

Candidates must complete this page and then give this cover and their final version of the extended essay to their supervisor.

Candidate session number

Candidate name

School number

School name

Examination session (May or November)

May

Year

2013

Diploma Programme subject in which this extended essay is registered: IT in modern Society

(For an extended essay in the area of languages, state the language and whether it is group 1 or group 2.)

Title of the extended essay: The advancement of artificial intelligence
and its integration into modern society.

Candidate's declaration

This declaration must be signed by the candidate; otherwise a grade may not be issued.

The extended essay I am submitting is my own work (apart from guidance allowed by the International Baccalaureate).

I have acknowledged each use of the words, graphics or ideas of another person, whether written, oral or visual.

I am aware that the word limit for all extended essays is 4000 words and that examiners are not required to read beyond this limit.

This is the final version of my extended essay.

Candidate's signature:

Date:

Supervisor's report and declaration

The supervisor must complete this report, sign the declaration and then give the final version of the extended essay, with this cover attached, to the Diploma Programme coordinator.

Name of supervisor (CAPITAL letters)

Please comment, as appropriate, on the candidate's performance, the context in which the candidate undertook the research for the extended essay, any difficulties encountered and how these were overcome (see page 13 of the extended essay guide). The concluding interview (viva voce) may provide useful information. These comments can help the examiner award a level for criterion K (holistic judgment). Do not comment on any adverse personal circumstances that may have affected the candidate. If the amount of time spent with the candidate was zero, you must explain this, in particular how it was then possible to authenticate the essay as the candidate's own work. You may attach an additional sheet if there is insufficient space here.

's extended essay shows a lack of planning and research. While the essay has many interesting ideas, they are not organized in a coherent manner nor are they supported by research. The only references given in the paper are to popular movies—none to the list of sources on "Sources" page (which does not include references to cited movies). Throughout the fall semester, I sought out and asked to discuss his work. He admitted that he did not have enough material to have a discussion. did not submit his work to me until December, when I met with him and discussed how he had a wide variety of unsupported ideas which gave me the impression that he "finished" the essay several times and then re-started a new one in the next paragraph. His final submission is much the same as this essay, with a continued lack of coherence or academic support to his ideas.

This declaration must be signed by the supervisor; otherwise a grade may not be issued.

I have read the final version of the extended essay that will be submitted to the examiner.

To the best of my knowledge, the extended essay is the authentic work of the candidate.

I spent 30 ^{minutes} ~~hours~~ with the candidate discussing the progress of the extended essay.

Supervisor's signature

Date:

Assessment form (for examiner use only)

Criteria	Achievement level					
	Examiner 1	maximum	Examiner 2	maximum	Examiner 3	
A research question	<input type="text" value="0"/>	2	<input type="text"/>	2	<input type="text"/>	
B introduction	<input type="text" value="0"/>	2	<input type="text"/>	2	<input type="text"/>	
C investigation	<input type="text" value="1"/>	4	<input type="text"/>	4	<input type="text"/>	
D knowledge and understanding	<input type="text" value="1"/>	4	<input type="text"/>	4	<input type="text"/>	
E reasoned argument	<input type="text" value="1"/>	4	<input type="text"/>	4	<input type="text"/>	
F analysis and evaluation	<input type="text" value="2"/>	4	<input type="text"/>	4	<input type="text"/>	
G use of subject language	<input type="text" value="1"/>	4	<input type="text"/>	4	<input type="text"/>	
H conclusion	<input type="text" value="0"/>	2	<input type="text"/>	2	<input type="text"/>	
I formal presentation	<input type="text" value="0"/>	4	<input type="text"/>	4	<input type="text"/>	
J abstract	<input type="text" value="0"/>	2	<input type="text"/>	2	<input type="text"/>	
K holistic judgment	<input type="text" value="0"/>	4	<input type="text"/>	4	<input type="text"/>	
Total out of 36		<input type="text" value="6"/>	<input type="text"/>		<input type="text"/>	



The advancement of artificial intelligence and its integration into
modern society.

by

Information Technology in global societies

Candidate:

Advisor:

Word Count: 3,760



Abstract

The purpose of this essay is to examine and explore the possibilities that artificial intelligence may hold. I will look at various types of artificial intelligence and how we can define. I will explore how these intelligences can achieve life and how that life will be defined. Will make sure to address all problems associated with true artificial intelligence and how it will affect our society as a whole. Another purpose in this essay is to discover how we as a human race can define life and how we can apply to synthetic life to show how it is living. I will be comparing the artificial intelligences rise to that of real world events that have occurred. It will tie into various points in history and help to understand what could happen in the event of the creation of artificial intelligence. This essay will discuss the implications that having a true artificial intelligence will hold and what it will do to our society as a whole. I will also the discuss the broader implications on how it will affect the future and the long-term of effects of this creation.

The world in which humans live today is surrounded and consumed by computers and digital information. It is known as the information age, where information flows freely and can accessed almost instantly. The ease at which information can be accessed could be largely attributed to the creation of the internet. The World Wide Web as we know it today is a network of millions of interconnected computer systems that can be accessed instantly at the touch of a button. This massive cloud of digital information allows humans to gain knowledge and learn in a way that they never could have before. Technology is evolving at an unprecedented rate. Many computer parts become obsolete after just one year of being created. This evolution seems to be taken for granted as we soon forget and throw away old technology. Humans barely have time to appreciate what they have before something new is offered to them. The fast pace of growth make one wonder what the future holds for us. Artificial Intelligence is becoming a bigger part of our lives every day as it seemingly becomes smarter and continuously does more jobs for us. Artificial Intelligence and the accelerating rate of development make an interesting combination as it allowed us to see primitive programming evolve into decision-making robots. While robots today might not have near as much intelligence as humans, it can be speculated that in just a few short years the artificial intelligence of machines could near equivalent to a human's. A man named Alan Turing developed a test that would determine a machine's ability to appear human; it was dubbed the Turing test. The test is very simple to understand. One person and one machine participate in a conversation, several judges then review the conversation without knowledge of which was human and which was a machine. The judges try to which were human and machine. The machines ability to appear human is determined by the amount of judges that couldn't determine which was which. We have not yet reached a point in time where the majorities have been fooled, but in recent tests 3 out of 12 judges have been fooled. If artificial intelligence can appear human enough to 25 percent of people how far are we really to achieving near human artificial intelligence. If we do achieve this level of intelligence, is the intelligence merely an illusion or do these machines have a consciousness? How can we determine whether they do or not?

If one we were to determine whether a machine had artificial intelligence and a consciousness, can we then deduce that are *alive* in some manner? While there is not one broad definition that defines life accurately, there are a set of criteria that scientists have come to an agreement to. These include maintaining homeostasis, organization, metabolism, growth, adaption, response to stimuli and reproduction. If a robot was able to think and feel like a human, had metabolic processes and



maintained homeostasis, is it alive? If this machine is considered alive does it receive all rights that humans receive? With the way technology is evolving everyday humans may need to find an answer to this question very soon. Most humans would probably agree that in order to receive rights the subject in question must have sentience. If we can create a machine that meets the criteria of a living being, perhaps one can be created that has near human intelligence. There is a general consensus among scientist that this is defined by exhibiting the following attributes: reason, use strategy, solve puzzles, make judgment when uncertain, represent knowledge, plan, learn, communicate in a language, and integrate all of these toward a goal. The problem lies with determining whether the machine is actually displaying these traits or if it's just programmed to show these.

With the technology is advancing humans may have to integrate themselves with machines that have human-like intelligence. If it can be accurately determined that their intelligence is actual intelligence and they are conscious there will probably be some outrage from some individuals of the public. The machines will most likely be outcasts for a while as humans tend to reject thing that they do not understand. Machines will definitely be ostracized when they first are able to live and think like humans. If a robot can learn and think like a human, can it know morality. The only way to one-hundred percent guarantee this is to make a synthetic brain that is an exact replica. The problem is that the brain is most complicated thing on the planet. The brain is barely understood and it might take hundreds of years to fully understand it. With this in mind it might be unfeasible to replicate the human brain. If this cannot be done then there is no guarantee that morality will be a concept that this artificial intelligence can comprehend.

Earlier it was mentioned that to be considered to have human-like intelligence one must be able reason and make judgment. One could say that morality is all about judging and reasoning during different situations. If that is all morality can be defined as, how does make their own moral code? Perhaps morality is taught and is culturally influenced. Perhaps the only requirement for obtaining a sense of morality is the ability to learn. Humans have something called empathy which basically allows us to reflect another person's feeling and emotions. So maybe the problem of ensuring intelligent are created with a sense of morality isn't trying to replicate morality in the brain, but by making sure that these intelligent being have empathy; perhaps this issue will be solved. The problem after creating a machine with artificial intelligence equivalent to a human's is integrating it into to society. Just like anything different it will most likely be stigmatized, robots are no different. Integration will probably be the hardest challenge of making a sentient artificial intelligence. Many people will most likely accuse humans of playing god and will try to protest any sort of project that aims to create an intelligent machine. Organizations will most definitely be created to counter the production of these intelligent machines. A large effort must be made to ensure that those who would try to stop this are properly educated about the benefits that these machines.

Making sure that dissent is properly dealt with will ensure that machines are respected and that the general public will be informed and accept these intelligent beings as equal to human. Having these beings seen as equals will probably be the most difficult challenge faced. Events similar to segregation in the United States will most likely occur. If artificial intelligence can emulate the human condition, there may even be a 'robot's rights' movement. Similar to the civil rights, it will include many protests by machines and even riots. Police brutality may be seen and even machines may even be killed. Robots will be shunned and most likely be forced to live in ghettos. Even with education and a great effort to sway public opinion, it most likely won't be enough to quickly ensure rights. Years will pass by before humans are enlightened and accepting.

Computers have been advancing since 1943 when construction of the ENIAC began. It started the digital revolution, composing of thousands of tubes and wires that that ran at 5000 cycles per



second. This machine was literally a several hundred pound calculator. It was used to calculate for artillery and such. Ever since then computers have slowly been progressing to more and more complex systems that would be used for a multitude of tasks by a plethora of people. The use of computers has only recently sky rocketed, beginning around the early 1990s. This is mostly because of cost and practical use of computers was not something that a civilian could use. In the 1990s, computers became affordable and useable for a novice. It allowed anyone to use it for anything and only became better as time went on. From the period ENIAC was until the 1980s computers did advance significantly, but only relatively as in the next 20 years computer evolution would start to move at the speed of light. The processing power of computers and amount of memory they had increased dramatically. Every few years people would need to upgrade in order to keep up with the times. It was truly amazing that computing was able to evolve so quickly. The evolution was caused by a combination of factors including research and development by a multitude of companies and corporations, governmental need, and consumer buying. The market for personal computers increased so much that competition basically caused computers to advance incredibly fast. Computer manufacturers were literally improving their machines just to beat competitors and make a sizeable profit. The advancement was fueled almost directly by the consumer buying into the idea of a personal computer. Year after, computer manufacturers were constantly looking for ways to make a better product for their consumer to make a larger profit than their competitors. It had a great outcome where computers advanced very quickly and they still are. Because of this processing power, memory, bandwidth, disk space, and the abilities of the operating system have all gotten bigger and better. This will most likely continue for a very long time. Until personal computers have been replaced a bigger and better technology. Then the cycle will continue. This bring up an interesting question though, how much does the consumer control the advancement of technology and such? But that is most certainly an unrelated question that should be answered another time. With this fast evolution, it most certainly lead to the creation of *artificial* life. A machine so advanced its intelligence would be indistinguishable from that of a human. This conclusion is inevitable, it would most certainly happen if you take past events into consideration, especially the evolution of humans since their beginning. In twenty-thousand years, we have gone from so-called 'cavemen' to building machines that use microscopic electrical conductors to create complex system that is capable of near uncountable tasks and applications.

With this incredible rate of evolution we can expect new, crazy, and braze developments that will the blow our minds in 50 years. This brave new world will probably be met with dissent as it always has. But recent generation and children seems open and accepting of new things. But of course time changes everything to some degree and this is doubly true for people. The open-minded outspoken young people of today may be the close-minded cranky old people of tomorrow. The emergence of new and innovative technologies may upset some people and cause them to reject to the future. You can see it happening today. Many people of the older generation refuse to learn about or use the new computers and devices. The dissent would probably be more so for this, because the mere topic is very controversial. There would be a plethora of those who would come out saying how unnatural it is for a mere human to create life, even artificially. It is a very touchy for many people. Even though history has shown us that people 'grow out' of dissent, so to speak, I feel that this will be one the those subjects that people will fight for years to either gain recognition as genuine or try to destroy it outright. It is comparable to embryonic research that is being done today. It is advancing fast and the scientists of today are finding out new stuff and making new discoveries everyday about the subject.

What about the implication of integration? If a machine that had the thinking power and intelligence of a human was created, how exactly would this be integrated into modern society? If we assume that this 'robot', if you will, is able to communicate and think on the level of a human, but is still



able to perform calculations and such as a computer would; these machines could be the death of us. It has been shown in numerous movies and books, 'The Robot Apocalypse', but how accurate is this if such machines were brought into existence? In my opinion, it depends entirely on how these machines were made and how they were 'programmed'. For example, if a robot had the intelligence of a human and creative thinking power, free will and such, but was still able to be programmed to 'tweak' his free will to perform specific operations or tasks we might see similar results that we see in movies such as *2001: A Space Odyssey*, where the machine took its instructions so literally, that it killed several people to ensure that the task would be carried out successfully. The instruction, of course, was ensuring the success of the mission. It knew that human error could cause failure and eliminated it. The machine in question was *HAL 9000* a supercomputer capable of human level intelligence designed to carry missions in space. Now whether this outcome is realistic or not is dependent on the viewer. No determination can really be made in the real world. This is a recurring theme when dealing with artificial intelligences, 'Completing the mission at any cost', is what I would call it. Now if these machines were truly capable of being 'human level' they would have the ability realize the immoral behavior of murder. Even if these machines did, they might feel a disconnect, emotionally, with humans because they are a different species, so to speak. Similar to how humans feel toward animals. Now this brings me to my next thought, if they are capable of free will and thought, why they feel the need to wipe us off planet earth? I would think that would feel the same as when there two intelligent species on earth. One of them was wiped out, seemingly because of the notion of *survival of the fittest*. Now there is no way to prove this that this is why the other intelligent species was wiped out but it is a viable hypothesis. The same can could be observed if it was machines and humans. The strongest would survive. Perhaps we might coexist in some form, but based on the history of the earth, it does not seem likely.

So if two sentient life forms are not able to live in the same space as each other, would true artificial intelligence ever be able to integrate with humans? My answer would be no, they would not. Perhaps in the beginning massive efforts would be made for this outcome, but in the end, perhaps a century after the first appearance of artificial life, they would be incompatible with each other. This brings about one of two conclusions, either the 'robot' for a new country or nation for themselves or there is war between the humans and robots. What would be the most likely case is that a new nation for machines is created. I have come to conclusion based on the fact that its thought process would be very human like in nature, simply because it was designed by humans.

But what then would exactly happen if these intelligent machines were indeed integrated into our life? Well I would think the first that we would need to know how exactly it was implemented. In my understanding, whatever sort of machine created that this intelligence most likely would not be available to the public for some time, as with most creations such as the computer and such. Whichever company creates it whether it is IBM or Microsoft, the most likely case would be that it either sells to the military or some other government institution. Most likely because it would be too expensive for a private enterprise to purchase. This machine would most likely be connected to the internet. It is a massive network of information that is always getting bigger, expanding and changing. It is the greatest invention that the world has ever seen. It is able to connect everyone and everything. An incredible amount of information flows through it every day. If artificial intelligence were to gain access to this massive network, I do not think our downfall would be from weapons of mass destruction, but rather a destruction of our infrastructure. We can safely assume that by the time a being like the one I described is made, the country's infrastructure and almost every computerized system will be connected to the internet in one way or another. We can already see it happening today, everything is starting to be connected with everything else, literally. Now if a machine capable of learning thousands of times faster than any human could was connected to this, what would happen? It would absorb knowledge, all the

knowledge it could and at the same it differentiate fictitious knowledge from true knowledge. In fact that's probably all it would do. Until humanoid machines are built I doubt there will be much action on their part. When humanoid one arrive like the ones we see in *I, Robot* or *Bicentennial Man* many things will occur like I described earlier in this piece of work. If these machines capable of thought and emotion decide they are sick of humans, they will not need weapons to win any sort against the humans, if such a thing were ever to occur. They would need any weapons because a massive artificial intelligence network that monitors the infrastructure has already been learning about everything for the past several years. It would know all the loopholes in every security system and program. It could probably give itself any sort of authorization it needs. In fact it could rule the world without people even knowing it. So, if robot decided to rebel against the oppressive humans, the in place machines that control and monitor a large part or the country would most definitely help them in their cause. All it would need to do is shut down water cleaning facilities, sewage facilities, and various other places and it would cause widespread destruction. This is, of course, only speculation and cannot really be verified in any manner.

Enough about the speculation of a supposed robot apocalypse caused by an all-powerful machine networked into every electronic device on the planet. Let us now discuss what would go down, in detail, if intelligent robots were to find a place into our society. Let's start where most discussions and such should start, the beginning. In the beginning what will most likely be created it a large cube much like Watson, the supercomputer that contested in Jeopardy not too long ago. This will probably be the first intelligent machine created. After it has been nearly perfected or even before humans will strive to create things that have very similar traits to humans. Something that do a humans job, something that can follow directions, something that can learn task without the need to be programmed with any extensive instructions; Something that will be able to perform much faster and much more efficient than any human ever could do. A modern day slave, if you will. They will be constructed for the purpose of servitude only, at least in the beginning; and of course if they are able to feel and think like humans, the will start to question their place in the world. Even if they cannot feel pain or cannot be physically oppressed they would have emotions or a conscience. These machines would know that they are a lesser beings. Humans in time would begin to see robots refusing to do work, questioning why they need to such a task, or why they should obey this human. Robot would begin to have existential crises all over. Most definitely some humans would begin to see that these machines are being mentally tortured. Movements would start to happen all over. 'Robot Rights' the signs will read, and so would begin the road for robots have the same rights as humans. It would be rough at first, as with every race that has been seen as sub-human at the time. Many will oppose them getting any rights at all claiming that are not even living, that they are created machines built to perform tasks and do jobs that requires human dexterity and intelligence but that humans would not want to do. The other side of course will argue that while they may have created they have the same feelings and such as a human does, that in fact they just the 'metal version' of a human. Some would even go as far to say that have a soul or something of the like. It will be a rough road for these machines and their striving for human level rights. Evidence of this is seen everywhere in history, when an oppressed population strives for the same rights as their oppressors they have a literally bloody and brutal time getting them. And the road is paved with martyrs, but the end result causes them to finally feel the bliss that they have obtained something that they only previously dreamed of. That feeling, I imagine, would be indescribable.

So now we finally come to the conclusion and the question must ultimately be answered. What would be the implication if an artificial intelligence capable of human level thought was introduced to modern society and what impacts would it have? In my very honest opinion I would literally think that this would cause mass hysteria and huge disconcertion in the world. There is no way that a mass amount of robots, so to speak, would ever be compatible with humans in any society. There would be



too much conflict between the entities. I say with confidence that the only type of artificial intelligence that could coexist for a prolonged period of time with humans is one that is not humanoid; one that one would not think of as being human in any way. It would only have the mind of a human. This way it could interact with humans without it being able to cause conflict with it at all. Even then, it might still cause some conflict with humans, but not an overly large one. The introduction of artificial intelligence will most likely cause a change in human behavior or even change the course of history. Having something that is able to think like a human, but isn't would cause the world to figuratively stop turning. A creation like that would be so great that the world would probably have meetings to discuss its implications.



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