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Neuro Fuzzy And Artificial Intelligence

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ABSTRACT

A Neuro fuzzy method for resolving Multi-level linear programming issues is presented in this work. This method typically solves a multilevel programming problem in fewer rounds without making the underlying difficulties more complex. The suggested method is compared with a number of methods in the literature using numerical examples in next paper.

KEYWORDS

Computers, Multilevel linear and non linear , artificial intelligence, artificial neural networks, and neuro-fuzzy logic, multilayer, input output.

1 INTRODUCTION

Mathematical programs (MP) with a subset of their variables bound to be an optimal solution to other programs parameterized by their remaining variables are known as multilevel optimization problems (MLOPs)[1]. It is implicitly determined by a set of optimization issues that need to be resolved in a specific order (Kassa et al., 2013). The social and behavioral sciences frequently use hierarchical data structures, and multi-level (ML) decision making models are created to analyze such data[10,12,14]. Therefore, a significant area of operations research is multi-level programming (MLP), which is a problem with two or more levels, such as first level, second level, and so on up to 4) 5) 6) 7.) The external impact on a DM's dilemma can be seen in both his range of viable options and his objective function. One level's cost loss is not equal to another level's increased gain[7,10,12]. The play's order is crucial, and the upper-level limits' selection influences the lower-levels' strategy. Decisions are carried out in a sequential manner from higher to lower levels. Only a portion of the decision variables are under the control of each DM. Independent of other levels, each level optimizes its own objective function. 8) Every DM is fully aware of every previous decision. The MLP problem is a series of optimization problems where the answer of other decision makers (DMs) determines the constraints region of one. The leader is the first (higher, upper) level Decision Maker (DM1). DMs at lower levels (DM2, DM3, etc.) referred to followers. Following the decision of higher level DMs, they carry out their policies. The leader then independently optimizes his goal, however he may be impacted by the followers' response (G. Anandalingam, 1988, Anderson 2005, O. Ben-Ayed 1993)[7].

Many people believe that a neural network is a "black box" that doesn't reveal much about its predictions. Humans can better comprehend this prediction process by extracting rules from neural nets. Rules are a type of knowledge that may be readily expanded, transmitted, and verified by human specialists. It is easier for humans to understand rules when they are presented in their natural form. Fuzzy set-theoretic notions are appropriately applied to this issue[3,5]. Neural networks and language

understanding have a reciprocal relationship [3]. Thus, numerical data and linguistic information can be used to train neural network-based classification systems, and linguistic knowledge and fuzzy rules taken from neural networks can be used to create fuzzy rule-based classification systems[4,6].
Neuro-fuzzy systems offer a potent AI method for managing uncertainty, nonlinearity, and complicated system modeling by fusing fuzzy logic reasoning with neural network learning[9,11]. Intelligent control systems, automated decision support systems, pattern recognition, data classification, and predictive modeling are important applications. Example, in manufacturing ,engineering ,agriculture ,healthcare etc.

2 DEFINITION

Fuzzy systems and neural networks are both dynamic, parallel processing systems that estimate input-output functions. They use sample data to gain experience and estimate a function without the need for a mathematical model. From representative numerical samples, a fuzzy system adaptively deduces and adjusts its fuzzy relationships. Conversely, fuzzy rules can be blindly generated and refined by neural networks using training data . Hayashi and Buckley shown that a neural net can approximate any rule-based fuzzy system, and a rule-based fuzzy system can approximate any neural net (feedforward, multilayered). Based on the similarities between the local receptive fields of the network and the membership functions of the fuzzy system, Jang and Sun have demonstrated that fuzzy systems are functionally identical to a class of radial basis function (RBF) networks.

The term "neuro fuzzy system" was created by combining these two distinct approaches to solve engineering challenges for which the traditional approaches lack a straightforward and accurate answer. The neuro fuzzy method yields exact solutions. Advanced artificial intelligence technologies or smart systems have been used to nearly every facet of human comprehension. Fuzzy thinking deals with things in an imprecise manner. When a condition is imprecise, a specific value is not required. For instance, in the digital method, carry out a specific action if, for example, a variable's value equals x. Imprecise method: carry out a certain action if the variable's value is somewhat closer to x.

I Neural networks :

In essence, different methods of studying biological organisms provide as inspiration for neural networks. The majority of the time, it is inspired by how people learn. It is a theory of learning. Due to its distributed nature, fault tolerance, simultaneous data processing, and distributed structure, this artificial network learns from examples. The input nodes, weights, activation function, and output node are the fundamental components of an artificial neural network. Synaptic weights are linked to inputs. After being added together, they are all run through an activation function to produce output y. The output is essentially the total of the signal multiplied by the synaptic weight over numerous input channels.

This is the brain and the central processing unit(CPU) of a computer. Let's examine the relationship between a brain and the fast computers that are currently on the market. The human brain has about 10 to the power of 14 synapses, while a CPU typically has 10 to the power of 8 transistors. The element size is nearly identical both are 10 to the power minus 6 and the energy consumption is nearly identical that is, the amount of energy used in a brain is nearly equal to that of a computer. However, the processing speed is visible. Our brains process information at a near about 100 hertz, whereas computers nowadays, are some Giga hertz. Although we can only compare of AI with human memory but can not be replaced ,because all machine are made by only human being.

II Artificial Neural Network (ANN) models:

The following are main models

a).Convolution Neural Network (CNN)

b). Connections are modifiable based on experience

c). High degree of connectivity between basic units

d). Learning is a continuous unsupervised process

e). Learns based on local information

f). Parallel Distributed information processing

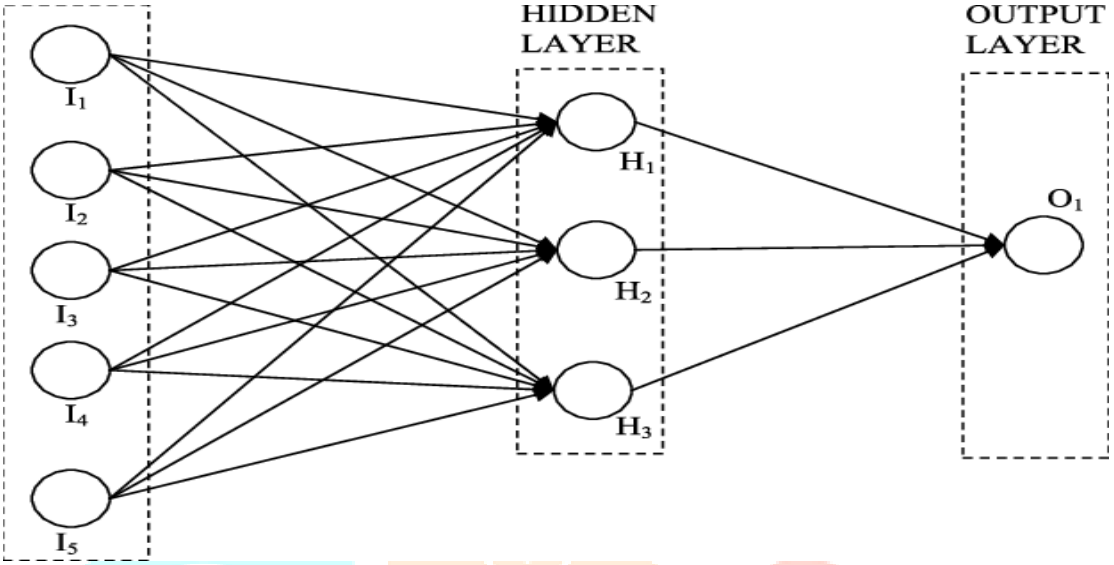
g). Performance degrades with less units

h). Stochastic Gradient Descent

Every technique that has been discussed thus far makes a strong assumption about the surrounding space; that is, whether we use fuzzy logic, neural networks, or any other technique that may have been used in an intelligent control framework, they all make very strong assumptions and typically cannot function in a generalized condition. Is it possible for them to formulate a theory? Every time I design one of these controllers, I take the data; the engineer takes the data. He consistently creates these updated models. Based on the plant's reaction, they adjust their own weights. However, the engineer determines the intelligent controller's structure as well as the controller's structure and the model that we use to assume the physical plant. We don't have a computer that can make assumptions about everything, including the model and controller it should choose based only on facts because what ever we uploaded in the computer that only show ,no extra result provided by itself. Can it develop a certain controller architecture and system model when it comes across a particular type of data from a plant? We are currently posing that question. You will notice that we will be talking about different tools during the entire course. They will only have to cope with these two issues: behavior. In reality, these instruments were created by imitating human behavior rather than human methods of operation. A machine that can learn, think, and act in accordance with thought processes is said to be intelligent. That's what we want, but it's a long way off. At the very least, we are still a long way from actual intelligence. We have a really distinct and cohesive style of seeing the world. This is referred to as unity of perception, and intelligence is related to this unity of perception, consciousness, and certain things that are yet unclear to us. Therefore, a computer that learns, thinks, and acts in accordance with cognitive processes is considered intelligent as command provided.

III Functionality of Neural Model

Inspired by biological neural networks, artificial neural networks (ANNs) are computational models made up of interconnected nodes, or neurons, arranged into input, hidden, and output layers. They acquire the ability to solve intricate, nonlinear patterns, such those found in data prediction or image recognition.
In this model there are five input is equal to one output shown in fig.



Figure

3 ARTIFICIAL NEURAL NETWORKS AND ITS APPLICABILITY

There are so many applications of applications of AI with neural networks ,some of important are as follows:
I Customer care
II Education
III Financial Field
IV Healthcare
V Marketing
VI Personal Assistants
VII Sports field
VIII Agriculture

IX Dairy farma

X Traffic and carrier

4 CHALLENGES AND FUTURE SCOPE OF NEURO FUZZY AND AI

I Challenges of Neuro-Fuzzy Systems

- Data dependency
- Interpretability issues
- High computational complexity
- Overfitting
- Parameter optimization
- Rule explosion problem
- Scalability problems

II Challenges of Artificial Intelligence (AI)

- Data-related problems
- Ethical and social issues
- Generalization & adaptability
- High computational cost
- Lack of explainability
- Security & robustness
- Network gliching challenges

III Future Scope of Neuro-Fuzzy Systems And AI

Neuro-fuzzy key role in interpretable and hybrid AI systems ,while AI is smarter, explainable, human-centered systems and may or may not be requirement of more human senses.

5 CONCLUSION

This study provides a straightforward description of how to model a nonlinear system using neurofuzzy logic and AI. The majority of controllers are used to describe fuzzy logic methods and the operation of fuzzy systems with AI. In essence, a neuro fuzzy system combines fuzzy logic and neural networks, both of which are essential for simulating the human brain by the help of AI. When it comes to managing and resolving fuzzy-related issues, the fuzzy inference system gives more accurate results than the other type result . Since both fuzzy logic and neural networks have drawbacks and benefits, they are merged to overcome these drawbacks and take advantage of their applications. Neural network algorithms and fuzzy logic systems serve as the foundation for the neurofuzzy related field. The neurons of the fuzzification layer (membership functions) are connected via complete connections in the typical daily life problems.

REFERENCES

[1] Anil Kumar Yadav ,Savita Mishra, B.N. Prasad,Neuro-Fuzzy Programming to Finding Fuzzy Multiple Objective Linear Programming Problems, Volume 8, Issue 4, April 2023 International Journal of Innovative Science and Research Technology ISSN No:-2456-2165.

[2] A.Castro, V. Miranda, Mapping neural networks into rule sets and making their hidden knowledge explicit application to spatial load forecasting, in: Proceedings of the 14th Power System Computation Conference, 2002.

[3] B. Kosko, Neural networks and fuzzy systems: a dynamical systems approach, Prentice Hall, Englewood Ciffs, NJ, 1991.

[4] Boso DP, Lee SY, Ferrari M, Schrefler BA, Decuzzi P. Optimization particle size for targeting diseased microvasculature: from experiments to artificial neural networks. Int J Nanomedicine. 2011;6(1):1517.

[5] D. D. Nauck and A. Nürnberger, “Neuro-fuzzy systems: A short historical review,” Stud. Comput. Intell., vol. 445, pp. 91–109, 2013, doi: 10.1007/978-3-642-32378-2_7.

[6] F. Scarselli, M. Gori, A. C. Tsoi, M. Hagenbuchner, and G. Monfardini, “The graph neural network model,” IEEE Trans. Neural Networks, 2009, doi: 10.1109/TNN.2008.2005605.

[7] G. Anandalingam, A Mathematical Programming Model of Decentralized Multi- Level Systems, Journal of Operational Research Society, 39 (11) (1988) 10211033.

[8] G. G. Tiruneh, A. R. Fayek, and V. Sumati, “Neuro-fuzzy systems in construction engineering and management research,” Autom. Constr., vol. 119, no. May, p. 103348, 2020, doi: 10.1016/j.autcon.2020.103348.

[9] Kustrin S, Beresford AR. Basic concepts of artificial neural network (ANN) modelling and its application in pharmaceutical research. J Pharm and Biomed Analysis. 2000;22(5):717–27.

[10] M.S. Osman, et al., A multi-level Nonlinear MultiObjective Decision Making under Fuzziness, J. Appl. Math. Comp., 153 (2004) 239–252.

[11] Ruqaiya Khanam, A Study on Neuro Fuzzy Systems and Fuzzy Set, 2018 JETIR July 2018, Volume 5, Issue 7,www.jetir.org (ISSN-2349-5162).

[12] Sinha, Fuzzy Mathematical Programming Applied to Multi-Level Programming Problems, Computers and Operations Research, 30 (2003) a 1259–1268.

[13] V. S. Kodogiannis, and A. Lolis, "Prediction of foreign exchange rates by neural network and fuzzy system based techniques," European Symposium on Artificial Neural Networks, Bruges, Belgium, 2001.

[14] Y. Bai and D. Wang, “Fundamentals of fuzzy logic control , fuzzy sets, fuzzy rules and defuzzifications,” in Advances in Industrial Control, 2006.