An Evaluation of Multidisciplinary Fields Using Fuzzy Logic

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***Abstract*—** When we come across a government of issues in the real world and are unsure if the nation is true or untrue, their hazy excellent judgment offers much-needed reasoning flexibility. The currently available article examines the Fuzzy Logic Model in Multidisciplinary areas. However, although the fuzzy Interference set continues to score highest, the Fuzzy Set and Fuzzy Rules model is a potential Fuzzy Logic model that may be shown in future research. In the future, it is likely that fuzzy interferences, which are a combination of fuzzy sets and fuzzy rules with various reinforcement Fuzzy Logic models, will continue to be the technique of choice for most research. The currently available article examines the Fuzzy Logic Model in Multidisciplinary areas. However, although the fuzzy Interference set continues to score highest, the Fuzzy Set and Fuzzy Rules model is a potential Fuzzy Logic model that may be shown in future research. Furthermore, most of the readings in multidisciplinary areas such as agriculture and health care dealt out utilized fuzzy sets, which might be elevated if combined with fuzzy sets, resulting in Fuzzy Interferences. In the future, it is expected that fuzzy interferences, which are a combination of fuzzy sets and fuzzy rules with various validation Fuzzy Logic model, would continue to be the technique of choice for most research.

***Keywords*—** fuzzy logic, multidisciplinary fields, logic model, interferences.

I. INTRODUCTION

The term "fuzzy" refers to things that are no longer clear. When we come across a government of issues in the real world and are unsure if the nation is true or untrue, their hazy excellent judgment offers much-needed reasoning flexibility. Any situation's errors and uncertainties may be evaluated in this manner. The absolute truth price in the Boolean device truth value is 1.0, whereas the absolute false value is zero. However, there is no common sense in the fuzzy system for absolute truth and absolute false value. However, with fuzzy logic, there is also an intermediate cost that is both true and false. The notion of relative graded membership, as inspired by human perception and cognitive methods, lies at the heart of the fuzzy logic concept. In 1965, Lotfi A. Zadeh published his renowned lookup work on fuzzy units. Fuzzy logic can deal with ambiguous, imprecise, unclear, partially real, or withholding sharp boundaries data from computational perception and cognition. The incorporation of hazy human judgments in computer issues is permitted by fuzzy logic. It also has the benefit of being able to resolve conflicts with extra criteria and a better evaluation of alternatives. In the development of smart systems for selection, identification, sample recognition, optimization, and control, new computing techniques based on fuzzy logic may be used [1]. The study's main goal is to look at current FL techniques utilized in Artificial Intelligence. It also aims to identify the various models utilized in various Artificial Intelligence systems. The study covers papers from 2010 to 2018 that use Fuzzy Logic in artificial intelligence.

II. FUZZY LOGIC

For load forecasting, the research has been acknowledged between two contemporary techniques, ANN and FL. The simulation results show that the ANN model outperforms the FL approach by a considerable margin. This is remarkable to the point that, under the same constraints, the search for an accurate and complete linear regression curve for the FL technique continues. Furthermore, this model will not be systematically evaluated, and the examination findings will not be provided in an acceptable way. Another research continued to demonstrate the use of ANN for load forecasting. Short-term LF findings for comparison are accurate to guarantee consistency and near closeness to load duration for short load data. Aside from having superior outcomes, a more sophisticated topology for the neural network that can distinguish start-up days from other days may be required. We used the only temperature as well as other meteorological data in this case. ANN, on the other hand, may agree to allow us to model such meteorological data for a short-term LF process. Additional meteorological factors, such as per cloud coverage in addition to wind speed, could improve the findings [2]. Fuzzy logic has made significant progress in control nonlinear systems during the past several decades [3]. In addition, the fuzzy logic method was used to deal with the uncertainty circumstances, and the fuzzy logic approach has the benefit of being able to work with imprecise and inadequate data [4]. The most suitable theory, according to the author, is the qualitative definition of language variables, the avoidance of mathematical standards, and the relationship between fuzzy logic theory and linguistic variables. Variables as

input ideals also provide a result that is capable of being positioned towards a specified linguistic variable. As stated, the aforementioned is the best appropriate theory for qualitatively characterizing linguistic variables while avoiding labor with numerical values. This fuzzy logic theory combines linguistic variables with input values and produces a result that may be used to completely specify linguistic variables. However, fuzzy logic has shown to be a highly helpful tool in a variety of other fields, including risk assessment, enabling for the implementation of better and sufficient safety measures wherever they are needed [5].

Fuzzy Set

The fuzzy range is calculated using a membership graph that blends three Gaussian functions with a specific core and different, in contrast to conventional net impact methods that assume symmetrical and linear interactions between variables, and the fuzzy range is calculated using a membership graph that blends three Gaussian functions with a specific core and different. [6], [7]] The IFS characteristic is that each entity is given a membership degree and a non-member degree that equals one entity. Nonetheless, in many real-world decision-making processes, the degree of participation and non-membership of the choice that matches the decision-criteria maker's may be higher than 1, but the square number is equal to or less than one. [8]. The membership matrix, which is a combination of three Gaussian functions with a common center and different widths, reflects a visual representation of degrees and is used to produce flat outputs, was used to compute the fuzzy set. [9].

Fuzzy Rules

The proposed model will also model the run-environment and system actions [10]. A general approach to integrating calculated numerical knowledge and human linguistic details into a popular framework-a hybrid fuzzy rule base and can prompt the actions of a system in an easily understood way and their variables can remain reconfigured by the run-, the proposed model will also model the run- environment and system actions. The suggested model will also represent the run-environment and system activities [11].

Fuzzy rules may stimulate the behaviors of a system in an easily understandable manner, and their variables can stay changed by the run-. SCD's knowledge base is made up of a collection of conditional rules that may be created using a variety of linking operators and the negation of ancestor comparisons, which are fuzzy comparisons. Fuzzy logic, when used as a decision-making tool based on expert language knowledge, lowers mistakes and increases reliability. The use of fuzzy logic as a decision-making technique based on expert linguistics knowledge reduces errors and improves accuracy [12], [13].

Fuzzy Interference

Fuzzy logic was used to create a current ranking algorithm based on the fuzzy deduction system. To forecast energy-input potato yields, ANFIS and neural artificial networks (ANNs) have been adjusted. [15]

Based on membership functions and rule aggregations, the fuzzy inference is built with predefined evaluation parameters, such as value ranges for fuzzy language words and weights of land variables. The majority of existing evaluation criteria systems, on the other hand, are based on practitioner knowledge and may be extremely subjective and ambiguous. [16]

III. MULTIDISCIPLINARY FIELD USING FUZZY LOGIC

Health Care

Dagar et al. reviewed the research and concluded that the fuzzy logic approach may provide a reliable outcome for illness detection. The Human problem was utilized to test the system, and a system for medical diagnostics was suggested, which was created using the MATLAB Fuzzy Logic Toolbox.

The scenario unmistakably indicates medical diagnosis. Furthermore, the fuzzy logic that was utilized to create the Fuzzy Knowledgebase on MATLAB and the fuzzy rules that were employed in the system are based on expert knowledge [17]. The fuzzy logic and fuzzy set provide a strong foundation for creating new knowledge in medical, especially in illness detection, and methods such as fuzzy logic computing are used in the work [18].

Aside from that, the fuzzy system is used to assist deal with the noise and complexity of medical data [19]. Furthermore, the wavelet IT2FLS approach signatures were compared to other machine learning techniques such as neural networks and other systems, resulting in a novel suggested strategy for application in decision support systems in clinicians and other medical practitioners.

Agriculture

The agricultural sector employs an intelligent wireless sensor for drip irrigation systems, as well as fuzzy logic, water, and fertilizer. The study also includes real-time data, which necessitates the use of fuzzy logic for data processing. According to Cornelissen et al., 2001, fuzzy

logic was utilized to assist a choice for sustainable development in an agricultural production system. Expert systems with equivocal or imprecise data and information, on the other hand, may benefit from fuzzy logic. [21],. In addition to fuzzy logic, an intelligent controller is used for grain drying, and it is a good choice controller and a very strong technique for the system in uncertain deals with nonlinear behavior [22]. Furthermore, using Support Vector Machines and Fuzzy Logic, the Agricultural is categorized as the basis for producing fruit shapes and sizes. The outcome seems to be very encouraging. [23].

Using fuzzy logic to determine the potential worth of vil lag under the effectively defined criteria in the fields of agricultural, big cattle, small livestock, and poultry. As a consequence, the fuzzy logic approach is suitable for calculating the resultant search from the prospective [24].

Figure 1.

The suggested model will also represent run-time and system activities, and fuzzy logic also has the benefit of needing only modest computer resources [25]. Fuzzy rules may prompt system actions in an easy-to-understand way and their variables can be changed by run-time.

Transportation

For the sake of simplicity, admittance control in a multi-UAV system is studied, and the admittance controller mimics a virtual spring mass damper system to construct a force feedback controller for the follower UAV. When measuring the vector damping coefficient, however, the Fuzzy approach would suggest the output of the controller, based on heuristic and intuitive measurement data. In contrast to a constant damping admittance method, the suggested system provides effective output, which is supported by the results presented in this article and implemented using

Fuzzy Logic in a computer-based AV model. [26]. Using Fuzzy Logic and integrating it into an algorithm-driven AV architecture, the idea has the ability to control the safety hazards associated with the operation [27].

The mathematical method of fuzzy logic has been proven to be a highly promising mathematical approach to modeling traffic and transportation.

The significance of fuzzy logic systems as universal approximates in transportation problems is emphasized. Verification of the solution's effectiveness using the fuzzy interval method [28].

IV. RESULTS AND DISCUSSIONS

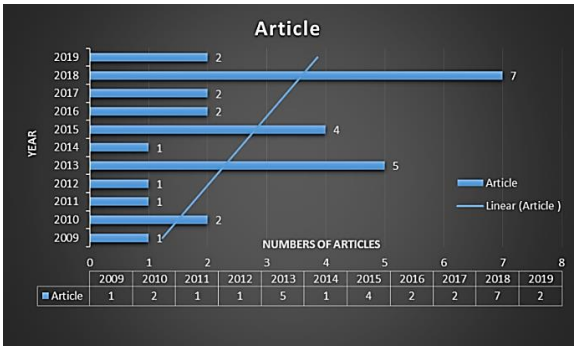

Figure 1. Distribution of reviewed article by year of publication

From 2009 to 2019, Figure 1 depicts the distribution of reviewed articles. From 2013 to 2018, many Fuzzy Logic methods were found to be utilized in various areas. Furthermore, in 2015, 2013, and 2018, the adoption of Fuzzy Logic methods in Various Fields rated first, second, and third, respectively.

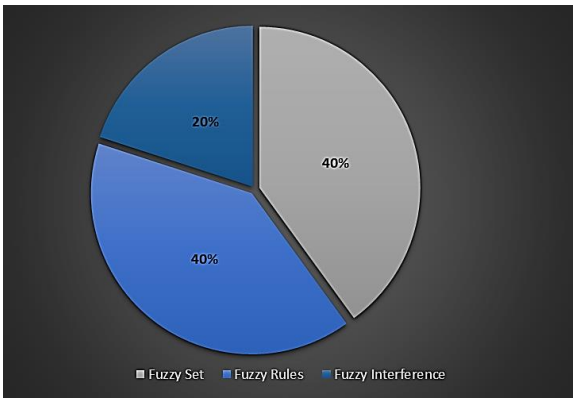

Figure 2. Distribution of reviewed article by ITS Area

Figure 2 depicts the distribution of the Examined item by Fuzzy Logic regions. It implies that agriculture was the focus of many of the research. Furthermore, the majority of research in the fields of medicine and transportation have used Fuzzy Logic.

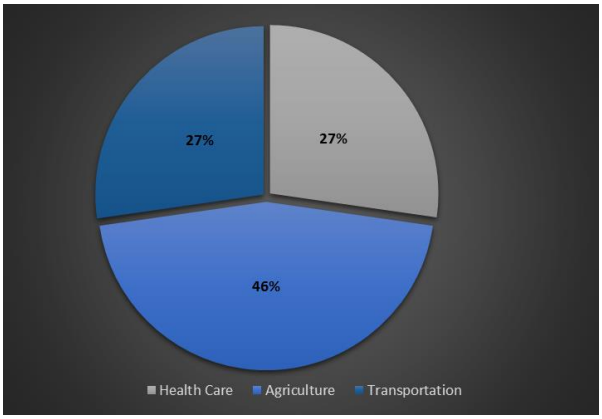

Figure 3: ML category distribution of peer-reviewed articles

Figure 3 depicts the dispersion of examined articles according to the Fuzzy Logic Category. It can be seen that the majority of research have chosen Health Care and Transportation as their main topics, followed by Agriculture, which is a promising Fuzzy Logic model.

V. CONCLUSION

The currently available article examines the Fuzzy Logic Model in Multidisciplinary areas. However, although the fuzzy Interference set continues to score highest, the Fuzzy Set and Fuzzy Rules model is a potential Fuzzy Logic model that may be shown in future research. Furthermore, most of the readings in multidisciplinary areas such as agriculture and health care dealt out utilized fuzzy sets, which might be elevated if combined with fuzzy sets, resulting in Fuzzy Interferences. In the future, it is expected that fuzzy interferences, which are a combination of fuzzy sets and fuzzy rules with various validation Fuzzy Logic model, would continue to be the technique of choice for most research.

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