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Machine Learning and Applications a Review Study

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ABSTRACT: The proliferation of information and the construction of many databases have made the extraction of data from usable information a pressing issue that has to be addressed. Machine learning is the central focus of research in artificial intelligence. This paper provides an introduction to the definition of machine learning and its fundamental structure. Machine learning techniques including rote learning, inductive learning, explanatory learning, learning using neural networks, and knowledge discovery are also covered. In addition to outlining the present course of machine learning's progress, this article provides an introduction to its aims.

KEYWORDS: AI applications, methodologies, artificial intelligence, machine learning.

I. INTRODUCTION

Acquiring knowledge is the primary characteristic of human intellect and the fundamental method to get information. Machine learning is the primary method for imbuing computers with intelligence. R. Shank has said that a computer without the ability to learn cannot be classified as intelligent. Learning is a complex cognitive process that involves several mental functions such as memory, reasoning, perception, and emotion, which are intimately interconnected. Researchers from many disciplines provide distinct interpretations and perspectives [1].

II. MACHINE LEARNING

In machine learning, researchers investigate ways to program computers to learn in a way that is similar to how humans do it and enhance computer performance and capabilities. It involves developing techniques for computers to acquire new information and skills, recognize current knowledge, and consistently improve their performance and achievements [2][3].

Machine learning is quicker and more efficient than human learning. It quickly accumulates information and spreads the outcomes of learning more easily. Advancements in machine learning will augment the computational capacity of computers, hence exerting a profound influence on human civilization [4][5].

A. *The Fundamental Framework Of Machine Learning*

Utilize H•Simon's notion of learning [1] as the foundation and construct the fundamental model shown in Figure 1. During the machine learning process, the accuracy and reliability of the data

The external environment is the main aspect that the system relies on. The external environment refers to the collection of external information that presents itself in various forms. It serves as a source of outside information. Learning, on the other hand, is the process through which this external information is transformed into knowledge. It begins by acquiring information from the external environment and then processing it into knowledge, which is then stored in a repository.

A repository contains a collection of basic concepts that serve as guidelines for doing a specific activity[5][6[7]. The environment supplies many types of information for the learning system. The quality of this information directly affects the effectiveness of the learning process, determining whether it is smooth or chaotic[8][9][10].

The second factor that determines how a learning system is designed is the repository. Knowledge may take many forms, including eigenvectors, production rules, semantic networks, frameworks, and first-order logic assertions. The merits of each of these representational styles are distinct[10][11].

Consider four factors while making a choice: powerful in terms of expression, simple to deduce, repository that is easy to edit, and knowledge that is easy to grow. The implementation is the use of the repository's knowledge to accomplish a specific

job, and to provide feedback on the information acquired during the task's completion to facilitate learning and direct future study[12].

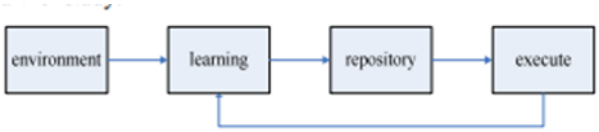

Figure 1 illustrates a fundamental paradigm of machine learning.

2.1.1. Rote Learning

Rote learning is a cognitive process that involves memorizing new information and retrieving it when needed. The calculation and reasoning learning system does not need the retention of any information in order to utilize it. In the rote learning approach, information acquisition occurs in a structured and focused manner. The system needs little processing. The implementation aspect of a learning system may be conceptually seen as a function[13][14].

The function takes input variables (X1, X2, ..., Xn) and computes the corresponding output values (Y1, Y2, ..., Yn). Rote learning involves memorizing the direct mapping between the input variables (X1, X2, ..., Xn) and their corresponding output values (Y1, Y2, ..., Yn). When F(X1, X2, ..., Xn) is required, the implementation process involves searching for (Y1, Y2, ..., Yn) in the memory instead of recalculating it.

Attention: Employ suitable storage methods to expedite the research pace and guarantee that the stored knowledge can readily accommodate the evolving demands of the external environment without compromising system performance[15][16].

B. Inductive Learning

Inductive consequence utilizes inductive techniques to extract general knowledge from an adequate number of particular instances and to derive universal principles. It is a progression from the specific to the broader. Inductive learning is a way of learning that utilizes inductive reasoning.

Inductive learning may be categorized into two types: learning of examples and learning of observed, depending on whether it is guided by instructors. The former refers to studying with a teacher, whereas the latter refers to learning without an instructor. The learning system model is shown in Figure 2:

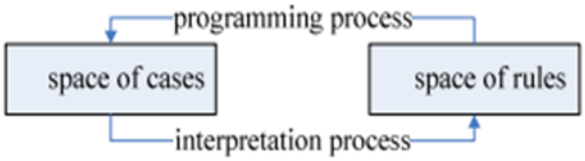

Figure 2. depicts the learning system model.

Before passing on selected active instances to the interpretation step, the programming process investigates a variety of scenarios to choose examples.

The programming method effectively converts the given instances and maps them to a conceptual representation of the set of rules. This representation serves as a guide for searching the set of rules.

2.1.2. Example-Based Learning

The acquisition of knowledge is achieved by studying specific instances that exemplify a broad notion within a certain context. Take a group of animals into consideration, and tell the learning system which ones are called "Ma" and which ones aren't. The learning system can distinguish "Ma" from other animals and identify it after it has gathered enough data to build a mental picture of the animal[17][18][19].

B. *Observational Learning*

The process of acquiring knowledge by observation is often referred to as descriptive summary. Its objective is to determine the overall characteristics of a law or theory, portray the collection of observations, and define the properties of specific objects.

2.2.1. the analog system Learning

An analogy may effectively and succinctly illustrate the resemblance between something. Analogy learning is the process of learning by drawing comparisons between comparable entities. For instance, when a professor aims to instruct students on a

complex concept that may be challenging to comprehend, they often employ figures of speech[20]. These figures of speech draw parallels between examples that students have already mastered and the new concept, facilitating a profound understanding through analogy. The process of analogy learning encompasses four primary processes:

- Enter a set of established conditions and a set of conditions that are not entirely determined;
- For the two inputted conditions, based on their descriptions, identify the corresponding relationship between each using a comparable definition.
- One way to learn how to tackle new problems is to apply the concept, characters, processes, and relations from one problem to another using the similar transformation method.
- Validate the acquired information derived from the analogy of the new challenges, and save the accurate knowledge in the repository. Unverified information is stored in the repository just as referenced knowledge.

Using similar definition and analogous transformation is the most important part of analog learning. To achieve the goal of analog learning, the object's definition is adjusted. The definition should be based on the commonalities between new and old topics if the goal of learning is to gain certain traits of fresh subjects. If, on the other hand, you want to learn how to solve new kinds of difficulties, then you should base your comparison on how similar those old problems were.

2.2.2. Explained Learning

The process of acquiring knowledge by interpretation is referred to as elucidated learning. The technique of learning analysis involves using the information within a certain subject to generate a cause and effect explanation tree that can be used to answer specific occurrences. During the process of obtaining new information, it gains understanding by elucidating the nature, phenomena of tokens, and internal relationships, among other things. The process, which is dependent on interpretation, is shown in Figure 3:

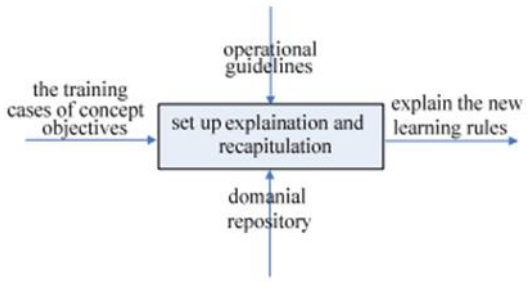

Figure 3 The procedure that is dependent on interpretation in a broad sense

During the learning process, the system first identifies the underlying cause behind the training examples, which serve as evidence for the target concept based on domain knowledge. It then expands upon this evidence using operational rules. Finally, it formulates a universal description of the target concept, which can be expressed using general knowledge formalization

E- Neural Network-Based Learning

Topological structure and suitable values and operational rules are the two main aspects that define a neural network's nature. These two things may come together to form the backbone of a network. The process of changing the values inside a neural network is known as the learning challenge.

There are two approaches to determine a neural network's worth: by doing calculations during design and by analyzing the network according to predetermined criteria. The second method is what most neural networks utilize to determine their network's value. The Hopfield network, the back propagation algorithm, and other comparable approaches are well-known examples of network models and learning methods.

F- Knowledge revealing

Knowledge discovery in repositories is a sophisticated and controlled procedure aimed at identifying efficient, innovative, promising, valuable, and comprehensible models from vast quantities of data. The process of knowledge discovery is shown in Figure 4.

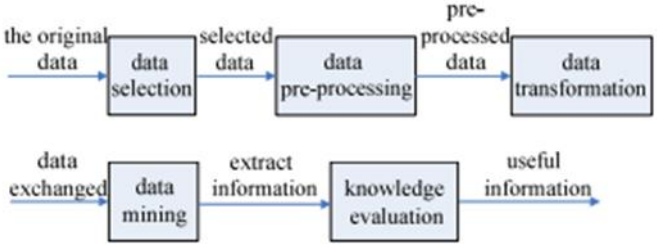

Figure 4 The process of acquiring knowledge

In order to fulfill the unique needs of each user, data selection entails retrieving relevant information from a database. Additional processing on the data, checking for consistency and quality, dealing with noisy data, filling in missing data using statistical methods, and building a complete database are all part of data pre-processing. Choosing data from a researched database is an integral part of data transformation. Transformation is mostly accomplished by grouping analysis and discrimination analysis. Depending on the demands of the user, data mining attempts to identify the precise kind of information that needs to be discovered. Finding the right knowledge discovery approach is the next step before it retrieves the pertinent information from the database. In order to decide whether the learned rules should be included to the basic knowledge database, knowledge assessment mostly evaluates them.

There are essentially three steps to the process of discovering new information.

In particular, the procedure includes data preparation, data mining, and data processing of the findings. A number of sectors, including finance, insurance, retail, healthcare,

engineering and manufacturing, research, entertainment, and satellite observation, have reaped the benefits of knowledge discovery. It has greatly improved people's ability to make scientific decisions.

C. *The Use of Machine Learning*

Studies indicate that machine learning technology has been extensively used in the fields of marketing, finance, telecommunications, and network analysis.

Machine learning technology is extensively employed in marketing for tasks related to classification. In finance, it is predominantly used for forecasting. In network analysis, machine learning technology is applied to tasks pertaining to relationships. In telecommunications, it is widely utilized for classification, prediction, and surveillance purposes. Furthermore, machine learning is utilized in conjunction with other applications, particularly in the domain of data mining. Standard methods include neural network training, ML study using evolutionary computing, ML research investigating level categorization, and ML research employing rough set theory.

III. CONCLUSIONS

This article presents the notion of machine learning, including its fundamental paradigm and its wide-ranging applicability across several domains. While there have been some first research findings in the field of machine learning, the research is still in its early stages and there are still unresolved challenges that need additional study and resolution [7]. Initially, the learning algorithm is selected only from a limited set of well-established algorithms, without doing a comparative study or designing novel algorithms in relation to these existing algorithms. Furthermore, contemporary research mostly relies on the whole of the gathered data and seldom takes into account the issue of sampling. If the data sets are too vast, there will be a need for additional time to collect and process these data.

In addition, current techniques for determining application kinds are very restricted and imprecise, rendering them inadequate for meeting the requirements of individual applications. In my view, future research should prioritize the investigation of optimum recognition algorithms and combining approaches.

REFERENCES

1) Hassan, M. D., Nasret, A. N., Baker, M. R., & Mahmood, Z. S. (2021). Enhancement automatic speech recognition by deep neural networks. Periodicals of Engineering and Natural Sciences, 9(4), 921-927.
2) Mahmood, Z. S., Nasret, A. N., & Mahmood, O. T. (2021, October). Separately excited DC motor speed using ANN neural network. In AIP Conference Proceedings (Vol. 2404, No. 1). AIP Publishing.
3) Mahmood, Z. S., Coran, A. N. N., & Aewayd, A. Y. (2019, October). The impact of relay node deployment in vehicle ad hoc network: Reachability enhancement approach. In 2019 Global Conference for Advancement in Technology (GCAT) (pp. 1-3). IEEE.
4) Mahmood, Z., Nasret, A., & Awed, A. (2019). Design of new multiband slot antennas for wi-fi devices. International Journal on Communications Antenna and Propagation (IRECAP), 9(5).
5) Mahmood, Z. S., Coran, A. N. N., esam Kamal, A., & Noori, A. B. (2021, August). Dynamic spectrum sharing is the best way to modify spectrum resources. In 2021 Asian Conference on Innovation in Technology (ASIANCON) (pp. 1-5). IEEE.
6) Kamal, A., Nasret, A., & Mahmood, Z. (2020). Design of multiband slot patch antennas for modern wireless applications. International Journal on Communications Antenna and Propagation (IRECAP), 10(5), 353-359.
7) Mahmood, Z. S., Kadhim, I. B., & Nasret, A. N. (2021). Design of rotary inverted pendulum swinging-up and stabilizing. Periodicals of Engineering and Natural Sciences, 9(4), 913-920.

8) Nasret, A. N., Noori, A. B., Mohammed, A. A., & Mahmood, Z. S. (2021). Design of automatic speech recognition in noisy environments enhancement and modification. Periodicals of Engineering and Natural Sciences, 10(1), 71-77.
9) Coran, A. N. N., Mahmood, Z. S., & Kamal, A. E. (2021, October). Classification of Acoustic Data Using the FF Neural Network and Random Forest Method. In 2021 International Conference on Smart Generation Computing, Communication and Networking (SMART GENCON) (pp. 1-4). IEEE.
10) Nasret, A., & Mahmood, Z. (2019). Optimization and integration of rfid navigation system by using different location algorithms. International Review of Electrical Engineering (IREE), 14(4).
11) Mahmood, Z. S., Coran, A. N. N., & Kamal, A. E. (2018). Dynamic approach for spectrum sharing in cognitive radio. Int. J. Eng. Technol, 7, 5408-5411.
12) Kadhim, I. B., Khaleel, M. F., Mahmood, Z. S., & Coran, A. N. N. (2022, August). Reinforcement Learning for Speech Recognition using Recurrent Neural Networks. In 2022 2nd Asian Conference on Innovation in Technology (ASIANCON) (pp. 1-5). IEEE.
13) Kamal, A. E., Mahmood, Z. S., & Nasret, A. N. (2022). A new methods of mobile object measurement by using radio frequency identification. Periodicals of Engineering and Natural Sciences, 10(1), 295-308.
14) Laylani, L. A. A. S. S., Coran, A. N. N., & Mahmood, Z. S. (2022, January). Foretelling Diabetic Disease Using a Machine Learning Algorithms. In 2022 International Conference for Advancement in Technology (ICONAT) (pp. 1-5). IEEE.
15) Salih, A. B., Mahmood, Z. S., Ali, A. H. M., & Nasret, A. N. (2022). Enhancement of motor speed identification using artificial neural networks. Indonesian Journal of Electrical Engineering and Computer Science (IJEECS), 27(3), 1388-1396.
16) Coran, A. N. N., Ali, A. H. M., Mahhmood, Z. S., & Mohammed, S. F. (2021, December). Design Speech Recognition Systems in the nosily Environment by Utilizing intelligent Devices. In 2021 Second International Conference on Smart Technologies in Computing, Electrical and Electronics (ICSTCEE) (pp. 1-6). IEEE.
17) Coran, A. N. N., Sever, P. D. H., & Amin, D. M. A. M. (2020). Acoustic data classification using random forest algorithm and feed forward neural network. Int. J. Eng. Technol, 9(2).
18) Kamal, A. E., Salih, A. B., & Coran, A. N. N. (2018). Spectrum sensing algorithm using ANN in cognitive radio. International Journal of Engineering & Technology, 7(4), 5151-5155.
19) Coran, A. N. N., Mahmood, Z. S., & Salih, A. B. (2018). Satellite network underlying LMS for coverage and performance enhancement. International Journal of Engineering & Technology, 7(4), 5404-5407.
20) Kadhim, I. B., Nasret, A. N., & Mahmood, Z. S. (2022). Enhancement and modification of automatic speaker verification by utilizing hidden Markov model. Indonesian Journal of Electrical Engineering and Computer Science, 27(3), 1397-1403.
21) Mezaal, Y. S., & Nasret, A. N. A New Microstrip Bandpass Filter Design Based on Slotted Patch Resonator.
22) Mohammaed, A. H., Mahmood, Z. S., Nasret, A. N., & Salih, A. B. (2023, September). A new method to road traffic monitoring using artificial systems. In AIP Conference Proceedings (Vol. 2839, No. 1). AIP Publishing.
23) Nasret, A. N., Kamal, A. E., & Mahmood, Z. S. (2023, September). Design of end-to-end speech recognition system by used hybrid CNN-LSTM. In AIP Conference Proceedings (Vol. 2839, No. 1). AIP Publishing.
24) Mhmood, Z. S., Nasret, A. N., Noori, A. B., & Mohammed, A. B. (2023). Neural Network-Directed Detection and Localization of Faults in Railway Track Circuits: An Application of Dempster-Shafer Theory. Ingénierie des Systèmes d'Information, 28(3).
25) NASRET, A. N., KAMAL, A. E., & MAHMOOD, Z. S. (2023). Radar Target Detection by Using Levenberg-Marquardt Algorithm. Przeglad Elektrotechniczny, 99(3).
26) Mahmmod, Z. S., Najdet, A. N., & Noori, A. B. (2023). A New Filter Design Built Into CMOS Image Sensor. Journal of Image Processing and Intelligent Remote Sensing (JIPIRS) ISSN 2815-0953, 3(03), 1-8.