Islam and Science in the Future

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ISLAMIC PHILOSOPHY AND ARTIFICIAL INTELLIGENCE: EPISTEMOLOGICAL ARGUMENTS

by Biliana Popova

Abstract. This essay presents an analysis of different processes of machine learning: supervised, unsupervised, and semisupervised, through the prism of the epistemologies of several prominent Islamic philosophical schools. I discuss the way each school conceptualizes the ontological absolute (immortality, death, afterlife) and the way this shapes their respective epistemologies. I present an analysis of the different machine learning processes through the prism of the epistemological constructs of each of these philosophic traditions. I conclude with the argument that more scholars from the Islamic philosophical tradition should engage in the debates about the development of artificial intelligence and its implications, given that many Muslim countries are among the leaders in this development and its application in everyday life.

Keywords: artificial intelligence; epistemology; islamic philosophy; machine learning

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Many Muslim countries are among the leaders in the development and use of artificial intelligence (henceforth: AI). To mention a few examples: smart cities, smart security systems, smart educational and medical devices, and even *smart judges* who can easily settle property disputes, are being used in countries such as the UAE, Saudi Arabia, Oman, Iran, Pakistan, Malaysia, et al. However, the ideologies and philosophies that underpin AI development and use from an Islamic perspective have yet to receive the attention they deserve. This essay proposes that various epistemological theories from within Islamic philosophical traditions

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could be used as a framework for the analysis of different kinds of machine learning. An understanding of machine learning from Islamic epistemological perspectives is important, in order to enable a fruitful dialogue among the different stakeholders and agents of the AI industry in Muslim countries, be them judges, lawyers, economists, or just regular citizens and users of the devices. The essay is written in the belief that the discussions between scientists and philosophers, and in this case, Islamic philosophers, are crucial for societies in the twenty-first century, in which AI presence in our daily lives is inevitable and imminent.

DEATH, RANDOMNESS, DETERMINISM, AND PROBABILITY

Much of the literature discussing the relationship between AI and humans analyzes some of our deepest questions regarding life and death, and the impact of our beliefs on ethics and meaning. Many of these debates can be grouped into two categories: (a) whether we are capable of transforming inanimate objects, *dead matter*, into animate things, which leads to discussions of what *animate* or living things actually are (Barbour 1999; Insa-Cabrera and Hernandez-Orallo 2011; Parkes and Wellman 2015; Jeavons 2017; Lazarov 2019); (b) what the characteristics of our relationships and interactions with our *intelligent* creations are, given that we are capable of transforming inanimate matter into an animate thing (Jackelén 2002; Kim and Kim 2012; Vicini and Brazal 2015; Pressman 2018). Religion also plays a role in our attitudes toward intelligent devices: a large number of studies claim that relying on Judeo-Christian traditions may allow people to co-exist with virtual reality entities (avatars, uploaded human consciousness in an online space, and so on) than coping with physically embodied devices such, among others, as robots, whereas people from, for example, the Shinto tradition find robots useful and pleasant to coexist with (Geraci 2006; Lee and Sabanovic 2014). Other scholars pay attention to the question of immortality (Rougier 2016; Savin-Baden and Burden 2019): how virtual reality may be the awaited heaven on earth and the impact of this on our ethical and moral beliefs.

I base my essay on the premise that the three main human concerns which religion addresses are life, death, and the ways we know, and thus, interact with the world around us. The way humans conceptualize death is related to the development of different epistemological theories, which, voluntarily or not, are imbedded in the way AI is developed. Hence, in this essay I will outline three different conceptualizations of death and knowledge in the Islamic philosophical tradition and analyze how they relate to three different epistemological principles in AI development.

The structure of my analysis is based on several key notions, namely scientific determinism, randomness, and probability principles[1] of pattern

construction and the way they relate to three ontological absolutes: immortality, death, and afterlife that are viewed differently in Islamic philosophical schools (*madhāhib*): Muʿtazilism[2] and Falsafa,[3] the Ashʿari[4] school and Su¯fism. I also include in the analysis the pre-Islamic beliefs about *dahr* in its sense of the pre-Islamic notion of time that is in the basis of the fatalistic belief that time is the one that destroys life, and there is nothing else beyond the earthly existence, once time has accomplished its imminent destruction. Although *dahr* is a pre-Islamic belief, it plays an important role as the main juxtaposition of the Islamic notions of afterlife.

I argue that the ontological and cosmological theories of the Muʿtazilites[5] and Falasifa deny the creation of the world as a *temporal* phenomenon and, thus, construct an eternal universe in which linear, and not temporal causality is the underlying principle (al-Baghdādī 1994, 127–29). Matter is the actualization of intellect and intellect is the actualization of matter, thus, humans live in eternal ascending and descending movements where matter is a potentiality and through demonstrative logic it is purified and transformed into intellect (Ibn Rushd 1964; al-Fārābī 1995).[6] Muʿtazilite and Falasifa thinkers also held the viewpoint that the Qurʾān was created, rather than eternal which, among the many other theological implications, implies that language is a sociocultural phenomenon and therefore is not a sufficient medium for discovering and establishing universal truths. Rather than the poetics of language, both groups try to create or incorporate in the Islamic philosophical tradition another medium—demonstrative *(burhānī)* logic—and methods that rely on rationalistic analytic, rather than synthetic principles (Ibn Rushd 1964; al-Fārābī 1979; Salim 1983; al-Nadīm 1997; Ibn Sīnā 2007).

The underlying promise that matter, being a potentiality, can be transformed into pure intellect and thus united with the Creator, rejects the fear of death. Death can be overcome, and immortality can be achieved. This promise of immortality implies another postulate: that there is only one way to achieve immortality and that is by obeying the rules of demonstrative logic and rationalistic philosophic thought. Hence, in an interesting way, the promise of immortality provides the basis for an epistemological theory that is underpinned by scientific determinism—rationalized signs and linear causality are the only means through which humans can reach immortality. They can do so only in a strict hierarchical system, guided by philosophers and scholars. Thus, the individual is of importance, but only as far as he or she follows the guidance of universal truths and deontological ethics outlined by philosophers.

The main epistemological belief in Falsafa is that humans can achieve absolute knowledge, because "being" is a result of Allah's (the First Principle's) eternal act of self-cognition (al-Fārābī 1985, 42–51). My argument is that the same epistemological principle can be found in the development of supervised machine learning, in which the input data are

labeled by programmers and which follow rationalistic rules of formal logic and reasoning.

The pre-Islamic belief of *dahr* (time, fate) however, constructs a completely different epistemological theory. When *death* (stillness) is the ontological absolute, then *life* becomes a matter of movement and constant change, and the driving force becomes eros, the strong desire to continue the life of the species—the tribe, the nation, the political coalition (*ʿisaba*), not the life of the individual. The underpinning principle of epistemology becomes mathematical randomness. In this ontological construct, intersubjective links become more important than normative rules or individualistic subjective reasoning. *Idafa* (a structure indicating possession and belonging that implies the use of hermeneutics of parallax in the meaning making process. *Idafa* is a link that shows the meaning of something only in terms of a relation to something else), and not deference becomes the most important epistemological link. All judgments and evaluations are situational, and the analysis of a situation is based on *heterarchical* principles. In other words, the use of *idafa* as an epistemological tool underpins the belief that knowledge of something can be acquired only by understanding its relation to something else, and the nature of the understanding of the relation itself does not have to be subject to one type of hierarchical rules. Knowledge is seen as a heterarchical genealogical process, and thus, essentialism and a determined hierarchy of relations between things are refuted.

The main epistemic postulate is that humans can try to know, but due to their limited abilities, they can never achieve total knowledge, and thus, no evaluation of their actions can be absolute—everything remains relative. Thus, individuals *per se* have little importance, but their actions in different intersubjective situations do because their lives are not as important as the actions that will save the clan, the tribe, the *ʿisaba*, the nation, etc… The same epistemological principles are found in the development of unsupervised machine learning the way it is conceptualized in neoliberal ideologies and posthumanism where the former objective rationalism is rejected as a valid epistemological principle in favor of the validity of multicultural narratives. In the latter, the central role of humans as unique beings is rejected in favor of a more inclusive world view that sees nonhuman beings' existence as equally significant to that of humans.

Ashʿarism as well as Su¯fism, albeit being quite different in their philosophical understandings, held the belief that the ultimate ontological reality is an *afterlife* provided by a "benevolent" God. This ontological belief implies that humans are the favorite creatures and, thus, are the representatives of Allah on earth, which also implies their responsibility and their accountability before a higher power. Their belief that the Qurʾān is "eternal" implies that language—a medium that allows for both formal and antiformal logic—is part of human nature and is as universal

as it is relative to the sociocultural realia. Physical life and physical senses are a crucial part of our ways to know the world and, thus, rationality and formal logic represent only one epistemological path, yet certainly not the ultimate one. Their religious philosophy allows for the concept of free will to retain its importance, since humans are perceived as limited, yet they are held accountable for their actions by the higher power. This, precisely, allow the mathematical principle of probability—between determinism and randomness—to be the basis for the epistemological theory, with the additional understanding that ethics cannot be separated from the process of acquiring knowledge (al-Ghaza¯li¯ 1964; al-Ashʿari¯ 1990). The same epistemological principle is applied in unsupervised machine learning which is developed on the premises that human critical analysis is always necessary in applying the outcomes provided by AI to society.

I would mention that many discussions in the popular media seem to suggest that technology and Islam are *somehow* incompatible or *inherently contradictory*. Such discourses were mainly underpinned by Westerners in general and Europeans in particular in the twentieth century through which they linked industrialization to the concept of progress—a very Marxist understanding, I would add. Let us not engage with such a debate here as then the essay will shift its focus. I only want to emphasize that all Muslim scholars cited here—including al-Fārābī (d. c. 950), al-Naẓẓām (d. c. 835), al- Ghaza¯li¯ (d. c. 1111), Shiha¯buddi¯n Suhrawardi¯ (d. c. 1191)—have discussed and debated at length the relations between scientific knowledge and religion, never in terms of *whether* the two are compatible, but *how* they are compatible; to what extent religion influences the way we acquire scientific knowledge and viceversa and how this is important in everyday life.

Today, we see a grandiose project for building an entirely *smart* city, Neom, in Saudi Arabia that is to be completed by 2025. Yet, this city will be in a jurisdiction of its own, separated from the jurisdiction of Riyadh. AI devices are constantly introduced in the Moroccan higher education institutions, and yet cannot be fully employed due to the centralistic and rationalistic (in the classical Falsafa meaning of the term) ideology that underpins the *modus operandi* of most administrations. Engineering is clearly not the issue. The clashes emerge when the engineers' philosophies are in contradiction with institutional, social, and legal philosophies. Hence, my argument is that more Muslim philosophers and scholars should or need to join the debate on AI development, especially since many Muslim countries are among the leaders in the production and use of AI and smart devices; Islamic philosophy may offer all required theoretical frameworks and epistemological tools for a fruitful engagement with AI development.

Free Will, Death, and Eros

AI development and use is present in our everyday lives and naturally its presence has raised many concerns. I will briefly mention some of these raised by Yuval Harari in *21 Lessons for the 21*st *Century* because on the one hand they are quite popular and exemplify the global discourse on AI development, and on the other hand they serve as a bridge between global questions related to AI and concrete Islamic theories that I will examine later in this essay. Harari explains that the Western liberal notion of free will is based on the premise that no one can ever know a person better than oneself, and since all people were deemed to be equal, then naturally only the citizen, the voter, the customer can make the right choices since they have the power of free will. The relation between knowledge, power, and responsibility is of course, as mentioned earlier, the basis for further debates among Muslim philosophers of all ages. The issue is that in the twenty-first century algorithms are destroying this notion. They know more about us than we do, and they will acquire even greater knowledge in the future. Hence, humans will no longer remain at the center of social, commercial, economic, educational, decisions; we are shifting authority back to the *more knowledgeable*, but unlike the middle ages when the knowledgeable were the religious scholars, now they are the machines. Harari explains that free will has been a useful workable compromise for a time when science lacked sufficient capability to explain our internal processes. Now, we know that biology and chemistry can extensively explain *free will*, and we understand that everything boils down to calculations. Thus, given that machines can *calculate* much faster than we can, humans will eventually give up our authority and rely on AI in all spheres of life (Harari 2019).

Harari's arguments, however, seem to be based on the proposition that the major driver of human advance is the instinct for survival and selfpreservation. Anything which leads to a lengthy, healthy, and *happy* (whatever that concept may imply) life is commendable and whatever leads to the opposite is reprehensible, in the Freudian sense of his *Beyond the Pleasure Principle* (1922). And, in Harari's interpretation, it seems that what we see as *healthy* and *successful* are those actions and decisions aligned not only with the preservation of individual life, but also with the desire to make this life a quality life. In opposition, whatever we see as *unhealthy* are desires driven by the *death-wish*.

For the purpose of this analysis, however, I rely on the axiom that the driving force behind human development is *not* the survival of the individual, but the survival of the species, and that this force shows itself in different epistemological paradigms according to society's beliefs about the ontological absolutes: immortality, death, and afterlife. I shall borrow Freud's term eros, yet I shall use it in the meaning of desire for the

preservation of the species. This notion of eros I support with the notions of the French biologist Gourmont that are synthesized in the statement "The animal cares not about the preservation of its own life, but about its reproduction" (1903, 18). This notion is used in his argument that the formal differentiation between intellect and instinct, in which intellect is taken as superior, is wrong since only intellectual activities that help the preservation of the species are actually transformed into instincts and, thus, passed or transferred genetically. However, the counterpart of eros I do not take as Thanatos in the Freudian sense—I use the common term death.

The reason for these clarifications is that this dualism, death-eros, is crucial for presenting the different ontological beliefs of the Islamic philosophical schools, and thus, for understanding their epistemological theories and the relations between the latter and AI epistemological principles. Hence, eros as used here, is the desire to move, to animate, to fight against stillness and unanimity. This constructed dualism enables me to present the relation between the mathematical principles of randomness, determinism, and probability in different Islamic epistemologies. As previously mentioned, the ontological beliefs about death are the ones that determine the enactment of eros and the different epistemological principles, where—in the pre-Islamic beliefs of *dahr*—death is the ultimate ontology. Eros is acting according to the mathematical principle of randomness, any movement in any direction in order to continue the species, and where the intersubjective relationships are more important than the individual. In Falsafa and Muʿtazilism, *immortality* is the ultimate ontology.

Hence, death's importance shifts from an ontological to an epistemological underlying force and mathematical determinism becomes crucial and with it the need for normativity and a strictly hierarchical structure. The eros drive is limited by a death-like structure: a still and stable one. The importance of the individual is strictly linked to her role in the hierarchical society and this is reflected in the respective epistemological theory. In Ashʿarism and Sūfism, the ultimate ontology is the *afterlife*. Death becomes a secondary ontological principle—a threshold between one state and another that nevertheless keeps the importance of human physicality. Eros' drive then is acknowledged to be limited and to be the subject of mathematical determinism, however, its movements are not completely restricted.

The different ultimate ontologies: death, immortality, and afterlife not only determine the principles of eros, but also the different epistemological theories within each Islamic philosophical school, and they on the other hand can be used as a prism to understand the different AI epistemological principles and their implications.

Immortality, AI, and Islamic Epistemologies

The first AI epistemological principle can be observed in supervised machine learning, where empirical adequacy is the ultimate criteria for success and which relies on statistical regression and, thus, on the principle of mediocrity as known in biology, and where the aim is to deduce an algorithm from a selected input. From an Islamic philosophy point of view, this type of AI development relies on classical Falsafa and Muʿtazilism as their ontological and epistemological positions are positivistic, and they are based on the idea of the epistemological certitude of scientific knowledge. The epistemological approach is normative (the norm is constructed by considering the frequency of the phenomenon within a rationalistic framework) rationalistic, demonstrative, and it can be analyzed within the framework of the cosmological and ontological system developed by Ibn Bājja (1993), al-Fārābī (1995), and Ibn Rushd (1964) among other classical Falasifa. This system is constructed on the belief that the world is eternal, the Qurʾān was created, which also aligns with the Muʿtazilite position (al-Ashʿarī 1990) and thus, normative logic and *kulliyāt* (universal ethical principles) are possible only within a strict hierarchical system. Moreover, the construction of a strict hierarchical system of the types of knowledge or disciplines is the only possible construction that allows learning to take place. If the First Principle, God, emanates being through the excess that is created through His cognition of Himself, then the world exists in an eternal cycle where the link with the active intellect is the one that converts spirit into matter and matter into spirit and through which humans can achieve immortality (al-Fārābī 1995, 30–42). This strongly relates to the futuristic dream of uploading consciousness and achieving immortality through AI, where matter will be overcome at last and humans will be able to live a virtual life without physical constraints.

The classical machine learning methods that are still in use today are statistical and logistic regression. Their aim is to produce simple numerical outputs (statistical regression) or categorical observations (logistic regression) using large amounts of input data. This type of machine learning is used typically for predicting stock market prices, student performance, and potential criminal behavior, among many other examples. The epistemological principle that underpins these processes is usually testing against historical data: retrodiction and regression (Blackwell 2019). Blackwell explains that the process of statistical regression in machine learning originates in the study of eugenics where the term "regression toward mediocrity" was introduced, so in machine learning this process consists in finding an underlying average from the analysis of historical data. Thus, the prediction is the most mediocre explanation.

Statistical regression and logistic regression are used in the context of supervised learning, which has been developed in the tradition of

scientific realism and its epistemological positivism. Even though, as Parisi (2019) argues, the classical view of computation that consisted of tracking effects from pre-established causes (classical programming) has failed, statistical and logistic regressions as machine learning processes continue to be within the tradition of positivist epistemology. Both processes rely on formal logic and official mathematical languages, which makes them instrumental rather than interpretative. The input data are labeled and categorized by the programmers, and the processes follow a hierarchical logical causal structure that is the result of human programming.

The greatest danger of statistical and logistic regression is thus twofold: on one hand, it presents its products as objective results that appear to be immune to critical analysis. However, as Blackwell (2019) points out, their epistemological authority is deemed as *objective* only as long as they replay the programmers' subjective judgments. On the other hand, the outputs of statistical and logistic regression may lead to committing Lord Arthur Savile's crime (Wilde 1998)—if one holds the category of *murderer* to be the basis of investigation, and then through statistical regression a machine points out that most murderers currently serving jail sentences have a strongly expressed fate line on their palms, then they, as a citizens who have a strongly expressed fate line, may murder as well, since they would trust the objectivity of the machine learning output. And, while AI researchers recognize Blackwell's objection that correlation does not imply causation, supervised machine learning and statistical and logistic regressions at their core rely on human categorization and human causal interpretations as principles of programming.

The latter is perhaps a less of an issue; problematic is the claim that the outputs are objective, whereas they can always be traced to the subjective judgment of persons who are hidden from view. (Blackwell 2019). This epistemological principle is also seen in the foundation of classical Falsafa. Al-Fārābī (1995) and Ibn Rushd (1964) claim that social norms should be established not by interpreting ancient texts and traditions, but through the undertaking of vast sociological studies of all ethnicities, cultures, and nations to establish which are universal and which are culturally bound. Then, through demonstrative formal logic these customs and practices should be analyzed, systematized, and categorized to abstract their underlying principles and apply them in Muslim societies. Al-Ghaza¯li¯'s (1961) objection to this proposal consists precisely in questioning the right of philosophers to analyze and categorize: he objects to their seemingly *universal* authority to evaluate and to impose their judgments. The counterargument that Fala¯sifa provide is that rationality is the highest form of human reasoning and it is the only way through which humans can overcome the limitations imposed by their physicality and be part of the cosmic system whose first causal (not temporal) principle is God.

Even if we presume that supervised learning or semisupervised learning does not limit itself to a simple input-output transaction, but goes through a Peircean triadic system of logic, as Parisi (2019) argues it does, the core of the issue remains the same. Parisi explains that when the machine learning applies Peircean triadic logic, it first initiates a process of predicting unknowns through general observations using induction, then it establishes some temporary hypotheses using deduction, which are subjected to new testing against available data by using induction again, and then it establishes new rules though deduction and the process goes on. With each step, the horizons of the framework are expanded, until an acceptable outcome is reached. However, to apply Peircean triadic logic, as Parisi explains, historical regression is not enough. The machine learning process must also include speculative articulation of hypotheses. This process, very much like the processes described in the section on unsupervised learning, is based in pragmatism, but not in terms of utilitarianism, rather, it is based in terms of an epistemological approach, which extracts laws and rules from the analysis of already established social practices. In this sense, no matter how many intermediate stages of broadening the horizon of the framework with speculative hypotheses we have, the initial stage of machine learning still relies on an input of data, as it is categorized and represented by persons and within the social context of the age.

The epistemological principles found in supervised machine learning in general, and statistical, logistic regressions as well as suggested triadic logic have been the focus of philosophical discussions among many Fala ̄sifa and Muʿtazilite. The ideas that *knowledge* is neither Platonic (ideal, *a priori*, recollected), nor Aristotelian (empirical, *a posteriori*), but that it is actually the natural process of humans to *conver*t a posteriori knowledge to an *acquired knowledge*. That knowledge, once acquired, enlarges the net of *a priori* knowledge that humans have and, thus, allows for even further *a posteriori* knowledge to be obtained and this cycle is repeated *ad infinitum*. The assumption is that humans have certain *a priori net*, then they are exposed to the world, they acquire a posteriori knowledge, and insert it in the a priori knowledge net, which, by becoming larger, allows them to collect even more *a posteriori* experiences, convert them to acquired knowledge, and so on. Falāsifa claim that *perfect knowledge* is when knower, known, and knowing coincide, and they say that humans can aspire to that, but it is implied that they can never reach this state because when the three are united, they represent the absolute being—*Islamically* speaking: Allah. What humans do is a constant effort to shorten the distance between knower and known throughout their lives and that is a constant transformation—like alchemy—and is precisely what constitutes *knowledge*, where knowledge is the process of *becoming*. To summarize, the theory of knowledge that al-Fārābī proposes in *Kitāb Taḥṣīl al-Saʿāda* ("The Attainment of Happiness") (1995) is that reality (social, industrial,

scientific) should be observed and studied, common and universal rules abstracted, and on the basis of the observed principles established as valid through demonstrative logic, universal concepts, and theories, and then should be applied to reality once again.

The implications then in statistical and logistic regressions are quite similar to the implications of Falsafa and Muʿtazilism: the processes of supervised learning by using statistical and logistic regressions will enable us to establish universal norms, which, by definition, will represent the *average case*. These norms should be taken as laws and applied to reality. Bearing in mind that the aim of these supervised and semisupervised learning processes is not to describe, but rather to evaluate reality, in order for the evaluation to be consistent and well supervised, the use of formal logic and rationalistic mathematical languages is mandatory. Individualism and exceptions are then not taken into account. The aim of Falāsifa as well as the Muʿtazilites was to construct an ideal and universal society where knowledge would be structurally controlled by the scholars from the respective schools of thought. This aim is a logical outcome from the belief that God emanates being through the process of self-cognition, he does not have anthropomorphic attributes or a special benevolence toward humans, values are deontological, and immortality is achieved by the abstraction of the spirit from matter through rational reasoning. Since immortality can be achieved, *eros* as the desire for life, movement, change, and the continuation of the species becomes an irrelevant factor—human life becomes subject to the mathematically deterministic structure of formal logic.

Dahr, AI, and Islamic Epistemologies

The second epistemological principle in AI is related to unsupervised learning, nonconscious cognition, and an antiformal view of data. The algorithms learn through adjustment and adaptation of their behavior in accordance with a qualitative synthesis of given quantities of data. Unlike the previously described process where deduction is the main *modus operandi*, here abductive thinking and nonmonolithic inferential logic is used. New explanatory hypotheses are constantly developed without being limited by structures of symbolic references. From an Islamic perspective, this processes of thinking and learning relate to the pre-Islamic belief in *dahr* (time, fate), that time is the only factor that controls human life and that death is the ultimate ontology. That makes the epistemological position relativistic and, thus, intersubjectivity as a driving principle prevails over subjectivity. This situation becomes more important than individualism and is closest to the mathematical principle of randomness, and thus, is in the foundation of the notion of posthumanism.

The pre-Islamic belief of *dahr* had a great impact on the cultures and ways of life of people in the Arabic Peninsula (Pavlovitch 2003). The belief

in *dahr* at its core consists of the belief that the ultimate future, or the ultimate reality is death—the inanimate state, matter without spirit, and that it is unavoidable: "What is there but our life in this world? We shall die and we live, and nothing but time can destroy us" (Q 45:24). Within the framework of this belief, the survival of the species becomes extremely important—the fight of eros to avoid death is crucial. When death is the ultimate ontological reality, eros becomes the strongest drive force. The continuation of the species as a sole goal opens infinite possibilities for combinations, situations, and narratives. The individual *per se* becomes of secondary importance. Ethical principles are constructed within complete relativism, because the only meaning making referents are intersubjective connections and meaning making processes within a dynamic society. The ways humans know the world are heterarchical and situational. In other words, the meaning making process relies on signs whose referents can change in accordance to every different situation and whose importance is not subject to a *universally accepted* hierarchical structure.

The epistemological paradigm of the philosophical tradition in which *dahr* is the ultimate ontological power can be paralleled with the epistemological principles underpinning the unsupervised learning process in deep learning approaches to machine learning. Machine learning can be understood as the opposite of programming: machines do not deduce an output from an algorithm, but rather produce the algorithm that produces said output. The rules are not predesigned—they are formulated through the process of supervised or unsupervised machine learning (Parisi 2019). Unsupervised learning consists of allowing the machine to use input data that have not been labeled by humans and which are processed by the machine to uncover patterns and schemas on its own. This process enables the possibility to reduce physical reality to information (Schuurman 2019).

The principle on which unsupervised learning operates may be rooted in antirealism and pragmatism, which in turn is rooted in instrumentalism. Instrumentalism, thus, dictates that the aim of science is mainly to provide with mathematical framework in which the phenomenon has to be saved and embedded. The main criteria that measures the success of the unsupervised learning process is whether the machine has been able to make empirically adequate predictions (Psillos and Ruttkamp-Bloem 2017). And since, from a pragmatism standpoint, successful learning occurs when the machine is able to give adequate predictions, the process of coding is seen as necessary and acceptable, without the need to challenge and question the changes that coding techniques make in the nature of the epistemic content that they manipulate.

While it is true that coding is a process that depends on discretization techniques that rely on established theories, coding itself is usually the result of idiosyncratic problem-solving approaches (Symons and Alvarado 2019). In other words, the algorithmic rules produce patterns from an

irrational assemblage of data, an assemblage that is based on a multimodal logical synthesis of vast quantities of data (Parisi 2019). Parisi compares this process to the nonconscious processes that human brain goes through before the data coding reaches the consciousness level of cognition. She explains that this nonconscious cognition in machine learning performs complex tasks without following the rules of formal languages of mathematics, structure of symbolic reference, and logical order of deduction. On this subject, artificial thinking is beyond the models of deduction and induction and operates within the model of abduction with experimental axiomatics at its core, transforming outputs into inputs on a statistical, rather than causal principle (Parisi 2019). This notion of axiomatics can be related to Abū Bakr al-Rāzī's (d. c. 925) thoughts on the use of formal signs, in which he explains that they are the ones whose correct usage can be proved by demonstrative logic, whereas antiformal signs' use cannot be demonstrated by logic and, therefore: first, they are neither valid nor necessary, but they do represent a possibility, and second, they do not lead to certain and universally valid knowledge (Koetschet 2017, 81).[7] Despite the latter statement, ar-Razi explains that the acquired thus knowledge is persuasive, more adaptive, and more adequate for the people's daily needs (Koetschet 2017).

I would not argue against the practical value of this epistemological principle. However, I would disagree with Parisi's (2019) claim that the abduction of machine learning and the experimental axiomatics of machine thinking are the closest to natural epistemological principles. The main issue is precisely *eros*, no matter how random the data collection, evaluation, and analysis in living organisms is, there is one preprogrammed goal, and to the best of our knowledge, that is the preservation of the species. Without the understanding of eros, every output may be practical and temporarily useful, yet without human judgment, it does represent an arbitrary decision from a god-like entity (Godhead based on AI) (Schuurman 2019) that will remain beyond human comprehension and, thus, lead humanity to the new age of miracles and blind worship.

Afterlife, AI, and Islamic Epistemologies

With the third epistemological principle, AI is again linked with unsupervised AI learning in a position between randomness and determinism that allows for the principle of probability. It relies on logistic regression and categorical, rather than numerical, causation where unknowns have ontological superiority. This, from an Islamic perspective, can be related to Ashʿarism and Sūfism in the sense that there is an understanding of a metaphysical afterlife, which translates into a shared ontological belief of an ultimate metaphysical reality and which, unlike the ultimate physical reality, death, and unlike the notion of eternity and immortality,

still leaves a space for humanism. The notion of humanism thus is safe guarded by the open-ended future, in which everything is possible, but nothing is inevitable. It keeps a balance between conscious and nonconscious cognition, which in turn creates the balance between individualism and collective pragmatism.

Johnston (2004) argues that there has been an epistemological shift in the twentieth century in the development of Islamic science, which consisted of moving from the classical Ashʿarī position favoring specific textual injunctions (*juzʾiyyāt*) that took into consideration public interest (*maṣlaḥa*), to the Muʿtazilite principle of searching for deontological universal ethical principles (*kulliyāt*). From a "classical" Ashʿarī perspective, human moral judgment would always be faulty, since it is always constrained by a sociotemporal context. Therefore, the classical Ashʿarī position supports the modern objection to the seeming objectivism of AI output. The objection that states that while a rational epistemic output may give us the most practical result, a reasoning that is embedded in our social practices and judgments may be wiser to follow (Symons and Alvarado 2019). Hence, the concepts of *ijmāʿ* ("consensus of scholars") and *istiṣlāḥ* ("society's common interest") cannot and should not be overlooked in favor of purely mathematical and scientific outcomes—the latter cannot simply overrule the former.

This leads to the arguments that knowledge without moral and ethical considerations is incomplete and far from perfection, or, as Heck (2006) states, it reminds us of the medieval arguments regarding the superiority of religious knowledge over philosophical knowledge. Moreover, it is arguable that a metaphysical assumption is embedded in every scientific paradigm, and it is precisely these implicit assumptions that provide us with scientific categories. Denying this implies that modern science relies on axioms that are universal and neutral, which is a debatable notion (Mahomediya 2015). If one, however, accepts the metaphysical implication of Allah as a creator and human beings as the Creator's work, one also accepts the notion that humans have a temporal mastery over the physical world, which in itself implies responsibility and accountability. Human responsibility and accountability in its turn implies that uncovering the hidden mechanisms of nature (and subsequently implementing them in AI development) is by far not sufficient as the sole task and goal that has to be accomplished. So, morality, ethics, and values remain central to the Islamic position on acquiring knowledge and in developing epistemological theories. This is at the core of the *Tawhidi* approach that does not separate natural and social sciences and harmoniously develops them (Mahomediya 2015). Revealed knowledge which is projected in ethics and purpose of human life is an inseparable part of the process of acquiring unrevealed knowledge.

Furthermore, if one takes into account Sūfī theories of epistemology, s/he can see that scholars, such as Shihābuddīn Suhrawardī, refuse to

accept demonstrative logic of causal relations. For Suhrawardī, the main epistemological principle is that the formation of knowledge relies on *idafa*, and by *idafa* he actually means the relation between subject and object (Ziai 1990).[8] His philosophy is built on the premise that there are two ways of acquiring knowledge: an indirect way (*ḥusūlī)* by which we acquire knowledge through some form of reasoning and reading of signs, and a direct way (*ḥuḍūrī*), by which the truth illuminates us directly through a mystical experience when knowing subject, knowing object, and knowledge completely coincide—when the I (Arabic: *ana*) and essence (Arabic: *huwiya*) are unified in a specific moment of time (Arabic: *ʾan*) (Habib 2018). This philosophy resonates greatly with the postmodern critique of the epistemological principles embedded in symbolic AI, namely that we cannot separate the kinds of knowledge from the kinds of knowing subjects—no knower is universal and identical to other knowers and politics and ethics are an essential part of knowing (Adam 2000).

Su¯fī Philosophy defends the belief that the essence of man is his soul, which was created by God before the creation of Adam, before their appearance in the world, and in that primordial state, the souls were perfect. This belief is based on the following verse of the Qurʾān: "And [recall] when your Lord took from the children of Adam—from their loins—their descendants and made them testify of themselves, [saying to them], 'Am I not your Lord?' They said, 'Yes, we have testified.' [This] – lest you should say on the day of Resurrection, 'Indeed, we were of this unaware'" (Q 7:172) Ali (2012).

This verse is considered to be the basis of Su¯fī philosophical teachings. When God created the souls, they were created in three categories of essence: animalistic, human, and angelic. The human soul is the one whose essence is positioned between the other two—animalistic and angelic. And since God gave free will to humans—neither animals nor angels have it—then they have the potentiality to *transform* their souls into either an animalistic or angelic ones, and that can be done only through their existence in the material world (Khojeh 2009, 147).

Generally speaking, for Su¯fīs, God, who in essence is both the knowing subject and knowledge itself, created the world in a desire to become the object of knowledge and love vis-à-vis a material creature with a free will—the human being. This understanding is very well exemplified by Ibn ʿArabī's (d. c. 1240) citation of a prophet tradition (*ḥadīth*) in his book *al-Futu¯ḥa¯t al-Makki¯ya* ("The Meccan Revelation"): "I was a hidden treasure that no one knew, and I wanted to be known" (1998, 232).

According to Su¯fī philosophy, God is oneness, not as a sum of multiplicities as it may appear. The appearing multiplicities are only different aspects of His theophany, which are perceived as *different* by their material bodies' human souls, whose perception is highly impaired by the fact that they exist in the world, the fact that they are spatially and temporally restricted phenomena (Chittick 1979). This claim differs from the

Falāsifa's position, which asserts that by his self-cognition, God emanates being and therefore the goal of every human is to reach divine knowledge. The closer humans come to reaching this knowledge, the closer to immortality they are. Sūfīs claim that God should be the object of knowledge that each human has to know in their own way through reason, emotions, and senses. Physical life is precisely the transformation that humans undertake to return to their primordial state of perfection.

Al-Ghazālī and Field (2008) as well as Ibn ʿArabī (1998) explain on different occasions that the sensual experiences that the body has create imprints on the soul, memories, which then become the basis of imagination. Al-Ghazālī argues that sensual experiences such as the scent of a pleasant perfume can lead to the path to God. In a way, Sūfī philosophy defends the idea that the human soul could reach perfection through imagination and art. An art which is not a human creation, but a theophany. This argument is in the core of the Sūfī belief that language as a medium *per se*, as well as the human tradition of *defining* phenomena are obstacles, not facilitators, for humans in their path toward divine knowledge and truth.

The epistemological and ontological beliefs underlining Ashʿarism and Sūfism have three major implications: first, that humans are a combination between their animalistic nature (eros, drive) and their longing for knowing metaphysical truths (and death), which cannot be separated. Second, the existence of a higher power implies the possibility of responsibility and judgment, which creates a balance among mathematical randomness of actions and patterns of behavior, the possibility for the creation of determined social structures, and the calculation of probability. Third, the responsibility that humans have as temporary representatives of the higher power renders individuals important and their choices, as limited as they may be, meaningful. Last, but not least, these beliefs open the possibility for a balance between statistical knowledge that uncovers universal patterns, and the human right to make an evaluation of these patterns, all the while bearing in mind human limitations.

Conclusions

The way different Islamic philosophical traditions conceptualize *death* has a direct impact on the epistemological beliefs that they construct within their respective traditions. Many of the questions that they discuss are found in the discourse of AI development. The epistemological theories from within the Falsafa and Muʿtazilite philosophical traditions here are used as a prism to analyze the epistemological principles of supervised machine learning and to discuss the implications of statistical and logistic regression machine learning processes. The pre-Islamic philosophical belief in *dahr* provides a theoretical framework to analyze unsupervised machine learning epistemological principles and their possible impact

on human life. Ashʿarism and Su¯fi¯ philosophies' epistemological and ontological beliefs are examined as a possible basis for further machine learning development and use in society, a possibility that is based on the premise that unsupervised machine learning can be most useful to humans when humanism remains at the core of the debates.

I would argue that scholars of Islamic philosophy should engage more in analyzing and developing the third of the described paradigms along with the scientists who develop AI because it already is affecting everyday life. The robot Sophia has received citizenship from Saudi Arabia where the smart city of Neom will soon be completed, the UAE has launched an AI Fatwa Service, and Malaysia has been engaged for several years in the debates on smart schools that can also "save your soul" (Thomas and Nayan 2011). Islamic philosophy both in general and in its different schools and their respective ontological, epistemological, and ethical beliefs, have a lot to offer in the discussions on AI development and this should be taken into account, especially if we want to avoid the Godhead phenomenon—humans worshiping a machine simply because their power of knowledge has been taken away from them and their authority—nullified.

Notes

1. These concepts are often used in discussions of Darwinism and evolution. However, I use them here strictly in the mathematical sense of different types of pattern construction that have a role in the construct of epistemological theories in various Islamic schools of thought. As my essay focuses on two main relations: first, the relation between the way ultimate reality is conceptualized and that epistemological theories are constructed and second, the connection between these epistemological theories and machine learning principles, the types of pattern formation are suitable tools that allow the analysis of these relations in epistemology and their application in AI development.

2. Muʿtazilism (also known as *Ahl al-ʿAdl wa l-Tawḥīd*) is considered to be a *rationalistic* school of Islamic Theology. It was founded in the 9th century AD in Basra. Under the Caliph Maʾmūn Muʿtazilism was imposed as the only legitimate theological school in the Abbasside Caliphate. The school embedded in its tradition many notions and epistemological theories borrowed from Ancient Greek and Ancient Persian philosophies (Martin and Thomson, 2004).

3. I use the term *Falsafa* (philosophy) and its derivative term *Falāsifa* to designate the Muslim philosophers from the so-called "Golden Age" of the Islamic world. Many debates in the literature revolve around identifying these Muslim Philosophers as the successors of the ancient Greek philosophical schools-Peripatetics, Platonists, Neo-Platonists, and so on mainly because all of them have not only translated, but also analyzed ancient Greek philosophical works. Without engaging with these debates here, I examine Falsafa as a new phenomenon and not a mere continuation of Euro-Greek Philosophy and thus, I distinguish between the term Falsafa, as understood in the Islamic tradition, and the term Philosophy, as understood in the Euro-Greek tradition.

4. The Ashʿarism school of thought was founded in the 10th century AD in the Abbasside Caliphate. To a great extent, it was formed as a reaction against Muʿtazilism. It is one of the most dominant orthodox theological schools mostly found in Sunni Islam.

5. The creation of the world is a notion that lead to disagreements between Fala¯sifa and Muʿazilites and among each group as well. Among the Muʿtazilites, it is al-Naẓẓa¯m who most notably defends the idea of the eternity of the world, while many others reject it. Among the Fala¯sifa, al-Kindī rejects the notion of the eternity of the world, unlike many others. In other words, I would not claim that all Fala¯sifa and Muʿtazilite agreed upon this notion. But I say that it was a notion they seriously took into consideration. Whereas the temporality creation of

the world may be a very controversial issue, the notions of the potentiality of matter and intellect are widely accepted by both Fala¯sifa and Muʿtazilites.

6. As I do not have access to the original manuscript, I rely on their modern editions.

7. Here I am relying on Koetschet's translation of a newly found source—a treatise on logic by al-Rāzī that was considered as lost.

8. Unlike the *idafa*—the relativist situational relation described in the previous parts of the essay, here al-Suhrawardī indeed adds to the meaning of the term and uses it to emphasize the relation between subject and object in the process of acquiring knowledge meaning making.

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