to distinct levels of concepts, where higher-level concepts are defined from lower-level ones, and the same lower level concepts can help to define many higher-level concepts.
Deep learning, a new era in machine learning, can be defined as a cascade
Representations. Unlike conventional machine-learning and data mining techniques, deep learning is able to generate very high-level data representations from massive volumes of raw data. Therefore, it has provided a solution to many real-world applications.
A deep learning technology works on the artificial neural network system (ANNs). These ANNs constantly take learning algorithms and by continuously increasing the amounts of data, the efficiency of training processes can be improved. The efficiency is dependent on the larger data volumes. The training process is called deep because the number of levels of neural network increases with the time. The working of the deep learning process is purely dependent on two phases which are called the training phase and inferring phase. The training phase includes labelling of large amounts of data and determining their matching characteristics and the inferring phase deals with making conclusions and label new unexposed data using their previous knowledge.
There are many deep learning models developed by the researchers which give a better learning from the representation of large-scale unlabelled data. Some popular deep learning architecture like Convolutional Neural Networks (CNN), Deep Neural Networks (DNN), Deep Belief Network (DBN) and Recurrent Neural Networks (RNN) are applied as predictive models in the domains of computer vision and predictive analytics in order to find the insights from data.

Methods:
In this study a survey is performed on various research papers on various architecture of deep learning and its applications. The research paper from 2012-2020 selected for study. This study presents a brief survey on the advances that have occurred in the area of Deep Learning (DL), starting with the Deep Neural Network (DNN). The survey goes on to cover Convolutional Neural Network (CNN), Recurrent Neural Network (RNN), including Long Short-Term Memory (LSTM) and Gated Recurrent Units (GRU), Auto-Encoder (AE), Deep Belief Network (DBN), Generative Adversarial Network (GAN), and Deep Reinforcement Learning (DRL). The paper also explained the major differences between the deep learning, classical machine learning and conventional learning approaches and the major challenges. The objective this paper is to explore a comprehensive survey of the major applications of deep learning covering variety of areas, study of the techniques and architectures used and further the contribution of that respective application in the real world.

Results:
The majority of the existing deep learning implementations are supervised as well as unsupervised learning. There are different supervised learning approaches for deep leaning, including Deep Neural Networks (DNN), Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNN), including Long Short Term Memory (LSTM), and Gated Recurrent Units (GRU). This study explained in detail the different supervised deep learning techniques, including DNN, CNN, and RNN. The un-supervised deep learning techniques, including AE, RBM, and GAN, were reviewed in detail. This survey also inspect that deep learning architectures such as deep neural networks, deep belief networks, recurrent neural networks and convolutional neural networks have been applied to fields including computer vision, machine vision, speech recognition, natural language processing, audio recognition, social network filtering, machine translation, bioinformatics, drug design, medical image analysis, material inspection and board game programs, where they have produced results comparable to and in some cases surpassing human expert performance.

Conclusions:
This study surveys the state-of-the-art techniques and architectures in deep learning. It starts with a history of artificial neural networks since 1940 and moves to recent deep learning algorithms and major breakthroughs in different applications. Then, the key algorithms and frameworks in this area, as well as popular techniques in deep learning, are presented. In this paper, we have provided an in-depth review of deep learning and its applications over the past few years.

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