

## Chapter 9

# A Scoping Review of Current Developments in the Field of Machine Learning and Artificial Intelligence

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### **ABSTRACT**

*This chapter gives a broad outline of machine learning and artificial intelligence, and introduces the reader to many novel and latest developments in the field of machine learning. The first half of this compilation provides a comprehensive view of the classical concepts of machine learning. Subsequently, examples of machine learning frameworks are discussed. Deep learning, concepts, models, types, and algorithms in machine learning are elaborated in the subsequent section, followed by a detailed introduction to neural networks, concepts of weights, propagation, and initialization. The final section of this chapter introduces the reader to the fascinating and latest world of cutting-edge applications of machine learning like convolutional neural networks (CNNs), bidirectional long short-term memory (BLSTM), artistic, image-generating AI engines like DALL-E and stable diffusion, music and drama writing AI engines, human-like chatbot ChatGPT, art generation with AI, generative neural network concepts, regenerative neural network, and natural language processing (NLP).*

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## **INTRODUCTION**

Machine learning (ML) is the process of learning meaningful patterns from a given complex data and produce meaningful predictions about the data found in the real-life situation with minimal human involvement. The term was coined by Arthur Samuel in 1959. Like all human experiences, like playing football, the ability of computer to learn improves with experience or training. The data that is used to train or teach the computer is called the “training set”. The most common example of ML is the spam filter that filters junk mail from genuine ones that arrive daily at our inbox. Another common example of ML is heuristics, used in the antivirus program that differentiates a virus program from a genuine one. Yet, another example is the personalized suggestions given on sites like Google or Amazon. These ML prediction on our liking, are based on data harvested from our browsing or shopping habits. A set or collection of data is called a dataset (Watters, 2021).

## **ENSEMBLE LEARNING**

Ensemble learning is an advanced machine learning technique utilized to improve the predictive accuracy of a model by combining the predictions from multiple individual models. By training multiple models with different supervised (regression and classification) algorithms, ensemble learning leverages aggregated insights from different classifiers or regressors for enhanced predictive power. This highly versatile strategy functions well for complex real-world problems as it narrows down uncertainties in prediction tasks due to its ability to capture cross-model correlations across data sets. Furthermore, through intuitively deciding which models are good candidates for data extraction based on their overall performance, ensemble learning can help reduce overfitting and the need for substantial amounts of training data (Sullivan, 2017).

## **BIG DATA**

“Big data” means that large datasets that are usually, automatically generated and that cannot be processed using traditional data management software like Microsoft Excel or Access. This term was popularized by John Mashey in 1900s. Essentially, parallel computation and large storage media are needed to process big data. Special software like Apache Hadoop, Java based Hive, Cloudera, MemSQL, Apache Spark, Amazon S3 can handle the volume of big data. This is due to the sheer size of the data produced, that storage and manipulation is cumbersome. For example, it is

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