Turkish Studies
Information Technologies & Applied Sciences

Volume 13/29, Fall 2018, p. 47-59
DOI: 10.7827/TurkishStudies.14730
ISSN: 1308-2140
Skopje/MACEDONIA-Ankara/TURKEY

INTERNATIONAL BALKAN UNIVERSITY
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Research Article / Araştırma Makalesi

Article Info/Makale Bilgisi

Received/Geliş: *Aralık 2018* ***Accepted/Kabul:*** *Aralık 2018*

Referees/Hakemler: *Doç. Dr. Mihalis KUYUCU - Dr. Öğr. Üyesi Özgür Erkut ŞAHİN - Dr. Öğr. Üyesi Sinem ÇAMBAY*

This article was checked by iThenticate.

A LEARNING-BASED APPROACH TO FUZZY LOGIC IN FRAMEWORK OF PHILOSOPHY OF INFORMATICS

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ABSTRACT

In the present age, the technology is developing rapidly and the need for information increases at an elevated speed as well. However, there are certain problems in obtaining and using the accurate information. The doubtful validity of the information distributed by the Internet makes it necessary to seek the truth and find out the facts. The philosophy of informatics fulfills an essential task at this point, and individual reasoning begins to take place. Fuzzy logic proposes solutions to such problems by addressing uncertainty. This line of focus is where the fields of philosophy of informatics and fuzzy logic intersect. Fuzzy logic systems, which can produce effective solutions to existing problems, have become more functional with the introduction of artificial intelligence. The fuzzy logic introduced by Lotfi Zadeh can be modeled qualitatively with the help of the human brain, placing the human brain in the center. Fuzzy logic, which is essentially extended by Zadeh's students following his first studies revealing the relation between fuzzy sets and fuzzy logic, has a broad range of application areas today from medicine to engineering and from space and aviation and control systems to earth sciences. The data that is handled and digitized in a relative-nature can be modelled using fuzzy logic. The problems experienced in learning may arise not only from the learner but also from the inefficient teaching methods applied. In this study, learning activities realized under artificial intelligence-supported fuzzy logic systems are discussed within the framework of philosophy of

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informatics. A theoretical analysis of the subject is presented, and reasonable conclusions are given.

STRUCTURED ABSTRACT

Information technologies are developing rapidly in the current 21st century. These developments in information technologies have made significant contributions to the development of the global communication network through distance education applications. In the 21st century, which we call the information age, communication has become a serious need for individuals from every segments of the society. Distance education applications which were regarded as an utopian idea for societies in the past years, have become easily applicable using the global communication network, thanks to developments in information technologies.

The rapid advances in technology drive all societies towards an information-intensive life. Training programs, investments in education and education policies are also being planned as information-intensive. The general consensus reached by all scientists and all other segments of society is that the 21st century is an information age. Change is at the top of hot topics in the last century we live in. Indeed, this century brings such technologies that can radically change social structures. There is a transition to information society all over the world through fundamental changes in production systems and the technology they are based on.

The philosophy of informatics is based on thinking. Fuzzy logic is based on thinking like human beings and turning these thoughts into mathematical functions. The main feature of fuzzy logic is being based on fuzzy set theory instead of Aristotle binary logic. In this study, fuzzy logic will be examined within the framework of philosophy of informatics and the intellectual structure of fuzzy logic will be analyzed. The word “felsefe” in Turkish is the Arabic translation of the Greek “philosophia” term (love of wisdom). Rather than having a holistic knowledge directly encompassing everything, it proposes to pursue knowledge and obtain it wherever and by whom it is produced, and more importantly to be friend with knowledge. This means that the love of wisdom means wanting and loving to know the origin of all the existence no matter concerned with man or God. A similar situation applies to knowledge. Knowledge is actually a general concept. In this respect, it is possible to define knowledge as “the understanding of something as something”. However, because of the words of “something” and “understand”, then there will be a “person who understands” and “what is understood” or a “person who knows” and “what is known”. Then, since the definition requires such a determination, knowledge is usually a knowledge of a "thing". In this sense, the phenomenon is the first step. Philosophy, art and science are carried out on top of this phenomenon.

Philosophy of informatics is a concept that has developed especially in recent years. With the development of smart technologies and the emergence of cyber intelligence, this concept has steadily increased its influence and extended its coverage. Philosophy is the basis of every science. Therefore, it is necessary to examine the concept of philosophy of informatics in detail. Semantic web can be regarded as

a very important concept in the development of web technologies and the future of these technologies. The studies on semantic web (web 3.0) was initiated by W3C in 2001. The web version 3.0 is expected to be built completely on the semantic web infrastructure. Currently, it is being used on the intranet to develop projects, to conduct experiments and to set standards in experimental terms. However, with the use of RDF and OWL languages as standards in web pages published on the web servers of the system, and with all information content being expressed in metadata, the web will become passed to this technology.

Fuzzy logic, while forming and expressing a judgement, mentions where the judgement stays in a mathematical classification. It provides a new definition to some data at hand based on how much the data belongs to a specific judgement cluster. Lotfi Zadeh from the University of California at Berkeley discovered fuzzy logic in 1965, after many years in the field of control, working to form equations that are not much linear. Although fuzzy logic has gained importance over time, it has been argued that such problems can be managed through sciences such as probability and statistics without a need for fuzzy logic. Although fuzzy logic uses numbers as in the statistics, it is a more appropriate method than the statistical methods in cases where linguistic variables are more common.

Artificial intelligence systems and products steadily increase in the world. The basic philosophy of artificial intelligence is to make intelligent systems similar to human intelligence. An important unit of artificial intelligence is fuzzy logic. Fuzzy logic is a logical system in which words are used instead of numbers in calculation and reasoning. Fuzzy logic is the ability of the computers to see also gray colors just like humans rather than describing events purely as black or white. In other words, it evaluates more than one event and executes decisions in a certain framework, and may adopt its decisions under changing conditions.

Learning is of great importance for individuals of all ages and of all segments. Numerous studies show that four important factors play role in adult learning process and these factors facilitate learning. These factors constitute of self-learning and the control and responsibility of adults in planning the purpose of learning and where and how it will take place, and in the management and the assessment of the results. Critical reflection is the learning of individual by wisely working using logic and dialectical thinking skills, and where fair reflections are observed, and reasoning abilities are used, and the awareness of the individual about how he/she thinks and criticizes through cognitive epistemological explanations. Experimental learning; Lindeman described in 1926, adult education as a “process of ongoing evaluation of experiences.” It is a dominant idea in adult learning, that the individual's life has an important place and that knowledge is formed by experiences changing shape and can occur again and again through new experiences. Learning to learn is the awareness of adults about the cognitive awareness in the learning process. What underlies our thinking and what make us believe in something is our awareness of the present reasoning, prediction, evidence and tools.

As is seen, every development in the field of informatics has a philosophical dimension. Because, technology itself is an intellectual

activity. Artificial intelligence is a setting which makes inferences about the data through algorithmic calculations, and reaches the predetermined targets in different ways, thus making things easier. The integration of fuzzy logic and artificial intelligence has positively affected the learning technologies, and the strong artificial intelligence approach that had only carried out its pre-programmed tasks, now has created a system that facilitates learning by improving the programmed contents through algorithmic calculations. It is possible to say that artificial intelligence will play a more active role through the introduction of Web 3.0, and that the philosophy of informatics will become highly mentioned all over the world.

Keywords: Philosophy of Informatics, Artificial Intelligence, Fuzzy Logic, Learning.

BİLİŞİM FELSEFESİ ÇERÇEVESİNDE BULANIK MANTIĞA ÖĞRENİM TEMELLİ BİR YAKLAŞIM

ÖZET

Çağımızda teknoloji her geçen gün hızlı bir gelişim göstermekte ve bilgiye olan ihtiyaç ise günden güne artmaktadır. Ancak doğru bilgiye ulaşma ve doğru bilgiyi kullanma noktasında bir takım sorunlar mevcuttur. İnternet ortamında yer alan bilgilere şüpheyle yaklaşılması ve bu tür bilgilerin sorgulanması ise gerçeği ve doğruyu aramayı zorunlu kılmıştır. Bilişim felsefesi bu noktada önemli bir görev üstlenmiş, bireysel akıl yürütmeler gerçekleşmeye başlamıştır. Bulanık mantık ise var olan belirsiz durumları ele alarak bu tür sorunlara çözüm yolları aramaktadır. Bilişim felsefesi ve bulanık mantığın kesiştiği ortak nokta da budur. Mevcut problemlere etkin çözüm yolları üretebilen bulanık mantık sistemleri yapay zekâyla birlikte daha işlevsel bir hale gelmiştir. Lotfi Zadeh tarafından ortaya konan bulanık mantık insan beyni yardımıyla niteliksel bir şekilde modellenebilmekte ve böylece insan beyni merkeze yerleştirilmektedir. Zadeh'in bulanık kümeler ve bulanık mantık bağıntısını ortaya koyan çalışmalarından sonra özellikle öğrencileri tarafından genişletilen bulanık mantık günümüzde; tıptan mühendisliğe, uzay ve havacılıktan kontrol sistemlerinden ve yerbilimlerine kadar geniş bir alanda uygulama bulmaktadır. Göreceli bir düzlemde ele alınıp sayısallaştırılan veriler bulanık mantık kullanılarak temellendirilebilmektedir. Öğrenme konusunda yaşanan sorunlar sadece öğrenciden değil, kullanılan yanlış öğretim yöntemlerinden de kaynaklanabilmektedir. Bu çalışmada yapay zeka destekli bulanık mantık sistemi kapsamında gerçekleştirilen öğrenme faaliyetleri bilişim felsefesi çerçevesinde ele alınmış ve konu teorik düzlemde tartışılarak sonuca varılmıştır.

Anahtar Kelimeler: Bilişim Felsefesi, Yapay Zeka, Bulanık Mantık, Öğrenme

INTRODUCTION

Communication is very important concept in the world (Büyükbaykal & Büyükbaykal, 2018: 321). The transition to information age and the developments in information technologies have rendered the traditional management concept inadequate. Information technology is a development that affects every sector together with the employees in the sector. In our age, as a result of rapid technological developments, intense competition and globalization, a high speed of information access and knowledge gain has become the most valuable instrument for enterprises. This development made the beginning of the twenty-first century an information age. There has been a structural transformation with the expansion of the Internet throughout the world.

Information technologies are developing rapidly in the current 21st century. These developments in information technologies have made significant contributions to the development of the global communication network through distance education applications. In the 21st century, which we call the information age, communication has become a serious need for individuals from every segments of the society. Distance education applications which were regarded as an utopian idea for societies in the past years, have become easily applicable using the global communication network, thanks to developments in information technologies.

The rapid advances in technology drive all societies towards an information-intensive life. Training programs, investments in education and education policies are also being planned as information-intensive (Aydoğdu & İlhan, 2018: 685). The general consensus reached by all scientists and all other segments of society is that the 21st century is an information age. Change is at the top of hot topics in the last century we live in. Indeed, this century brings such technologies that can radically change social structures. There is a transition to information society all over the world through fundamental changes in production systems and the technology they are based on.

As new production and communication technologies and virtual techniques are intensively used in daily activities, the results of interdependent interaction between nature, society and consciousness will accelerate and transform into chaotic development processes, and will become increasingly unpredictable processes. Informatics is known to be a structural science that investigates the theoretical foundations of information and computation and the practical techniques that enable them to be applied in computer systems.

Informatics has a philosophical dimension as well. Philosophy is an area of systematic and holistic field of activity that tackles the existence, the valuable, and all things entirely and examines the basic principles and the first elements of it in very detail, and explores, interprets, and criticizes the resulting knowledge. It is an undeniable reality that technology has an intellectual dimension. The value of knowledge also reveals its philosophical status. Knowledge is a phenomenon that emerges with thought.

The effects of the transformations in the philosophy of science on the field of communication were aimed at emphasizing the mental structure rather than the material structure of the communication. The communication bodies formed in a widening spectrum from interpersonal to mass scale have been reorganized as the historical heritage is wiped out, the philosophical inquiries that will contribute to intellectual thought are delimited, and the sociological definitions of the society are regarded invalid, in line with the needs of division and market structure. This situation clearly demonstrates the importance of philosophy of informatics.

The philosophy of informatics is based on thinking. Fuzzy logic is based on thinking like human beings and turning these thoughts into mathematical functions. The main feature of fuzzy logic is being based on fuzzy set theory instead of Aristotle binary logic. In this study, fuzzy logic will be examined within the framework of philosophy of informatics and the intellectual structure of fuzzy logic will be analyzed.

1. Overview of Philosophy of Informatics

Philosophy began in many parts of the world at the same time between the 6th century BC and the 5th century BC. A number of wise men in the east, south and north of the Mediterranean, in China and India, tried to create a new order as they are not satisfied with the established habits, religious and mythological beliefs of their cultures. These wise men or philosophers, who had thoughts with certain abstraction tendency, asked deeper questions and produced more demanding, more speculative and ambitious answers (Cevizci, 2009: 5). The search for knowledge has been the basis of the philosophical ground.

1.1. The Essence of the Concept of Philosophy

The word “felsefe” in Turkish is the Arabic translation of the Greek “philosophia” term (love of wisdom). Rather than having a holistic knowledge directly encompassing everything, it proposes to pursue knowledge and obtain it wherever and by whom it is produced, and more importantly to be friend with knowledge. This means that the love of wisdom means wanting and loving to know the origin of all the existence no matter concerned with man or God (Topdemir, 2009: 120).

Man always longs to understand the truth. There are questions in his head for centuries: the real state of the universe as a whole, what man is and what it should be, and all the other similar questions. Man has been systematically working using various methods for centuries to know the truth of everything. Philosophy is investigating every aspect of truth as a whole. Other sciences, on the other hand, explore certain parts and aspects of the whole reality. Philosophy is a universal “science”, it researches the whole of the truth, its latest and original foundations (Ergün, 2015: 1-3). The essence of philosophy does not mean the possession of reality, rather it can reveal the truth without getting stuck in a certain judgement. This phenomenon can be observed in the exact, unchangeable and useful information given in propositions. However, philosophy means being on a certain path. The questions of philosophy are more important than their answers, and each answer becomes a new question.

A similar situation applies to knowledge. Knowledge is actually a general concept. In this respect, it is possible to define knowledge as “the understanding of something as something”. However, because of the words of “something” and “understand”, then there will be a “person who understands” and “what is understood” or a “person who knows” and “what is known”. Then, since the definition requires such a determination, knowledge is usually a knowledge of a "thing". In this sense, the phenomenon is the first step. Philosophy, art and science are carried out on top of this phenomenon (Topdemir, 2009: 120). Philosophy is based on human experience. The astonishment and confusion the human experienced when he/she fails to understand and explain the cases relating to functioning of the universe led him/her to think, to make inquiries, to research and to know. On the other hand, the doubts raised about the information obtained through the experience resulted in human not accepting anything directly and led to critical thinking. Doubt has led people to think and research (Ergun, 2015: 2).

In addition to this insight which assumes an essential integrity, it is also possible to see nature as a source of mythic, in other words irrational, forces in Ancient Greek thought. Therefore, it would not be accurate to say that nature is entirely in the domain of mind. The irrational forces always remain active in nature. More clearly, it can be seen as a strong beginning in philosophy to find the nature -the body in other words- invaluable, as is prevalent in rationalist traditions, due to a claim that it is an unreliable ground, a thought that is most clearly seen in Plato (Tatlı, 2018: 301). At this point, it will be most appropriate to refer to the concept of philosophy of informatics.

1.2. The Content of Philosophy of Informatics and its Relationship with Communication

Philosophical communication includes different ways of thinking and methods of analysis, just like strategic communication, which are used to express the problems of an era. However,

philosophical communication reverses the point of view of strategic communication; it analysis the process from inside rather than outside. Communication is not considered to resolve, as in strategic communication, how, why and at what purpose a message is sent within the framework of external, mechanical and cybernetic models and in the form of causal processes and opposing messages. Philosophical communication explores how words and meanings conveyed during the communication process can be affected by the communication process. This exploration is not a research as in strategic communication, but a philosophical inquiry. Plato gave the first example of philosophical communication in history (Ergüden, 1989: 70). Against the teachings that deny the mind and base morality on teleological principles, we come across Kantian duty-based ethics. According to Kant (2015: 5), the moral domain is related to practical principles that exist in our minds as a priori and what must be done is to establish a "moral metaphysics" that explores a priori ethics. Here, there exists contradiction. It will be appropriate to examine the scientific ethics and the concept of morality within the framework of the philosophy of informatics.

Philosophy of informatics is a concept that has developed especially in recent years. With the development of smart technologies and the emergence of cyber intelligence, this concept has steadily increased its influence and extended its coverage. Philosophy is the basis of every science. Therefore, it is necessary to examine the concept of philosophy of informatics in detail. Semantic web can be regarded as a very important concept in the development of web technologies and the future of these technologies. The studies on semantic web (web 3.0) was initiated by W3C in 2001. The web version 3.0 is expected to be built completely on the semantic web infrastructure. Currently, it is being used on the intranet to develop projects, to conduct experiments and to set standards in experimental terms. However, with the use of RDF and OWL languages as standards in web pages published on the web servers of the system, and with all information content being expressed in metadata, the web will become passed to this technology (Demirli & Kütük, 2010: 100). Web 3.0 technology is based on the development of portals and search engines which collect information from websites and provide personalized features and more effective results.

Information also changes dimension in philosophy of informatics. Philosophy, a science based on the search for the truth, is also skeptical about the phenomenon of communication. Eco accepted that the information theory is problematic in explaining the communication among people but preferred to use it as an important metaphor. Again, according to Eco, signals turn into a different problem from the moment they are perceived by a person. Thereafter, information theory has nothing left to add. This new problem is a question of interpretation. This subject is also concerned with semantics and semiotics, because this new problem of interpretation is quite different from the ordinary questioning of meaning, which is the subject of information (Karahasan, 2015: 9).

1.3. The Role of Learning in the Philosophy of Informatics

Philosophy of Informatics also sheds light on learning-based inferences. Quantum phenomenon should also be mentioned at this point. Mach has been in search of a solid ground for science without carrying any concern about metaphysics. For this reason, he opposed making metaphysical entities subjects of science and philosophy. Since metaphysical entities are not observable, they cannot be described by observational statements. Therefore, they cannot be converted into theoretical terms. In order for a term to be theoretical, it must be defined with the words corresponding to the objects. As can be understood, Mach thought that all the meaningful propositions could be translated into propositions relating to direct observation data. Einstein's the well-known Theory of General Relativity was published in 1905. Quantum theory was developed in the following years (Demir, 1992: 20). The quantum learning model was developed and implemented by Bobbi de Porter in the United States in 1980s. The model, is based on "Accelerated learning techniques" and "Brain-compatible learning techniques and strategies", both developed by G. Lozanov. Describing quantum as "interaction that transforms energy into light", de Porter describes the quantum learning model as "Interaction of proven learning method -by school and business life- and the whole

philosophy". It also states that quantum learning techniques are appropriate models for learners of all age groups and having different learning styles (de Porter and Hernacki, as cited in Güllü, 2010: 4).

In fact, it is possible to describe computers as extensions of the mind. As the computer technology dramatically advanced, the focus of the world shifted to concept of informatics. According to Locke (2007: 55-57), human senses first take partial ideas and begin to fill the mind, which is an empty room. As they are recognized in the mind, they are placed in memory and they are named. The mind then abstracts them and learns to use common names so that the use of mind becomes clearer day by day. This is the advanced stage in which the mind begins to use names-words, however, the use of mind in humans begins before this stage. At this point the logic also comes into play.

2. FUZZY LOGIC AS A SYSTEMATIC PHENOMENON

Fuzzy logic has become an important concept also in the field of informatics today. The need for fuzzy logic is increasing every day, particularly in the current period of sophisticated technological developments. Therefore, it would be appropriate to examine the concept of fuzzy logic in detail.

2.1. Fuzzy Logic Approach

Fuzzy logic, while forming and expressing a judgement, mentions where the judgement stays in a mathematical classification. It provides a new definition to some data at hand based on how much the data belongs to a specific judgement cluster (Sıramkaya, 2006: 25). Lotfi Zadeh from the University of California at Berkeley discovered fuzzy logic in 1965, after many years in the field of control, working to form equations that are not much linear. Although fuzzy logic has gained importance over time, it has been argued that such problems can be managed through sciences such as probability and statistics without a need for fuzzy logic. Although fuzzy logic uses numbers as in the statistics, it is a more appropriate method than the statistical methods in cases where linguistic variables are more common (Şen, 2004: 8).

Artificial intelligence systems and products steadily increase in the world. The basic philosophy of artificial intelligence is to make intelligent systems similar to human intelligence. An important unit of artificial intelligence is fuzzy logic. Fuzzy logic is a logical system in which words are used instead of numbers in calculation and reasoning (Zadeh 1996: 103). Fuzzy logic is the ability of the computers to see also gray colors just like humans rather than describing events purely as black or white. In other words, it evaluates more than one event and executes decisions in a certain framework, and may adopt its decisions under changing conditions.

Fuzzy logic is an upper cluster that is reached as a result of the expansion of the classical binary logic to include the concept of "partially true" which is placed between “completely true” and “completely wrong”. It can also be defined as a method by which logic-based propositions which do not provide clear-cut distinctions are examined through a logic filter (Zimmermann, 1987: 1). Fuzzy logic is a process that analysis the values obtained from the experiences of the people and from the data at hand using certain algorithms and produce rule-based results with the help of mathematical functions. In Western culture, there is Boolean, that is, Aristotle's binary value logic. Fuzzy logic derives results in a broad range of values, taking into account the values between these two, and expresses the size variable, for example, with corresponding appropriate definitions from the verbal language such as limited, small, modest, medium, long, and massive. It allows the use of intermediate values (such as 0.7, 0.89) instead of 0-1 only. It makes further generalizations possible by extending the binary membership to a multidimensional one (Keskenler & Keskenler, 2017: 3).

2.2. Basic Properties of Fuzzy Logic

Fuzzy logic has not only been found successful in many fields of application, but also brought a new perspective to logic and probability methods. It caused drastic changes both in theoretical and

practical fields. Some argue that fuzzy logic is the end of a centuries-old misunderstanding or a grudging acceptance (Eryilmaz 2015: 39).

Different implications of fuzzy logic are being made. Zadeh states (cited in Yılmaz 2015: 11) the basic properties of fuzzy logic as follows:

1. Fuzzy logic use approximations instead of clear-cut distinctions.

2. Fuzzy logic is very suitable for systems where the representing mathematical model is very difficult to construct.

3. Everything is represented by a certain value in the range of 0 to 1.

4. Every logical system can be fuzzified.

5. Information is in the form of linguistic expressions such as big, small, little.

6. Fuzzy inference is done using rules defined on linguistic expressions.

3. PHILOSOPHY OF INFORMATICS AND LEARNING IN FUZZY LOGIC FRAMEWORK

Learning takes place throughout the whole life. Individuals continue to learn different concepts and gain information in a wide range of non-formal learning environments as well as in formal education institutions. There is a philosophical background of learning with developing technologies and important advantages of fuzzy logic.

3.1. Importance of Fuzzy Logic in Learning

Learning is of great importance for individuals of all ages and of all segments. Numerous studies show that four important factors play role in adult learning process and these factors facilitate learning. These factors constitute of self-learning and the control and responsibility of adults in planning the purpose of learning and where and how it will take place, and in the management and the assessment of the results. Critical reflection is the learning of individual by wisely working using logic and dialectical thinking skills, and where fair reflections are observed, and reasoning abilities are used, and the awareness of the individual about how he/she thinks and criticizes through cognitive epistemological explanations. Experimental learning; Lindeman described in 1926, adult education as a “process of ongoing evaluation of experiences.” It is a dominant idea in adult learning, that the individual's life has an important place and that knowledge is formed by experiences changing shape and can occur again and again through new experiences. Learning to learn is the awareness of adults about the cognitive awareness in the learning process. What underlies our thinking and what make us believe in something is our awareness of the present reasoning, prediction, evidence and tools (Türkmen, 2017: 15-16).

Fuzzy set and the related logical processes are the basis of fuzzy logic. Classical logic produce results in absolute terms such as “yes” or “no”, “black” or “white”, or as 0 or 1 while dealing with the probability of events. Fuzzy set and fuzzy logic are concerned with the degree to which the event or result exists. While probability states whether an event will occur or not, fuzziness reveals the what degree the event does occur. In contrast to classical set theory, events and objects may belong to different fuzzy sets in varying degrees of memberships. In classical set theory an object either belongs to a set or not, while in fuzzy sets it has membership degrees shown in decimal points between 0-1. This partial membership allows the solution of problems with missing, unclear or linguistic data using simple and easy fuzzy logic operations. The complexities and uncertainties caused by the lack of information can be easily modeled with fuzzy logic (Uysal, 2010: 1040). At the same time linguistic variations that exist in different people's judgement, insight and decision-making processes can be modelled by fuzzy logic and correct inferences can be made for events, making the learning process become easier.

Fuzzy logic can be associated with many disciplines. In the field of sociology, fuzzy logic may reach interpretations with more transparent boundaries between the societies while examining the interconnections of them. Likewise, in the judicial proceedings, the idea of fuzzy logic can play a decisive role in lawsuits that pose dilemmas and reach dead ends. Similarly, in the field of education, which is the focal point of our research, it helps students and education staff to build strong decision-making mechanisms. It is known that academic success is directly and indirectly related to many factors. There are various attempts to examine the academic success and determine the cognitive-affective components that affect academic achievement (Bahadir, 2017: 29-30). Indeed, fuzzy logic applications are used in field of effective learning in many countries of the world.

Fuzzy logic algorithms which are a type of artificial intelligence, enable learning styles to get rid of restricting lines and become more flexible. While regulating the learning life based on fuzzy logic learning styles, numerous studies can be done taking into account tens, even hundreds of criteria according to type of membership function selected (Özdemir and Kazu, 2010: 36).

3.2. Learning using Artificial Intelligence in the Framework of Philosophy of Informatics

Studies in computer and neural networks have provided new educational opportunities. Developments in computer software have led to the emergence of artificial intelligence techniques. Intelligent Teaching Systems (ITS), a second generation artificial intelligence technique, have been developed to be used in computer-aided teaching (CAT). The widespread use of internet has contributed to the development of Internet-based education techniques. ITS are designed to know how and what to teach students, to follow the learning stages, and to present and control learning tools and equipment in a regular way. A teaching which can offer behavior close to the behavior of the teacher is possible with the ITS (Erdemir, 2015: 2). Learning becomes easier through these types of applications and the training process becomes more comprehensive.

Nowadays, teaching and learning activities are gradually changing with the effect of new communication technologies. With the emergence of digital systems and the development of internet technology, the boundaries of time and space have disappeared in the field of education. Thus, the distance education service which has been realized through letters in the past has started to become more widespread throughout the world (Kırık, 2014: 75). Information underlies the philosophy of informatics. Indeed, philosophy of informatics has great duties and responsibilities in searching for the truth and reaching the information.

Hume's philosophy of knowledge is based not on "pure reason" but on "experience", as in John Locke, his contemporary and the father of political liberalism. This approach to the source of knowledge, even seen as a simple difference revealed between two concepts, is a distinction that determines the viewpoint on many values such as the universe, world, state, society, individual, politics, and authority. In the modernization period of Europe, thinkers, who base knowledge on pure reason, have developed the idea of a society and state that sets aside all historical and cultural achievements of societies. The thinkers in this strand of thought advocate that man has a mind (reasoning) that operates independently of history, culture, religion, tradition, customs, habits and practices. Thus, they conclude that individuals can re-create the society and the state all over again each time independently of all these. All the revolutionary ideas that evolved in Europe and spread to different parts of the world over time are based on this philosophical approach (Çaha, 2004: 16).

Although the results of artificial intelligence studies caused anxiety among some scientists and IT professionals such as Stephen Hawking, Bill Gates and Elon Musk, most of us consider artificial intelligence as a factor that provides us with ease in many areas of our lives. Robots, which are autonomous electro-mechanical devices capable of performing pre-programmed tasks, started to be integrated with artificial intelligence, and they increasingly become part of our daily lives brimming

with advanced features like visual perception, voice recognition, idea production and even learning from past experiences. The "thinking machines" that characterize artificial intelligence will change library processes, personnel requirements, and service users. While the potential effects of artificial intelligence have been reported recently, there is not much news about the effect of artificial intelligence in terms of library and information sciences (LIS) (Yıldız & Yıldırım, 2018: 28). The learning activity becomes easier, but the philosophical dimension of artificial intelligence is constantly discussed within the scope of the philosophy of informatics. Because, accessing information has been important for human beings all the time.

CONCLUSION

Emerging communication technologies have reshaped the life, the society, and the visual and auditory instruments, and caused the 21st century named as the new media age. The increase in knowledge and the formation of the information society caused the need for philosophy of informatics to arise. All sciences want to reach the accurate information through the methods they use. This is also the case for the philosophy of informatics. But at this point, technology and artificial intelligence take on major importance. However, the aims of the sciences belong to the field of objective accuracy and limited entity. Philosophy, on the other hand, is a general explanation of the entity. Accordingly, it has a theoretical structure that works with thinking and reasoning.

Philosophy is a discipline that examines the universe, nature, human, human actions, thought, knowledge, formation of knowledge and wants to reach various principles related to them. Thinking is the basis of philosophy. Human beings need to learn to carry out a thinking process properly. Today, with the development of information technologies, the information society has a philosophical background. Through the philosophy of informatics, the individual examines every content supplied with technology and feels doubt about every message he/she receives. Because, at this point, it is quite important to search and find the truth.

Fuzzy logic is another phenomenon that has a special importance today in individual or collective learning. Fuzzy logic has been used in many different fields of study. Fuzzy logic enables learning to be easily modeled through human experience and the possibility to mathematically express even ambiguous concepts. This approach enables the numerical modeling of daily linguistic expressions, and also the analysis of probable cases that cannot be expressed using the probability theory. Since the clarity and definiteness consist of a set of deterministic relationships, the analysis of such environments can be done by using classical mathematics and statistical techniques. However, uncertain systems should be analyzed using approximate expressions due to insufficient information (Tütmez, 2007). Fuzzy logic, which is an effective tool in uncertainty analysis, allows to analyze the system approximately by using multi-level calculation techniques instead of binary calculation.

As is seen, every development in the field of informatics has a philosophical dimension. Because, technology itself is an intellectual activity. Artificial intelligence is a setting which makes inferences about the data through algorithmic calculations, and reaches the predetermined targets in different ways, thus making things easier. The integration of fuzzy logic and artificial intelligence has positively affected the learning technologies, and the strong artificial intelligence approach that had only carried out its pre-programmed tasks, now has created a system that facilitates learning by improving the programmed contents through algorithmic calculations. It is possible to say that artificial intelligence will play a more active role through the introduction of Web 3.0, and that the philosophy of informatics will become highly mentioned all over the world.

REFERENCES

Aydoğdu, A. G., & İlhan, E. (2018). “Etik Kavramı Çerçevesinde İletişim Fakültesi Öğrencilerinin Magazin Medyasına Yaklaşımı”, *Electronic Turkish Studies*, 13(18), pp. 683-703.

Bahadır, E. (2017). "Bulanık Mantık Yaklaşımının Eğitim Çalışmalarında Kullanılmasının Alan Yazın Işığında Değerlendirilmesi", *Uluslararası Sosyal ve Eğitim Bilimleri Dergisi,* 4 (7), pp.28-42.

Büyükbaykal, G., Büyükbaykal, A.C.I. (2018). "Türkiye'deki İletişim Fakültelerinde Eğitim ve Yaşanılan İstihdam Sorunları", *Electronic Turkish Studies*, 13(18), pp. 321-334.

Çaha, Ö. (2004). "Muhafazakâr Düşüncede Toplum", *Liberal Düşünce*, Vol: 34, pp. 15-23.

Cevizci, A. (2009). *Felsefe Tarihi. Vol. 5*, İstanbul: Say Yayınları.

Demir, Ö. (1992). *Bilim Felsefesi*, İstanbul: Ağaç Yayınları.

Demirli, C., Kütük, Ö.F. (2010). "Anlamsal Web (Web 3.0) ve Ontolojilerine Genel Bir Bakış", *İstanbul Ticaret Üniversitesi Fen Bilimleri Dergisi*, 9 (18) Fall, pp. 97-107.

Erdemir, M. (2015*). İnternet Tabanlı Bir Zeki Öğretim Sisteminin Fizik Eğitimine Uyarlanması ve Uygulanması*, Ankara: Gazi University Institute of Educational Sciences, Doctoral Dissertation.

Ergüden, A. (1989). "Çağdaş İletişim Felsefesi ve Sorunları", *Kurgu Anadolu Üniversitesi İletişim Bilimleri Fakültesi Uluslararası Hakemli İletişim Dergisi,* 6 (6), pp.65-80.

Ergün, M. (2009). *Eğitim Felsefesi*. İstanbul: Pegem Akademi.

Eryılmaz, H. E. (2015). *Fuzzy (Bulanık) Mantık Üzerine Bir Araştırma*, İzmir: Dokuz Eylül University Graduate School of Social Sciences Unpublished Master's Thesis.

Güllü, A. (2010). *Kuantum Öğrenme Modelinin Orta Öğretim Düzeyinde Öğrenci Başarısına Etkisi (Konya Örneği),* Selçuk University Graduate School of Education Sciences Secondary School Science and Mathematics Education Department Physics Education Department Unpublished Master's Thesis.

Kant, I. (2015). *Ahlâk Metafiziğinin Temellendirilmesi* (İ. Kuçuradi, Trans.), Ankara: Türkiye Felsefe Kurumu.

Karahasan, H. (2015). "İletişim Çalışmalarındaki Felsefi Temeller Üzerine Bir Deneme", *Felsefe Tartışmaları,* Vol 51, pp. 1-17.

Keskenler, M. F.; Keskenler, E.F. (2017). "Bulanık Mantığın Tarihi Gelişimi", *Takvim-i Vekayi*, 5(1), pp. 1-10.

Kırık, A.M. (2014). "Uzaktan Eğitimin Tarihsel Gelişimi ve Türkiye'deki Durumu", *Marmara İletişim Dergisi*, Vol: 21, pp.73-94.

Locke, J. (2007). *İnsanın Anlama Yetisi Üzerine Bir Deneme,* C.I, (M. D. Topçu, Trans.), İstanbul: Öteki Yayınları.

Özdemir, O., Kazu, İ.Y., (2010). "Bilgisayar Destekli Bilgisayar Öğretiminde Yapay Zekâ ile Öğrenme Ortamı Sunmanın Öğrenci Başarısına Etkisi", *Doğu Anadolu Bölgesi Araştırma ve Uygulama (DAUM),* 8 (2), pp.35-46.

Şen, Z. (2004). *Mühendislikte Bulanık Mantık ve Modelleme Prensipleri*, İstanbul: Su Vakfı Yayınları.

Sıramkaya, E. (2006). *Veri Madenciliğinde Bulanık Mantık Uygulaması*, Selçuk University Graduate School of Natural Sciences Unpublished Master's Thesis.

Tatlı, F.B. (2018). "Antik Yunan Düşüncesindeki Temel Karşıtlıkların Eril Karakteri: Platon", *FLSF (Felsefe ve Sosyal Bilimler Dergisi),* Vol. 25 Spring, pp.289-306.

Topdemir, H. G. (2009). "Felsefe nedir? Bilgi nedir?" *Türk Kütüphaneciliği,* 23(1), pp. 119-133.

Türkmen, H. (2017). "Visiting Agenda of Adults for Informal Learning Environment: The Case of Sasalı Wildlife Park" *Journal of European Education,* 5 (1), pp.17-26.

Uysal, M. P. (2010). "Öğrenme Stillerinin Bulanık Mantıkla Modellenmesi", *Konya: Selçuk University 4th International Computer & Instructional Technologies Symposium*, pp.1040-1045.

Yıldız, M., Yıldırım, B.F. (2018). "Yapay Zekâ ve Robotik Sistemlerin Kütüphanecilik Mesleğine Olan Etkileri", *Türk Kütüphaneciliği,* 32 (1), pp. 26-32.

Yılmaz, A. (2015). *Sinirsel Bulanık Mantık Modeliyle Kanser Risk Analizi*, Sakarya: Sakarya University Institute of Natural Sciences Unpublished Doctoral Dissertation.

Zadeh, L. A. (1996). "Fuzzy Logic = Computing with Words", *IEEE Transactions on Fuzzy Systems*, 4 (2), pp. 103-111.

Zimmermann, H.J. (1987). *Fuzzy Sets,Decision Making, and Expert Systems*, Boston: Kluwer Academic Publishers, pp.1-14.