

Machine Learning

by No No

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Machine learning (ML) is a newly developed field in artificial intelligence (AI). "It enables computer systems for searching and identifying hidden information or patterns, without being programmed explicitly, when exposed to new data sets" [1]. That is to say, machine learning will abstract the data into special mathematical models and use appropriate methods to solve these models. During this process, researchers may assess it and make improvements so that its accuracy and be increased. Since we have stepped into the age of big data and almost everything is stored electronically, machine learning is of high significance due to its efficiency. In this literature review, we will have a basic understanding of machine learning categories and algorithms, know some applications of machine learning, and propose a future development in machine learning.

There are different categories of ¹ machine learning, including supervised learning, unsupervised learning, reinforcement learning, multitask learning, ensemble learning and so on, and different algorithms are used in different categories [1]. The most important categories and corresponding algorithms will be introduced. For supervised learning, well-classified data will be given to train the machine so that it can know the characteristics of each categories. Then, using these characteristics, it will try to classify new data. The corresponding algorithms includes ² decision tree, naïve bayes, support vector machine (SVM) and so on [1]. For unsupervised learning, unlabeled data will be given and the algorithm itself will try to extract information from the data and separate them into different categories based on the characteristics. The corresponding algorithms includes K-means algorithm, principal component analysis (PCA) and so on [1]. For reinforcement learning, award will be given when the

algorithm gets right, and punishment will be given when the algorithm gets wrong. With trials increased, it can predict the following state by trying to “maximize reward and minimize the penalty” [1]. The corresponding algorithms includes Q-learning algorithm and so on [2].

Machine learning is of great help in text categorization. Researchers have used multiplicative weight updating, adaptive resampling, and SVM to realize text categorization and improve its performance so that it can categorize millions of documents into thousands of topics [3]. The experience of text categorization can be applied into other categorization fields, including voice recording categorization and image categorization, if we can choose appropriate models and algorithms to identify the non-text content.

Machine learning is of great help in psychology and social science. Supervised learning is widely used in this field while unsupervised learning provides an efficient way to summarize the relation among the results and different variables. Besides, both linear and nonlinear model are used to predict suicides, and algorithms like decision tree is are used. However, researchers find that there is no significant difference between these two models and both of them can identify people who are most likely to commit suicide [4].

Machine learning is of great help in cancer prognosis and prediction. Both supervised and unsupervised learning are used in cancer prediction to build the predictive model. After thousands of case studies, the overall accuracy of prediction of cancer susceptibility, cancer recurrence and cancer survival can achieve 75% or higher, increased by 15% to 20%. However, some predictions with certain algorithms are only

around 60% accurate [5]. Therefore, some of the chosen algorithms are not suitable for building predictive models in these cases and how to choose the best algorithms is an important job in machine learning.

From the above research and applications of machine learning, we know it has stepped into different fields and started to influence all aspects of our lives gradually. However, we also find all of them require research to choose appropriate learning strategies, corresponding algorithms, and mathematical models. Otherwise, the accuracy or performance of it may be far from satisfactory when exposed to new dataset. Therefore, researchers should spend time to conduct pretest and distinguish between different algorithms, which are time consuming. There would be a huge optimization if people could find an approach to choose the best learning strategies, corresponding algorithms, and mathematical models. Hence, it could become a topic for further research of machine learning.

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