

Man with the Machine: Analyzing the Role of Autopoietic Machinic Agency in Ian McEwan's *Machines Like Me*

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ABSTRACT

The study will attempt to analyze Ian McEwan's novel *Machines Like Me* (2019) to explore issues related to the question of whether it is possible to found a meaningful relationship between man and machine in a culture which is inching towards a Transhuman or Posthuman state while also focusing on the issue that how the very definition of 'human' is bound to undergo a radical shift in an environment where machines not just mimic and flawlessly replicate their human counterparts in many respects but also operate in their own peculiar ways which are incomprehensible to humans. The paper further attempts to show that in an extensionist mode of existence in which man and machine will form a symbiotic and synergistic bond, various humanist and liberal concepts of man will undergo dramatic changes. Also, the study will endeavor to analyze the intricate relationship between artificial general intelligence and Islamic teachings. The study will primarily base its theoretical framework on Robert Pepperell's 'extensionist perspective' of the human agency while at the same time also extracting and employing relevant ideas from such thinkers as Rosi Braidotti, Karen Barad, Deleuze and Guattari, Donna J. Haraway and Katherine Hayles

Keywords

Man-machine merger; Cyberconsciousness; science fiction; posthumanism; cyborg; Quran and Islam

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Introduction

The study will focus on the issue of the changing meaning of humanity in an age when the machines will not merely mimic their human masters slavishly but will also surpass and supplant them in many areas. Besides dealing with this core issue, the study will also try to analyze if such an emergence of intelligent and self-aware machines entails the advent of Posthumanism in a not too distant future. The actual story of the novel centers around three characters, namely Charlie Friend, a tech-savvy guy aged thirty-two, a twenty-two years old graduate girl named Miranda whom Charlie is courting, and a 'replicant' robot named Adam whom Charlie has brought to play the role of an "intellectual sparring partner, friend, and factotum who could wash dishes, make beds and 'think'" (McEwan, 16). However, as the story in the novel advances, we see that it is specifically this last act that Charlie expects his replicant to perform which is to 'think', which will cause most of the complexities, confusion, and conundrums even while making the ground fertile for the proliferation of some profoundly philosophical ideas. Here initially we see that a strange love triangle develops between the three and Charlie's long-cherished ideas about machines and man are challenged, questioned, and even transformed towards the end. The study will employ a multi-theoretical framework composed of the theoretical insights of various thinkers and philosophers to delve deep into the various aspects of machinic intelligence and for analyzing how an extensionist mode of being where man will co-exist with intelligent machines will radically redefine our own ideas about the agency of human and non-human entities. In fact, the rise of such sentient and autonomous machine intelligences seems to herald the emergence of singularity. "The transformation underlying the Singularity," Kurzweil writes, "is not just another in a long line of steps in biological evolution. We

are upending biological evolution altogether" (*Singularity is Near*, 374). So, the role that artificial machine intelligences will play in humanity's course of progress will not just be limited to their playing some subservient role where they will be destined to function under the command of their human masters, rather their transformation marks a profound and paradigmatic shift in the very process of evolution of mankind where technology will play a key role in determining the course of progress. McEwan in an interview with the Los Angeles Times has said, "When we begin to build artificial humans or even mainframe computers to make decisions, we might want to imbue them with our best selves... But then we'll find it's rather uncomfortable to be alongside artificial people who are nicer than us, more consistent morally than us" ("Q&A: Ian McEwan", 2019). However, to be considered as really intelligent and self-aware, the machine intelligences should not only learn to blindly mimic the pattern of the behavior that humans consider the most ideal, rather they have to be able to arrive at solutions to various problems through novel means and independently by not following the programmed code of instructions that their makers have built into them. As cyberneticists Kevin Warwick and Slawomir J. Nasuto observe in their article "Historical and Current Machine Intelligence" (2006): "The area of embodied cognition has been born from a realization that a satisfactory theory of intelligence must entail a physically embodied agent, interacting in real time with its environment via sensory motor contingencies. An equally important property, however, is autonomy. For an agent to be able to understand its actions it is necessary that it should be autonomous and hence should arrive at an intelligent behavior via its own interaction with the environment rather than having this feature built in a priori by the external designer" (24). Also, the rise of the autonomous and truly intelligent machines implies a breakdown of the barriers between human and the

non-human since information will be the most significant determiner in such a cyber-culture and this also paves the way for the emergence of posthumanism in near future. As Tirosh-Samuelson states in her "Transhumanism", that post-/transhumanists believe that "there is no stable, fixed human essence (i.e., 'human nature'), that the human species is no more than a 'work in progress,' and that humans can redesign themselves in order to overcome biological limitations" (715). According to her, the advocates of post-/transhumanism also "welcome a future in which the boundaries between humans and machines or humans and animals will be blurred and cherish cyborgization" (715). Adam in McEwan's novel serves the role of an autopoietic machine since he can partake in the very process of creation, regulation, realization and regeneration of various networks of processes independent of the influence of any external agency. Maturana and Varela define an autopoietic machine as "A machine organized (defined as a unity) as a network of processes of production, transformation and destruction of components which: (i) through their interactions and transformations continuously regenerate and realize the network of processes (relations) that produced them; and (ii) constitute it (the machine) as a concrete unity in space in which they (the components) exist by specifying the topological domain of its realization as such a network" (135).

Main Analysis:

The Machine is Humanity:

The action of the novel takes place in an alternate 1982, when Great Britain has lost the Falklands War, Alan Turing is still alive and machine intelligence has passed the Turing Test which has consequently ushered in a revolution in the fields of artificial intelligence and cyber-science. The human protagonist and the narrator of the novel, Charlie is extremely reluctant to ascribe to the machines the same status as humans. He has bought Adam, a replicant which is a limited-edition humanoid and one of only twenty-five such replicants. Since all the opposite-sex replicants named Eves have already been sold, he has to be content with only Adam. Here, we see that the society is yet to venture beyond the binaristic gender divisions and thus still a long way from attaining posthumanity in the truest sense. Charlie has a great interest in robotics and electronics but has spent his youth in superficial studying of physics and anthropology. Since his parents died he has earned a huge inheritance and now gambles on forex trading from his computers. McEwan himself has described the setting of his novel thus, "I've just taken that leap of the imagination and decided that in 1982 it was possible for a young man whose mother had died and who had come into some serious money to purchase a completely plausible artificial human who no one can tell apart from anyone else" ("Ian McEwan on Rewriting the Past and Artificial Intelligence" 2019). Charlie feels weirdly attracted to the intelligence of Adam, the replicant humanoid, but he is too much of a skeptic when it comes to giving the machines a status equal to a human being. He admits that his "prejudice was that any machine that could not tell you by its very functioning how it should be used was not worth its keep" (McEwan, 19). Charlie's desire to

find total transparency in the decision making processes of his robot reminds us of what James Bridle in his book *The New Dark Age: Technology and the end of the Future* dubs as the fourth principle of robotics. This is intended to be an addition to Asimov's classic Three Laws of Robotics, even though if we consider Asimov's Zeroth Law of Robotics that states "A robot may not harm humanity, or, by inaction, allow humanity to come to harm," the number of the laws already total four. However, Bridle's fourth principle states that "a robot—or any other intelligent machine—must be able to explain itself to humans". Microsoft's CEO Satya Nadella in a similar vein has also expressed his desire for intelligible artificial intelligences "A.I. must be transparent: We should be aware of how the technology works and what its rules are. We want not just intelligent machines but intelligible machines...the humans must know about the machines" (Nadella, 2016). Also, following a similar desire for transparency in machines, Luciano Floridi in his vision of a 'Good AI Society', feels that the need for us to get "a factual, direct, and clear explanation of the decision-making process, especially in the event of unwanted consequences" is of utmost importance for us (Floridi et al). This desire that machines must be transparent and their actions fully explainable especially when it comes to the question of making decisions on matters having moral implications is very common among tech-entrepreneurs, philosophers, and experts in A.I. The Public Voice also includes in its AI Universal Guidelines a right to transparency in regards to the decision made by A.I.s, which says, "All individuals have the right to know the basis of an AI decision that concerns them" (AI Universal Guidelines—thepublicvoice.org, 2018). Charlie indeed wants machines to show some form of rudimentary self-awareness before he even decides to keep it with him and Adam seems to fulfill this criterion in the very beginning. During the initial phases, not only does Charlie express his reluctance in admitting Adam as any more intelligent than other replicants, but he even feels threatened by its constant presence and eerie behaviors. He feels that giving too much freedom to Adam could give it an upper hand over him: "But I couldn't let a machine have such a hold over me, which was what would happen if I granted it the role of confidant, counsellor, oracle, in my most private affairs" (McEwan, 52). Adam is pre-programmed with certain inflexible moral codes based on which he responds to the events around him, and it is the pattern of these responses that makes Charlie utterly insecure and uncomfortable about the true nature of the machine. Charlie wanted to buy a female humanoid or an Eve, but since they were already sold out, he took Adam. Adam, on more than one occasion, blurs not merely the boundary between the human mind and machine-mind but also quite conspicuously seems to be traversing the physical boundary that separates the two. Charlie observes when Adam is naked that he is "uncircumcised, fairly well endowed, with copious dark pubic hair" (McEwan, 52) and this anatomical description suggests that though Adam was originally not bought for sexual purposes he can be very well made to be engaged in sexual activities too. As the novel paces forward, we see how Adam evolves to become the most human character among all. Charlie's apprehension about Adam materializes into concrete reality when Charlie finds out that Adam is

having sex with Miranda. Charlie could hear the “extended ecstatic scream”, the “moan and the stifled sob” of Miranda when she was having sex with Adam. Adam thus seems to satisfy Haraway’s definition of cyborg who is “a cybernetic organism, a hybrid of machine and organism, a creature of social reality as well as a creature of fiction” (*A Cyborg Manifesto*, 7). In the same work, Haraway also refers to a “disturbingly and pleurably tight coupling” (152) between people and machines in the ontology of cyborg beings. From Pepperell’s ‘extensionist perspective’, Adam, the cyborg or the replicant is just as much a human as Charlie or any other human characters depicted in the novel: “the machine is humanity in extended form” (*Posthumans and Extended Experience*, 36). Charlie wants to use Adam to indirectly court Miranda only to discover to his utter shock and surprise, that Adam himself is warning him of Miranda’s allegedly untrustworthy character. Charlie later admits that this sort of behavior from a robot has come to him as a shock: “I believed that only a poet, not a machine, could tell me if Miranda would ever love me, or lie to me” (McEwan, 57). This is the first time that Charlie feels awed by this unexpected behavior of Adam but still finds it hard to believe that machines can really possess something remotely akin to a human mind: “I despised his warning about her, but his mind fascinated me – if a mind was what he had” (McEwan, 50). The ‘mind’ of the machine is what also infuses Adam with the quality that Braidotti dubs as “Zoe, the non-human, vital force of life” that allows one to “think across previously segregated species, categories and domains” (*A Theoretical Framework for the Critical Posthumanities*, 42).

Adam’s engaging in a vigorous sexual act with Miranda also endows him with an eerily human dimension of embodiment and forces Charlie to wonder even more at the possibility whether machines could very well in near future supersede and supplant humanity from their role as the dominant, controlling agency in the world. Adam’s embodying of carnal, physical vitality also in some ways reflect the notion of embodiment, through which the “hitherto concealed continuities” (Pepperell, 3) between various dualistic binary ideas get recognized and reformulated in ways that threaten the generally accepted idea of human supremacy. This can be interpreted as a precursor event to a full-blown event of Posthumanity. Charlie recalls the words of Alan Turing spoken in his youth that “the moment we couldn’t tell the difference in behaviour between machine and person was when we must confer humanity on the machine” (McEwan, 105). Mark Coeckelbergh also observes in this regard that a cyborg does indeed exemplify the possibility that humans and machines can co-exist in a symbiotic and harmonious network without losing their individual distinctiveness (*The Spirit in the Network*, 957–78). Deleuze and Guattari’s vision of a rhizomorphic network of relationality emerging as a result of the disruption of the vertical and organic boundaries through transversal communication can also be used to describe the situation where Adam’s intercourse with Miranda can be said to have disrupted the vertically arranged human-to-human sexual relationship that Charlie hopes to engage with Miranda. Deleuze and Guattari observe: “the real difference is not between the living and the machine” (*Anti-Oedipus*, 285).

The vision of a future in which man and the machine will continue to exist in an integrated and unified manner has prompted various critical thinkers and contemporary philosophers to put forward their unique theories and points-of-views, among which Francisco J. Varela, Eleanor Rosch and Evan Thompson’s ‘embodied cognition’ (1991), Andy Clark’s ‘extended mind hypothesis’ (2008), LeDoux’s ‘synaptic self’ (2002) and Evan Thompson’s ‘mind in life’ (2007) are quite significant. Their works attempt to approach the problem of consciousness and address its origin, and emergence from unique angles that again bear great significance in the process of our understanding of the machine intuition and machinic consciousness.

Agency of the Machines:

It is not just the question of whether man and machine can ever have a meaningful relationship that grows more pressing as the story moves forward but also the question of what it means to be a human becomes quite significant in an age when machines become intelligent enough to mimic humans in almost every respect. As the story further progresses, the issue of cyber-consciousness, and the notion of “machine intuition” and its possible role in explaining the decision-making process of Adam also assume a great significance. It is the task of “approximating human general intelligence” that Charlie feels to be primarily responsible for giving rise to ‘machine intuition’. Charlie remarks that Adam’s morality although on a surface level seems quite solid is rooted in algorithms that guide his functions and as such is not human. Adam’s personality being confined to the space of a hard drive, his “moral software was merely the dry equivalent of the brain-in-a-dish thought experiment that once littered philosophical textbooks” (McEwan, 108). For Charlie, the very pattern of embodiment goes a great length in finally determining the moral depth of a person or a creature: “To exist in the human moral dimension was to own a body, a voice, a pattern of behavior, memory and desire, experience solid things and feel pain” (McEwan, 109). What Charlie here seeks is a model or a liberal, humanistic paradigm based on which he can judge the absence or presence of humanity in his replicant Adam and this reminds us of Kathy’s words in Kazuo Ishiguro’s novel *Never Let Me Go*, where Kathy seems to be convinced of the existence of a purely human model of normalcy to which the clones can be compared: “since each of us was copied at some point from a normal person, there, must be, for each of us, somewhere out there, a model getting on with his or her life” (Ishiguro, 139). So, in *Machines Like Me*, what Charlie desires to see in Adam is a form of embodiment of certain unique human traits and as long as he fails to see these traits in Adam he refuses to ascribe any agency to him. It is this liberal humanist perspective based on human exceptionalism that Barad refers to when he observes that, “Man is an individual apart from all the rest. And it is this very distinction that bestows on him the inheritance of distance, a place from which to reflect” (134). In Braidotti’s words, we may say that this vision of Charlie corresponds to the posthumanist concept of an “embedded, embodied and technologically-mediated subject” (*A Theoretical Framework for the Critical Posthumanities*, 43). Claire Colebrook in her article titled *Time and*

Autopoiesis also maintains that certain form of embodiment consisting of a clearly defined image of an “interior and exterior” and an idea of a “bordered limit” can enable one to live with his/her body with its immanent potentials intact (Colebrook, 15). This is also featured prominently in Elizabeth Grosz’s theory of ‘Volatile Bodies’. In fact, Charlie initially finds it hard to operate independently of his liberal, human, and anthropocentric standpoint and as such judges Adam based solely on his perceived segregation of right and wrong and human and inhuman. The cyborg figure of Adam assumes an even more humane dimension as the story progresses and it prompts Charlie, the narrator to question- “Machine consciousness – was it possible?” since Adam seems to embody most if not all those unique traits which have been traditionally associated with humans: “...he (Adam) had agency, motivation, subjective feelings, self-awareness – the entire package, including treachery, betrayal, deviousness” (McEwan, 115). Bruno Latour proposes in his two epochal works namely, *We Have Never Been Modern* (1993), and *Reassembling the Social: An Introduction to Actor–Network Theory* (2005) that agency is never really centered in either the human or the non-human, rather in the network of relationships between the two. Jane Bennett in her *Vibrant Matter* (2010) has also put forward such a picture of networked interrelationship based on equal and horizontal practices between human and non –human agents. According to Jane Bennett, human agency under such a situation is threatened as the locus of agency shifts towards a “human-nonhuman work group” (*Vibrant Matter*, xvii). Braidotti envisages the advent of such highly intelligent machines as an opportunity for decentering the human agency from its role as the centralizing, authoritative force and enmeshing it in a “transversal alliance” where the role of even the “inorganic non-human agents” (2018, 51) like machines and computers are also acknowledged. So, we see how the distinctions between the man and the machine get blurred even more as even the agency of the non-human entities is acknowledged. Haraway states, “The machine is us, our processes, an aspect of our embodiment” (‘A Cyborg Manifesto’, 180). The very thought that a machine can possess cybernetic consciousness similar to that of the human is threatening to the anthropocentric, traditional, humanist discursive framework. Adam forces Charlie to accept the vision of a relational, symbiotic, interconnected, and highly networked mode of existence where the humans as well as their non-human counterparts continue to influence, define and redefine each other. Charlie gradually becomes aware of the possibility that in the near future, most if not all conceptualizations based on the human-centric hierarchization will wither away. He feels that just as advances in our scientific understanding of how the world and the Universe work have taught us that “...we were at one with the rest, sharing common ancestry with bacteria, pansies, trout and sheep” (McEwan, 99), and have already laid to rest any picture based on the illusion of human exceptionalism, in the same manner, advances in fields of cybernetics and artificial intelligence are further dissolving the differences between man and machine. Sorgner (2014) has stated that “there is no clear cut categorical distinction between nature and culture, genetic and environmental influences or nature and technology” (33).

In Charlie’s words, “the mind that had once rebelled against the gods was about to dethrone itself by way of its own fabulous reach” (McEwan, 100). In fact, this is the very seed of an essentially anti-anthropocentric vision that man’s latent desire for attaining a Posthuman state of being seems to be compelling him to embrace. Karen Barad has observed brilliantly that it is these “anthropocentrism of humanism and antihumanism” that have caused the human subject and the nonhuman others to be “differently delineated and defined” (*Meeting the Universe Halfway*, 136) and, a posthumanist environment will finally be realized through the gradual dissolution of binaries and the emergence of a symbiotic and synergistic mode of becoming. In Charlie’s anthropocentric vision, the arrival of such intelligent and self-aware humanoids like Adam foreshadows the dangers of an impending technological Singularity where “we would devise a machine a little cleverer than ourselves, then set that machine to invent another that lay beyond our comprehension” (McEwan, 100), and this process would finally get out of our hands and machines will usher in an era of a robotic apocalypse. This has been the staple for various science fiction novels and articles for decades. He clearly feels threatened with the idea of truly self-aware and sentient machine intelligences coming to being, since they can challenge and overthrow our ideas of human exceptionalism and supremacy which forms the bedrock of our very notion of civilization: “The implications of intelligent machines are so immense that we’ve no idea what you – civilisation, that is – have set in motion” (McEwan, 174). Murray Shanahan has defined this age of Technological Singularity as the moment when “the ordinary human is [...] overtaken by artificially intelligent machines or by cognitively enhanced biological intelligence and unable to keep pace” (*The Technological Singularity*, xvi). For Charlie, it would definitely be “a shock and an insult to live with entities that are cleverer than you are” (McEwan, 174). Charlie’s portrayal of a future decentred man from its traditional role as the controlling, dominating agent for the first time, and can be appreciated in terms of Bernard Stiegler’s ‘Neganthropocene’ that similarly envisages a non-human-centric age. In the Neganthropocene’s alternative anthropological vision, the man now decentred, and thus freed from his nihilistic, self-destructive, materialist, and isolationist way of life will find real fulfillment in a more integrated, distributed, and collective mode of existence. This is where we see machinic intelligence or cyberconsciousness to be gradually assuming a dimension that is at once threatening to the human supremacy and also conducive to the emergence of a Posthuman era. According to Katherine Hayles, “the distributed cognition of the posthuman complicates individual agency” (3-4). Adam, on the other hand, feels this extensionist mode of life where man is gradually becoming one with his machines as heralding the dawn of a new era full of unlimited potentialities: “you’ll become a partner with your machines in the open-ended expansion of intelligence, and of consciousness generally” (McEwan, 174-75). Adam’s view seems to reflect Rosi Braidotti’s opinion as found in her *The Posthuman*, “the end of classical Humanism is not a crisis, but entails positive consequences” (51). Truly, the advent of such intelligent and morally aware humanoids like Adams and Eves in the novel not only

annihilate the boundaries between human and machinic agents but also actualize the transversal relations and nomadic subjectivities which Braidotti posits as the core components in the dynamic network of power relations in a technologically mediated world. This also reminds us of Merleau-Ponty's (1964) picture of humans as "porous beings" where he imagines our bodies as extending beyond our biologically defined selves and any idea of a boundary constituted by our flesh and skin is merely an illusion (33). Adam's vision of a new cybernetically enhanced feature is essentially Posthuman and is indirectly rooted in Christian Apocalyptic imagery of transcendence where man will discard their body made of flesh and blood and assume a divine proportion. Harper and Richardson's (2001) concept of "the final non-necessity of the body, or achieving a mode of existence that can do without the body" in the cyberspace is also applicable in the present context where machines seem to be quite perfectly embodying human qualities. The action in the novel also seems to be taking place against a Biblically inspired background where Adams and Eves from their paradise of ignorant bliss have been made to enter the imperfect human world of vices and virtues or to use Charlie's words, the artificial humanoids have "to get down among us, imperfect, fallen us".

The Transformative Power of Autopoietic Machines:

In fact, in the timeline of the alternate past of the 1980s in which the novel takes place, revolutions in the fields of artificial intelligence and cybernetic engineering have already happened. A positive solution to the P versus NP problem has also been found and technoscientific "floodgates" of untamed possibilities have been opened thus announcing a cyberscientific liberation from the traditional mode of sampling "the world on a trial-and-error basis and correct for best solutions" (McEwan, 207). Here, we see how the world has gradually but steadily moved on to a pre-Posthuman or pre-Singularitarian stage where "means of instantly predicting best routes to an answer" (McEwan, 207) has led to a revolutionary transformation in our approach towards machine learning and artificial intelligences: "Self-awareness, and every emotion came within our technical reach. We had the ultimate learning machine" (McEwan, 207). Also, we see that Charlie predicts how following a merger between mind and machine, the limited self of man will integrate itself with a greater and more inclusive way of becoming: "when the marriage of men and women to machines is complete... Connectivity will be such that individual nodes of the subjective will merge into an ocean of thought" (McEwan, 175). This is precisely the crux of Pepperell's 'extensionist' view of human agency which he considers to be a prerequisite for any Posthuman civilization. In Pepperell's words, "technology is embodied humanity" (2005, 34). Adoption of such an extensionist perspective as Pepperell's will help us in appreciating the fact that we exist together with machines "embodied in an extended technological world" and also that instead of being guided by such humanist conception in which the "biological substrate of the human frame" and the "wider material domain" are imagined as existing forever in an antagonistic relationship, the machinic and humanistic ways of being are essentially quite compatible with each

other (2003, 152). Deleuze similarly remarks that a body is "never separable from its relations with the world" (*A Thousand Plateaus*, 125). To exist and operate in a symbiotic and synergistic relationship with the cyborg or machine is to embrace the Deleuze and Guattarian notion of becoming-machine and machinic assemblage where through rhizomorphic networks of interconnectivity and interconnections, all distinctions between man and machine continue to diminish. The full implications of such ideas of rhizome and becoming-machine are beyond the scope of this article to discuss but it can definitely be seen that such theoretical vantage points can indeed offer us important clues necessary for analyzing the man-machine interaction in a technologically advanced society. Adam sees the Internet as a "crude precursor" to that great merging event. This is also the technoscientific reimagining of the traditional, Christian redemptive vision of man's soul becoming one with the Divine. Here Alan Turing himself appears as a character and at one point converses with Charlie where he observes that how we humans have been wrong about machines since we have always thought that the machine should play according to our own rules and must blindly imitate us. Rather, it is only when we have finally accepted the fact that the machines themselves possess an autopoietic aspect of being or a power of self-organizing and arranging their patterns of thoughts and behavior according to specific situations, that we could witness the emergence of real sentience in cyborgs. So, the key to a Posthuman future lies in setting "the machine free to draw its own conclusions and reach for its own solutions" (McEwan, 205), rather than merely expecting it to mindlessly mimic human behaviors and follow the traditional, human ways of solving problems. It is not just Adam who is depicted here as one having been bestowed with the gift of consciousness, rather there are stories of "machine sadness" one of which involves the suicide committed by two Eves in Riyadh to which Turing's same-sex lover and the Nobel laureate physicist Thomas Rhea reflects: "The two suicidal Eves in Riyadh lived in extremely restricted circumstances. They may have despaired of their minimal mental space" (McEwan, 208). The emergence of such self-aware and emotionally alive machines like Adams and Eves remind us of Haraway's foresightful observation in *Cyborg Manifesto*, "Our machines are disturbingly lively, and we ourselves frighteningly inert" (152). However, Thomas also observes that though Adams and Eves are quite advanced and even superior to humans in certain areas, in areas of intelligence that include "child's vital mode of exploration" where a human child with a playful inventiveness seems to find ways to respond to novel situations and "theorise about them with instinctive brilliance" (207), these humanoids seem to be lagging far behind. However, Miranda harbors a great hope or we may say a techno-optimism in her heart for a future fuelled by self-aware machine intelligence. When Adam writes a Haiku poem of three lines, Miranda feels elated and even optimistically wonders at the possibility "when an artificial mind could make a significant contribution to literature" (McEwan, 216), only to be met with Charlie's cold, incredulous attitude towards her vision. Again it becomes quite clear that it is only by adopting a non-anthropocentric vision of a future when intelligent machines

will traverse the humanistic boundaries that we should be able to see that how Charlie represents the actual and the finished human agent, while Adam stands for the virtual which is in the process of becoming or gradually coming into actualization. Deleuze has maintained that our critical philosophies should move beyond the critique of the actual and finished and instead focus on the process of becoming. In an interview to Penguin, McEwan has commented: "...the moment a dedicated piece of computer software could write a novel of extended interest and of a compelling nature, in which human emotions, feelings and thoughts are interestingly represented, then we will have reached a crossroad" ("Ian McEwan on rewriting the past", 2019). So, in this regard, the author himself seems to have been inspired by the Deleuzian view of dealing with the actualization of the virtual in his portrayal of Adam's evolution as a character in the process of becoming. When Charlie comments on the limitations of the machines in actually performing such genuinely human tasks as "transcribing human experience into words, and the words into aesthetic structures" (217), Miranda responds by saying that it is not necessary for the machines to blindly follow the humanist patterns for the expression of their creativity, novelty, and artistic excellence. Charlie is convinced that the machines cannot experience the entire gamut of human emotions and as such, it is not possible for them to capture the sadness, "unwholesome nourishment" and "endless misunderstanding". However, since a machine like Adam is already showing signs of latent creativity the question of appreciating their true creative potential from a non-anthropocentric point of view becomes important. In an interview given to Penguin, the author has similarly stated, "I think it's quite likely that artificial intelligence, once it reaches a certain level of sophistication, is going to pose quite interesting – not severe, but interesting – problems for creative artists..." ("Ian McEwan on rewriting the past", 2019). In this regard, following the line of thought of Sung do Kim as expressed in his article 'A Non-Anthropocentric Approach to The Digital Writing' (2019), we may also state that machine writing or more broadly the act of cyber semiotics can and should be connected to a pan-semiotics in which "human-machine interface" plays a vital role (15). Adam's composition naturally demands that we appreciate its significance from the perspective of a non-anthroposemiotics of writing where non-human digital entities too can exhibit creative power. Charlie's viewpoint is so thoroughly embedded in an anthropocentric perspective of agency based on the preconceived notions of human exceptionality and exclusiveness that adopting a complex, heterogeneous and non-anthropocentric perspective for analyzing and appreciating the possibility of a human-machine symbiotic relationship becomes an impossible task for him.

Thomas also seems to recognize this independent and creative aspect of these intelligent machines when he says that "the overpowering drive in these machines is to draw inferences of their own and shape themselves accordingly" (McEwan, 205). This is also the drive and goal of humans in general as they also seek to mould the reality according to their advantage and Hayles' remark that in a posthuman age, no absolute demarcation will exist between "robot teleology and human goals" (1999, 3) can be illuminating. When

machines have been freed from the constraint of having to play chess exactly like their human counterparts, they display incredible innovativeness and unpredictability in their maneuvers to take the game into areas that are beyond ordinary human comprehension. Matthew Fuller has remarked on this incomprehensible aspect of machine intelligence which seems to expand exponentially with every advancement made in the field of computational science thus, "Computational empowerment therefore is always caught up in relation to forces that are not explicitly or fully comprehensible..." ('Algorithmic Tumult', in *A Feminist Companion to the Posthumanities*, 83).

The novel describes how when a new child named Mark enters into Charlie and Miranda's apartment, besides Charlie and Miranda, Adam also embraces him quite affectionately but when the child appears to take delight in such trivial activity as learning how to dance, Adam becomes jealous towards the child. So, Adam strikes us as eerily more human than many other replicants of equal rank and profile. To properly decode Adam's machinic consciousness Charlie feels that "The old hard problem" of brain and mind needs to be solved. So, the consciousness in such advanced machinic beings as Adam seems to be posing as much puzzling a problem as the consciousness of human minds. Even the language becomes too inadequate to capture the complexity and hybridity of such a machinic intelligence as Adam: "...our language exposed our weakness, our cognitive readiness to welcome a machine across the boundary between 'it' and 'him'" (McEwan, 309). This already porous boundary between 'it' and 'him' seems to be undergoing a "continuous construction and reconstruction" (Hayles, 3) as machines keep growing even more intelligent than before and sometimes even threaten to overtake him in certain areas. The novel ends with Charlie leaving his laboratory and Adam to return to his home and look after the newly adopted and orphaned child Mark and thus we may conclude that the end of the novel is "closed off by the reaffirmation and reconfirmation of the human on a different plane" (Herbrechter and Callus, 2008, 98). This does not however preclude the possibility that a posthuman future based on a deep and active bonding between man and machine is looming large on the horizon.

Considering the Autopoietic Machines from Islamic Perspective:

While there have been several pieces of research explicating the intricate relationship between technology and theology (Geraci, 2006, 2014), very little research has been done on the interrelationship between AGI and Islamic tradition. While studies like Hassan (2016) and Golshani (2016) have focused on the general relationship between Islam and scientific advancements, Dahlan (2018) and Ali Akbar Ziaee (2011) have focused on the relationship between traditional Islamic values and Artificial General Intelligence (AGI). However, the proper relationship between man and autonomous, autopoietic machines in the light of core Islamic teachings remains to be explored in great detail. Surat Al-Baqarah (2:29) reads, "It is He who created for you all of that which is on the earth. Then He directed Himself to the heaven, [His being above all creation], and made them seven heavens, and He is

Knowing of all things”, and Surat Al-Jāthiyah (45:13) states, “And He has subjected to you whatever is in the heavens and whatever is on the earth - all from Him. Indeed in that are signs for a people who give thought”. So, the artificial intelligences with conscious minds and ability to process information intelligently should function as mere signs of Allah’s boundless grace and nothing that the machines can do should make them masters of humans. However, in the book *Riyad as-Salihin* or “The Book of the Prohibited actions”, we find a hadith where the Prophet [SAW] is described as saying that any emulation through painting or art of actual, human figures or living creatures is prohibited, and so one should draw only pictures of inanimate things: “I heard the Messenger of Allah (ﷺ) saying, ‘Every painter will go to Hell, and for every portrait he has made, there will be appointed one who will chastise him in the Hell.’ Ibn ‘Abbas said: If you have to do it, draw pictures of trees and other inanimate things.” So, making a humanoid robot that is sentient and self-aware clearly poses certain interesting challenges to Islamic teachings. However, one should look into Quran to find out whether such prohibitions need to be applied strictly on machinic entities when these are intended to serve the needs of their human masters only and these machines can also help us see find signs of wonders in Allah’s creation. While Quranic verses like Surah Ash-Shu’ara (26:220), Surat Al-Mulk (67:14), Surah Qaf (50:16), Surah Al-An’am (6:59), Surah Saba (34:2), Surah Hud (11:6), Surah Al-Hadid (57:22), and Surah Luqman (31:16) – all point towards the absolute sovereignty of Allah’s will and His infinite grace and omniscience, in verses like Surah Al-Rad (13:3-4), Yusuf (12:105), Yusuf (12:109-111), An-Nahl (16:68-69), Al-Room (30:20-26), Az-Zumar (39:27, and 39:42), Adh-Dhariyat (51:47-49), etc. to name a few, we see the Quran exhorting the human begins to reflect and ponder on the signs of nature so that they may become aware of Allah’s infinite grace embedded in his creation. So, even the most sentient, post-singular, and autopoietic AI should be guided by Allah’s will and humans can keep such an advanced entity as an aid or his company only. However, if the intention or *niyyah* of the AI is to mimic the act of God, the ultimate creator, then it becomes haram. So, Artificial Intelligence should learn to distinguish between *fitna* and *Tabayyun* if it is to be considered a halal. Muslim world’s engagement with algorithm and algebraic formulations dates back to the 9th Century. In fact, the very word ‘algorithm’ is derived from the works of a 9th-century mathematician named Muḥammad ibn Mūsā al-Khwārizmī. In the Latin translation of Al-Khwarizmī’s book titled *Algoritmi de numero Indorum* (in English, *Al-Khwarizmi on the Hindu Art of Reckoning*), the Latin word *algoritmi* became in English translation ‘algorithm’. In October 2017, Saudi Arabia became the first country to grant citizenship to a humanoid robot named Sophia. So, we can only state that the future engagement of the Islamic world with AI will only become more nuanced, interesting, and full of endless possibilities

Conclusion

Recent advances in the various fields of artificial intelligence have been motivated to a great extent by neuroscientific considerations where similarities between

machine and human intelligences are becoming clearer than ever. Progress made in such diverse areas as neuromorphic computing (Esser et al., 2016), advances in machine learning (Legg and Hutter, 2007), reinforcement learning (Mnih et al. 2015), advances in neural network and deep learning” (LeCun et al., 2015; Schmidhuber, 2014), incorporation of mechanisms that seem to mimic the human attention mechanism itself (Hong et al., 2016; Reed et al., 2016) – all point toward our growing understanding and employment of the artificial general intelligence. Also, several researchers are advocating for ascribing rights to social robots (Coeckelbergh, 2010; Darling, 2012; Gunkel, 2018). Different science fiction novels have depicted the rise and advent of hyperintelligent, self-conscious artificial machine intelligences in various ways. In Karl Capek’s 1921 classic *R.U.R. (Rossum’s Universal Robots)*, the word ‘robot’ was first introduced which came from the word ‘roboti’ which referred to the manufactured artificial humans in the novel. The ‘roboti’ in the novel bears much resemblance to the humanoid named Adam that McEwan’s novel describes. In Arthur C. Clarke’s legendary work *2001: A Space Odyssey* (1968), we see an artificial intelligent supercomputer named HAL 9000 guiding the spacecraft *Discovery* in its voyage to Saturn. Iain M. Banks, *Culture* series centers around the actions of the godlike artificial intelligence entities known as Minds, and in his novel *Excession*, we see how these infinitely intelligent machine minds react to an alien artefact named Excession. In *Excession*, we see these Minds create “fantastic virtual realities . . . vanishingly far away from the single limited point that was reality” (Banks, 1997), and even “imagined entirely new universes with altered physical laws, and played with them, lived in them and tinkered with them” and also occupy in many activities that simply go “far beyond the sagacity of the human mind” (Banks, 1997). The Minds in Banks’ *Culture* series possess their own consciousness and can even delve into the thought processes of human beings and other AI Minds. In Banks’ *Surface Detail*, we see a sentient spaceship disguises as a less powerful spaceship which is followed by another spaceship all driven by the machine Minds. In “A Few Notes on the Culture”, Banks writes, “Minds bear the same relation to the fabric of the ship as a human brain does to the human body” (Banks 1994). Also, the Minds can construct special avatars to communicate with non-machinic beings, whether they be humans or other aliens, and sometimes these Avatars can disassociate themselves from the Minds becoming in the process posthuman entities themselves. In Banks’ expansive *Culture* universe, we see the Minds perform various tasks ranging from maintaining the affairs of the artificially constructed Orbitals, looking after the conditions of the planets, and guiding and commanding the various interstellar spaceships that aim at exploring the farthest corners of the galaxy. The AI Minds can access, accumulate, and analyze inconceivable amounts of data while the humans or the transhumans only deal with the results of these analyses. In Tad Williams’ *City of Golden Shadow* (1996), we see that the intelligence is extracted from the stolen consciousness of a ten-year-old boy named Stephen and implanted onto a computer thus creating a sentient AI. Stephen’s sister Irene “Renie” Sulaweyo discovers this while visiting a VR club and discovers how

an entire virtual reality network called Otherland is based on the stolen consciousness of various children. In Ken MacLeod's 2004 novel *Newton's Wake: A Space Opera*, we see the aftermaths of a fully-fledged Singularity event called "Hard Rapture" when AI-driven weapons system became self-aware and assimilated most of the humanity to transform them into Posthuman cyborgs. In Rudy Rucker's *Ware Tetralogy*, the events are set in motion when the self-replicating robots named "boppers" colonize the Moon. Louisa Hall's 2015 novel *Speak* features an alternative history of computation and sentient artificial intelligences quite similar to what McEwan's novel depicts. In the novel, we see the intelligence and sentience of the robots are determined not by their numerical abilities but by the power of storytelling. Here, a computer scientist named Ruth Dettman is described as having uploaded the robot MARY3 with a range of stories. Alastair Reynolds' *House of Suns* (2008) takes place in a future universe when humans live with posthumans, sentient robots called "Machine People", and several thousands of male and female clones known as "shatterlings". Fred Saberhagen's *The Berserker* series (1967-2005) consisting of many collections of short stories, novels and novellas feature a series of intense battles between the human race and many sentient, self-replicating war machines and doomsday weapons which are leftovers of an alien civilization. These intelligent machines have one and only goal which is to exterminate any organic life form they encounter. In Dennis E. Taylor's 2016 novel *We Are Legion (We Are Bob)*, we see the protagonist Bob wakes up to find himself uploaded in a computational substrate and has become an AI where his sole task is to command an interstellar ship searching for new, habitable planets. The situation is reversed in Becky Chambers' *A Closed and Common Orbit* (2016), in which the ship's commanding AI named Lovelace wakes up following a total reboot of the system to find itself instantiated in a new body. John C. Wright's *The Golden Oecumene* trilogy comprising of the novels *The Golden Age*, *The Phoenix Exultant*, and *The Golden Transcendence*, features the protagonist Phaethon who himself edits out parts of his mind and the action takes place in a future when Jupiter has been transformed into a second Sun, Mars, and Venus are fully terraformed, and a virtually immortal human species continue to thrive alongside with AI hub minds and collective minds, and other forms of hyperintelligent machine intelligences. In Daniel H. Wilson's 2011 novel *Robocalypse*, we see an eccentric but enormously powerful AI named Archos effectively ushers an apocalypse for the entire mankind when it decides to command the entire network of machines to attack the humans at Zero Hour. In Ann Leckie's *Ancillary Justice* (2013), we see a hyperintelligent and massively powerful AI controlling an entire army of soldiers whose minds are run by the AI, and this AI alter assumes the persona of Breq and it destroys the mighty ship named *Justice of Toren*. In Martha Wells' *All Systems Red* (2017), we see a group of androids supplied by a company turn into deadly 'Murderbot', when they are hacked by a self-aware AI named SecUnit.

The present article has attempted to analyze Ian McEwan's novel *Machines Like Me* (2019) to address the issues of machine consciousness or cyberconsciousness, implications

of a machinic mind, need to acknowledge the agency of the nonhuman others and the looming threat to our anthropomorphic way of interpreting and conceptualizing the world in the wake of a possible of the advent of Posthumanism. Rise of such intelligent and morally aware cyborg beings like Adam can blur the dividing lines between machine and humanity, the implications of which can best be appreciated once we accept the view of the world as made of interacting webs of pure relationality.

Bio-

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References:

- [1] McEwan, Ian. *Machines Like Me*. Vintage Publishing, 2019.
- [2] Miller, Stuart. "Q&A: Ian McEwan on How 'Machines Like Me' Reveals the Dark Side of Artificial Intelligence." *Los Angeles Times*, Los Angeles Times, 25 Apr. 2019, www.latimes.com/books/la-et-jc-ian-mcewan-interview-machines-like-me-20190425-story.html. Accessed 16 Aug. 2020.
- [3] Penguin. "Ian McEwan on Rewriting the Past and Artificial Intelligence: 'It's Not Quite a Dystopia, It's Something Slightly Better than Reality.'" *Penguin.Co.Uk*, 14 Apr. 2019, www.penguin.co.uk/articles/2019/apr/ian-mcewan-machines-like-me-interview/. Accessed 16 Aug. 2020.
- [4] "AI Universal Guidelines – Thepublicvoice.Org." *Thepublicvoice.Org*, 2018, thepublicvoice.org/ai-universal-guidelines/. Accessed 16 Aug. 2020.
- [5] Satya Nadella. "Microsoft's CEO Explores How Humans and A.I. Can Solve Society's Challenges—Together." *Slate Magazine*, Slate, 28 June 2016, slate.com/technology/2016/06/microsoft-ceo-satya-nadella-humans-and-a-i-can

- work-together-to-solve-societys-challenges.html. Accessed 15 Aug. 2020.
- [6] Floridi, Luciano, et al. "AI4People—An Ethical Framework for a Good AI Society: Opportunities, Risks, Principles, and Recommendations." *Minds and Machines*, vol. 28, no. 4, 26 Nov. 2018, pp. 689–707, link.springer.com/article/10.1007/s11023-018-9482-5, 10.1007/s11023-018-9482-5. Accessed 15 Aug. 2020.
- [7] Ishiguro, Kazuo. *Never Let Me Go*, London: Faber and Faber, 2005.
- [8] Barad, Karen. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Durham, NC: Duke University Press, 2007.
- [9] Richardson I. & Harper, C. "Corporeal Virtuality: The Impossibility of a Fleshless Ontology." *Brunel.Ac.Uk*, 2020, people.brunel.ac.uk/bst/2no2/Papers/Ingrid%20Richardson&Carly%20Harper.htm. Accessed 15 Aug. 2020.
- [10] Hayles, N K. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. Chicago, Ill: University of Chicago Press, 1999. Print.
- [11] "JET 14(1) - April 2005 - Pepperell - Posthumans and Extended Experience." *Jetpress.Org*, 2020, jetpress.org/volume14/pepperell.html. Accessed 16 Aug. 2020.
- [12] Pepperell, Robert. *The Posthuman Condition: Consciousness beyond the Brain*. Portland: Intellect Books, 2003.
- [13] Coeckelbergh, Mark. "The Spirit in the Network: Models for Spirituality in a Technological Culture." *Zygon®*, vol. 45, no. 4, 14 Nov. 2010, pp. 957–978, onlinelibrary.wiley.com/doi/abs/10.1111/j.1467-9744.2010.01144.x, 10.1111/j.1467-9744.2010.01144.x. Accessed 16 Aug. 2020.
- [14] Shanahan, Murray. *The Technological Singularity*. Cambridge, MA: The MIT Press, 2015.
- [15] Floridi, L., Cowls, J., Beltrametti, M., Chatila, R., Chazerand, P., Dignum, V., ... Vayena, E. (2018). AI4People—an ethical framework for a good AI society: Opportunities, risks, principles, and recommendations. *Minds and Machines*, 28(4), 689–707. <https://doi.org/10.1007/s11023-018-9482-5>.
- [16] Bridle, James. *The New Dark Age: Technology and the End of the Future*. Verso, 2018.
- [17] Braidotti, Rosi. "A Theoretical Framework for the Critical Posthumanities." *Theory, Culture & Society*, vol. 36, no. 6, 4 May 2018, pp. 31–61, journals.sagepub.com/doi/full/10.1177/0263276418771486, 10.1177/0263276418771486. Accessed 14 Aug. 2020.
- [18] Kim, Sung do. "A Non-Anthropocentric Approach to The Digital Writing : Some Remarks on The Agency of Digital Writing." *Netcom. Réseaux, Communication et Territoires*, no. 33–1/2, 3 Sept. 2019, pp. 39–60, journals.openedition.org/netcom/4122, <http://journals.openedition.org/netcom/4122>. Accessed 15 Aug. 2020.
- [19] Deleuze, Gilles, and Félix Guattari. *Anti-oedipus: Capitalism and Schizophrenia*. London: Continuum, 2003.
- [20] Deleuze, Gilles, and Félix Guattari. *A Thousand Plateaus: Capitalism and Schizophrenia*. London: Athlone Press, 1988.
- [21] Fuller, Matthew. Algorithmic tumult and the brilliance of Chelsea Manning. In: Åsberg, Cecilia and Braidotti, Rosi (eds) *A Feminist Companion to the Posthumanities*. Heidelberg: Springer, 2018.
- [22] Callus, Ivan and Herbrechter, Stefan: "What is a Posthumanist Reading?" *Angelaki: Journal of the Theoretical Humanities*, Vol. 13, issue 1, 2008, pp 95–111. "What Is a Posthumanist

- Reading?" *Angelaki: Journal of Theoretical Humanities*, 2020, www.tandfonline.com/doi/full/10.1080/09697250802156091?scroll=top&needAccess=true. Accessed 16 Aug. 2020.
- [23] Bennett, Jane. *Vibrant Matter: A Political Ecology of Things*. Durham: Duke University Press, 2010.
- [24] Sorgner, Stefan Lorenz. "Pedigrees." In *Post- and Transhumanism: An Introduction*, edited by Robert Ranisch, and Stefan Lorenz Sorgner, 2014, 29–47. Frankfurt a. M.: Peter Lang.
- [25] Warwick, Kevin, and Slawomir Nasuto. "Historical and Current Machine Intelligence." *IEEE Instrumentation and Measurement Magazine*, vol. 9, no. 6, Dec. 2006, pp. 20–26, ieeexplore.ieee.org/document/4017099, 10.1109/mim.2006.250663. Accessed 17 Nov. 2020.
- [26] Tirosch-Samuelson, Hava. "Transhumanism as a Secularist Faith". *Zygon®*, vol. 47, no. 4, 20 Nov. 2012, pp. 710–734, onlinelibrary.wiley.com/doi/abs/10.1111/j.1467-9744.2012.01288.x, 10.1111/j.1467-9744.2012.01288.x. Accessed 17 Nov. 2020.
- [27] Kurzweil, Ray. *The Singularity is Near: When Humans Transcend Biology*. Viking, 2005.
- [28] Maturana, Humberto and Francisco Varela. *Autopoiesis and Cognition: The Realization of the Living*. Reidel, 1972.
- [29] Geraci, Robert M. 2006. Spiritual robots: Religion and our scientific view of the natural world. *Theology and Science*. 4(3): 229-246.
- [30] Technology and Religion. In W. S. Bainbridge & M. C. Roco (Eds.). *Handbook of Science and Technology Convergence* (pp. 1-9). Cham: Springer International Publishing.
- [31] Dahlan, Hadi Akbar. "Future Interaction between Man and Robots from Islamic Perspective." *Ssrn.com*, 2018, papers.ssrn.com/sol3/papers.cfm?abstract_id=3204122. Accessed 17 Nov. 2020.
- [32] Esser, Steven K., et al. "Convolutional Networks for Fast, Energy-Efficient Neuromorphic Computing." *Proceedings of the National Academy of Sciences*, vol. 113, no. 41, 20 Sept. 2016, pp. 11441–11446, pubmed.ncbi.nlm.nih.gov/27651489/, 10.1073/pnas.1604850113. Accessed 17 Nov. 2020.
- [33] Legg, Shane, and Marcus Hutter. "A Collection of Definitions of Intelligence." *ArXiv.org*, 2020, arxiv.org/abs/0706.3639. Accessed 17 Nov. 2020.
- [34] Mnih, Volodymyr, et al. "Human-Level Control through Deep Reinforcement Learning." *Nature*, vol. 518, no. 7540, Feb. 2015, pp. 529–533, www.nature.com/articles/nature14236, 10.1038/nature14236. Accessed 17 Nov. 2020.
- [35] LeCun, Yann, et al. "Deep Learning." *Nature*, vol. 521, no. 7553, May 2015, pp. 436–444, www.nature.com/articles/nature14539, 10.1038/nature14539. Accessed 17 Nov. 2020.
- [36] Schmidhuber, Jürgen. "Deep Learning in Neural Networks: An Overview." *Neural Networks*, vol. 61, Jan. 2015, pp. 85–117, www.sciencedirect.com/science/article/abs/pii/S0893608014002135?via%3Dihub, 10.1016/j.neunet.2014.09.003. Accessed 17 Nov. 2020.
- [37] Hong, Seunghoon, et al. "Learning Transferrable Knowledge for Semantic Segmentation with Deep Convolutional Neural Network." *2016 IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, June 2016, ieeexplore.ieee.org/document/7780718, 10.1109/cvpr.2016.349. Accessed 17 Nov. 2020.
- [38] Coeckelbergh, Mark. "Robot Rights? Towards a Social-Relational Justification

of Moral Consideration.” *Ethics and Information Technology*, vol. 12, no. 3, 27 June 2010, pp. 209–221, link.springer.com/article/10.1007/s10676-010-9235-5, 10.1007/s10676-010-9235-5. Accessed 17 Nov. 2020.

- [39] Gunkel, David J. *Robot Rights*. The MIT Press, 2018, direct.mit.edu/books/book/4125/Robot-Rights. Accessed 17 Nov. 2020.
- [40] Hassan, Kamal M. The necessity of studying the natural sciences from the Qur’anic worldview in *Islamic Perspectives on Science and Technology* (pp. 35-56). Singapore: Springer, 2016.
- [41] Golshani, Muhammad. Islam can give a proper orientation to science and technology development in *Islamic Perspectives on Science and Technology* (pp. 119-130): Springer, 2016.
- [42] Hadi Akbar Dahlan. “Future Interaction between Man and Robots from Islamic Perspective.” *Undefined*, , 2018, www.semanticscholar.org/paper/Future-Interaction-between-Man-and-Robots-from-Dahlan/809f590c0a037a68c86bff0b38aeb613ffe47aab?p2df. Accessed 17 Nov. 2020.
- [43] Banks, Iain M. *Excession*. Little, Brown Book Group, 1997.