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Pioneering Ideas on Fuzzy Logic in al-Miyānajī's Philosophy

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Abstract: It is possible to say that human thinking and logic began with his existence. Although Aristotle, who shaped the world of thought of humanity for two thousand years, is regarded as the father of logic, logic and correct thinking existed before and after him. In this process, Islamic philosophers such as al-Fārābī and Ibn Sina made important contributions. Al-Ghazālī, on the other hand, made Aristotle's logic digested by Islamic schools of thought. Over time, there were philosophers who challenged classical logic and introduced different methods of logic that would surpass it. Among these philosophers, one of the pinnacle figures who had a serious influence on the following periods is 'Ayn al-Qudāt al-Hamadānī al-Miyānajī. al-Miyānajī influenced the following periods both with his views on the philosophy of existence and with his unique logical propositions and principles of thinking that have survived to this day. It can be said that al-Miānajī is the first precursor of the quantum system, the theory of relativity and fuzzy logic. Addressing his views in the context of understanding the background of the era of Informatics and Artificial Intelligence will make a different contribution to our world of philosophy, logic and thought.

Keywords: Al-Miānajī, Zadeh, Aristotle, Logic, Fuzzy Logic, Relativity.

Article Information

el-Miyânecî'nin Felsefesinde "Bulanık Mantık"a Dair Öncü Görüşler

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Öz: İnsanın düşünme faaliyetinin ve mantığın, onun varoluşu ile başladığını söylemek mümkündür. İki bin yıl boyunca insanlığın düşünce dünyasını şekillendiren Aristoteles, mantığın babası olarak kabul edilse de; mantık ve doğru düşünme ondan önce de vardı, ondan sonra da var olmuştur. Bu süreçte Fârâbî ve İbn Sina gibi İslam filozoflarının önemli katkıları olmuştur. Gazzâlî ise Aristoteles'in mantığını İslam düşünce ekollerine hazmettirmiştir. Zaman içinde klasik mantığa meydan okuyan ve onu aşacak farklı mantık yöntemleri ortaya koyan filozoflar olmuştur. Bunlar arasında sonraki dönemler üzerinde ciddi etkisi olan zirve isimlerden biri Aynülkudât el-Hemedânî el-Miyânecî'dir. el-Miyânecî, kendisinden sonraki dönemlere, hem varlık felsefesine dair görüşleriyle, hem de bugünlere kadar uzanan kendine has mantık önermeleri ve düşünme esaslarıyla etkili olmuştur. Denebilir ki el-Miyânecî kuantik sistemin, görelilik kuramının ve bulanık mantığın ilk habercisidir. Bilişim ve Yapay Zeka çağının arka planını anlamamız bağlamında onun söz konusu görüşlerini ele almak felsefe, mantık ve düşünce dünyamıza farklı bir katkı sağlayacaktır.

Anahtar Kelimeler: el-Miyânecî, Zadeh, Aristo, Mantık, Bulanık Mantık, Görelilik.

Makale Bilgileri

Introduction

It is possible to trace the beginning of logic back to the first human thinking activity. It can be said that logic existed with the first thinking human being. One way or another, if a thinking organisation, a logical order potentially exists, one can also speak of the existence of thinking.

The existence of reasoning devices in ancient religious texts, as well as natural health and medical treatment studies in the times before Aristotle (384-322 BC), who is considered the architect of logic, confirms the existence of logic.[1]

Although the fact that both distinction and unification were found in the Indian Rig-Vedas in the X. - V. centuries B.C. was considered "illogical" or "the impossibility of the coexistence of two opposite logics" 50-60 years ago[2]; today, when fuzzy logic is dominant, it is not possible to characterise the same picture as "illogical"; perhaps it stands as the most popular position of logic.

Similarly, in the classical Chinese world, linguistic logic (grammar) and metaphysical logic are found in the XXII-VIIIth century BC.[3] It is seen that the Egyptians and Babylonians had an astonishing art of calculation and mathematics before the Greeks, long before Aristotle; likewise, there is an advanced level of mathematics in Sumerian writing finds.[4] In this context, an "irrationality" to the extent of claiming that there is no logic where there is mathematics cannot be considered scientific and reasonable. However, when we say this, of course, we are not talking about the existence of a work or text on the science of logic in these ancient times.

When we consider this process with its own basic sources, we see that the problems of logic in the history of philosophy and science have manifested themselves in many naturalist philosophers from Thales (620-546 B.C.) to Democritus (460-370 B.C.) before Aristotle on the axis of "the fallacy of the perceptions of the senses and the phenomenon of knowing".[5] However, Aristotle grounded, systematised and revealed the logic that had existed in the natural flow of the world of thought since the past until his time. Aristotelian logic has functioned in the world of thought and science for two thousand years.

As thinking activity increased, logic and mathematics developed, and as logic and mathematics developed, serious thinking, science and technological developments took place. In this process, not only science and technology evolved, but also "classical logic" known as Aristotelian logic. The field, scope and even the "what" of logic, as systematised by Aristotle, have undergone serious changes as a result of important developments in the last century and the first half of this century, and brand new views and systems have emerged.[6]

Although the validity and functioning of Aristotle's logic for two thousand years is mentioned, there were philosophers and thinkers who used logic other than classical Aristotle's logic, albeit in a narrow field and at partial times. al-Fārābī (d: 339/950) and Ibn Sina (d: 428/1037) made important contributions to classical logic and brought new expansions and dimensions to it. This process was characterised by serious philosophical and logical debates. According to Taylan, until al-Ghazzālī (d.505/1111), there was not much positive attitude towards classical logic in the Islamic world. In fact, the pioneering Muslim theologians of the first period rejected classical logic,

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[1] Hamdi Ragıp Atademir, *Aristo'nun Mantık ve İlim Anlayışı* (Ankara: Ankara Üniversitesi Yayınları, 1974), 15-18.

[2] Hilmi Ziya Ülken, *Mantık Tarihi* (İstanbul: İstanbul Üniversitesi Edebiyat Fakültesi Yayınları, 1942), 14.

[3] Ülken, *Mantık Tarihi*, 20.

[4] Von Freytag Löringhoff, *Mantık: Saf Mantık Sistemi*, trans. Takiyettin Mengüşoğlu (İstanbul: İstanbul Üniversitesi Edebiyat Fakültesi, 1973), 10.

[5] Löringhoff, *Mantık: Saf Mantık Sistemi*, 12.

[6] Doğan Özlem, *Mantık: Klasik/Sembolik Mantık, Mantık Felsefesi* (İstanbul: İnkılâp, 2004), 363.

especially Aristotle's understanding of Category, as harmful in the context of Islamic beliefs in general, and "quarreled with Aristotelian logic".[7]

In the history of Islamic thought and logic, al-Ghazzālī is an important intersection that should be emphasised, studied and not missed in the context of legitimising logic. In this context, Ayn al-Qudāt al-Hamadānī al-Miyānajī (d. 525/1131), one of the pioneering thinkers of Azerbaijan, who lived in the same neighbourhood and in a period so close to al-Ghazzālī that we can say he was related to him, who gave hints of a new and different system of logic, and who was one of the pioneers of the school of love, light and symbols, is also one of the important cornerstones. al-Miyānajī is one of the thinkers with an original system of logic and ontological thought.

Even in many doctoral dissertations that I have closely followed, which examine the philosophical background of fuzzy logic, it is not mentioned whether the early Islamic philosophers put forward a different view in this context,[8] and it is not even necessary to investigate whether there is any approach to quantic system or fuzzy logic. Even this framework gives special importance to al-Miyānajī's views on the quantum system and fuzzy logic and the particles of knowledge.

Classical logic, which shaped the world of humanity's thought and science for a long time such as the 20th century, has been replaced by logistic/symbolic logic since the middle of the XIXth century. It is possible to say that the most remarkable, widespread and current one among these new logics and thinking systems that surpass classical Aristotelian logic is "fuzzy logic". Following the new logic studies and probability theories, the "fuzzy logic" system has taken over science and technology as a whole since the 1970s.

Fuzzy logic, introduced by Prof. Dr. Lotfi Alesker Zadeh (1921-2017), born in Baku, Azerbaijan, in 1965, is a logic system created by transcending classical logic. Fuzzy logic developed by Zadeh introduces a paradigm in which truth values are expressed in degrees instead of "binary absolutes". Fuzzy logic is an important and current form of logic derived from fuzzy set theory to create the concept of "partial truth" in which the truth value can vary between true and false, in contrast to classical "dualistic logic" which requires a proposition to be either completely true or completely false. This new logince, which allows various degrees of truth in the same proposition, is particularly useful in structures and systems that are indexed to "uncertainty" and "ambiguity", such as control systems and artificial intelligence applications.[9]

In the thought system of Ayn al-Qudāt al-Hamadānī al-Miyānajī (d. 525/1131), one of the Islamic thinkers immediately after al-Ghazzāli, we come across serious propositions and new approaches that go beyond classical logic and caress fuzzy logic. Al-Miyānajī's propositions in question, his pioneering and new approaches that influenced the centuries after him are the focus of our article. In the context of discovering the roots and ancient foundations of fuzzy logic, this study may be a beginning.

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[7] Necip Taylan, *Mantık (Tarihçesi-Problemleri)* (İstanbul: Marifet Yayınları, 1981), 67-69.

[8] Yücel Yüksel, *Puslu Mantık ve Felsefi Arka Planı* (Istanbul Üniversitesi Sosyal Bilimler Enstitüsü Felsefe Anabilim Dalı, Ph.D. Dissertation, 2006), 5-7; Şevki Işıklı, *Kuantum Mekaniği İlkelerinin Felsefi İçerimleri* (Ankara Üniversitesi Sosyal Bilimler Enstitüsü Sistematik Felsefe ve Mantık Anabilim Dalı, Ph.D. Dissertation, 2011), 162-223; Metin Koçhan, *Bulanık Mantığın Yeni Fiziği Betimlemedeki Rolü ve Felsefeyle İlişkisi* (Ankara Yıldırım Beyazıt Üniversitesi Sosyal Bilimler Enstitüsü Felsefe Anabilim Dalı, Ph.D. Dissertation, 2022), 8-10.

[9] Lütfi A. Zadeh, "Fuzzy Sets", *Information and Control* 8 (1965), 338-353; George J. Klir - Bo Yuan, *Fuzzy Sets and Fuzzy Logic: Theory and Applications* (New Jersey, 1995), 12-15.

1. Place and Foundations of "Fuzzy Logic" in Logic Science

Logic can be defined as the processing mechanism and road map of the mind in thinking, thinking functions and expressing its thoughts in a correct, consistent, valid and result-producing way. While Grüberg-Onart defines logic as "the science that deals with the rules that determine the consistency of propositions and the validity of inferences",[10] Emiroğlu-Altunya defines the science of logic as a discipline that reveals the rules and laws of logical, that is, correct and consistent thinking.[11]

The word "logic" derives from the Arabic word "nutk", which means "to speak" and "to express something with sound and letters whose meanings are known".[12] The word "nutk" is the Greek equivalent of "logos", which means both "reason" and "speech". Therefore, logic (logos) entered Arabic in the sense of thinking or knowledge of speech, and through Arabic into Turkish.[13]

Although some sources in the history of philosophy say that Heraclitus (535-475 BC) was the first philosopher to use the word "logos", there is considerable evidence that the word logos was widely used before him.[14] It can be said that a "natural logic" was in operation before Aristotle (384-322 BC). It would be absurd to say that the Miletian thinkers from Thales (624-546 B.C.) to Anaximander (611-549 B.C.) and Anaximenes (585-548 B.C.) in the pre-Socratic period, with reasoning devoid of experimental apparatus, made their approaches and inferences that the origin or first principle (arkhe) of everything is "water", "apeiron" or "air" with a logic devoid of "logic". As a matter of fact, Guthrie writes:

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> "The first reason likely to occur to a modern mind is that water is the only substance which can actually be observed, without any apparatus of experiment such as was not available to Thales, to change, according to its temperature, into solid, liquid and gaseous form. That therefore is the reason given for Thales's choice by some modern scholars, for example Burnet. But it was not the reason that occurred to Aristotle, and though he, like ourselves, was making a conjecture, it is possible that he came nearer to the mind of his Ionian predecessor.".[15]

In addition, Heraclitus' cosmos, which evolved from "fire", can be considered as a reactionary reasoning and natural logic inference.[16]

Going back further, the Divine Book and mythologies inform us that the first humans shaped their lives through observation, reasoning, data interpretation and inferences based on natural logic. As a matter of fact, the Holy Qur'an tells us that Adam's son (Cain), who killed his brother (Abel), learnt from a "crow" the process of burying his brother's corpse in the ground, and applied the knowledge he obtained through observation and comparison.[17] Rabbi Eliezer in Pirke De Rabbi Eliezer, one of the Jewish sources among the Torah commentaries, writes that Adam and his wife were mourning over the body of their son Abel, who was protected from predators by his dog, when a raven (from the crow family) came and they saw it burying another dead bird of its kind in

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[10] Teo Grünberg - Adnan Onart, *Mantık Terimleri Sözlüğü* (Ankara: Türk Dil Kurumu Yayınları, 1976), "Mantık", 93.

[11] İbrahim Emiroğlu - Hülya Altunya, *Örnekleriyle Mantık Sözlüğü* (İstanbul: Litera Yayıncılık., 2018), "Mantık", 210.

[12] Muhammad b. Ya'kûb al-Firûzâbâdî, *el-Kâmûsu'l-Muhît*, ed. Enes Muhammed eş-Şâmî - Zekeriyya Cabir Ahmed (Kahire: Daru'l-Hadis, 2008), "ntk", 1622.

[13] Emiroğlu - Altunya, "Mantık", 210-214.

[14] William K. C. Guthrie, *A History of Greek Philosophy* (Cambridge: Cambridge University Press, 1962), 1/419-424.

[15] Guthrie, *A History of Greek Philosophy*, 1/61.

[16] Heraclitus, *Fragmanlar*, trans. Cengiz Çakmak (İstanbul: Kabalcı Yayınevi, 2005), 89-90.

[17] Diyanet İşleri Meali (Yeni), *Kur'an-ı Kerim Meali*, trans. Halil Altuntaş - Muzaffer Şahin (Erişim 13 Ağustos 2024), al-Mā'ida 5/31.

the sand, and they buried their son in the ground after that observation and reasoning.[18] These data show that observation, comparison, data interpretation and inference are natural logic processes that have existed since the first human beings. In short, human beings did not start to think logically with Aristotle's logic.

1.1. Aristotle's Stamp on The Science of Logic

When his works are examined, it will be realised that neither logic nor dialectics have a place in Aristotle's system of sciences. However, as Bochenski points out, although logic may have been seen by Aristotle as a "tool" to be learnt before these sciences, this perspective does not mean that Aristotle did not see logic as a "theoretical discipline". As a matter of fact, Aristotle's intense endeavour in logic and the place he allocated to logic in his system are indicative of this.[19]

The fact is that Aristotle (384-322 B.C.) compiled and wrote his book on the principles of the ancient and natural order of logic that had existed up to his time in a way so radical that it influenced the centuries that followed him. The system of logic he constructed was valid for about two thousand years, including the centuries of medieval Islamic enlightenment.

For two thousand years, "Aristotle the logician" played an active role in the world of human thought and science, as much as "Aristotle the metaphysician" and perhaps even more than him, with his knowledge of the syllogistic logic that fills rational thought and the necessary.[20] While Aristotle was satisfied with "analytics"[21] by eliminating his predecessor "dialectic", which expressed "possibilities"; in reality, he was locking the systematic of thought and logic into black-white duality.

However, Aristotle's theories of logic are not only a system of thought, but also important in terms of mathematical modelling and algorithmic thinking.

In Aristotle's logic, "probability" and "possibility" naturally exist. He even mentions "the law of probability" in his system of logic.[22] In Aristotle's system of logic, we see "coincidence and chance", which we can call a form of quantification of "possibility". As a matter of fact, while Aristotle accepts the existence of three states in the relationship between cause and effect in his system of logic, he mentions the third state as "chance and coincidence". However, according to him, coincidence is not a real state but an "accident".[23] Despite all this, Aristotle does not regard "probability" as knowledge in his system of logic; he states that "because of the diversity of the middle term, probabilistic things are neither knowledge nor of syllogistic value as proofs".[24] Ibn Sina, Aristotle's able student and commentator, even follows his teacher and prefers to repeat that "the few and equally probable are not used in the sciences".[25] For this reason, it is hardly possible to see the concept of probability/coincidence in Aristotle as an ancient reference for fuzzy logic.

We can say that fuzzy logic is not based on Aristotle's principles of absolute truth and falsity; instead, it recognises a spectrum of degrees of truth. Zadeh's theory of fuzzy logic has improved

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[18] The Great Rabbi Eliezer, *Pirke De Rabbi Eliezer*, trans. Gerald Friedlander (London: Kegan Paul, Trench, Trubner & Co. Ltd, 1916), 156.
[19] Joseph M. Bochenski, *Ancient Formal Logic* (Amsterdam: North Holland Publishing Company, 1951), 25.
[20] Atademir, *Aristo'nun Mantık ve İlim Anlayışı*, 11.
[21] Atademir, *Aristo'nun Mantık ve İlim Anlayışı*, 72-73.
[22] Aristotle, *The Poetics of Aristotle*, trans: Butcher S. H., (London: Macmillan and Co. and Newyork, 1895), 31, 33, 99.
[23] Aristotle, *al-Tabi'a*, v. I, trans: Ishaq b. Hunayn, Commentary: Ibn al-Samh, Ibn Adiyy, Metta b. Yūnus, Abū al-Faraj Ibn al-Tayyib, Critical ed. Abdurrahman Bedawi, (Egypt 1984), 111, 118, 121-122, 125-126.
[24] Aristotle, *Kitab-u Analutika al-Ûla ev Kitabü'l-Kıyas*, In the: *al-Nassü'l-Kâmil li-Mantıkı Aristu*, 3rd Volume, Prepared. Ferid Jebr, (Beirut: Dar al-Fikri al-Lebanese, 1999), 226; Aristotle, *al-Tabi'a*, 124-125.
[25] Ibn Sīnā, Abū ʿAlī Ḥusayn b. ʿAlī, *al-Shifa al-Mantik 4 - Qiyas*, v. 2, Prepared. Said Zaid, (Cairo, 1964), 176.

logical reasoning processes, especially in cases of uncertainty and multivalence.[26] In this context, building a bridge between Aristotle's systems of logic and modern fuzzy logic can perhaps help us understand the dynamic and evolutionary nature of logic.

According to Smith, Aristotle's work on logic includes the mathematical foundations of logic, and these foundations have contributed to the development of modern theories of logic.[27] Smith argues that there is a striking similarity between Aristotle and modern theorists of logic. According to him, Aristotle not only presented a system of deductive inference; he also made this system itself the object of theoretical study.[28]

It is possible to see the protective approach of some scientists and logicians of the Western world towards Aristotle as an effort to give Aristotle his due, in spite of the fact that the fuzzy logic and modern thinking mechanisms that have marked the information age have far surpassed Aristotle's logic. As a matter of fact, the state of probability and possibility seen in Aristotle's logic is not accepted as knowledge even in his own system.

1.2. Contributions of Islamic Philosophers to The Science of Logic

The influence of Aristotle's theories of logic on Islamic thought is widespread and profound. Islamic philosophers such as Ibn Sina and al-Fārābī took Aristotle's theories of logic, developed and integrated them into their own philosophical systems.[29] In particular, al-Ghazālī introduced logic as a legitimate tool in Islamic thought and made it digestible, and in this process, Aristotle's influence became much more pronounced. al-Ghazālī's works on logic provided serious guidance on how logic should be used in Islamic sciences.[30]

The transmission of Aristotelian logic to the Islamic world, like the transmission of philosophy, took place through new conquests and translation activities. Muslims became acquainted with Aristotle's philosophy, especially the developed form of classical logic, in and around Syria, which was conquered in the middle of the VIIth century, and they began translation activities in the VIIIth century.[31] According to Timuçin, Ibn Sina adopted Aristotle's entire understanding of logic, while al-Ghazzali took Aristotle as an example.[32]

Ibn Sīnā (d. 428/1037), who not only devoted chapters to the science of logic in many of his basic philosophical works such as Uyūn al-Hikma and al-Shifā, but also wrote two works on logic (Mantiq al-Mashrikiyyīn, Qasīdat al-Muzdawīja fi al-Mantiq), increased the number of chapters to nine by including al-Īsāgūjī to the corpus of logic, which had existed as eight chapters until him. He also added new things to logic and subjected it to a different arrangement; logicians such as al-Zernūjī (d. 600/1203), al-Khūnajī (d. 646/1248), al-Abharī (d. 663/1265), and al-Urmawī (d. 682/1283) took Ibn Sina as the basis for their works.[33]

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[26] Zadeh, "Fuzzy Sets", 338.

[27] Robin Smith, "Aristotle's Logic", *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta - Uri Nodelman (Metaphysics Research Lab: Stanford University, Winter 2022), 45.

[28] Robin Smith, "Grote on Aristotle's Logic", *Brill's Companions to Classical Reception*, Critical ed. Kyriakos N. Demetriou, Volume 1 (Leiden: Brill, 2014), 369.

[29] Majid Fakhry, *A History of Islamic Philosophy* (New York: Columbia University Press, 2004), 134-143.

[30] Abu Hamid Muhammad al-Ghazzâlî, *The Incoherence of the Philosophers*, trans. Michael E. Marmura (Provo: Brigham Young University Press, 2000), XVII-XVIII, 8-11; Abu Hamid Muhammad al-Ghazzâlî, *Mi'yâru'l-İlm / İlmin Ölçütü*, trans. Hasan Hacak - Ali Durusoy (İstanbul: Türkiye Yazma Eserler Kurumu Başkanlığı Yayınları, 2023), 28-44.

[31] Nihat Keklik, *İslam Mantık Tarihi ve Al-Fārābī Mantığı (İslam Mantığının Kaynakları, Süryanilerde Mantık ve İslam Mantıkçıları)* (İstanbul: İstanbul Üniversitesi Edebiyat Fakültesi Yayınları, 1969), 1-2/68-69.

[32] Afşar Timuçin, *Aristoteles Felsefesi* (İstanbul: Kavram Yayınları, 1976), 158.

[33] Keklik, *İslam Mantık Tarihi ve Al-Fārābī Mantığı (İslam Mantığının Kaynakları, Süryanilerde Mantık ve İslam Mantıkçıları)*, 1-2/58-59; al-Fārābī, *Mantığa Başlangıç Risaleleri*, 39.

Although Ibn Sina seems to differ from al-Fārābī by stating that logic is not concerned with words in terms of signifying meanings, and thus accepting logic not only as a prescriptive tool but also as an independent science whose subject is the second intelligibles, he also developed al-Fārābī's ideas.[34]

Considering al-Fārābī's (d. 339/950) works on logic and his influence on the following centuries, al-Fārābī, who is known as "Muallim al-Sânî" in philosophy in the Islamic world, can also be seen as "Muallim-Sânî" in logic. Al-Fārābī characterises classical logic as an "art". According to him, the name of the art of logic is derived from the word "nutk/speech".[35]

As a matter of fact, the concept of logic in Western languages comes from the Greek word "logos", which means "reason, thinking, law, order, order, principle, word, etc."[36] When we look at the meanings of the Greek root, it expresses both word, reason, thinking, principle and order.

In his Kitab al-Mantik and Kitab al-Burhan, al-Fārābī, while discussing the concepts of "uncertainty" and "certainty", examines the nature of logical inferences and the ways of reaching knowledge, and provides indirect indications of how uncertainty and ambiguity can be handled in logical analyses.

As a matter of fact, in his Kitab al-Burhan, while discussing the methods of reaching certain knowledge, it is possible to associate some of his evaluations on how uncertain or incomplete information should be handled with the concept of "uncertainty", which forms the basis of modern fuzzy logic theories. In addition, while discussing the definition and classification of concepts in the context of how logical inferences should be made in his chapters on the certainty of concepts and propositions in his Kitab al-Logic, it is possible to associate the indirect signs he exhibits on the axis of the fuzziness and uncertainty of concepts with the fuzzy boundaries of concepts and sets in modern fuzzy logic.[37]

If we read al-Fārābī's logic through definition and description, it is possible to find approaches that open the door to fuzzy logic. As a matter of fact, he says that while it is not possible for a single species to have many definitions, it can have many descriptions; conversely, while each species has only one definition, it can also have many characteristics.[38] Although al-Fārābī's works on logic and philosophy are not directly related to the theories of fuzzy logic in the modern sense, it is possible to say that the chapters he opened on the axis of the concepts of uncertainty and certainty bear some similarities with the foundations of the fuzzy logic system.

Ibn Sina (d. 428/1037), known as Avicenna in the Western world, is one of the Islamic philosophers whose works in the field of logic have serious similarities with the concepts and principles of modern fuzzy logic. It is even possible to interpret his contributions to logic, especially his detailed treatment of propositions, as pre-shaping some aspects of the system that emerges today as fuzzy logic. Indeed, Ibn Sina's allowing partial membership in quantitative propositions in his logic can be said to be directly related to membership functions and fuzzy set theory in fuzzy logic.[39]

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[34] Tony Street, *İslam Mantık Tarihi*, trans. Harun Kuşlu (İstanbul: Klasik, 2014), 41.

[35] al-Fārābī, *Mantığa Başlangıç Risaleleri*, 42.

[36] Özlem, *Mantık: Klasik/Sembolik Mantık, Mantık Felsefesi*, 27.

[37] Abu Nasr Muhammed al-Fārābī, *el- Mantık 'İnde'l-Fârâbî*, ed. Refik al-'Acem (Beyrut: Daru'l-Meşrık, 1985), 1/85-112; Abu Nasr Muhammed al-Fārābī, *Kitabu'l-Burhan*, ed. Majid Fakhry (Beyrut: Daru'l-Meşrık, 1987), 45-78.

[38] al-Fārābī, *Mantığa Başlangıç Risaleleri*, 50.

[39] Abū ʿAlī Ḥusayn b. ʿAlī Ibn Sīnā, *Kitab al-Najāt fi'l-Hikmah al-Mantikiyya wa't-Tabiiyya wa'l-İlahiyya*, ed. Majid Fakhry (Beirut: Dâr al-'Afâq al-Jadīda, 1985), 43-63; Zadeh, "Fuzzy Sets", 339-350.

In addition, Ibn Sina not only clarifies that positive "conditional" propositions can be universal or in a certain form, but also deals with the degrees of "certainty" and "uncertainty" of these propositions by classifying certain propositions. According to Ibn Sina, the degree of certainty of certain propositions may vary according to whether they are valid under certain conditions or not; in this context, it is stated that "conditional" propositions may be valid for certain situations or may be accepted as true under certain conditions.[40]

Ibn Sina's treatment of quantitative propositions in terms of the extent to which a predicate applies to a subject resembles the ratings seen in membership functions in fuzzy logic, where an element can belong to a set to a certain degree, either "completely" or "not at all".[41]

Likewise, Ibn Sina, who distinguishes between "absolute" and "conditional" truths in terms of qualitative propositions, accepts that certain propositions are true under certain conditions or contexts, opening the door to the more variable and dynamic truth structure present in fuzzy logic, where the "truth value" depends on the "context" or "degree of certainty".[42]

Aristotelian logic has been so effectively embedded and rooted in the procedure of basic Islamic sciences such as theology and fiqh that Islamic thinkers and scholars, especially the schools of theology and fiqh, have been engaged in thinking and judgement according to Aristotelian logic. Al-Ghazzālī had a significant influence on this. It can be said that with his views in his works such as Miyaru'l-Ilm, Mekasidu'l-Falasifa and Tehafut al-Falasifa, he legitimised and almost traditionalised the classical understanding of logic in the wide circle of science in the Islamic geography.

Although al-Ghazzālī, in al-Munkīz, also mentioned some of the evils of the logicians and spoke of a permissive type of logic that would lead those who are not familiar with the investigation of religious sciences to "kufr / apostasy"[43]; he generally regards Aristotelian logic as a science of means that has no positive or negative aspect regarding religion. According to al-Ghazzālī, logic is "miyar", that is, the measure; it is the measure of reason. Logic (the science of measurement) is to the intellect what "arûz vezin / arûz prosody" is to poetry and "nahiv / syntax" is to "i'rab / desinential inflection". Logic is the scales of reason.[44]

Al-Ghazzālī seems to have internalised taking logic, which is the measure and scale of the intellect, from Aristotle and operating the intellect with his system of classical Greek logic; he speaks of him in a flattering manner. As a matter of fact, he states as follows: Aristotle was the one who organised the science of logic, and made the philosophical sciences easily usable. In this way, the hard-to-understand parts of these sciences became easier to understand.[45]

1.3. The First Seeds of Fuzzy Logic and its Current State

Even though the concept of "fuzzy logic" in the modern sense does not exist in al-Ghazzali's world of logic and thought, as in the Muslim philosophers before him, it is possible to associate some of his views with the concepts of uncertainty and fuzziness in the system of "fuzzy logic".

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[40] Nicholas Rescher, "Avicenna on the Logic of 'Conditional' Propositions", *Notre Dame Journal of Formal Logic - University of Pittsburgh*, IV/1, (1963), 51-52, 57.

[41] Lenn E. Goodman, *Avicenna* (London: Routledge, 1992), 197-199.

[42] Dimitri Gutas, *Avicenna and the Aristotelian Tradition* (Leiden: Brill, 2014), 204-206; Didier Dubois - Henri Prade, *Fuzzy Sets and Systems: Theory and Applications*, ed. William F. Ames (London: Academic Press Inc, 1980), 45-49.

[43] Abu Hamid Muhammad al-Ghazzâlî, *el-Munkızu Mine'd-Dalâl*, trans. Hilmi Güngör (Ankara: Maarif Basımevi, 1960), 34.

[44] al-Ghazzâlî, *el-Munkızu Mine'd-Dalâl*, 30.

[45] al-Ghazzâlî, *el-Munkızu Mine'd-Dalâl*, 29.

According to him, the knowledge and worlds below the "realm beyond the intellect" are blurred, uncertain, and a kind of imagination.

al-Ghazzali, who discusses the narrow functioning of the senses and the limitation of rational knowledge in his al-Munkiz, is of the opinion that the human intellect cannot always attain certain knowledge. Therefore, the world of the senses and the intellect, which al-Ghazzali outlines, is an uncertain, blurred, and imprecise realm.[46]

al-Ghazzali imagines the human knowledge-intellect process as realms within realms, like a matryoshka. In the realm of the senses (mahsūsat), man works with the data of the senses, which are limited, uncertain and doubtful. He passes from the realm of the senses to the stage of appeal. Here he perceives things that are not in the realm of senses. After the stage of appeal, he travels to the realm of reason.

Here, he learns basic propositions, necessary and contrary knowledge, and finds the possibility of comparison. This field of reason is also a kind of "imagination" realm. However, there is beyond, there is the realm and knowledge beyond the intellect, which cannot be perceived with the intellect. The process and stage up to the realm beyond the mind is a doubtful, limited and uncertain process, a delusion, in short, the stage of sleep. Until the human being reaches the reality of the realm beyond the intellect, this is the realm of certain knowledge. This is the realm of truth, heart, enlightenment, clairvoyance and "waking up from sleep", which in Islamic literature is called "revelation" for prophets and "inspiration" for distinguished people other than prophets. According to al-Ghazzali, every moment and every being are variable realms that carry form within form, possibility within possibility, doubt within doubt, and reason within reason until they reach the truth or prophethood, which is beyond reason.[47]

In al-Ghazzali's system of logic and knowledge, "1" is not only one and "0" is not only zero in the realm of senses/sensations, appeal, and intellect; there are different ones in 1 for everyone and different zeros in 0 for everyone. In the field of prophethood, which is beyond reason, "1" is one and only one. This point of view, which opens the door to modern fuzzy logic, is one of al-Ghazzali's basic perspectives.

In the XVIIth chapter of his Tehafut, al-Ghazzali underlines that physical existence/matter is also recreated every moment "with the manifestation of divine power"[48] (Qur'an 55:29), but the intellect cannot realise this "every moment existence" due to habit. Giving the example of fire and cotton, al-Ghazzali states that he believes that it is permissible both to burn and not to burn in the meeting of fire and cotton, and explains the modes and details of this occurrence. According to al-Ghazzali, it is possible for the same being to be 1 and 0 at the same time. In fact, according to him, what is impossible for the intellect and sub-realms below the "supra-rational realm" may not be impossible for the supra-rational realm. al-Ghazzali's approach of "multiplicity" in "unity" opens the door to the possibility of many possibilities between 1 and 0. This should be an important pioneering reference for fuzzy logic.[49]

Similarly, al-Ghazali's views on "nūr/nour" and "ishraq" can be seen as an approach that contains the first important references to "relativity" and "fuzzy logic".[50]

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[46] al-Ghazzâlî, *el-Munkızu Mine'd-Dalâl*, 15-21, 84-90.
[47] al-Ghazzâlî, *el-Munkızu Mine'd-Dalâl*, 67-72.
[48] Diyanet İşleri Meali (Yeni), *Kur'an-ı Kerim Meali*, al-Raḥmān 55/29.
[49] al-Ghazzâlî, *The Incoherence of the Philosophers*, 166-177.
[50] Abu Hamid Muhammad al-Ghazzâlî, *Mişkâtü'l-Envâr*, trans. Süleyman Ateş (İstanbul: Bedir, 1994), 15-17.

Ayn al-Qudāt al-Hamadānī al-Miyānajī (d. 525/1131), who can be said to be right next to al-Ghazzali, is the forerunner of al-Suhrawardī Maqtul (d. 587/1191), the pioneer of Isrākism, in whose system of contemplation the approach of fuzzy logic and relativity is most original, first and most obvious. He is also one of the important Islamic thinkers who is considered to be the spiritual master of Ibn al-'Arabī (d. 638/1240), the pioneer of Wahdat al-Wujud. The main axis of our study is al-Miyānajī's pioneering ideas in the context of fuzzy logic.

The systematisation of fuzzy logic, the pioneering ideas and some basic references of which we find in al-Miyānajī, one of Azerbaijan's early greats, by another Azerbaijani scientist makes the subject even more interesting and attractive.

In the modern period, fuzzy logic, which was introduced by Azerbaijani scientist Lotfi A. Zadeh in 1965, aims to better model human thought processes, especially in the presence of uncertainty and ambiguity. Unlike Aristotelian logic, Zadeh's fuzzy logic approach accepts the fact that a proposition may be partially true or partially false and uses fuzzy set theory to express this situation mathematically.[51] According to Zadeh's fuzzy logic system, the degree to which an element is a member of a set can take a value between 0 and 1.

While summarising the principles of Zadeh's fuzzy logic system, scientists point out that in fuzzy logic, thinking based on approximate values is used instead of thinking based on exact reasons, everything is represented by a certain degree in the interval [0,1], every logical system can be expressed as fuzzy, and fuzzy logic is very suitable for systems whose mathematical model is difficult to obtain.[52]

The mathematical foundations of fuzzy logic include fuzzy set theory as well as fuzzy relations, fuzzy rules and fuzzy inference systems.[53]

The most important feature of the fuzzy logic system, which makes it very different from others, is that it processes "information based on perception" instead of "information based on measurement". This is the biggest dilemma of probability theory, because probability lacks the use of "perception-based knowledge". In the fuzzy logic system, there is no need to be bound by numbers to make inferences and calculations; it is possible to make verbal inferences and perform calculations with words. Knowledge based on perception is more general, while knowledge based on measurement is narrower. In this context, it can be said that since perception-based knowledge also includes measurement-based knowledge, the fuzzy logic system can be considered to have internalised the function of probability theory. Both theories explaining uncertainty are similar to each other.[54]

It can be said that the fuzzy logic system is a lively logic system that has penetrated and transformed many areas of logic, mathematics and geometry and has the ability to renew itself according to the conditions. As a matter of fact, we see fuzzy logic in the fields of fuzzy sets, fuzzy relations, fuzzy graphs, fuzzy numbers and operations, fuzzy functions, fuzzy derivative, fuzzy integral, fuzzy geometry etc.[55]

Since the last quarter century, the place of fuzzy logic in science and technology has become quite common and indispensable. It has found application especially in fields such as engineering, artificial intelligence, control systems, economics and medicine. It is possible to say that fuzzy logic

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[51] Zadeh, "Fuzzy Sets", 340-348.
[52] Nazife Baykal - Timur Beyan, *Bulanık Mantık İlke ve Temelleri* (Ankara: Bıçakçılar Kitabevi, 2004), 41.
[53] Klir - Yuan, *Fuzzy Sets and Fuzzy Logic: Theory and Applications*, 12-18, 45-50.
[54] Baykal - Beyan, *Bulanık Mantık İlke ve Temelleri*, 313-314.
[55] Baykal - Beyan, *Bulanık Mantık İlke ve Temelleri*, 53-305.

applications and artificial intelligence technologies have also accelerated the Transhumanism movement. In this respect, we can say that fuzzy logic will be a serious determinant in the philosophy, science, technique and world of the future.

2. Fuzzy Logic System in al-Miyānajī's Philosophy

The martyred South Azerbaijani saint Ayn al-Qudāt al-Hamadānī al-Miyānajī, whose pioneering ideas and fundamental views on fuzzy logic are mostly found in his works "Zubdat al-Hakaik" and "Shaqwā al-Garīb", is one of the important figures in the history of Islamic thought.

When al-Hamadānī's works are analysed, it is seen that his scale of knowledge, thinking and reason is very different and unique from other philosophers and people of wisdom. In al-Miyānajī's philosophy, the Absolute Knower and Absolute Knowledge is God, unchanging, omniscient and creator. He is both absolute knowledge, absolute scholar, and absolute teacher. Anything other than Allah is open to all kinds of possibilities.[56]

In al-Miyanajī, the fields of reason and knowledge are intertwined and related to each other in various contexts. Each field has its own levels and categories. In these intertwined fields, it is possible for something that can be true (1) from one perspective to be false (0) from another perspective at the same time. Between these two, there is an intermediate field that can be considered both existent and non-existent. It is possible to see these fields, which al-Miyānajī calls "tawr", as "sets" in the fuzzy logic system.[57]

al-Miyānajī characterises these "attitudes" as "the realm of reason / tawru al-ʿaql", "the realm beyond reason / tawru vera al-ʿaql", and the realm of "present/wahm", which means "nothing" as a point between these two realms.[58] According to him, these fields are not independent, disconnected, and separate fields, but rather multiple and transitive "tawrs" that are interrelated and intersect with each other. In other words, between 0 and 1, there are multiple numbers and meanings that are both 0 and/or 1 or neither 0 and/or 1.

In this context, in al-Miyānaji's logic system, it is possible to see concepts such as "absolute many", "absolute few", "relative many" and "relative few" in the context of quantity and quality. While there is no difference between them in terms of "knowledge/science" in the field of "essence", which al-Miyānajī describes as "absolute knowledge", they differ in the field of intellect. According to al-Miyānajī, "In God's knowledge, absolute many is like absolute few without any difference".[59]

It is possible to see the philosophical implications (ontological and epistemological) of quantum mechanics, relativity/relativity theory, and fuzzy logic in al-Miyānajī's main works, especially Shaqwā al-Garīb. In al-Miyānajī's philosophy of knowledge, there is only one "absolute knowledge", and that is the "knowledge of God". Any knowledge other than His knowledge is not absolute and open to possibilities.

We can say that al-Miyānajī adopted a multi-possibilistic and paradoxical mindset, arguing that knowledge in the "created/existent world" is not absolute and that some situations can be

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[56] Ayn al-Qudāt al-Hamadānī al-Miyānajī, *Temhîdât - Aşk ve Hakikat Üzerine Konuşmalar*, trans. Halil Baltacı (İstanbul: Dergâh Yayınları, 2015), 14-16, 57-67.

[57] Ayn al-Qudāt al-Hamadānī al-Miyānajī, *Zübdetü'l-Hakâik*, ed. Ahmet Kamil Cihan, trans. Ahmet Kamil Cihan vd. (İstanbul: Türkiye Yazma Eserler Kurumu Başkanlığı, 2016), 70-72.

[58] al-Miyānajī, *Zübdetü'l-Hakâik*, 70-72, 89, 91, 95.

[59] al-Miyānajī, *Zübdetü'l-Hakâik*, 90, 94.

both true and false. Therefore, it can be seen that in his philosophical, logical and theological approaches, he put forward ideas that foreshadow the quantic system and fuzzy logic.

As a matter of fact, al-Miyanajī himself discusses how the same thing can be both true and false in the ontological context and tries to offer a perspective through persuasive methods:

"There is a sequential order in the emergence of beings from it. Some of the entities are prior, such as the compounds, and some of them are posterior, such as the compounds. This is true if we look with the eye of reason. If we look with the eyes of knowledge, this is wrong. The intellect can never realise the truth of this. When the intellect hears something like this, it becomes aroused and protests and says: How can the same thing be both true and false?".[60]

In al-Miyānaji's works, one can also find basic views that go beyond the dichotomic structure of classical logic and accept the existence of a third state. While the principle of "the impossibility of the third option" is one of the essential foundations of classical logic, the view of "the possibility of the third option" is considered one of the characteristics of fuzzy logic.[61]

In al-Miyanajī's thought, something can exist (existent) and not exist (ma'dum) at the same time in the entire sphere of existence other than God, the "Absolute Being"; this is within the realm of possibility. According to him, "something exists in one way and disappears in another. This is a valid judgement for all existent things, except for the one whose existence is self-subsistent".[62]

While discussing the relation of God's attributes with existence, al-Miyānajī explains the possibility and probability of the third option in the "field of being/created" in the context of the possibility of the simultaneous combination of two attributes "Muhyī" (reviver-resurrects) / "Mumīt" (lifetaker-soultaker) that are the same or different or opposite to each other in the same essence, with the following interesting example:

"The number 10 has a meaning understood in itself. This meaning is an indivisible meaning and it is signalled by the word 'ten'. If we consider the ratio of 10 to 5, this is expressed by the word 'times' (that is, we do not talk about it, but about 2 times of 5). If the ratio of 10 to 20 is considered, this is expressed with the word 'half'. If we consider the ratio of 10 to 30, this is expressed with the word 'one third'. When the number 10 is considered in relation to other numbers, it is possible to express it with different words. These adjectives (multiples, halves, thirds, etc.) arising from the fact that the number 10 is characterised according to different ratios are one and the same in one aspect and many in another aspect. When the direction of these adjectives following 10 is taken into consideration, there is no increase and multiplication in the adjectives. When the aspect that follows the parts of the numbers is taken into account, there is an increase in the attributes in terms of proportions, since the numbers attributed to 10 increase".[63]

Al-Miyanajī's approach that "The attraction of each soul to its own body is probably similar to the attraction of iron to a magnet, gold to mercury, and each body to its special place"[64] can be considered as the attraction and interaction of entities from the perspective of the quantum system. This view of his resembles the concepts of attraction and interaction in quantum mechanics.

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60 al-Miyānajī, *Zübdetü'l-Hakâik*, 154.
61 Baykal - Beyan, *Bulanık Mantık İlke ve Temelleri*, 39.
62 al-Miyānajī, *Zübdetü'l-Hakâik*, 108.
63 al-Miyānajī, *Zübdetü'l-Hakâik*, 110, 114.
64 al-Miyānajī, *Zübdetü'l-Hakâik*, 192.

al-Miyānajī sees "tawr al-ʿaql" as a field of empirical experience based on sensory perceptions and rational interpretation, and " tawru vera al-ʿaql" as a completely different and separate field of knowledge from sensory perceptions and rational interpretations. The transitive "wahm" attitude in between is formed by the intersection and correlation of two seemingly independent fields. In this respect, the last part of "tawr al-ʿaql" is the beginning of the "attitude beyond reason". Therefore, even if each concept in his system of existence is the same in terms of terms and words, it may contain "multiple" and "distinct" meanings in these basic fields and transitional fields.

al-Miyānajī adds three new fields to these three intersecting fields/clusters of intellect and knowledge. According to him, there is the "attitude of wilayat" armed with "qurb/love" as an intermediate transitional attitude after the "supra-rational attitude".

After these, i.e., the attitudes of supra-rationality and wilayat, there is the realm of "prophethood" related to the essence of Wahjullah / God, which is "Absolute Beauty", "Absolute Knowledge" and "Absolute Love".[65] The equivalent, value and meaning of the same thing in each world are very different. According to him, the same being, concept, and knowledge acquire different meanings and forms according to these fields. al-Miyānajī draws attention to the diversity of knowledge as well as the ways of acquiring knowledge.

Thus, for example, what is "1" in the field of Zāt can be "0" in the attitude of intellect, "0.1" in the attitude of estimation, "0.5" in the attitude of supra-rationality, "0.7" in the attitude of Qurb (proximity to Allah), and "0.9" in the attitude of prophethood.

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al-Miyānaji also mentions the relativity of intellect and knowledge. According to him, what the attitude of intellect perceives or says exists in relation to the attitude of the beyond intellect and the world is not real; perhaps it should be called "estimation". However, according to al-Miyānajī, this does not mean that everything perceived by estimation is not true. For the realities that each attitude perceives are different. As a matter of fact, what is perceived by the irrational attitude is a secret for the rational attitude.[66] al-Miyānajī explains this relativity with the following metaphor:

> "The eye perceives sensible things, and its judgement about them is divided into true and false. For example, while its judgement that 'this piece is this much' is true, its judgement that 'the size of the sun is the size of a shield, and the size of the stars is the size of a dinar' is a false judgement. False judgements are based on the inability of the eye to perceive the distance as it perceives the near. Likewise, you should know with certainty that the judgement of the intellect, 'Allah exists, is one, is eternal, and is the Creator,' is a correct judgement. Its judgement that 'Every existence, including the affairs of the Hereafter, must be realised' is absolutely wrong. After this, you should know that Allah, whose sovereignty is sublime, is infinitely distant from the mind's eye, just as the sun is distant from the eye. It is impossible for the intellect to perceive Him because of His infinite distance and the completeness of His realisation. The relation of the mind's eye to perceive Him is like the relation of bats to perceive the light of the sun. The relation of the 'ârif – weli / saint' to perceive it is like the relation of man to perceive the roundness of the sun. The existence of the bat in terms of the sun and the existence of the human being in terms of the truth cannot be imagined".[67]

al-Miyānajī emphasises the limits of reason and the importance of spiritual and metaphysical experiences beyond it. This approach coincides with the capacity of fuzzy logic to process uncertainty and imprecise knowledge. According to him, the irrational attitude is a level of

[65] al-Miyānajī, *Zübdetü'l-Hakâik*, 74, 83, 86, 94.
[66] al-Miyānajī, *Zübdetü'l-Hakâik*, 208.
[67] al-Miyānajī, *Zübdetü'l-Hakâik*, 204.

understanding beyond knowledge; this level is associated with a transcendental experience. It is possible to say that his approach parallels the ability of fuzzy logic to process "uncertain" and "imprecise knowledge".

According to al-Miᶜānajī, 'a' is not always 'a'; according to him, beings, objects, and concepts other than God do not have absolute reality, but are multi-formed realities.[68] Such that, according to al-Miᶜānajī, each part or even letter of reality does not have the same meaning for one person as it has for another; the same concept has different meanings for each person. al-Miᶜānajī says, 'What is said to Zayd is not said to Amr. What Khalid sees, Bakr cannot see'.[69] In other words, while 'a' is 'a' for Zayd, the same 'a' is not the same 'a' for Amr at the same time. Al-Miyānajī states that 'the light that exists in any breath, even in a certain breath, is different from the light that exists before and after it' and considers this as a necessary rule.[70]

In al-Miānajī, the truths have at least seven invisible (subtle, internal, and veiled) aspects in addition to having a visible (zāhir) face that varies according to the 'attitude of intellect' and 'perception'.[71] al-Miānajī states that 'intellectual matters are divided into matters that have two aspects and matters that have three aspects in any respect'.[72] According to al-Miyanajī, the view that objects and concepts are intertwined and multifaceted can be regarded as the basis of his philosophy of existence. al-Miyanajī considers it intellectually possible for a thing to be both itself and something else; 'for example, a thing can be existent in one aspect and non-existent in another'.[73] It is possible to interpret his approach in parallel with the principle of fuzzy logic that 'a' is not always 'a' because probabilistic and different truths are hidden in the truths between 0 and 1.

Al-Miyānajī[74], who holds the view that the diversity of perception, knowledge, and souls cannot be limited, exemplifies the idea that the same thing can appear in the form of different truths with the 'drop metaphor':

> "A drop in the sea can see itself as the sea. If you say that the drop is different from the sea, that is true. If you say that the drop is from the sea, that is also true. If you say that it sees itself in the sea, this is also true. However, it is not possible to express our intention completely... Saying the majmal in detail causes some issues that turn geometrical talismans upside down".[75]

The plurality and relativity based on perception and perception in concepts such as truth and falsity in al-Miyānajī's philosophical logic points to the characteristic of 'the existence of intermediate values' and 'perception-based information processing' that we observe in fuzzy logic.

Because the most important feature of the fuzzy logic system, which makes it very different from others, is that it processes 'perception-based knowledge' instead of 'measurement-based knowledge'.[76]

By emphasising the limited cognitive capacity of the intellect, al-Miyanajī lays the foundations of the concept of "uncertainty", one of the main principles of fuzzy logic. According to

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[68] al-Miyānajī, *Zübdetü'l-Hakâik*, 62.
[69] al-Miyānajī, *Temhîdât - Aşk ve Hakikat Üzerine konuşmalar*, 15.
[70] al-Miyānajī, *Zübdetü'l-Hakâik*, 150.
[71] al-Miyānajī, *Temhîdât - Aşk ve Hakikat Üzerine konuşmalar*, 12; *Zübdetü'l-Hakâik*, 162, 166, 188.
[72] al-Miyānajī, *Zübdetü'l-Hakâik*, 166.
[73] al-Miyānajī, *Zübdetü'l-Hakâik*, 30.
[74] al-Miyānajī, *Zübdetü'l-Hakâik*, 188.
[75] al-Miyānajī, *Temhîdât - Aşk ve Hakikat Üzerine konuşmalar*, 230.
[76] Baykal - Beyan, *Bulanık Mantık İlke ve Temelleri*, 313-314.

him, the intellect cannot always reach complete and certain knowledge; this is contrary to its creation; sometimes it has to make decisions in uncertainty. According to him, in fact, the intellect was created for the cognition of the a priori, which does not need premises. It is as if its cognition of the difficult aspects of theoretical matters through inference and thinking with premises is outside its essential natüre.[77] In this field that transcends the intellect, an extra-rational attitude / "tawru vera al-ʿaql" and natüre / "fıtrat" are necessary.

Al-Miyānaji considers the intellect's inability to access knowledge outside its original nature as a natural arrangement, not a deficiency, and clarifies the issue with the difference in knowledge and perception between the sense of touch and the sense of sight:

"This is just like the fact that the sense of touch was originally created to perceive tactile objects in the sense that they are tactile. When a blind person uses the sense of touch to infer the existence of something perceived with the sense of sight, this is outside the nature of the sense of touch".[78]

In al-Miyānajī's system, we see not only the relativity of reason and knowledge, but also the relativity of pleasure, enjoyment, and emotion. According to him, in different people or in different states of the same different person, the pleasure of realising the Truth with a supra-rational attitude and the pleasure of realising the Truth with an intellectual attitude are very different. While a person experiences the pleasure of perceiving the splendour of God with the attitude of the intellect, he cannot experience the pleasure of perceiving the splendour with the attitude of the intellect; its pleasure is a pleasure in terms of being known, like the pleasure of mathematics, medicine, and other objects.[79]

Al-Miyānajī's words, "Know that existents are divided into three parts: substance, accident, and body. The body is subordinate to these two and is not a medium for anything other than these two. Each of these has a truth for the other" [80] can be seen as a discussion of the concepts of existence and essence that form the basis of the quantum system, as well as the possibility of immaterial entities in the physical world.

It is possible to say the following: Fuzzy logic and quantum mechanics, which have manifested themselves in the last half century, have not yet completed themselves, have not yet been systematised with their basic propositions, frameworks and results, and therefore are not stable, static and closed to development. On the contrary, it can be characterised as a process-structure that feeds on uncertainty, updates itself by utilising all the relative/relativistic possibilities of time, and improves its existence with each new possibility. Contemporary philosophical researchers and science-thinkers have begun to discuss whether the affirmative relationship between classical mechanics and classical logic can be established between quantum mechanics and fuzzy logic; they have taken the approach that new phenomena require new logics.[81] In this context, we can say that al-Miānajī's views on fuzzy logic should not be considered separately from his quantum approaches. In fact, it is clear that it would be useful to consider al-Miānajī's works and views from the perspective of relativity and quantics as well as fuzzy logic.

As a matter of fact, new logics and mechanics have emerged in proportion to modern science's departure from the classical mechanical understanding, and even started to dominate

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[77] al-Miyānajī, *Zübdetü'l-Hakâik*, 88.
[78] al-Miyānajī, *Zübdetü'l-Hakâik*, 88.
[79] al-Miyānajī, *Zübdetü'l-Hakâik*, 92.
[80] al-Miyānajī, *Temhîdât - Aşk ve Hakikat Üzerine konuşmalar*, 230, see also: 178-179.
[81] Işıklı, *Kuantum Mekaniği İlkelerinin Felsefi İçerimleri*, 71.

technology as in fuzzy logic. Such that quantum mechanics, general systems theory, Gödel theorems, fuzzy logic, etc. are some of them. This process is a process with a deep history and deep-rooted background. In this, it is possible to say that pioneers such as al-Miyānaji and contemporary people of thought, science and wisdom such as A. Zadeh have made significant contributions to this process.

Conclusion

In conclusion, it can be said that logic and thinking methods in the world of existence are as old as the beginning of thinking due to the existence of human beings. Although Aristotle is regarded as the father of logic, logic existed before him and will exist after him. In fact, today, logic and thinking systems are progressing at a much faster pace than before, showing continuous development.

In the history of Islamic thought, many philosophers, especially al-Fārābī (d. 339/950) and Ibn Sina (d. 428/1037), made important contributions to classical logic and brought new dimensions to it; so much so that these Muslim philosophers made serious contributions to the preservation of the validity and functionality of Aristotelian logic for two thousand years.

Although the validity and functionality of Aristotelian logic for two thousand years is mentioned, there were also philosophers and thinkers who used logic other than classical Aristotelian logic, albeit in a narrow field and at partial times.

The fact that many Muslim philosophers in the Islamic world until al-Ghazzali contested with many principles of Aristotelian logic not only contributed to the development of classical logic, but also enabled the establishment of the basic principles of thinking and logic systems other than classical logic.

Although al-Ghazzali made vital contributions to the absorption of Aristotelian logic by Islamic schools of thought, in the period coinciding with his time, representatives of the school of love such as Ayn al-Qudat al-Hamadani al-Miyānajī laid the foundations of logic systems different from classical logic.

It is possible to see many of the basic principles of the fuzzy logic system, which humanity has become acquainted with through Zadeh's works, in al-Miyānajī's philosophy and world of thought. In this context, al-Miyānajī can be regarded as the precursor of the quantic approach and fuzzy logic.

al-Miyānajī, one of the pioneering names of Azerbaijan's world of science and thought, clearly and clearly reveals that "absolute knowledge" is only with Allah. He considers the other than God, i.e. the whole created world, as a "field of possibilities". In addition, al-Miyanajī's ontological and epistemological views on the "possibility of the third option", his discussion of the possibility that everything can be both true and false at the same time, his mention of systems resembling the concepts of attraction and interaction in quantum mechanics, and his views that draw attention to the ontological and epistemological relativity of reason, time, space, knowledge, and existence, it is possible to see him as the precursor of the quantum era and fuzzy logic.

Considering Azerbaijani-born Zadeh's fundamental studies on fuzzy logic in modern times, a wide-scale consideration and re-evaluation of al-Miyānajī's views in the context of the quantic system, relativity theory and fuzzy logic will open up many different scientific and philosophical horizons for humanity.

Mehmet Emin Koç

el-Miyânecî'nin Felsefesinde "Bulanık Mantık"a Dair Öncü Görüşler

Genişletilmiş Özet

İnsanın düşünme faaliyetinin ve mantığın, onun varoluşu ile başladığını söylemek mümkündür. İki bin yıl boyunca insanlığın düşünce dünyasını şekillendiren Aristoteles, mantığın babası olarak kabul edilse de; mantık ve doğru düşünme ondan önce de vardı, ondan sonra da var olmuştur. Bu süreçte Fârâbî ve İbn Sina gibi İslam filozoflarının önemli katkıları olmuştur. Gazzâlî ise Aristoteles'in mantığını İslam düşünce ekollerine hazmettirmiştir. Bu süreçte Aristoteles'in klasik mantığıyla cedelleşen, klasik mantığı aşan farklı mantık önermeleri ve düşünme yöntemleri ortaya koyan düşünürler olmuştur. Bunlar içinde kadim, özgün ve kendisinden sonraki dönemlere ciddi etkileri bulunan zirve isimlerden biri, Azerbaycan'ın görkemli bilgini şehit veli Aynülkudât el-Hemedânî el-Miyânecî'dir. el-Miyânecî, kendisinden sonraki dönemlere ve düşünürlere, hem varlık felsefesine dair görüşleriyle, hem de bugünlere kadar uzanan kendine has mantık önermeleri ve düşünme esaslarıyla etkili olmuştur. Bu bağlamda el-Miyânecî'nin kuantik sistem, izafiyet/görelilik kuramı ve bulanık mantığa dair görüşleri son derece dikkat çekici, özgün ve orijinaldir. Konunun ilginç ve tevafuk olan tarafı ise, klasik mantığa karşı ve onu aşan önermeleri ve matematiği içeren "bulanık mantık"ın, modern dönemde bir başka Azerbaycan asıllı bilim insanı tarafından sistemleştirilmesidir. 1965 yılında Azerbaycan asıllı bilim insanı Lütfi A. Zadeh tarafından ortaya atılan bulanık mantık, özellikle belirsizlik ve bulanıklığın bulunduğu durumlarda insan düşünce süreçlerini daha iyi modellemeyi hedeflemektedir. Malumdur ki, Aristoteles mantığında bir şey aynı anda hem doğru hem yanlış olamaz. Bu temel yaklaşımın aksine; geçmişte el-Miyânecî ve modern dönemde Zadeh'in bulanık mantık perspektifi, bir önermenin kısmen doğru veya kısmen yanlış olabileceği gerçeğini kabul etmektedir. Zadeh, bu durumu matematiksel olarak ifade edebilmek için bulanık küme teorisini kullanmaktadır. Zadeh'in bulanık mantık sistemine göre, bir elemanın, bir kümenin üyesi olma derecesi 0 ile 1 arasında da bir değer alabilir. el-Hemedânî'nin eserleri incelendiğinde, onun bilgi, düşünme ve akıl skalasının diğer Müslüman filozof ve hikmet insanlarından çok farklı ve kendine özgü olduğu görülmektedir. el-Miyânecî'nin felsefesinde Mutlak bilen ve Mutlak bilgi Allah'tır, değişmezdir, her şeyi bilen ve yaratandır. O hem Mutlak ilim, hem mutlak âlimdir, hem de mutlak muallimdir. Allah'tan gayrısı ise, her türlü olasılığa açıktır. Ontolojik ve epistemolojik olarak tek Mutlak varlık Allah'tır; O'nun dışındaki varlık, bilgi ve âlemler Mutlak Varlık ile olan ilintileri nispetince olasılıklı ve opsiyoneldir. el-Miyânecî bu "çoklu" yaklaşımını "tavr skalası" ile açıklamış ve sistemleştirmiştir. el-Miyânecî, söz konusu "tavr"ları, "akıl alanı/tavru'l-akl", "akıl ötesi alan / tavru verai'l-akl" ve bu iki alanın arasında bir nokta kadar "hiç" anlam ifade eden "şimdiki/vehm" alan olarak nitelemektedir. Bu tavr sınıflandırmasını, kendi içinde "zat" alanında olduğu gibi daha detaylandırdığını görmekteyiz. Ona göre; söz konusu alanlar birbirlerinden bağımsız, kopuk ve ayrı alanlar değildir. Bilakis birbirleriyle ilintili ve kesişen çoklu ve geçişken "tavr"lardır. Yani 0 ve 1 arasında, hem 0 ve/veya hem 1 olan yahut ne 0 ve/veya ne de 1 olan birbirleriyle ilintili, kesişen aynı anda tekli/çoklu sayı ve anlamlar söz konusudur. el-Miyânecî'nin mantık sisteminde Mutlak ifadesi de çoklu kavram olarak karşımıza çıkmakta; onun düşüncesinde nicelik ve nitelik bağlamında "mutlak çok", "mutlak az", "izafi çok" ve "izafi az" gibi kavramları görmek mümkün olmaktadır. Nitekim el-Miyânecî'nin "Mutlak Bilgi" olarak nitelediği "zat" alanında "bilgi/ilim" bakımından bunlar arasında hiçbir fark yok iken; akıl alanında bunlar farklılık arz etmektedir. el-Miyânecî'ye göre; "Allah'ın ilminde mutlak çok, hiçbir fark olmaksızın mutlak az gibidir." Bu yaklaşım ve kavramlar kuantik sistem ve bulanık mantığın öncü temel taşları sayılabilir. el-Miyanecî'nin düşüncesinde en çok dikkat çeken görüşlerden biri de; ontolojik bağlamda aynı şeyin nasıl hem doğru, hem de yanlış olabileceğini bizzat tartışması ve bu bağlamda ikna yöntemleriyle özgün bir perspektif sunmaya çalışmasıdır. Varlıkların meydana gelmesindeki düzen, akıl gözüyle görülürken doğru, marifet gözüyle bakılırken yanlış idrak edilebilmektedir. Dolayısıyla el-Miyanecî'ye göre bu tip çelişik durumlarda akıl galeyana gelerek karşı çıkabilmekte; akıl "aynı şey nasıl hem doğru hem de hatalı olur" diye feveran etmektedir. Akıl burada yaya kalmakta; Mutlak ilim ile aydınlanmış marifet ise kendi "tavr"ı nispetince gerçeği idrak edebilmektedir. el-Miyaneci, klasik Aristoteles mantığının dikotomik yapısını kökünden sarsmakta; söz konusu dikotomik yapının ötesine geçen ve üçüncü bir durumun varlığını kabul eden temel görüşler ortaya koymaktadır. el-Miyânecî bu yaklaşımını, Allah'ın sıfatlarının varlıkla ilişkisine dair konuyu ele alırken somutlaştırmaktadır. Ona göre, Allah'ın sıfatlarının zâtının aynı veya gayrı yahut birbirine zıt iki sıfatın (Muhyî-dirilten / Mumît-öldüren) aynı zatta aynı anda cem olmasının yanısıra "varlık/yaratılmış alanında" üçüncü şıkkın imkanı ve olasılığı söz konudur. "Üçüncü şıkkın imkansızlığı" esası klasik mantığın olmazsa olmaz temellerindendir; el-Miyânecî bu temele karşı "üçüncü şıkkın imkanı"nı ortaya koyarak, bulanık mantığın karakteristiklerinden birini inşa ettiği söylenebilir. el-Miyânecî'nin sisteminde tavr içinde tavr, imkan içinde imkan sözkonusudur. Öyle ki, onun sisteminde sadece akıl ve bilgi izafi değil; onun da ötesinde haz, zevk ve duygular da izafi olabilmektedir. Ona göre farklı kişilerde veya aynı farklı kişinin farklı hallerinde akıl ötesi tavr ile Hakk'ı idrak etmenin hazzı ile, akıl tavrı ile Hakk'ı idrak etmenin zevki çok farklıdır. Bu perspektiften bakıldığında denilebilir ki el-Miyânecî, kuantik sistemin, görelilik

kuramının ve bulanık mantığın ilk habercilerindendir. Özgün ve orijinal yaklaşımları, yeni ufuklar açacak "bulanık mantık" şifreleri sunmaktadır.

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