

Review: Deep Learning and Fuzzy Logic Applications

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ABSTRACT: The modeling and prediction field bosses a variety of practical applications, deep learning is a powerful tool used in this field. It has been proved that deep learning is a useful technique for extracting extremely accurate predictions from complex data sources, and also Recursive neural networks have demonstrated their usefulness in language translation and caption production, but convolutional neural networks remain the dominant solution for image classification tasks. In addition, deep learning, also known as deep neural networks, involves training models with multiple layers of interconnected artificial neurons. The primary idea of deep learning is to learn data representations through raising levels of abstraction. These strategies are effective, but they don't explain how the result is produced. Without knowing how a solution is arrived at using deep learning. In the field of artificial intelligence, deep learning and fuzzy logic are two powerful techniques. In addition, fuzzy logic combines deep learning will help deep learning select the desired features and work without supervision, this will make it possible to develop reliable systems with rich DL information even in the absence of hand-labeled data. Fuzzy logic that interpreted these features will subsequently provide explanations for the system's choice of classification label. This survey highlights the various applications which use fuzzy logic to improve deep learning.

KEYWORDS: deep learning, neural network, fuzzy logic, artificial intelligence, optimization method, machine learning, learning model.

1. INTRODUCTION

In machine learning, the progress of deep learning has become a significant research area in all facets of life. It has several applications such as natural language processing, image processing, precision medicine, self-driving cars, and speech recognition, however those models continue as black boxes, which represent an important barrier to the extensive distribution of deep learning technology, thus many users will not be trusted a model whose solutions ambiguous (cannot be explained) (Mu & Zeng, 2019). Deep neural networks use sequential layers of nonlinear processing to extract features from dataset and they are a category of machine learning model. Nevertheless, the training of deep learning networks is very mathematically intensive, and it uses for widely utilized optimization techniques that do not ensure optimal performance. Moreover, such networks do not work well in areas where data are insufficient and sensitive to noise in data. One way to help understand neural networks is to extract rules. Therefore, deep learning and fuzzy logic contributes to solving complex problems and making more accurate predictions (Shinde & P, 2018). These studies will help the researchers of fuzzy logic to solve complex problems of artificial intelligence and improve the applications in machine learning. Recent years, there are several a number of literature work in this domain (Yang et al., 2020). During the

2019, presented a paper of major study, they found insert a new fuzzy layer to be used for deep learning. This fuzzy layer has the advantage of being able to be embedded anywhere in the network, highly flexible. In addition, it can implement any fuzzy gathering method like Sugeno fuzzy and the Choquet integrals. This study introduces a deep learning approach that incorporates fuzzy techniques that is based the implementation of semantic partition utilizing per-pixel classification. Tests are carried out on a standard data set. Also, a data set gathered at a U.S. Army location by an unmanned aerial system for the purpose of automatically segmenting roads, and the early results are encouraging (Price et al., 2019). In 2021, demonstrated a hybrid system that combines deep learning and deep learning fuzzy logic controller as well as two neural networks. To calculate the current wind and predict the future wind, deep learning algorithms are applied. Evaluation and prediction were combined to identify the efficient wind to support the fuzzy logic. An improvement has been achieved with 21% acquired regard to the PID controller, and 7% regard to the criterion fuzzy controller (this is respecting for medium and low wind speeds). The use of technology in medical diagnosis and patient care is not an easy task that is performed by professional developers (Sierra-Garcia et al.,2021). This technology is used to improve medical decision taking