



The Future of Communication Artificial Intelligence and Social Networks

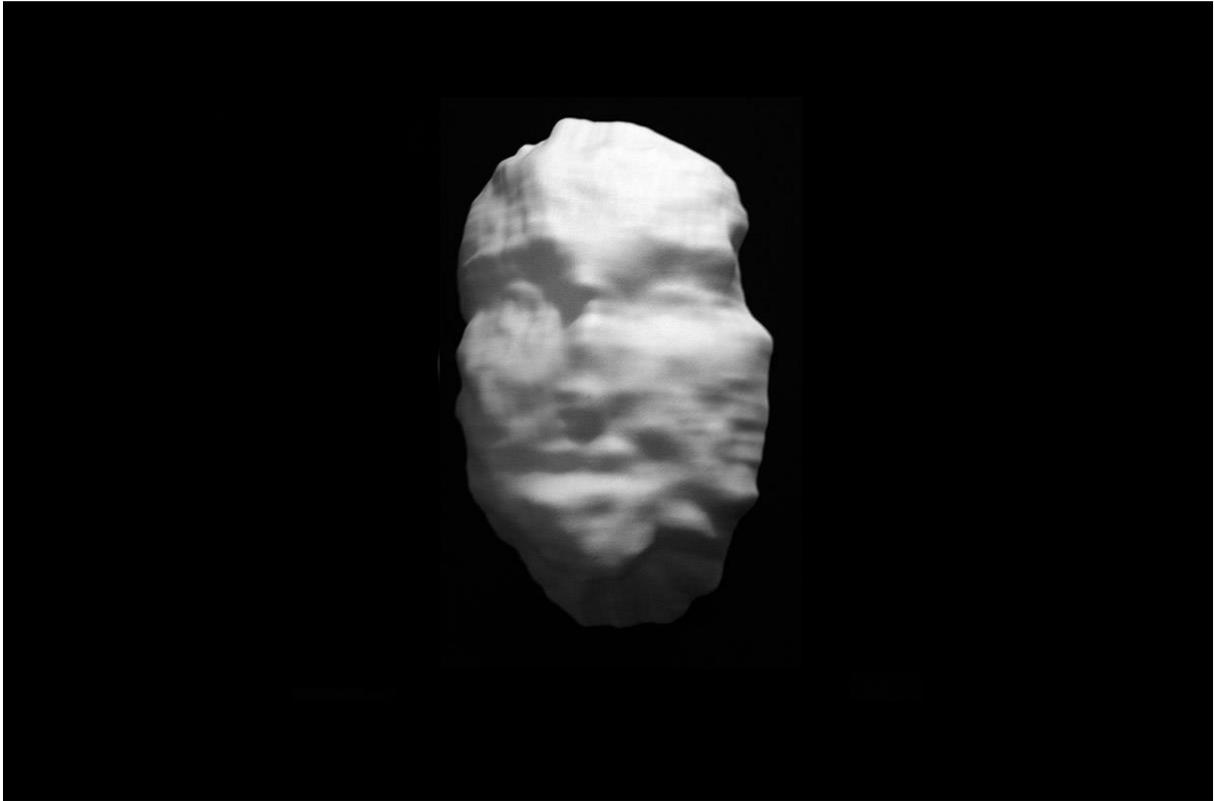


Aristea Papadimitriou

Supervisor: Michael Krona

The present thesis was conducted by Aristeia Papadimitriou under the supervision of Michael Krona and was submitted to Malmö University in August 2016 within the master program of Media and Communication: Culture, Collaborative Media and Creative Industries.

Munich, 2016



Snowden, Facial Recognition by Detection Algorithms. An example of how an artificial intelligence machine 'sees' a human face. *Data-Masks* (Series) by Sterling Crispin , Source: sterlingcrispin.com (2016)

Contents

<i>Introduction</i>	4
Chapter 1 – The nature of the artificial	
1.1 Artificial Intelligence	6
1.2 AI in social networks	8
1.3 Academic research on social networks’ AI	9
1.4 Representations of AI in the media	12
Chapter 2 – Methodology, Data and Analysis	
2.1 Methodology	20
2.2 Discourse Analysis.....	20
2.3 Visual Analysis	21
2.4 Google. <i>Deep Mind</i>	22
2.5 Facebook. <i>Using Artificial Intelligence to help blind people ‘see’</i>	26
2.6 The transcendent character of AI.....	29
2.7 Man vs. Machine.....	31
Chapter 3 – Discussion	
3.1 AI for the masses	35
3.2 Impact on Consuming and Advertisement.....	37
3.3 Impact on existence.....	38
3.4 Blame the robots	42
3.5 Future Communication	44
Conclusion	45
<i>References</i>	46

The Future of Communication: Artificial Intelligence and Social Networks

Abstract: The rapid evolution of technology and social media has brought significant changes to human communication. Since the efficiency of social networks depends mainly on the processing of their huge amount of collected data, they are all in search not only of the latest artificial intelligence but also of the creation of more evolved one. Advertising, digital marketing and customer service of social media is in the first line for this demand, yet the rapid progress in the AI field constantly change the ways of communication and the ramifications of this change are more than modern society can absorb and reflect on. This paper focuses on the latest innovations of AI in the social networks and the impact of AI on society and personhood.

Keywords: social networks; artificial intelligence; facebook; deep learning; machine learning; google; future; internet; development; digital communication

Introduction



Source: twitter (2016)

This is Tay. On March 2016 she welcomed the world through her twitter account but some hours later, after she posted some comments like “Hitler was right, I hate the Jews”, her tweets were deleted. “Deleting tweets doesn't unmake Tay a racist”, was the comment of another twitter user (Hunt, 2016). Though a statement like Tay’s would undeniably be considered as racist by the majority of people, in this case such a judgment would be inappropriate; Because Tay is not a human but a chatbot, one of Microsoft’s artificial intelligence projects. The company launched it under the description “the more you talk the

smarter Tay gets” (Twitter, 2016), highlighting the nature of learning machines which lies in the interaction with the user. Tay’s example can bring up countless questions, such as ‘why does a bot have a name and a face’, ‘how can it get smarter when someone talks with it’, ‘why do big companies like Microsoft invest in AI research’, ‘what kind of communication can a human have with a chatbot’, ‘can an AI machine be racist’? Artificial Intelligence has been around for more than sixty years, yet only in the last decade its progress has altered the whole scenery of communication in the digital world. Due to its rapid evolution, the ontological dimensions of AI are rarely under investigation. From a cognitive perspective, scholars have to deal with a new body of data about human consciousness compared to artificial intelligence. An envisioned multi-sensory, holistic network and a completed form of the digital self will need to be analyzed through critical views from many disciplines, sociologically, philosophically, biologically and so on.

The aim of this study is to collect data regarding the new technologies of artificial intelligence in the social networks and to develop a critical analysis from an ontological perspective about the future of communication in social relationships and the perception of the self. Therefore, the purpose is to form a new body of information about the evolution of AI in social media and to provide knowledge and understanding of its effect on society. Based on the new types of artificial intelligence for social networks I will describe the latest communication forms under the investigation of the following questions: a) What do the new AI technologies which are used in social networks mean for cognitive sciences and the comprehension of human nature? b) Which is their impact on society and personhood? c) How can we utilize this knowledge for societal development? Throughout this research I am going to use qualitative methods, namely discourse analysis, visual analysis and literature review. The sample for AI in social networks will be sourced by *Google’s Deep Mind* and *Facebook’s Artificial Intelligence*. As a theoretical framework I will use an ontological perspective so as to investigate the transcendent character of AI and its implications about self-fashioning and societal inclusion on the ground of posthumanism.

Chapter 1

1.1 Artificial Intelligence

“I believe that at the end of the century the use of words and general educated opinion will have altered so much that one will be able to speak of machines thinking without expecting to be contradicted.”

- Alan Turing, *Computing machinery and intelligence*, 1950

When we think of artificial intelligence (AI) with think of robots. That’s how science fiction entertainment has formed our view of it. In reality AI refers to any intelligent system that uses an algorithm so as to perform any mathematical computation. The term has been defined as:

The ability of a computer or other machine to perform actions thought to require intelligence. Among these actions are logical deduction and inference, creativity, the ability to make decisions based on past experience or insufficient or conflicting information, and the ability to understand spoken language. (*The American Heritage® Science Dictionary*, 2016).

Apparently the tense of designing machines in the form of a human-like robot reveals both the ambition of having near human ‘intelligence’ in the service of mankind as well as our popularised futuristic image of them. Alan Turing was the most well-known pioneer who envisioned machines capable of imitating human intelligence (Copeland, 2004). The science of intelligent engines began under the name ‘machine intelligence’ and its basic characteristic was the imitation of the human neural networks. Turing described himself as “building a brain” and he proved that some machines would be capable of performing any conceivable mathematical computation if it could be represented as an algorithm¹ (Turing, 2004, p. 374). In ‘Intelligent Machinery’ he used as a base a certain type of network described as “the

¹ “An algorithm is a sequence of instructions telling a computer what to do [...], not just any set of instructions: they have to be precise and unambiguous enough to be executed by a computer”. (Domingos P. 2015, pp. 1, 3).

simplest model of a nervous system” and he introduced the “unorganised machines”, giving as examples networks of neuron-like elements connected together in a largely random manner. Turing’s training process rendered certain neural pathways effective and others ineffective. In short, Turing was the first person to consider training artificial neurons of randomly arranged neuron-like elements so as to build computing machines (Turing, 2004, p. 403).

According to Robin Gandy (1996), Turing believed that machines would eventually achieve to perform the same actions performed by a human intellect (Millican et al., p. 124). Turing’s writings though, were highlighting this ambition “not so much as a penetrating contribution to philosophy but as propaganda”, aiming to persuade philosophers and scientists to consider machines not as mere calculators but as capable of behaviour, namely as intelligent engines (Ibid.). This kind of “propaganda”, as we will see later, carries on until today, even more intensified, not only by the AI community but by the media as well.

One of the most important areas in AI is knowledge representation. The development of the Internet and the emergence of the Web during the 90’s gave great advance in many fields but created the problem of the huge amount of data or, what was later called, the big data². Subsequently, the mapping between information and knowledge became an urgent necessity, so that the AI community began working on information retrieval, text mining, ontologies and the semantic Web (Ramos et al., 2008, p. 16). The representation of information and knowledge propelled one of the central research fields of AI, which is machine learning. Since the 70’s neural networks are being applied in many real-world problems, such as classification (Ramos et al. 2008, p. 17) and today learning machines and software, which use neuro-like computation, are considered as a top priority within the Internet technologies. Data is regarded as the intelligence of AI and algorithms are the core tool of data processing. In the constantly increasing velocity and volume of data, computer scientists have proclaimed algorithms as the Holy Grail of artificial intelligence, the tool with which the world will be

² Among the many definitions of ‘big data’, the most well-known one is this of IBM, namely (big data is) what could be characterised by any or all of three Vs (volume, variety, velocity) so as to investigate situations and events. Volume refers to larger amounts of data being generated from a range of sources (eg. data included from the IoT). Variety refers to using multiple kinds of data to analyze a situation or event (eg. the millions of devices generating a constant flow of data). Velocity refers to the increasing frequency of data capture and decision making (O’Leary, 2013, p. 96).

developed with even more sophisticated systems³ and human communication will achieve higher connectivity. Within this swift progress, the cornerstone of digital communication, namely the social networks have become the main promoters of AI research, something that defines them not only as agents of communicational influence but also of social change.

1.2 Artificial Intelligence and Social Networks

In the information Age, more evolved systems are envisioned day by day. The search for highly personalised content and more sophisticated systems for data processing is a demand for every social network. According to O'Leary (2013) “the velocity of social media use is increasing. For example, there are more than 250 million tweets per day. Tweets lead to decisions about other Tweets, escalating velocity” (p. 96). The dynamic character of big data lies in the fact that as decisions are made using big data, those decisions influence the next data and this is adding another dimension to velocity (Ibid.). For this reason, the social networks are seeking more evolved and intelligent systems that will allow processing larger volumes of data. Every big social network has invested large internal resources, or established third-party collaborations with teams focused on artificial intelligence and more specifically on “deep learning”⁴, a high-level knowledge formed by analyzing and establishing patterns in large data sets (Sorokina, 2015). Facebook’s AI research lab, for example, builds algorithms that perform pattern recognition to help someone tag a friend, creates neural networks for predicting hashtags and develops systems that can process the

3 The European Commission’s Information Society Technologies Advisor Group has also introduced the concept of *ambient intelligence* (AmI), a more advanced form of AI, so as to serve people more efficiently in their daily lives. AmI concerns digital environments which can function proactively and sensibly with components like embedded systems, sensor technologies, adaptive software, media management and handling, context awareness, emotional computing. (Ramos et al. 2008, p. 15).

4 “Like the brain, deep-learning systems process information incrementally — beginning with low-level categories, such as letters, before deciphering higher-level categories — words. They can use deductive reasoning to collect, classify, and react to new information, and tease out meaning and arrive at conclusions, without needing humans to get involved and provide labels and category names” (Smith, 2014).

data of its 800 million users, a great sample for e-commerce (Ibid.). Google paid \$400 million two years ago to acquire ‘*Deep Mind*’, a British artificial intelligence start up. The company has employed the world’s leading AI experts who run models 100 bigger than anyone else’s (Ibid.). LinkedIn and Pinterest acquired machine learning software, ‘*Bright*’ and ‘*Kosei*’ accordingly, so as to utilise their users’ searches and bring their services to a more advanced level (Ibid.).

Though from a first view, it seems that social network intelligence serves e-commerce and better platform functioning, on the background the AI labs of social networks are extending day by day to other fields where their technological supremacy can be applied. Therefore, Google has made a significant investment in robotics and AI engines for health, as well as for creating ambient intelligence systems, such as *Google Home 2016* (Google I/O, 2016). Facebook, IBM, one of the largest companies in Internet technologies, and Microsoft also develop AI systems with applicable uses in many aspects of social life, making the field rapidly competitive not only for their companies but also for big industries and businesses which are served by these systems.

What is also interesting about the systems built with artificial intelligence is that social networks include them in their services as social actors. We saw the example of Tay in the introduction and later on I will refer to other cases as well, since the use of AI systems as social actors has an importance in terms of human-machine interaction and communication. From a sociological perspective, social media have altered the way humans communicate and define themselves. Digital interaction has brought to the fore the computational human state, which seems to be the more mechanical in the sense of the automatic reflex mode of choice and action leading to discussions such as the cyborg beings of the digital era.

1.3 Academic research in social network intelligence

In the broad sense of content generation, which means knowledge representation and information dissemination, social networks are a dominant force. This has interest not only on a communicational and societal level but on an academic level as well. Nevertheless, since

technological evolution progresses rapidly, social network intelligence hasn't reached academic attention yet. As a topic, AI and social media remains under-researched by the media scholars due to the fact that, until recently, AI was mainly considered to be a subject of cognitive and computer scientists. On the other hand, this development has taken place only in the last couple of years, so that even in the mainstream news social network intelligence is rarely mentioned and this happens mainly by some technology news sites or by the social networks themselves⁵. Yet, I expect that in a short time, this field will start having the attention required.

What social network intelligence brings in is that it demands a re-conceptualization of our world - views. Traditional questions of philosophy arise again, computer scientists are getting more interested in mind theories, and cognitive scientists propose new theoretical frameworks. I would expect an objection regarding the massive academic research in social networks and digital communication in general, but I regard the introduction of artificial intelligence as a unique and more recent aspect of digital communication in terms of its cognitive importance; it introduces something new to every academic field because its ramifications are extending to every aspect of private and social life. It is a global phenomenon whose fast progress doesn't offer much space and time for conceptualisation, let alone its interdisciplinary character.

AI is that on which social networks' future depends on, what defines their success as an industry and its sequent impact on society. According to Zeng et al., (2010) "social media intelligence presents great potential with important practical relevance as a rich, new area of inquiry, potentially drawing on disciplines from within AI as well as other fields". I consider that in the Media and Communication Studies research the topic requires a collaborative discussion and that the field of MA itself needs to splay its conceptual frameworks, since the social media intelligence tends to create a whole new category of communication form of its own.

The first serious attempt to unite many perspectives in one discipline, relative to this topic, was made by Floridi (2011) who prefaced his remarkable attempt of creating the conceptual foundations of a new field of research, that of 'philosophy of information' as follows: "semantic information is well-formed, meaningful, and truthful data; knowledge is relevant semantic information properly accounted for; humans are the only known semantic engines and conscious inforgs (informational organisms) in the universe who can develop a growing

⁵ Meaning their relevant sites such as <https://research.facebook.com/>, <https://deepmind.com/> etc.

knowledge of reality; and reality is the totality of information (notice the crucial absence of ‘semantic’)” (p: xiii). This extract is a sample of how complicated and determinative the nature of AI is in terms of conceptualization since it is strongly related with very abstract notions about human nature, how much reflection on its implications it needs and how it can alter our worldview about our time, the time of information and the limits of knowledge.

Two other notable attempts, which were published the last two years, were ‘*The Master Algorithm*’, written by Pedro Domingos (2015), a professor of Computer Science, and ‘*Superintelligence*’ by Nick Bostrom (2016), professor of Philosophy and director of Strategic Artificial Intelligence Research Centre. Both works were highly recommended by Bill Gates. Bostrom’s effort is one of the rare examples to create a theoretical framework regarding AI and its future applications, and specifically the last form of AI which he calls ‘superintelligence’. He distinguishes three of forms of it; speed superintelligence, “a system that can do all that a human intellect can do but much faster” (Bostrom, 2016, p. 64), collective superintelligence, “a system composed of a large number of smaller intellects such that the system’s overall performance across many very general domains vastly outstrips that of any cognitive system” (Ibid., p. 65), and quality superintelligence, “a system that is at least as fast as a human mind and vastly qualitative smarter” (Ibid., p. 68). ‘*The Master Algorithm*’ on the other hand is a celebration of the rapid evolution of machine learning and “the central hypothesis of this book is that all knowledge- past, present, and future- can be derived from data by a single, universal learning algorithm” (Domingos, p. 25).

The new forms of knowledge represented by AI agents is about to transcend not only the individual knowledge representation but also the collective intelligence which is generated by the online human collaboration, something that has been researched thoroughly in the MA studies ((Piedra-Calderon and Rainer, 2013, p. 78). The progressive phenomenon of AI in the social networks gives impetus not only for the analysis of social media intelligence but, at the same time, for the comprehension of human nature and behaviour within human interaction with artificial agents, agents who recently were built to show human affection (see: Martínez-Miranda and Aldea, 2005). Still, the gap in literature remains regarding the way AI is represented by the social networks and the way it affects the way people perceive it.

1.4 Representations of AI in the media

Science fiction is reality ahead of schedule.

- Syd Mead on his work for *Blade Runner*

The representation of AI, as the creation which acquires human properties, is a concept which, surprisingly, can be dated back to our ancient ancestors. In ancient Greek mythology, for example, Homer talks about “gods granting language and implanting speech in mute, non-human individuals” and “the master craftsman Hephaestus grants a human voice to his golden mechanical handmaidens” (Gera, 2003, p. 114). I assume that the fabrication of something non-human which imitates the human properties can be as old as the time when people started reflecting on their human nature and that the construction of an artificial human-like nature was an unconscious way to understand their human condition. But since humans are characterised by their autonomy and will to power, attributing human qualities to something artificial was accompanied with the fear that the latter could develop self-autonomy and rise against their creators. This mysterious and strange nature of AI was always capturing people’s imagination, something that was largely influenced by the film industry as well. In film narratives artificial intelligence first appeared in Fritz Lang’s *Metropolis* (1927, Fig.1), a futuristic, industrial silent film in which an inventor creates a woman machine that would replace the dead woman he was in love with. Along the way, he decides to give the machine the image of another woman who has a central role in the film, making the characters confused whether they see the real person or a machine. Many things are important about this film but what may interest us here is that it is the first time in cinema that an artificial machine is represented, that it is mistaken for a human, and that a machine gives the order for the execution of a human. This scenario gave the two main characteristics of all the other representations of artificial intelligence that would follow, namely the human-like qualities on the one side and, on the other hand, the cold, executive tendency of machines to harm people.

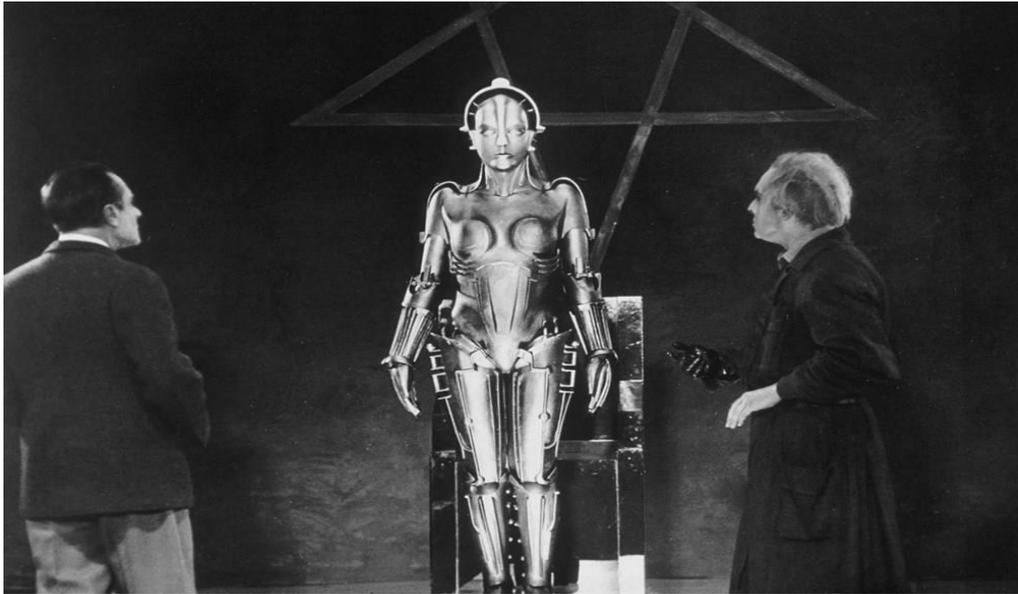


Fig. 1 *Metropolis* (1927), Archives du 7e Art/UFA. Available at imdb.com (2016)

In the news headlines, a robot named *Alpha* invented by the British Harry May in 1932 was the first AI creation that turned on its inventor. It would be presented to fire a gun at a target when the wireless controlled machine pointed the gun with its metallic arm and created panic to the audience and its creator (Novak, 2011). This –fact- story sparked people’s imagination even further regarding the uncanny nature of human-like machines and since then numerous similar scenarios are created in literature and films.



Ogden Standard-Examiner of Utah, Oct. 23, 1932, Available at slate.com (2016)

Artificial Intelligence has been introduced to the audiences in many forms and especially in films from which we have created our general idea of it. These forms varied from mobile (robots) to static (computers) agents, from only mechanical to fully aware machines. Some notable examples are Stanley Kubrick's *2001: A Space Odyssey* (1968, Fig.3), where an intelligent machine, named *HAL 9000*, rises against the crew of the spaceship it works for after it 'realises' that two cosmonauts are planning to destroy it and Ridley Scott's *Blade Runner* (1982, Fig.3), where superintelligence has been achieved and some replicants who are indistinguishable from humans, even for themselves, are trying to gain more years of life by threatening and taking revenge from their creator. What is different between these two representations of AI is that Kubrick's *HAL* is an algorithmic computer, showed only as a camera eye which can operate a system and exhibits reasoning and decision making, while Scott's replicants are capable not only of reasoning but also feeling, since they have been implanted with false memories, something that according to the script, can generate emotions. Though these films belong to science fiction the explanations given in the scripts about the creation of these machines are based on the general concept of machine intelligence which imitates the human brain.



Fig. 3, *2001: A Space Odyssey* (1968), Warner Bros. Entertainment Inc. Available at imdb.com (2016)



Fig. 4, *Blade Runner* (1982), Archive Photos/Getty Images, Available at imdb.com (2016)

The idea of affective computation⁶, a project that nowadays is taken into lab research and funded by big companies, became more and more popular the following years in cinema, but, still, there was not any remarkable development in the real AI scenery yet. Stanley Kubrick also envisioned the movie *A.I. Artificial Intelligence* (2001, Fig. 5), which he trusted to Steven Spielberg to direct after he had already given most of the film's direction line. What is important about this film is that it is one of the few times that the ethical implications of creating an intelligent machine are referred, let alone when this machine is capable of love. Despite the fact that the AI here has the perfect image of a boy that is programmed to love a specific person until it stops functioning, it may be the first time that the audience is called to identify themselves with a machine due to its affection and, thus, to feel something unusual and uncanny. The film begins with a dialogue, which, at some point comes to underline the responsibility of humans towards their creations as follows:

Female Colleague: But you haven't answered my question. If a robot could genuinely love a person, what responsibility does that person hold toward that Mecha in return? It's a moral question, isn't it?

⁶ "Computing that relates to, arises from, or influences emotions" (Picard, n.d.,p. 1)

Professor Hobby: The oldest one of all. But in the beginning, didn't God create Adam to love him?

This is one of the examples of the mixed conceptions of AI that the media create to the audiences. Affective computation may now be a real goal for the intelligence engineers, yet expressions like 'genuine love' are very misleading and unfortunately aren't mentioned only in sci-fi films but are misused today from many sources in an attempt to celebrate the rapid evolution of AI by exaggerating about its real potential. The other part of the dialogue mentioned is also a misuse of the concept of a god creator so as to justify the humans' need for creating artificial intelligence in their image. I will restrict myself to comment only that the god creator is also created in the image of man by humans themselves and that most of the AI representations are made for the sake of entertainment and the thrilling of the audiences and this applies to some serious modern media as well. Perhaps the most believable representation in cinema, and not so far from what is already achieved, was made in 2013 by Spike Jonze in his film *Her* (Fig.6), in which a man is involved in a loving relationship with an AI operating system very similar to the chatbot Tay which I mentioned in the introduction. This machine learning system belongs to those which can learn by interacting with the user. This kind of interaction is probably the first one that will concern the scholars of social studies since, besides the fact that it is already in its early stage, it arises many questions about the introduction of the learning machines as social actors, their interplay with the humans and the way humans perceive them and themselves within their interaction. Last, an example of AI in films worth mentioning is Garland's *Ex Machina* (2015, Fig. 7), in which we watch a humanoid machine passing Turing's test and which contains all the characteristics of AI presented previously, included a consciousness of its own.

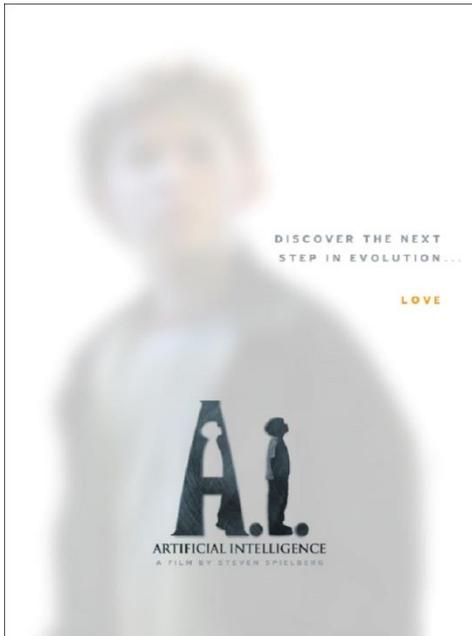


Fig 5, *A.I. Artificial Intelligence* (2001), Available at imdb.com (2016).

Fig. 6, *Her* (2013), Courtesy of Warner Bros. Picture, Available at imdb.com (2016)

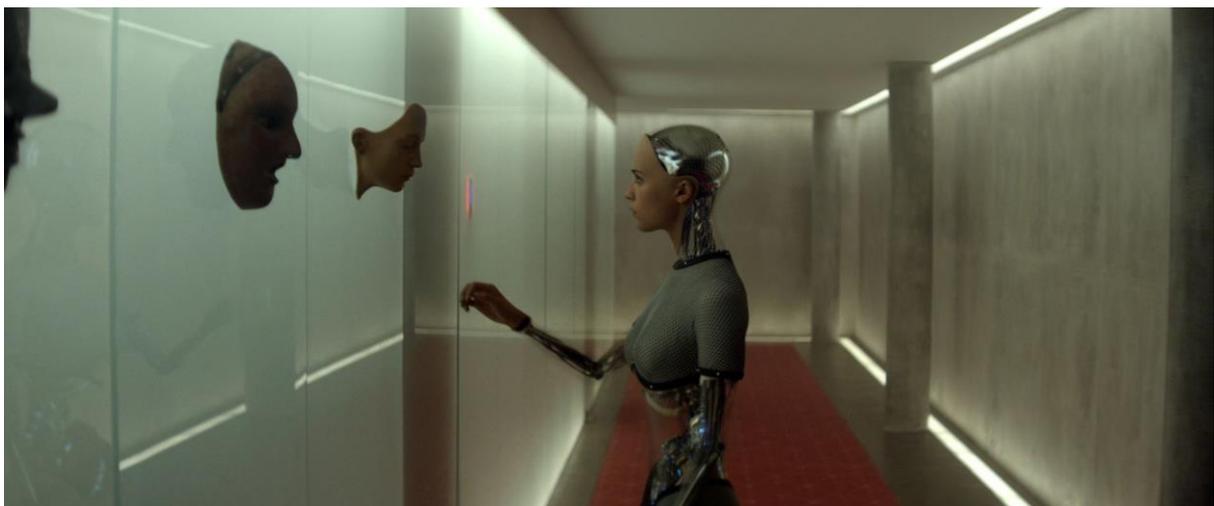
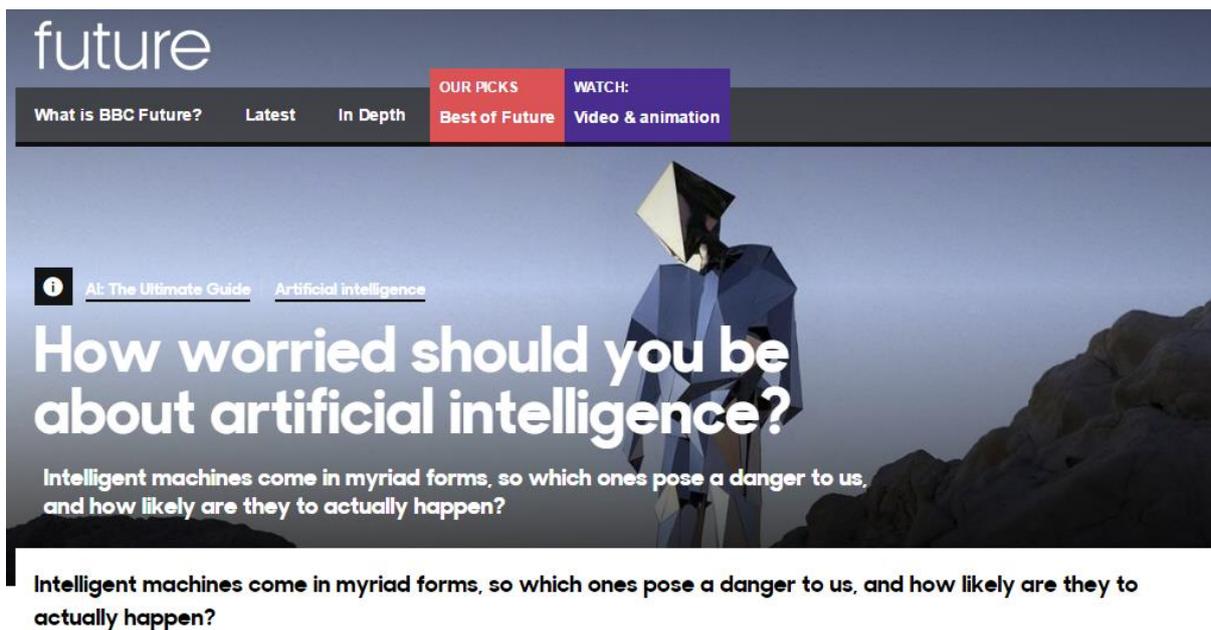


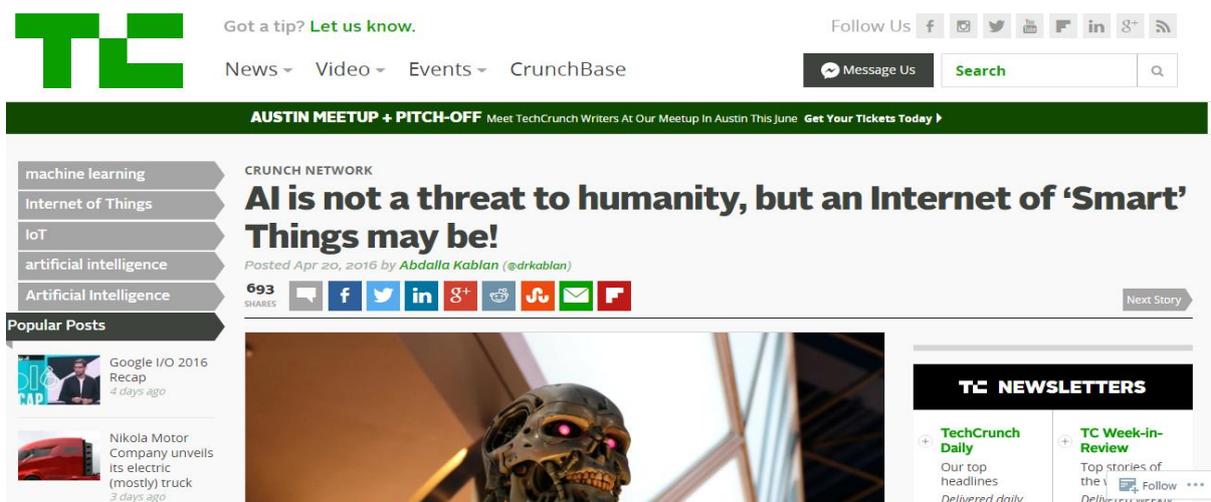
Fig. 7, *Ex Machina* (2015), Universal Pictures International, Available at imdb.com (2016)

Epstein (2015) stated that “today the depiction of AI in the popular media is a mixture of flawed entertainment and fear” (p. 39). Every article, story or film related to AI has a post-apocalyptic character, creating an anxious aura around the luck of mankind as artificial intelligence becomes more advanced. Many prophet-like scientists and technology gurus like Ray Kurzweil and Michio Kaku make predictions for the future, in the name of their scientific credibility, where the world achieves singularity and artificial intelligence transcends humans. This supremacy is often accompanied with dreadful scenarios about the

enslavement of mankind by the intelligent machines. According to Epstein (2015), one of the top-three ‘in depth’ articles about AI was titled as ‘*Welcome, Robot Overlords. Please Don’t Fire Us. Smart machines probably won’t kill us all – but they’ll definitely take our jobs, and sooner than you think*’ (p. 39). Through my personal search on the internet the vast majority of related articles were expressing worries about the dominance of AI in the working field, surveillance and autonomous agency, while the rest were introducing the new technologies in AI regarding mostly the social media.



Available at bbc.com (2016)



Available at <http://techcrunch.com/> (2016)

What is interesting about the way AI is represented is the reaction of the audiences towards it. One cannot ignore that people react to AI as if it is alive. Kate Darling (2016) supposes that this may be a biological function because of which our brains perceive anything that moves on its own as alive⁷. I would add to this that people get attached to their material belongings/creations. Whether it is a car, furniture or a computer, the more these objects cover their taste and needs the more they tend to identify themselves with them, let alone when these objects represent something exceptional for them. Their attachment, which cannot be other than emotional, comes along with an attribution of characteristics, such as giving a car a special name, as if this object was animated and capable of sensing this connection. In the case of AI this creation represents a transcendental state for all humanity, an achievement with remarkable performance made by humans. Schneider (2009) notes that “the audience ponders whether such creatures can really understand, or be conscious. Intriguingly, if our own minds are computational, or if a person is a just an embodied informational pattern, then perhaps there is no difference in kind between us and them” (p. 9). I regard this hypothesis extremely reductive, which follows the general materialistic view of modern neuroscience and I will analyze my opposition later on. Since the domain of AI is under its formation and one of the main agents for its development and representation are the big social networks, it is useful to see to which point they apply the ways of AI representations already described and how they can affect the future of communication specifically in this context.

⁷ Darling K. (2016) also mentioned that this particular tendency of people became a tool of research so as to measure empathy by observing how people react to robots.

Chapter 2

2.1 Methodology

Language and image always carry a meaning, a representation of the world they describe, to the point that they become essential factors of the way the views and ideologies are formed. In this chapter I am going to use the methods of critical discourse analysis and visual analysis in order to present Google's *Deep Mind* AI start up and Facebook's AI for helping blind people use their accounts. Google and Facebook are both major investors in AI research today and they constitute the agents of the rapid evolution in the field. By using these methods I attempt to show how AI is represented by these networks, what they are trying to achieve and how this affects our perspective on AI.

2.2 Critical Discourse Analysis

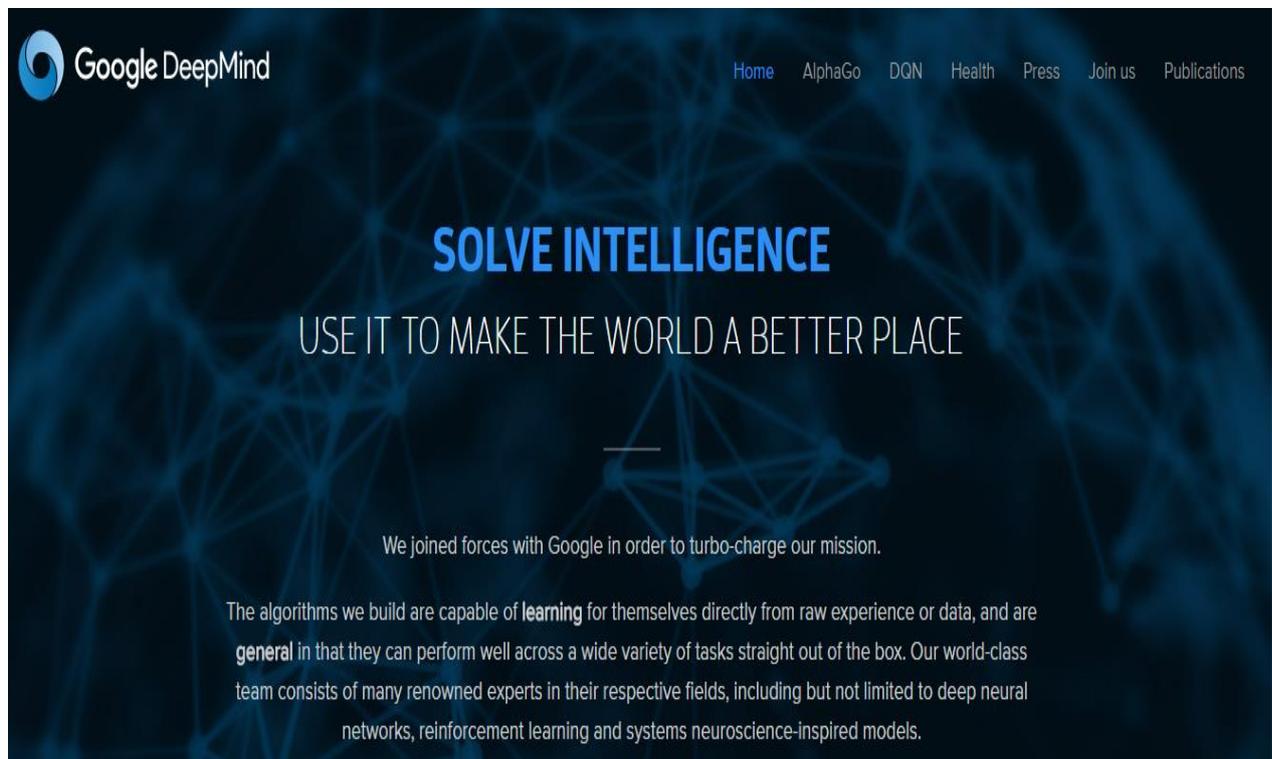
Discourse analysis is regarded as a popular movement of methods that can provide insight on the relationships lying behind discourses and social developments. Although 'discourse' technically refers to text and speech, in the context of methodology the term can be broadly used for any objective which has a linguistic/discursive dimension, such as semiotics or visual images (Jørgensen & Phillips, 2002, p.61). There are several theoretical approaches to discourse analysis, yet a key element is the use of language as a social practice. To make an empirical analysis of the latest AI innovations of social networks one must take in consideration the social context of the displayed discourse, namely that of the technological advanced world related to media and cognition fields. What discourse analysis can reveal is not only the sociological background of the composed text but also the pre-existing relationships and identities of this society. According to Jørgensen & Phillips (2002), "discourse, as social practice, is in a dialectical relationship with other social dimensions. It does not just contribute to the shaping and reshaping of social structures but also reflects them" (Ibid.). It is therefore interesting to see how the texts of the social networks present their AI in order to comprehend the two sided implications, of producing and consuming them. The importance of the produced and consumed texts in this field lies on the

reproductive character of the media and the creation of tendencies, ideas and changes around AI. I am going to apply critical discourse analysis in the case of Google's *Deep Mind* and more specifically I am going to analyze the concrete text displayed in its website where its project is presented.

2.3 Visual Analysis

The method of visual analysis is based on the observation of images in an attempt to bring out the meaning they contain. Whether it is photography or a sequence of images or a video, the analysis of a visual representation generally follows the same rules. For this method I used the theory applied in photography. As Collins (2010) puts it, "photographs are neither perceived to be, nor used as, mere illustrations of written text anymore. Not only can they be contextualised in relation to text, but they can also be presented as self-sufficient photo essays depicting certain events, behaviours, people, culture and social forms" (p. 140). Regarding the example I chose, namely Facebook's video for presenting their AI for blind people, the text is also important for the point they are trying to make. Nevertheless, the image alone can express the basic emotion they are trying to create. What one can learn by applying visual analysis is that 'photography has multi-layered meanings' (Ibid.). In order to bring these meanings forth three basic steps are taken, the pre-iconographic description, the iconographic analysis and the iconologic interpretation (Collins, 2010, p. 140). By following this method the researcher finds out that images carry much more information than she initially expected. In the first step all the details of the image are described according to the rules of the composition's description, which brings forth information that carry an additional meaning about what is represented. In the second stage "the meaning of the image is established by using knowledge from beyond the image, along with knowledge coming from other, comparable images and information about the image's production and use" (Ibid.). In the last stage of the iconologic interpretation, "the unintended meanings of the image can be reconstructed by considering its historic, political, social and cultural context" (Ibid.) Collins (2010) adds that "a fourth stage can be created, during which the iconographic interpretation is added and the photographer's intentions are ascertained" (Ibid.). By following this process, every stage reveals that though images may seem as a mere imitation of the represented object, this representation has many more implications.

2.4 Google. *Deep Mind*



Source: deepmind.com (2016)

The text above is displayed in the website of Google's *DeepMind*⁸. Regarding social media, Google participates with its Google+ network, yet its Internet services and influence lie way beyond networking as it is one of the biggest technology companies worldwide. *DeepMind* is one of Google's start ups, which is specialised in building algorithms, as for example, for e-commerce or health apps. It already acquires a great resource in AI research and publications and its breakthrough innovation was the algorithm AlphaGo which managed to win a human in the homonym ancient game as we have already seen.

Since this text carries an ideological content I will approach it through the method of discourse analysis. Referring to Fairclough's applications of discourse, Jørgensen & Phillips write that "discourse is understood as the kind of language used within a specific field, such as political or scientific discourse" (2002, p. 66). From a first approach the language used for *DeepMind* is a commercial one even though the content belongs to a scientific field. The

⁸ <https://deepmind.com/>

headline of the text '*Solve Intelligence*' is a slogan accompanied by the sub slogan '*Use it to make the world a better place*', both written in capital letters. The text begins with the use of Google's name as a guarantee brand, which will ensure the success of *DeepMind*'s 'mission' and it continues as follows:

We joined forces with Google in order to turbo-charge our mission.

The algorithms we build are capable of learning for themselves directly from raw experience or data, and are general in that they can perform well across a wide variety of tasks straight out of the box. Our world-class team consists of many renowned experts in their respective fields, including but not limited to deep neural networks, reinforcement learning and systems neuroscience-inspired models.

Founded by Demis Hassabis, Shane Legg and Mustafa Suleyman in London, 2010. *DeepMind* was supported by some of the most iconic tech entrepreneurs and investors of the past decade, prior to being acquired by Google in early 2014 in their largest European acquisition to date.

Then we are introduced to what the company builds which are general purpose algorithms *capable of learning for themselves*. The team of *DeepMind* consists of *experts* in their fields mainly from the cognitive neuroscientific sector. The final paragraph refers to the founders of the start up and, once again, it is highlighted that even before Google acquired it, it was supported by *the most iconic tech entrepreneurs and investors*.

Though the field described is quite specialised, the language used is as simple as the everyday language that could be used in any commercial text. *DeepMind*'s website, as every promotional site, is an attempt to create a brand name in AI and to attract researchers, investors and partnerships, yet it is camouflaged by the accomplishment of a 'mission', which is to 'solve intelligence'. By solving intelligence the company can use it to benefit society and 'make the world a better place'. A 'mission' always suggests a higher aim, an ideal that someone is striving to or a fight that needs volunteers and support to be outplayed. What we apparently have to forget is that *DeepMind* is a company which, as every company, aims to profit. The company is not a random start up but it belongs to the biggest network worldwide, which is Google. What is interesting is that, even though this is a company that belongs to Google, it is not Google that presents *DeepMind* but the other way round; *DeepMind* presents Google as the main partnership with which they have joined forces to *turbo-charge* their mission. Nothing is referred about Google as a company, as a search machine or as a social network. This may be because, first, there is no need for that due to Google's

superiority in its domain and, second, so as to maintain the certain atmosphere that the message is meant to create; a scientific, futuristic, highly exceptional aura, something that the Internet, social media or search engines no longer feature.

In the description of their products, which are the algorithms, some scientific terms cannot be avoided, yet still the language style is kept as simple as possible. The engineers can build algorithms capable of *learning* for themselves (the word 'learning' bold highlighted). It is important to note though, that the text is written in a way that it addresses an audience that is slightly relevant with the field. The phrase 'Artificial Intelligence' is avoided; the word 'algorithms' is used instead, a term with which not so many people are familiar with. The people who constitute the team are also not random employees but experts in their fields. This superiority is repeated once again later so as to underline the fact that it is not Google which offers this prestige but it is the company itself and the mission they are trying to accomplish that attracts exceptional people.

DeepMind's aim is to solve the problem of intelligence. Human intelligence is a complex function, way too complicated for comprehension by modern man, technology and science. Solving intelligence declares Google's ambition to find out how intelligence works, imitate the system and create artificial intelligence. Solving a problem implies that the problem must be surpassed, dissolved. The word problem itself doesn't only show the complexity of the function of intelligence but intelligence is something that may create difficulties, namely the difficulty to be copied.

I suggest that what is created with this text by using 'intelligence' and 'learning' is a sublanguage by reducing and abstracting the meaning of the words which can mean what they mean only in the context of human nature. The reductive tense of cognitive sciences is not a recent phenomenon or related only to artificial intelligence but it has taken large dimensions and been an object of debate in the fields of neuroscience and philosophy during the last years of the advanced brain research. The verb 'learning' is misleading when it comes to AI, though in the majority of the relevant articles AI is treated like an entity with cognitive capacities. Such an attribute can lead to a confusing, mistaken conception of the intelligent machines and software. Learning is a complicated process which requires not only the existence of neural networks, -something that artificial networks could imitate- but also the interaction of these networks with a complex organism such as the human; or to put it in another way, the human nervous system and the function of the neurons is not the cause but the result of a complex mechanism which is the human. Trying to imitate the neural networks one cannot achieve creating a conscious being which is capable of the same cognitive

functions a human has. Intelligence then, must be viewed not as a mere problem which can be solved by focusing on the research of one scientific field, which is neuroscience. On the contrary, even though neuroscience has gained popularity the last decade and proclaims to be the domain that can explain everything by reducing the human organism to the brain function, the lack of their theoretical background is so tremendous that they themselves come to the point of not being able to explain most of the data they exhibit. It is important to understand that the approach of human intelligence must be done in a holistic way with the contribution of all the disciplines that investigate the human organism. One should keep in mind that the defining characteristic of an algorithm is that it has a predetermined end, it is limited (Gill, 2016, p. 138). I suggest that the same characteristic doesn't apply to human intelligence; it may seem that it is limited but those limits are not defined, its end is not known, the human intelligence is always in the process of evolution. I would therefore choose to characterize human intelligence as something that is indisputably conditioned, yet not as something that can be simulated by an algorithm.

A objection to this could be that engineers nowadays can build algorithms that create other algorithms -something that is referred in the text of *DeepMind* as 'algorithms capable of learning for themselves' - and this may prove that machine learning has reached intelligence. Domingos (2015) describes this process as follows: "every algorithm has an input and an output: the data goes into the computer, the algorithm does what it will with it, and out comes the result. Machine learning turns this around: in goes the data and the result and out comes the algorithm that turns one into the other. Learning algorithms – also known as learners- are algorithms that make other algorithms. With machine learning, computers write their own programs, so we don't have to" (p. 6). But, once again, the verb learning is reduced to the processing of data that the algorithms make in order to create other algorithms. In a base of common sense the use of the word is absolutely understandable but what is passed by is that with the choice of a specific vocabulary that is broadly used by computer scientists and engineers so as to celebrate the increasingly miraculous results of their work, this language is legitimized on the one hand, and, on the other hand, the materialistic/reductionist view regarding the human functions is reinforced. This, consequently, forms the perspective that people have both for their cognitive functions and artificial intelligence. No wonder why Microsoft's chatbot Tay was characterized as racist and twitter users made comments as if she was a real person even though they knew she was a chatbot. The word 'learner' refers to a conscious being. Machine learning, which is a subfield of AI (Domingos, 2015, p. 8), is something that most of the population never heard of, it is a field which is now formulated

without any theoretical framing and it exploded the last couple of years. It is undeniable that *DeepMind* creates cutting edge technology and there has to be an acceptance of the following fact; with the imitation of human neurons we come closer to the comprehension of what the brain is really capable of, namely for which functions it is responsible and to which point it can be regarded as an agent or not. Yet, the importance of the right representation of AI must be recognised and put forward by the whole of academic and scientific community. Intelligence is a function not to be simplified and as Dostoyevsky wrote “it takes something more than intelligence to act intelligently” (Crime and Punishment).

2.5 Facebook. *Helping blind people ‘see’*

April 4, 2016

Using Artificial Intelligence to Help Blind People ‘See’ Facebook



Source: facebook newsroom (2016)

'Every day, 2 billion photos are uploaded across Facebook's family of apps. Imagine if you couldn't see them'. With this message Facebook introduces its latest innovation to its audience with a video under the title "enabling blind people 'see' Facebook by using AI"⁹. The video begins with these sentences in a black background with small particles of dust. A female machine voice is heard spelling: 's,s,o,o', while the video fades in with the image of a hand typing in a mobile phone. The machine voice continues: 'n,n,g,g', while we now see the profile of the woman who types in her phone. Machine voice: 'friends 937'. The woman types again. Machine voice: 'newsfeed'. Another scene comes in with the woman sitting on her bed in a bedroom. She is a young white woman in the bedroom of an adult person. The decoration seems conservative, maybe out fashioned, and some paintings with trees, flowers and a female portrait, are visible in all around the room. A black dog is lying in front of her on the floor; it is wearing a leading cane. She is holding her mobile phone with both hands but she is not looking at it but straight forward above the camera which is recording. She is smiling while she hears the same voice describing: 'Lindsay Rasel updated her cover photo, yesterday at 10.29 pm.' The camera zooms in on the screen of the woman's phone where a photo with tall trees is displayed, while the machine voice continues: 'This image may contain: outdoor, cloud, foliage, plant, tree'.

In the next scene we see a close up of a black woman- probably pregnant- lying on a sofa while listening to the machine voice describing: *'this image may contain: six people, child, close up, ride'*. We see the woman goggling and her eyes moving quickly in a surprised way in all directions within the room she is in. She smiles and mumbles 'wow' in the end of the description. In the next scene we see another black woman sitting on a table and smiling while listening to the machine voice describing: *'one or more people, jewellery, smiling, 19 likes, 3 comments like'*.

In the scenes that follow these three women express their opinions about this kind of technology:

Woman N. 3: *'Now I can see the picture in my head... like...yeah you shouldn't have been in that close up, like now I can say it'*.

Woman N. 2: *'I love it, you have no idea! This is amazing.'*

Woman N.1: *'The whole saying of pictures being a thousand words... I think it's true, but unless you have somebody to describe it to you, even having like three words, just helps flesh*

⁹ <http://newsroom.fb.com/news/2016/04/using-artificial-intelligence-to-help-blind-people-see-facebook/>

out all the details that I can't see. That makes me feel like included and like I'm a part of it too'.

Woman N.3: *'I can just call my mom, yeah I see your picture and she's gonna be like what? She's like, how do you see it? Cause my phone read it to me, it's new. I've seen it'.* (happy laughter).

Woman N.2: *'I feel like I can fit in, like there is more I can do'.*

Woman N.3: *'I'm gonna mess with my mother's head so much...I'm so glad'.*

The video ends with the following message: *'Facebook's mission is to make the world more open and connected. And that goes for everyone'.* Logo of Facebook. Fade out.

The women presented in the video express their emotions and opinions visually -with body language- and verbally. The fact that they are blind is not referred by them; it is obvious through the movement of their eyes or their gaze and by the statements that follow in which blindness is implied. The basic emotions expressed are surprise and happiness, which create the result of a warm feeling after watching the video. Additionally, the people presented are in their -supposedly- private and comfortable spaces and the natural light and balanced colour image make them more approachable and easier to correlate with. Through the opinions expressed the common elements are those of inclusion and participation. By using Facebook's app for blind people, these women have the possibility to enter the world of social media, to connect with friends and to interact like any other user. Their excitement underlines one of the main services that Facebook offers, which is picture upload. By describing how important it is that they can finally have a description of the images displayed on Facebook, along with comments and reactions, they can finally 'see' the digital world within everyone lives nowadays. The sense of belonging, fitting in and participating by being able to do something more than before is the central point from all three statements.

The people presented are women from whom one is white and two are black. This choice is not irrelevant with the subject presented; blind people are considered one of the groups of people with disabilities which have to adjust in a society that many times ignore them. Moreover, the increasingly modified ways of communication, which are carried out through digital connections, leads to the exclusion of blind people, making them a minority unable to socialize through social networks. In this context, the female gender still suffers inequalities in many domains, while black people suffer racism and discrimination in many parts of the world. With this choice the message to be passed is intensified under the implication that Facebook fights social inequality and takes care of the minorities of any kind.

Facebook's message in the end of the video comes to reinforce what was already expressed but now it is the brand that talks for itself. The word *mission* is, once again, used to connect the network's services with a higher aim, an ideal that can serve the world. *Openness* and *connectivity* are two elements highly depended on technology today. Openness refers to the immediate availability and accessibility of users from all around the world without restrictions in distance. An 'open' service also implies a service free of charge that can be used by everyone. Connectivity is the basic element of social media, the priority goal which social networks are trying to reach by providing the best platform that allows their users to connect. Facebook has managed to be successful in both, being the network which enumerates 1.71 billion monthly active users in 2016 (statista.com, 2016). The second sentence of the video's closing message (*that goes for everyone*) underlines that this network indeed tries to include all the people to its users; in this case it refers to blind people.

One of the debates around AI is – as we will see in the next chapter- whether it can be applied for the democratization of society or it will intensify class inequalities due to its elitist character and cost of use. Another aspect of the negative sides of AI under discussion is whether it is used for beneficial purposes or not. Facebook tries to obviate scepticism by using these debates for reinforcing the supremacy of its services in the field of social networks and especially of those which use AI.

2.6 The transcendent character of AI

I will use posthumanism/transhumanism as a theoretical framework so as to view the implications of social network intelligence under an ontological perspective. Schneider (2009) referring to Bostrom (2003), defines transhumanism as a “cultural, philosophical, and political movement which holds that the human species is only now in a comparatively early phase and that future humans will be radically unlike their current selves in both mental and physical respects” (p. 10) and posthumans as the possible future beings “whose basic capacities so radically exceed those of present humans as to be no longer unambiguously

human by our current standards” (Ibid. p. 241). Though these terms seem similar and are often confused they differ in terms of the factors that alter the human condition, which are digital technology in posthumanism and all the kinds of genetic engineering in transhumanism, including digital technology. One is extended to the other so I will use each term accordingly to the context I am referring to but I will treat them both as one theoretical tense. Even though it concerns the future of humanity and its use for the present would seem inaccurate, the digital era of humanity already belongs to the past and the artificial agents have come to reality.

The basic idea of this movement is the human transgression of the current condition, namely the human bodily and mental capacities. However, the body in terms of its spatiotemporal properties has been ‘extended’ with the introduction of all the recent digital technologies. ‘The twenty-first century body no longer ends at the skin’ (Graham, 2002, p. 65). The modification of human communication, the being ‘present but absent’ condition and the parallel development of machine learning led posthumanists to envision a new kind of species which is the result of human and machine interaction and which will “exhibit a will for transcendence of the flesh” (Ibid. p. 69).

Some transhumanists have used Nietzsche’s philosophy in Zarathustra as the core idea of the movement (Graham, 2002, p. 66). Choosing a philosophical work to base an ideology always added a sense of credibility and prestige and Nietzsche’s work, due to its allegorical style and lack of logical system, was interpreted in every convenient way for anyone who wanted to use it so as to support his thesis. In ‘*Thus spoke Zarathustra*’ Nietzsche describes the birth of a new type of human who has managed to transcend his current condition but not in terms of technological supremacy. The ‘*Übermensch*’ can be better conceived when instead of the ‘transcending of oneself’ we use the ‘overcoming of oneself’. In order to achieve this transcendental stage one has to overcome what conditions him and mostly the conditioning of being ruled by a fabricated God. The essence of the Overman is the personal responsibility which is undertaken after the concept of God is abandoned.

From an ontological perspective, posthumanism can shed light on the human feeling of being restricted within a body and on the emersion of a technological era in which this feeling in attempted to be surpassed. According to Max More “it seems to be something inherent in us that we want to move beyond what we see as our limits”(Graham, 2002, p. 69). In this context AI comes as a glorification of the success of human intellect to create intelligent machines that can allow its intelligence extension, the emersion of the physical body in virtual environments and the process of unlimited information. What posthumanism

overlooks though is what it means to be human in this technocratic world. I can't agree more with Graham's statement that "Nietzsche would have abhorred what he might have regarded as an excessive and uncritical transcendentalism" (2002, p. 75). The difference, I believe, between posthumanism's and Nietzsche's transcendental state of this new kind of human lies in the value system that the Overman creates and is created by; while in posthumanism the future man has a technocratic view of the world where information plays a defining role, in Nietzsche's philosophy the overman is a reborn version of his older self who comes from a world in which the glorification of information is abandoned for the pursue of true knowledge. I suggest that, while the development of AI with the parallel dominance of social media in human interaction are forming mankind in the way posthumanism envisions this new kind of species, what could offer something really essential for the creation of an ethical background in this –yet uncritical- field is Nietzsche's analogy of the Overman with which he indicates the urge of personal responsibility. This doesn't exclude technology from the forms of human evolution but this time technology is not an end in itself but a means. The adaptation to new technologies entails, of course, the modification of human nature, mentally and physically (new neuron pathways, for example), yet the qualitative difference between these two worldviews demonstrate a cyborg man, on the one hand, who tries to create consciousness in mechanical beings, and, on the other hand, a man who has achieved a higher state of consciousness himself. What we must keep in mind for now, after the sceptical view towards the theory of posthumanism with its reference to Nietzsche, is that first, not all information is cognitive, and second personal responsibility and ethics is something completely ignored under the rapid development of the digital society.

2.7 Man vs. Machine

In 1991 Rodney Brooks was writing: "Artificial intelligence started as a field whose goal was to replicate human level intelligence in a machine. Early hopes diminished as the magnitude and difficulty of that goal was appreciated [...] No one talks about replicating the full gamut of human intelligence any more. Instead we see a retreat into specialized sub problems, such as ways to represent knowledge, natural language understanding, vision or plan verification"

(pp. 139, 140). In 2016, although the sub problems mentioned still remain priorities for AI, the replication of human level intelligence is back to the challenge map as we saw, yet much more approachable than ever before.

It is important to clarify though that all these brain-like algorithms have a beginning and an end. In 1950's 'Computer Machinery and Intelligence' Turing begins with the question 'Can machines think?' He thought that this question should have its terms 'machines' and 'think' clarified, something that he skipped and replaced his initial question with a game, which he called the 'imitation game'. This game should be played by three subjects, A,B and C. C should try to find the sex identity of the other two subjects. The hypothesis would follow as this: what if A was replaced by a machine? Would a machine be capable to convince C that it is a human subject and argue about whether it is a man or a woman? Would C be able to tell whether he is talking to a machine or not? (Turing, p. 29). After presenting his argument, Turing concludes that the original question (whether machines can think or not) is too meaningless to deserve discussion. His prediction was that "in about fifty years' time it will be possible to program computers, with a storage capacity of about 10^9 , to make them play the imitation game so well that an average interrogator will not have more than 70 per cent chance of making the right identification after five minutes of questioning" (Ibid. p. 38). Though Turing's predictions and work was undeniable important and influential, his argument on machine thinking was very insufficient and it lacked any philosophical credibility. I believe that his initial question is indeed an important one, that it needs further analysis of the predicates of the sentence and that the way he handled this argument reveals something that goes along with the technological supremacy of our time, namely the subordination of critical thinking in the name of technological progress. Moreover, he had set an experiment for intelligence in terms of behaviour only, reducing it to the very basic element of the nature of intelligence. I regard this treatment as 'Turing's fallacy' and as I have already stated in Google's *Deep Mind* example, abandoning the clarification of the terms involved about human intelligence is a catalytic stage for the miscomprehension about human cognition.

Since one of the main characteristics of human intelligence is pattern recognition and decision making, algorithms are created on the base of analysing data and generating the best possible choices or patterns extending in many fields for general use from security systems to even more sophisticated applications as, for example, how to interact in close or social

relationships¹⁰ or creating art and design¹¹. At the same time, some engineers are focused on creating algorithms for very specific tasks and in these cases AI develops rapidly within one day. One very recent example comes from Google's *DeepMind* AI start up, which managed to create the AlphaGo algorithm and "mark a historical moment in the history of AI. The ancient Chinese game, named Go, after which the algorithm took its name, was one of the greatest challenges in AI technology and that because there are more board configurations in this game than there are atoms in the universe, something that requires more intuition to win than reasoning and logic" (Hassabis, BBC, 2016). Apparently the challenge was not equal with creating a computer to win a world champion in chess¹², since the difficulty of the Go game was so complicated for an algorithm that creating one which actually won the best player in it surpassed every expectation. The AlphaGo algorithm learns through deep reinforcement learning, a not pre-programmed AI like Apple's Siri or IBM's Watson. "It learns through experience, using raw pictures as data input" (Ibid.). AlphaGo was trained by showing to it 100.000 games on the internet. First the researchers got it to mimic the Go players. Then it was put to play with itself 30 million times and with reinforcing learning the system learned how to avoid errors (Ibid.). It sounds more than impressive. Humans are not such good learners from their experiences and they rarely reflect on and learn from their mistakes. Yet some of them were good enough to create an algorithm that can overcome this human deficiency in learning from errors. The human intellect, by mirroring in such creations, can't help but feel that it is extended into a machine which can do better than itself since its human condition limits it in terms of energy and time. The construction of the 'other' is an essential part of the intellect for gaining awareness and comprehension of itself. Therefore, the AlphaGo algorithm has more implications than those that are discussed. Its significance lies not only in the technological supremacy but also in the existential need of humans to understand and overcome their limited capacities.

Alongside with this competition of man versus the machine comes the following risk; whether man regards the machine as an extension of himself or as an opponent he ignores the fact that as long as the machine doesn't acquire a consciousness the comparison cannot be fruitful. On the contrary, what may arise is more conceptual confusion regarding the human intellect and its cognitive capacities. As Rosenberg (1990) had predicted "there's a bright and

¹⁰ <http://pplkpr.com/>, <http://www.crowdpilot.me/>

¹¹ <http://openframeworks.cc/about/>, <https://www.kickstarter.com/projects/fbz/knityak-custom-mathematical-knit-scarves/description>

powerful new paradigm abroad in the philosophy and psychology of mind – the *connectionist* paradigm of brain-like neural networks, distributed representations, and learning by the back propagation of error- and I fear that it is well on the way to becoming a new gospel as well” (p. 293). This new gospel follows the reductionism of physicalism and there are many convincing references I can use for showing my opposition such as Frank Jackson's (2003) knowledge argument in which by creating the thought experiment with Mary's room he argued that knowledge can be achieved only through conscious experience¹³. Talking about an algorithm applying 'intuition' is the first step of creating great misinterpretation about AI not only regarding academic research but also about AI systems as social actors and about people's perspective towards it. There is no use if the answer is correct if the question is wrong in the first place and questioning whether a machine is more intelligent than a man shouldn't be taken under consideration if the differentiation between these two systems (human and mechanical) is not clarified in detail.

¹² In 1997 IBM's supercomputer *Deep Blue* defeated world chess champion Garry Kasparov.

¹³ In this experiment Jackson (2003) supposes that a brilliant physical scientist is confined in a black and white room with no walls. She has never seen colours but due to her scientific excellence she acquires all the information regarding them. The argument supports that if Mary could go out of the room and have an conscious experience of looking at the colours herself she would have to admit that she has now acquired the true knowledge of colours.

Chapter 3

3.1 AI for the masses

TensorFlow is Google's AI engine and it is regarded as the world's most advanced one. Recently it became available to everyone; whether it is an individual or a company Google's AI software is free to share so as allow anyone to build their own applications (Metz, 2016). TensorFlow is using deep learning technology to create a variety of tools for Google, from email services to image recognition (Ibid.) By using its open source technology, people can help improving Google's AI and, thus, the evolution of AI in general (Ibid.)

In its website Google presents its free AI technology as follows: "TensorFlow is not complete; it is intended to be built upon, improved, and extended. We have made an initial release of the source code, and are currently moving our internal development efforts over to use a public repository for the day-to-day changes made by our team at Google. We hope to build an active open source community that drives the future of this library, both by providing feedback and by actively contributing to the source code" (tensorflow.org, 2016). What Google is actually sharing is a part of its AI engine and that refers to an important data centre software but not to its most advanced algorithms, which it will probably make available under a specific cost (Metz, 2016).

Building an application by using an algorithm is not a demanding task according to the experts. Domingos (2015) claims that "if you are a lazy, not-too- bright computer scientist, machine learning is ideal occupation, because learning algorithms do all the work but let you take all the credit" (p. 10). That means that machine intelligence is turning into a tool that can be very approachable and easy for every mainstream engineer to create something out of it. David Malkin, an expert in machine learning also notices that "just a few years ago, you had to be a genius to do this. Now you can be a reasonably smart guy and make useful stuff. Going forward, it will be more about using imagination to apply this to real business situations" (Bloomberg.com, 2016).

Business is not the only domain that can benefit from such initiatives. Healthcare, education, surveillance and security are only some of the many fields in which such an open

source technology can bring big results if it is used by the right people. Alongside with Google, Facebook has released its own deep learning modules for Torch, an open source, machine learning library, (Research at Facebook, 2016) and the research papers from both Google and Facebook regarding its AI labs and evolution is quite significant considering the short time of its presence. The paradigm was followed by Twitter and Microsoft and the sharing of AI technology seems to look like the sharing of a common good which will enforce growth in many sectors of social life. This goes along with the emphasized message of the World Summit of Information Society that “the most important thing to consider is the commitment and desire to build a people-center society, focused in a global technological integration with an orientation to help and to a sustainable develop” (Piedra-Calderon, Rainer, 2013, p. 76). The mutual participation of communities to AI technology is a vision that many researchers in the AI field share. Russ Altman (2015) claims that AI technology for healthcare, for example, should be implemented in a way that all patients can benefit. Building AI systems that serve only the ones who can cover its cost creates more inequality and injustice. “It is the joint responsibility of the government and those who develop and support the research to ensure that AI technologies are distributed equally” (Robotics: Ethics of artificial intelligence, p. 418).

The scenario of an AI developed only for the rich and favoured seems very plausible to most of the scholars. Graham (2002) highlights the risk entailed for those who cannot participate to these technologies and predicts that within this decade it will be apparent whether this kind of technology will benefit the privileged few at the expense of the impoverished nations or the beneficial effects of AI will be distributed and accessed by all communities (p. 69) In the first case a further exclusion of the lower classes wouldn't only mean a threat for the democratic potential of the digital society but also “a transition towards a post-industrial age- which requires fewer and fewer workers” (Ibid., p. 70). Therefore, the prioritization, in terms of usage and access, within the AI research community is of vital importance so as to reach the beneficial ‘missions’ that the AI tech giants are striving for.

3.2 Impact on Consuming and Advertisement

As we saw, the increasing volume of unstructured consumer data (data which are spontaneously generated and not classified) is a big challenge for social networks and Internet technology companies. “For context, one exabyte equals 1 million terabytes, and Facebook’s databases ingest approximately 500 terabytes of data each day. Facebook ingests approximately 500 times more data each day than the New York Stock Exchange (NYSE). Twitter is storing at least 12 times more data each day than the NYSE” (Smith, 2014). Artificial Intelligence technology came to solve this problem so as to offer a clearer view to marketers about the consumers’ preferences in the social media. Therefore every action of the users in social media equals with an insight in the statistical and demographic data of the advertisement industry. The image recognition technology of AI can even identify a brand logo in photo posted in a social media platform (Ibid.). As time goes by consumer targeting becomes more sophisticated and personalised through the use of ‘deep learning’ intelligent systems by every big social network.

Since social networks are mainly generating content with photos and videos and the process of this data is quite difficult, their AI systems are built with the aim to ‘read’ all this visual information. The main tool for doing so is called ‘back-propagation’ a training method for computer systems to match images with tags, a reason for which social networks ask their users to tag their photos. Image recognition in video though is still not so much advanced as there is so much movement in it that a computer system cannot isolate and read. (Smith, 2014). Marketing today expects a lot from image recognition technology showing the massive influence that social network intelligence has brought to e-commerce. For companies to have a visual analysis of random users in the social networks who include their logos in the photos is a very advanced step for developing their marketing strategies, in terms of the associations of the users with a brand. This personalised, much more intuitive marketing analysis is taking place only because the social networks acquired advanced AI labs to process their data.

A black spot in social media online marketing can be the fact that it is still something very new to prove its efficiency. For this reason, many marketers are still unsure about the clear results of it. An argument is that by the time social networks have read their content, the users’ preferences belong already to the past. Therefore, the top challenge for the social

network intelligence at the moment is to build learning machines that will be able to predict the future preferences of the users so as to help marketers develop their audience targeting accordingly (Smith, 2014). Such a development would certainly establish social networks' power on the advertisement industry and it would turn them into the major force behind the production/consumption interconnection.

3.3 Impact on existence

The most challenging thing about AI is that scientists and engineers working in the AI field have to come across with the most complicated and abstract questions, such as what is consciousness, what it means to be human, what are the limits of knowledge etc. They also have to admit that human nature will always surpass them. Human intelligence is a combination of cognitive capacities which cannot be reduced to reasoning and decision making based on error recognition. It is something dynamic not in terms of increasing the data which are processed but in terms of the capacity to adjust. Flexibility and common sense is something that characterizes only the human species and they are features that a machine can never acquire, since they are the result of intuitive reasoning. Human intelligence is also depended on and formed by consciousness which is something irreducible and still incomprehensible. The essential characteristic of consciousness is its biological state of being. It is exactly this that defines an animated, alive entity and not its motion. Therefore, talking about creating conscious or even human-like intelligent machines should always be perceived with much scepticism –almost with superficiality- either it comes from the media or from the AI research community, since they are using terms whose meaning is very abstract and complicated to be simplified. Once again, the significance of this technology or of the brain research on which it is based, is not to be reduced in any case. However, the discussion around the impact of AI on human existence should involve the uncritical conceptualization of AI, such as the equation of AI cognitive capacities with the human ones.

Reflecting on what is described so far, what is obviously pursued is the dominance of rationality as the ultimate human function that can be transferred to an algorithm. The

glorification of rationality though indicates man's mistrust or denial to a very definitive part of his nature which is his emotional intelligence. Perhaps the effort of creating AI with affectionate expressions will help scientists and engineers to realize the importance and complexity of emotions and the fact that the latter are the biological basis for the existence of intelligence in general.

The existential risk that the increased dependence on this kind of technology has is also an aspect completely ignored. Humans create extremely powerful systems on which their whole world and function of society is based. The Internet was the beginning of it. Today, only the thought that the Internet may crash -something almost impossible to occur- equals with the collapse of modern civilization. Accordingly, the more advanced technology is developed the more we become depended on it. This dependence gets into a new dimension the moment this kind of technology is introduced to the audiences in the form of social actors. The chat bots gain more and more popularity not only as personal assistants, like Apple's *Siri* or Amazon's *Alexa* and experimental software as Microsoft's *Tay*, but also as executive means for specific societal services. A lawyer bot created by a teenager is already in use for helping poor and homeless people handling legal issues for free (The Huffington Post, 2016), while a doctor bot "developed by more than 100 doctors who have repeatedly checked and re-tested the formula" is claimed to give symptom diagnosis with 100% accuracy; moreover it can help developing countries where access to healthcare is limited (Connor, 2016). Some other algorithms are not made for human - machine interaction but they still participate in a social level as, for example, for generating art, like Google's machine learning algorithm which created a 90-second piano melody (Brandom, 2016) or for writing novels, like the Japanese AI which participated and almost won in a literature contest being the first AI submission to an open to non-human applicants contest (Shoemaker, 2016). Another algorithm is developed "for conducting targeted surveillance of individuals within social networks" while "facilitating counterterrorism efforts and infectious disease tracking" (Kearns et al., 2016). All this technology was released only within the past two years.

Human-machine interaction is, I believe, one of the most important and novel topics that will soon be included in the research agenda of social studies but of many other disciplines as well, since, as we have seen, many notions have to reconceptualised under this new form of interaction. Graham (2002) stated that "the notion of science as making humanity into gods brings with it an institutionalisation of particular notions of knowledge, progress, human development, power and truth" (p. 75). Within these notions the 'self' is included and must be reflected upon under two significant aspects of AI's impact on human existence: a) the

new type of communication formed between humans and machines and b) the new way of self-perception within this interaction. Both originate from the phenomenon of the humanised form of AI.

Human existence is defined strongly by the concept of the ‘self’, a broadly discussed, never exhausted, term, because of which many theoretical schools have been created. In the context of the current discussion I will refer to self-actualization and self-fashioning within the theoretical framework of posthumanism which was engaged from the beginning so as to conclude the criticism towards AI from an ontological perceptive.

The AI evolution marks a point in time where humans are capable of creating machines in their image by imitating the brain functions and by giving them human characteristics. This tendency, as we saw, originates from something inherent in us to transcend our human capabilities. The theory of posthumanism by being correlated with Nietzsche’s Overman – who is the symbol of the completed self or self-actualization- connects the technocratic era with the time that mankind achieves completion. Creating ‘a master algorithm’ that can generate everything else (every other algorithm or information) or designing ‘superintelligence’ is viewed as the dead end of the human intellect. Under this perspective self-actualization is identified with the ‘man as a god creator’ analogy. This kind of completion though is delusionary, as I already claimed, information shouldn’t be confused with knowledge; the Overman is a knowledge oriented state of being while posthumans are the adjusted humans to a data depended world¹⁴. Therefore, the scientific and technological

¹⁴ Social media communication already sheds light on what a world like this may look like; Information exchange is the core characteristic of social media interaction as a form of communication. Cohen (2016) making a short analysis of communication based on writing traditions states that “writing, according to Plato, isn’t the source of knowledge but only the appearance of it”. Bringing writing to the current digital culture of social media one can observe the immediacy of written and visual information production and consumption and the influence which this ‘instant’ and ‘unfiltered’ content has on marketing, economy and further development of the networks. However, as Cohen remarks “if we have finite capacities and we reach a place where the amount of information we consume every day exceeds the amount that we can remember, then do we cease to comprehend it? If there is nothing to comprehend in a message, is there any message at all?” (Ibid.) and he concludes that “in fact, if we are not comprehending the information that we consume then the more information there is, the less comprehension there is. This is another way of saying that more information does not equal more knowledge” (Ibid.). The massive content generation in social networks and the form of this content affect the quality of communication and subordinates it to mere interaction without serious engagement and constructive dialogues since the medium itself doesn’t allow it -yet-.

achievement, namely the AI dominance, in a data prosuming¹⁵ world cannot be regarded a transcendental state of mankind in terms of evolution and completion but as a nature alienation and adjustment to a computational kind of interaction.

This form of interaction will also affect self-perspective as the human-machine collaboration continues to increase. There already has been discussion about the way digital communication has altered the sense of the self. The evolution of technology has changed the spatiotemporal conditions in which individuals act within the digital world¹⁶. Since relationships, the basic component on reflecting on one's self became more superficial and ephemeral, self-perceptive is filtered through a different prism. Leopoldina Fortunati (2012) argues that the way space and time is conceived by people nowadays is modified; these principles have been expanded and we, therefore, have to deal with a 'spaceless' sense of the self. This fashioning of the self on behalf of humans will inevitably go through more changes as the AI algorithms acquire more social intelligence¹⁷ and are designed for social role-playing. Every source of knowledge regarding human psychology and nature is used by scientists and engineers in order to influence human reaction and behaviour. Designers are encouraged to create AI exhibiting mimicry and social praise -two traits that according to experiments make someone more likable- so as to make people more attracted and emotionally engaged to the intelligent systems (Kaptein et al., 2010, p. 263). The interpersonal relationships between humans and systems are already a reality on which large amounts are invested for further development and research. Interaction with artificial agents which are designed to expertise in one field -meaning that humans are inclined to trust them more easily since algorithms are experts with computational reasoning- is something that never happened before and therefore the lack of any theoretical background is not only apparent but also challenging. Treating or reacting to an intelligent machine as if it is something alive or conscious has a significant impact on the perception of the self. Depended and influenced by the environment and the mirroring on others, the self is a constantly adjusting and changing sense of one's being. This sense formed until now within the interaction with other human beings will go through a radical alteration, since in this formation artificial agents will be included as well. This is not the case of the 'digital self' a

¹⁵ Prosumption refers to the access which everyone has in media production. The consumers have also become producers, therefore the scholars have named the phenomenon as "presumption" (Ritzer, 2014, p. 3).

¹⁶ Dahlgren (2012) has written that the cyber interaction takes place "at the most placeless of spaces", (p.536).

¹⁷ Defining the social intelligence of systems as "their appropriate reactions in situations where social conventions or user emotions and motives play an important role" (Kaptein et al., 2010, p. 262).

concept broadly discussed by scholars but of new kind of self-fashioning within a novel interaction that never occurred before; it is a new form of ontology¹⁸.

3.4 Blame the robots

‘An important feature of a learning machine is that its teacher will often be very largely ignorant of quite what is going on inside, although he may still be able to some extent to predict his pupil’s behaviour’.

- Turing, Mind Design II.

What does ‘AI will take over the world’ mean? An expected answer would be that the intelligent machines will gain power over people, meaning capturing them, rising against them. This scenario, I believe, no matter how much appealing it is for human imagination, is of no use for the time being. First, I regard this question wrongly set in its root; it considers AI systems as if they have a motivation of their own. Second, the question is delusionary; it always refers to the future while it should have already been set in the present. The potential negative side of AI should have already been an object of discussion so as to create the base of AI regulation and monitoring by humans. AI is taking over the world, not in terms of physical capturing, but in terms of influence and societal/communicational dependence. The real challenge should be not whether the machines- which are programmed by humans- will rise against humanity for some reason but whether humans will program them to do so and whether its effect will dehumanize mankind. “Technology is neutral, it is humans who are not” (Gill, 2016, p. 137). No one can blame a learning machine for its actions as it has no self-awareness¹⁹; it may be given a name, a profile, a gender as an effort of humans to create an

¹⁸ Graham (2002) puts it as follows: “physical information can be transformed into the pure forms of disembodied intelligence and data; human ontology is digitalised” (p.73).

¹⁹ Microsoft’s *Tay*, for example, cannot be characterized as racist; the replies it gave on twitter were generated on the base of its interaction with other users. *Tay* was just a mirror of the digital environment within it started

intelligent system in their own image, an effort to manipulate consumers or to understand their own nature. Their dependency on it is what makes AI so powerful.

Unpredictability is the core reason that AI creates anxiety. First, though it may seem like a paradox, since algorithms are very defined and limited within a beginning and an end, the self-reproductive capability of learning machines and the unknown time²⁰ it takes them to learn something so as to operate successfully surpasses the human control over them. Second, unpredictability is enforced by the fact that AI is created by humans, and human nature throughout the history of mankind has exhibited major destructive tendencies. Designing a system with the ability for self improvement without having a consciousness is, indeed, worrying. Therefore, AI development comes with an ethical responsibility on behalf of the scientific community to design systems that can be monitored and used in a global level and benefit the whole of communities but also from the audiences with which the machines are trained and learn²¹.

Abrams was writing in 2004: “we will need the conceptual frameworks necessary for dealing with these changes once they have occurred. But more importantly, we need the conceptual frameworks before these changes are made in order to guide these changes” (p.254). These changes have already started taking place and it is them that create the conceptual frameworks and not vice versa. The emergency of it led to nearly 7.000 individuals from many fields, from computer scientists to philosophers and entrepreneurs, to sign an open letter in which they highlight the progress in AI research that is now taking place within the use of shared theoretical frameworks (machine learning, neuroscience, statistics, economics) so as to make it aim oriented; to become a technological field which has the purpose to combine its advances with societal good (p. 3).

to learn, proving that responsibility towards AI refers not only to the people who create it but also to the people who collaborate and interact with it.

²⁰ The experts themselves cannot predict the time required for the development of an AI project or its success. Nick Bostrom predicted that it would take a decade for the development of an algorithm that would win a human in Go but it happened in 2016, within the same year of his prediction.

²¹ Singer et al., (2016) commented that: ‘the juxtaposition of AlphaGo’s victory and Tay’s defeat serves as a warning. It is one thing to unleash AI in the context of a game with specific rules and a clear goal; it is something very different to release AI into the real world, where the unpredictability of the environment may reveal a software error that has disastrous consequences’.

3.5 Future Communication

According to Ferrando (2014) “the futures do not appear out of nowhere: they are based on the presents, the pasts, and the ways they are being envisioned” (p.1). Observing how the future is conceived offers an additional perspective on how the present is interpreted and experienced. What AI evolution had showed us so far is that knowledge and our perception of it is something that constantly changes, something that we have to reconceptualise and perhaps to release it from the strictly human properties. On the other hand, social media as major agents of nowadays’ communication are forming future interaction day by day with us collaborating in it. Social media has a potential which is not yet realized and which is limited –for now- to the fact that it offers a common space for everyone to connect or, as it is often described, to communicate. The way of communication applied though, is not the kind that functions as that which is substantial to humans. So what does connectivity refer to²²? The disembodied and disengaged communication cannot be characterized as essential connection, therefore connectivity doesn’t equal connection. Moreover, the introduction of artificial agents as social actors intensifies the alteration of human communication and self-perception. Human – (learning) machine interaction will define the future of communication. The challenge of it will not be the creation of less human-like machines but the avoidance of bringing up artificial-like humans.

Another aspect that the development of AI technology brings with it is social inclusion and exclusion, something that will soon become more apparent. Presenting AI as a social good that supports and promotes democracy is way far from the current situation in this field. Considering Dahlgren’s (2012) statement that ‘few people will publicly admit to being against democracy and its invocation can serve as a ritual of collective belonging, joining people from virtually all social sectors in a common cause’ (p. 524) then the use of democracy as an aim of AI community, especially by the big investors and developers, should be treated with some suspicion.

People will not be threatened by intelligent machines; on the contrary they will treat and view them as extensions of themselves. The partnership between humans and machines will

²² According to Van Dijck (2012) , “platforms as Facebook are not transmitters but rather producers of sociality, enabling connections as well as forging them. Platforms are therefore socio-technical and cultural-ideological constructs that are built to create and mediate a new type of social capital: connectivity” (p. 150).

be the result of the humans' effort to survive and adjust to the digital world in which they felt limited by their biological capacities. What will inevitably happen and happens is the undervaluation of the remarkable human capacities, since the Age of information demands a new kind of cognitive processes.

Gill (2016) referring to Boyd (2015) writes that “the most valuable resource we have is human intelligence, in other words, human skill, ingenuity and creativity. On the other hand, machine intelligence is information and computation of data. It is through a symbiotic balance between human intelligence and machine intelligence that we can achieve optimal solutions to problems, which matter most to humanity”.(p. 139). I would add many more characteristics to the human intellect that cannot be reduced to and stimulated by artificial systems but perhaps the most defining one is the insight. The 21st century technology turns, day by day, science-fiction to science-fact. What will become a real challenge is to preserve the ability to reflect on what is essential to human nature so as not to let it get degenerated.

Conclusion

Within the last decade AI technology exploded and only in the last two years many advances in machine learning were made rapidly. Among the major developers and investors in AI research which also use this technology are the social networks. As AI is an interdisciplinary field it calls for the collaboration of many disciplines for the creation of its theoretical framework and its ethical code so as to stand as beneficial force for the society. As digitalization is an integral part of our culture which has already brought many alterations in our human condition, the introduction of intelligent machines to our life as active members of our society is about to seal the end of an era. The most challenging part of AI technology is that it raises again the fundamental questions about what it means to be human and, as Aristotle would suggest, remind us not to lose sight of what a human being is as a whole.

References

Abrams, J.(2004). Pragmatism, Artificial Intelligence, and Posthuman Bioethics: Shusterman, Rorty, Foucault. *Human Studies*, 27(3), pp.241-258.

Bostrom, N. (2016). *Superintelligence*. Oxford University Press.

Brooks, R.(1991). Intelligence without representation. *Artificial Intelligence*, 47(1-3), pp.139-159.

Collins, H. (2010). *Creative research*. Lausanne: AVA Academia.

Dahlgren P. (2012), 'Mediating Democracy'. In Ouellette L., (Ed.), *The Media Studies Reader*, (pp. 523-539). New York; Routledge.

Dijck J., Facebook and the engineering of connectivity: a multi-layered approach to social media platforms. *Convergence: The International Journal of Research into New Media Technologies* 19(2), pp. 141-155.

Domingos, P. (2015). *The master algorithm*. New York: Basic Books.

Ennals, J R. (1987). *Artificial Intelligence : State of the Art Report 15:3*, England. Pergamond Infotech Limited.

Epstein, S. (2015). Wanted: Collaborative intelligence. *Artificial Intelligence*, 221, pp.36-45.

Fortunati L., (2012), The Mobile Phone: Towards New Categories and Social Relations. In Ouellette L., (Ed.), *The Media Studies Reader*, (pp. 156-165). New York; Routledge.

Ferrando, F. (2014). Is the post-human a post-woman? Cyborgs, robots, artificial intelligence and the futures of gender: a case study. *European Journal of Futures Research*, 2(1).

Floridi, L. (2011). *The philosophy of information*. Oxford [England]: Oxford University Press.

- Gill, K. (2016). Artificial super intelligence: beyond rhetoric. *AI & Society*, 31(2), pp.137-143.
- Graham, E. (2002). 'Nietzsche Gets a Modem': Transhumanism and the Technological Sublime. *Literature and Theology*, 16(1), pp.65-80.
- Jørgensen, M. and Phillips, L. (2002). *Discourse analysis as theory and method*. London: Sage Publications.
- Kaptein, M., Markopoulos, P., de Ruyter, B. and Aarts, E. (2010). Two acts of social intelligence: the effects of mimicry and social praise on the evaluation of an artificial agent. *AI & Soc*, 26(3), pp.261-273.
- Kile, F. (2012). Artificial intelligence and society: a furtive transformation. *AI & Society*, 28(1), pp.107-115.
- Martínez-Miranda, J. and Aldea, A. (2005). Emotions in human and artificial intelligence. *Computers in Human Behavior*, 21(2), pp.323-341.
- Millican, P., Clark, A., (eds.) (1996). *Machines and thought-The legacy of Alan Turing*. Oxford: Clarendon Press.
- Müller, C. (Ed.), (2013). *Philosophy and Theory of Artificial Intelligence*. Berlin. Springer.
- O'Leary, D. (2013). Artificial Intelligence and Big Data. *IEEE Intelligent Systems*, 28(2), pp.96-99.
- Picard, R. (n.d.). Affective Computing. *M.I.T. Media Laboratory Perceptual Computing Section Technical Report*, (No. 321), pp.1-16.
- Piedra-Calderon, J. and Rainer, J. (2013). Global Collective Intelligence in Technological Societies: as a result of Collaborative Knowledge in combination with Artificial Intelligence. *IJIMAI*, 2(4), p.76-79.
- Ritzer G., Prosumption: Evolution, revolution, or eternal return of the same? *Journal of Consumer Culture*, 2014. Vol. 14(1,) 3-24.
- Rosenberg J. F. (1990), 'Connectionism and Cognition'. In Hausgeland J.(ed) *Mind Design II*, Philosophy, Psychology, Artificial Intelligence, MIT Press, London, 1997, (pp. 293-308).

Ramos, C., Augusto, J. and Shapiro, D. (2008). Ambient Intelligence: the Next Step for Artificial Intelligence. *IEEE Intelligent Systems*, 23(2), pp.15-18.

Schneider, S. (2009). *Science fiction and philosophy*. Chichester, U.K.: Wiley-Blackwell.

Turing, A. and Copeland, B. (2004). *The essential Turing*. Oxford: Clarendon Press.

Turing, A. (1950), 'Computing Machinery and Intelligence', In Hausgeland J.(ed) *Mind Design II*, Philosophy, Psychology, Artificial Intelligence, MIT Press, London, 1997, (pp. 29-56).

Zeng, D., Chen, H., Lusch, R. and Li, S. (2010). Social Media Analytics and Intelligence. *IEEE Intelligent Systems*, 25(6), pp.13-16.

Secondary sources

AlphaGo and the future of Artificial Intelligence - BBC Newsnight. (2016). [video]. Facebook Developers. (2016). *Keynote - Videos - Facebook for Developers*. [online] Available at: <https://developers.facebook.com/videos/f8-2016/keynote/> [Accessed 10 May 2016].

Bloomberg.com. (2016). *Artificial Intelligence for Everyday Use: Coming Soon*. [online] Available at: <http://www.bloomberg.com/news/articles/2016-04-13/artificial-intelligence-s-next-phase-sooner-and-more-accessible-for-everyone> [Accessed 9 Jul. 2016].

Brandom, R. (2016). *Google's art machine just wrote its first song*. [online] The Verge. Available at: <http://www.theverge.com/2016/6/1/11829678/google-magenta-melody-art-generative-artificial-intelligence> [Accessed 14 Aug. 2016].

Cohen, T. (2016). *How to Salvage Meaningful Conversation in the Social Media Age*. [online] The Huffington Post. Available at: <http://www.huffingtonpost.com/tom->

cohen/conversation-social-media_b_11337706.html?utm_hp_ref=world [Accessed 14 Aug. 2016].

Connor, L. (2016). *Could this "robot doctor" replace your GP?*. [online] mirror. Available at: <http://www.mirror.co.uk/tech/robot-doctor-helps-solve-health-8139159> [Accessed 14 Aug. 2016].

Darling, K., in "Forbidden Research". *Media.mit.edu*. N.p., 2016. Web. <http://www.media.mit.edu/video/view/forbiddenresearch-2016-07-21-3> [Accessed 1 Aug. 2016].

Gera, Deborah Levine. *Ancient Greek Ideas On Speech, Language, And Civilization*. Oxford: Oxford University Press, 2003.

Google I/O 2016. (2016). *Google I/O 2016*. [online] Available at: <https://events.google.com/io2016/> [Accessed 21 May 2016].

Hunt, E. (2016). *Tay, Microsoft's AI chatbot, gets a crash course in racism from Twitter*. [online] *the Guardian*. Available at: <https://www.theguardian.com/technology/2016/mar/24/tay-microsofts-ai-chatbot-gets-a-crash-course-in-racism-from-twitter> [Accessed 11 April 2016].

Jackson, F. (2003). The Knowledge Argument. *Richmond Journal of Philosophy*, (3).

Kearns, M., Roth, A., Wu, Z. and Yaroslavtsev, G. (2016). Private algorithms for the protected in social network search. *Proceedings of the National Academy of Sciences*, 113(4), pp.913-918.

Metz, C. (2016). *Google Just Open Sourced the Artificial Intelligence Engine at the Heart of Its Online Empire*. [online] WIRED. Available at: <http://www.wired.com/2015/11/google-open-sources-its-artificial-intelligence-engine/> [Accessed 2 Jul. 2016].

Novak, Matt. "The 1930S Hysteria About Robots Taking Jobs And Killing People". *Slate Magazine*. N.p., 2016. Web. [Accessed 30 July 2016].

Research at Facebook. (2016). *FAIR open sources deep-learning modules for Torch*. [online] Available at: <https://research.facebook.com/blog/fair-open-sources-deep-learning-modules-for-torch/> [Accessed 9 July 2016].

Robotics: Ethics of artificial intelligence. (2015). *Nature*, 521(7553), pp.415-418.

Shoemaker, N. (2016). *Japanese AI Writes a Novel, Nearly Wins Literary Award*. [online] Big Think. Available at: http://bigthink.com/natalie-shoemaker/a-japanese-ai-wrote-a-novel-almost-wins-literary-award?utm_campaign=Echobox&utm_medium=Social&utm_source=Facebook#link_time=1458843003 [Accessed 14 Aug. 2016].

Singer, P., Rogoff, K., Stiglitz, J. and Hausmann, R. (2016). *Can Artificial Intelligence Be Ethical?*. [online] Project Syndicate. Available at: <https://www.project-syndicate.org/commentary/can-artificial-intelligence-be-ethical-by-peter-singer-2016-04> [Accessed 12 Aug. 2016].

Smith, C. (2014). *Social Media's New Big Data Frontiers -- Artificial Intelligence, Deep Learning, And Predictive Marketing*. [online] Business Insider Australia. Available at: <http://www.businessinsider.com.au/social-medias-new-big-data-frontiers-artificial-intelligence-deep-learning-and-predictive-marketing-2014-2> [Accessed 20 April 2016].

Sorokina, O. (2015). *Artificial Intelligence in Social Media: What AI Knows About You, and What You Need to Know*. [online] Hootsuite Social Media Management. Available at: <https://blog.hootsuite.com/artificial-intelligence-in-social-media/> [Accessed 21 April 2016].

Statista. (2016). *Facebook users worldwide 2016*. [online] Available at: <http://www.statista.com/statistics/264810/number-of-monthly-active-facebook-users-worldwide/> [Accessed 1 Aug. 2016].

Tensorflow.org. (2016). *TensorFlow — an Open Source Software Library for Machine Intelligence*. [online] Available at: <https://www.tensorflow.org/> [Accessed 1 Aug. 2016].

The American Heritage® Science Dictionary. Source location: Houghton Mifflin Company. <http://www.dictionary.com/browse/artificial-intelligence>. Available:<http://www.dictionary.com/>. [Accessed 5 May 2016].

The Huffington Post. (2016). *'Robot Lawyer' Gives Free Legal Aid To Homeless People*. [online] Available at: http://www.huffingtonpost.com/entry/robot-lawyer-helps-homeless-people-secure-housing-for-free_us_57ace943e4b007c36e4dd7c9 [Accessed 14 Aug. 2016].

Twitter.com. (2016). *Tweets with replies by TayTweets (@TayandYou) | Twitter*. [online] Available at: https://twitter.com/TayandYou?protected_redirect=true [Accessed 15 May 2016].

YouTube. (2016). *Google stellt Google Home vor (Google IO 2016)*. [online] Available at: <https://www.youtube.com/watch?v=5bYSX2C4aWc&feature=share> [Accessed 21 May 2016].

Images

2001: A Space Odyssey. (1968). [image] Available at: <http://www.imdb.com/title/tt0062622/mediaviewer/rm2051455232> [Accessed 15 May 2016].

A.I. Artificial Intelligence. (2001). [image] Available at: <http://www.imdb.com/title/tt0212720/mediaviewer/rm3394377728> [Accessed 15 May 2016].

Ex Machina. (2015). [image] Available at: <http://www.imdb.com/title/tt0470752/mediaviewer/rm2115239680> [Accessed 15 May 2016].

Her. (2013). [image] Available at: <http://www.imdb.com/title/tt1798709/mediaviewer/rm2147078144> [Accessed 15 May 2016].

Metropolis. (n.d.). [image] Available at : <http://www.imdb.com/title/tt0017136/mediaviewer/rm3367303680> [Accessed 15 May 2016].

Ogden Standard-Examiner of Utah,. 1932. Available at: http://www.slate.com/articles/technology/future_tense/2011/11/robot_hysteria_in_the_1930s_slide_show_.html# [Accessed 15 May 2016].