Chapter 1
The Impact and Evolution of Deep Learning in Contemporary Real-World Predictive Applications:
Diving Deep

Pritam Das
Chitkara University, India

Hakam Singh
Chitkara University, India

Nilamadhab Mishra
https://orcid.org/0000-0002-1330-4869
VIT Bhopal University, India

Nagesh Kumar
Chitkara University, India

Ramamani Tripathy
Chitkara University, India

Rudra Kalyan Nayak
https://orcid.org/0000-0003-4447-8391
VIT Bhopal University, India

Saroja Kumar Rout
https://orcid.org/0000-0001-9007-3665
Vardhaman College of Engineering, Hyderabad, India

ABSTRACT

Deep learning (DL) is making a significant impact on the lives of human beings, either directly or indirectly; we benefit from Artificial Intelligence (AI), Machine Learning (ML), DL and other technologies/networks in our day-to-day lives. DL not only can mimic a human brain and carry out tasks like a human being but has also outworked the approaches of ML, making itself the most efficient technology used nowadays. Maybe this is the reason why various fields like Cybersecurity, Medical

DOI: 10.4018/979-8-3693-6230-3.ch001

Treatments, Traffic Control, Weather Forecast, Bioinformatics, Fraud Detection, Robotics, Vocal AI, Computer Vision, Autonomous Vehicles, E-Commerce and so on are using DL techniques/algorithms rather than the traditional ML approach. This review will illuminate the History of DL, i.e. what DL is, how and why it has evolved so far, and what the various parts of DL are. Though DL is considered the most efficient, it has some limitations, and we will investigate them gradually. We will also study all pre-researched DL Techniques and their implications for contemporary real-world predictive applications.

1. INTRODUCTION AND BACKGROUND

In the year 1950, British Computer pioneer Alan Mathison Turing discussed a technology that computers have the potential to learn from experience and take necessary steps to find solutions to various problems, also known as Heuristic Problem solving. Later, in 1959, Arthur Samuel coined it as Machine Learning (ML) [Alzubaidi, L. et al., (2021); Sarker, I. H. (2021)]. ML feeds computers with new data and makes them capable of learning from those data and experiences and making predictions and solutions. Gradually, humans witnessed the inception of Artificial Intelligence (AI). After feeding data for so many years, Computers can now independently work in speech recognition, image recognition, and classification [Shrestha, A., & Mahmood, A. (2019) ; Mu, R., & Zeng, X. (2019)], Fraud detection, Trading and investing in the Stock Market, recommending videos on YouTube, and recommending products on E-Commerce websites. Our topic of discussion, i.e., Deep Learning(DL), is one of the various methods of ML, which has become the most promising method [Voulodimos, A. et al. (2018) ; Deldjoo, Y. et al.(2016)]. DL uses a huge amount of Unlabeled and Labeled data to teach the models, graphs, and transformational techniques, which helps it build a neural network with multiple layers. To learn from unlabeled data, unsupervised learning techniques like Auto Encoder (AE) or Generative Adversarial Network (GAN) are used to get representations, which we will discuss later. Moreover, we will also explore convolution neural network (CNN) techniques that mainly operate on modern deep learning frameworks.