

Chapter 57

Prospects of Machine Learning With Blockchain in Healthcare and Agriculture

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ABSTRACT

Presently, machine learning (ML) techniques have gained considerable attention, with growing interest in various areas and applications. Healthcare, agriculture, and bioinformatics are the most identified areas to study with the help of ML. This chapter introduces about the basic principle of ML such as data, model, basic mathematical details of ML, and types of learning. The important aspect of ML is “how to teach a machine.” This chapter focuses on the types of learning: supervised, unsupervised, semi-supervised, and reinforcement learning. Some commonly used ML algorithms such as decision tree (DT), k-nearest neighbor (KNN), support vector machine (SVM), naïve Bayes, k-mean, q-learning, etc. are briefly discussed for understanding. Finally, the author offers the application of ML with blockchain that is reforming the traditional healthcare and agricultural sector to a more reliable means.

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1. INTRODUCTION

Currently ML is one of the prominent techniques that are being applied in an extensive range of applications to solve a variety of complex problems. ML is a branch of Artificial Intelligence (AI) that offers computer systems the ability to automatically learn without explicitly programmed. The massive volumes of data are the base of ML concept and capable to design an expert system. These data are growing at an exponential rate due to a large number of connected devices and applications. ML enables us to tackle the difficult and challenging tasks that are also complex to resolve with traditional programs. ML is the training of computer algorithms that learn, expand and evolve automatically through knowledge and observation. Healthcare, Agriculture, human brain, Bioinformatics etc. are the most identified areas to study with the support of ML. The field of ML revolves around the basic principle:

- Collecting the data
- Preprocessing of data
- Learn the model with training data and algorithm
- Test the model for accuracy.

‘Learning’ in ML refers to the determination of model parameters using the given training dataset. There are four categories of ML: Supervised, Unsupervised, Semi-supervised and Reinforcement Learning that is used to sustain competitiveness in various fields and industries.

The basic principle of ML includes: data, computer algorithm and mathematics. With the knowledge of mathematics one can easily understand the ML. So, it is important to understand the mathematical concepts that are specifically applied in ML. ML comprises linear algebra, multivariate calculus, matrix decompositions, optimization, probability and statistics (Deisenroth, Faisal, & Ong, 2020). The existing initiative of integrating the AI with Blockchain and IoTs are reshaping the world. This will create a new opportunity in a big range of domains, like smart health, agriculture, retail, green energy, supply chain management, smart city and also personalized end-user applications. The Blockchain holds the potential, mainly when integrated with AI. With Blockchain technology, patients can attach to other hospitals, diagnostic center and accumulate their medical data automatically (Yoon, 2019). These medical data may also help the patient for disease prediction and treatment suggestion when refined by ML.

The main contributions of this chapter are to present an overview of basic concept of mathematics applied in ML. Author will cover the major types of ML algorithms; explain the benefits and applications of each of them.

The rest of the chapter is structured in different parts. Section 2 deliberates about the terminology used in ML. Mathematical Background of ML has been presented in section 3. Types of ML and its application have been discussed in section 4. Applications of ML and Blockchain have been given in section 5. Future work directions are represented in section 6. Section 7 concludes the overall chapter.

2. BACKGROUND AND TERMINOLOGY USED IN MACHINE LEARNING

In ML, computers use massive sets of data and apply ML algorithms for training, testing and predictions. The two definitions of ML have been most popular. According to Arthur Samuel “*ML is a core branch of AI that aims to give computers the ability to learn without being explicitly programmed*”.

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