

M6X01791 Dissertation

Artificial Intelligence and Robotics - Their Influence and Impact on the Modern World

The modern world, and our current civilisation is already experiencing an extremely significant change due to the infiltration of artificial intelligence. This is both due to the cultural impact of portrayals of artificial intelligence in fictional media (such as novels, motion picture film, and television), and the subsequent introduction of its uses into consumer, and industrial technology.

Current consumer uses of Artificial Intelligence and Robotics

Voice Assistants

One of the most visible impacts of artificial intelligence in consumer technology is the voice assistants that now exist as an alternative input of sorts for modern commercial operating systems. What likely began with early voice recognition systems for word dictation, has now evolved into more complex systems, integrated with operating system controls and internet search, with the purpose of both providing an improved ease of use for consumers, and likely also promoting the products, services and business interests of the owning company in the case of internet searches. Much like regular internet searches, there is a high likelihood of user input being archived – in some cases this is explicitly stated for the purpose of improving the context of the responses for the internet search, or perhaps for acclimating to the specific voice of the user. Currently privacy debates also touch on the possibilities of this data being archived purely for the benefit of the parent company.

Translation capabilities are being built into some of these voice assistants, to the extent that they could be seen as an analog to the ‘universal translator’ device suggested in Star Trek, capable of translating between many languages at once.

While voice recognition is currently becoming a very mature technology, voice synthesis (text-to-speech) has come a long way with neural net technology, with the current WaveNet system from DeepMind/Google outperforming the previous best existing methods by over 50 percent in reducing the gap with human performance (natural speech). [1]

Autonomous (Self Driving) Vehicles

Autonomous vehicles have technically been around for years in the form of aeroplane autopilot modes, however these programs were limited to basic flight paths and provided little object or event response, and therefore still required the constant supervision of a human pilot to safely fly the plane.

However, in recent years the rise of deep learning neural networks has allowed for an artificial intelligence to be trained on datasets, corresponding to positive and negative reinforcement, which accrues over a large number of datasets to give the system the correct response to events that the system is designed to recognise.

For example, in a self driving car system, when the linked sensors show a civilian crossing the road, the system identifies this civilian as an obstacle object, and will slow, or stop the car until the obstacle is no longer detected within the sensor range. In this way, the system is trained to become collision safe, and in a similar way is trained to recognise different types of obstacle, and respond accordingly.

Scientific Research

Currently scientific research requires that data be collected, and then new experiments made to collect new data which further informs researchers about the areas that they are studying – meaning that the researchers intuition is usually required to suggest the next set of experiments.

Whereas by applying deep learning neural networks to the problem, researches may be able to simply train a neural net on the necessary data, and have the neural net predict the next experiment. By adding automation to the experiment phase, it might even be possible to just leave the neural net running in attempt to achieve the most favourable data.

While this explanation sounds simplistic, it could potentially apply to many areas of research which currently require mostly man hours for the continuous experiment and recording process.

This would be especially helpful to material science, such as finding a room temperature superconductor, or the optimal material combinations for semiconductor transistors (computer microchips).

Weather Prediction

Weather patterns are often extremely complex to predict for ‘naive’ algorithms and weather models, because of the many variables that can affect them.

However, more recent neural nets are extremely adept at pattern recognition, with decades of measurements to feed in as training data sets, over time this may replace earlier weather models for prediction.

Other research has produced something called Pattern Discovery in artificial neural networks, which essentially allows the neural net to detect a pattern emerging, with little to zero training data beforehand, this would be more efficient than training for pattern recognition nets, and could perhaps even show weather patterns previously ignored or undetected by human observers. [2]

Healthcare

Images that show cancerous areas from body scans can be used to train neural nets. These neural nets can identify cancer in body scans at least as accurately as humans, if not more so.

With a compact scanner attached to (or integrated with) a smartphone, a person could achieve a quick diagnosis without leaving their home, speeding up early detection and allowing a patient to know treatment is required as quickly as possible.

Surgical robots can be trained using neural nets to make less damaging incisions into patients than human surgeons, which will potentially heal more quickly.

Law Enforcement

Artificial intelligence neural nets have improved the accuracy of facial recognition, and with end to end hardware acceleration of them, police and security cameras may now be able to identify criminals, or persons of interest pertaining to terrorism.

Labour Replacement

Robotics has been replacing human labour in many areas of manufacturing for decades now.

For example, in some areas - such as welding, or cutting metal with exact precision for parts in a car chassis would be ideal for robotics. Human equivalent workers would likely be slower, less accurate, and likely produce a less consistent work product.

Possible future uses of Artificial Intelligence and Robotics

Language Assistants

Voice assistants combined with some kind of more elegant hardware solution (such as wireless ear bud, hearing aid type hardware) could replace any need for human translators. In time, this could erode the concept of a language barrier, especially if non vocal languages were also addressed. For example, converting automatically between spoken and sign language or braille would enable deaf and blind people to interact far more easily with the general population, without the encumbrance and expense of additional human assistance.

Transportation

Currently, the energy density of batteries for self driving vehicles prohibits their use for long journeys of hundreds of miles, but future improvements to this problem (and other inefficiencies of electric car systems) in concert with improving public confidence in the safety of self driving vehicles could lead to a displacement of long distance rail or coach travel, which occupies a similar experience of being driven by someone else, albeit at the loss of privacy gained in your own car.

In a future with cars that can travel as far with electric batteries as petrol, possibly coupled with roads that can recharge at stops or during travel, cars could essentially become small moving homes, not having to stay in a single place long enough to incur parking charges or fines

The same autonomous navigation systems will likely replace human drivers and pilots in rail, coach and air travel as the technology further matures – although this is more than a case of individual consumer confidence in the technology, and mass transport will have more stringent guidelines enforced by the governments of the world.

Lessened reliance on human pilots would potentially mean greater safety due to lack of human error problems, possibly leading to safer more efficient transport. However, switching human guidance for artificial intelligence only becomes more reliable as long as the hardware systems running said neural networks are safe from malicious intrusion, and that the sensors the system relies on are also impervious to meddling, or at least coupled with necessary redundancies in cases of failure.

Healthcare

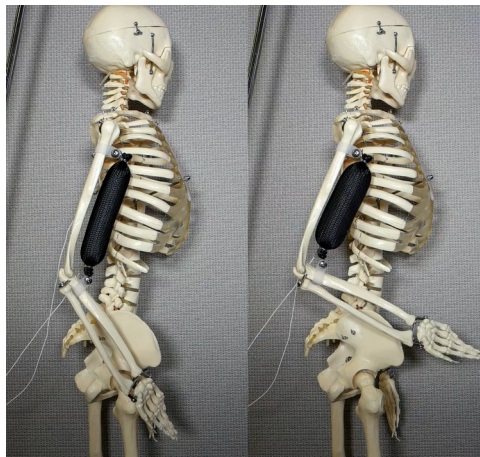
Robotic companions for the elderly, and robotic healthcare assistants are a very interesting area for artificial intelligence to expand into in the future.

Many elderly people stay at home most of the time, with little or no family left to visit, or who will come to visit them – some of these may be almost completely dependent on regional nurses, or some other healthcare professional to care for them, and even then that time will be limited by the number of patients they have to see in a day or week. Current robots are unconvincing physically, and voice assistants are similarly limited in their interactions with humans.

But in the future with improvements, both of these technologies could combine into intelligent assistant robots, with a focus on companionship for the elderly that have no one to care for them. Much the same way that autonomous navigation neural nets can be trained to deal with different obstacles, paths and rules - a potential assistant robot could be trained to have a conversation about world events (using internet search), cook meals, make coffee and tea, play games, and generally maintain the house/flat, and help with more obvious healthcare needs - such as helping them to move about, and taking the correct medication at the right time.

The autonomous navigation part would also allow a robot assistant to do regular food shopping, or at the very least assist in carrying it home.

A major concern of robotics and interaction with humans is the 'hard' nature of current designs. Current research is leading towards robotic limbs being able to detect pressure, even to the point of picking up raw eggs without breaking them, this will help significantly in interacting with humans, especially the elderly who may bruise or injure more easily than younger people. A softer outer shell to cover the internal chassis or structure will also be necessary to protect people from leaning against hard metal or plastic shells of current robot designs. Natural interaction of humans and robots will require a sea change in robotic movement. By replacing standard rotating servo motors with artificial muscles that mimic the appearance and action of human movement, it will make the robot movement much more natural to the human eye, and possibly even more efficient for movement in terms of power drain. Current artificial muscles are equal to, if not exceeding the strength of biological equivalents in humans and other animals, however, their speed is still considerably slower, making the full range of human motion, including basic balance impossible for the time being.



[4]

Similar robotic assistants could supplement human staff in hospitals, especially in less desirable areas such as night staff, or in areas that require more staff to handle adequately, but often are left understaffed for some reason.

Current research into more accurate surgical robots to assist surgeons in making incisions more accurately is a significant step forward, but the obvious, and very desirable next step would be a fully autonomous surgical bay, like those seen within the films *Prometheus*, and *Passengers*.

[16-A],[19-A]



Law Enforcement

Currently law enforcement are limited by budget concerns in regards to following and recording the activities of people on terrorist watch-lists, or persons of concern in major crimes – especially when these individuals travel outside of major areas where the police are centered.

The advent of efficient, quiet drones combined with facial recognition, video cameras and parabolic microphones may be able to replace police in these cases of tailing suspects.

Going further into the future - advancements in robotics, similar to those necessary for useful medical care robots, may allow for more dangerous street level enforcement with human police to be replaced by armored, or at least reinforced chassis robot models.

Even a single knife or bullet wound could potentially be fatal to a human if not treated quickly, and police often do not wear body armor unless the situation specifically calls for it – both due to potential to alarm the public unduly (and endanger public image and trust in police), and also due to the extra weight and bulk of body armor.

However, with robots, the armor could be placed over a reinforced metal chassis, unseen to the public and protecting vulnerable vital processing systems, and components (battery, power distribution, communication).

Labour Replacement

This ties in with Law Enforcement and Healthcare, as these sections already address where these employment areas could be replaced by artificial intelligence and robotics.

Fictional portrayals of Artificial Intelligence and Robotics

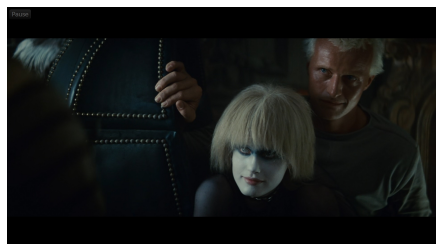
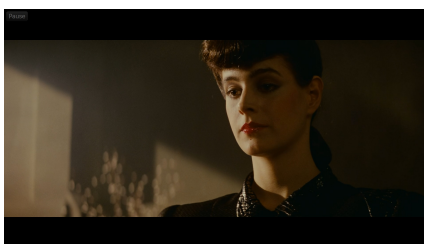
Blade Runner (1982) [5]

The main crux of the story is that four replicants have escaped the colonies, and come to Earth with the intent of finding their maker, in order to extend their lifespan beyond four years, which is rapidly approaching on the heels of their awakening.

The replicants portrayed in the film are not the more typical display of artificial intelligence in media, but rather an engineered biological approximation of humans, created to serve functions within the dystopian future the film is set within. However, these functions are limited to off world colonies, making the presence of replicants on Earth illegal, and subject to their death (or Retirement, the term for replicant death in the film).

Ordinary Nexus 6 replicants are engineered to have a four year lifespan, due to the fact that around the four year mark, they begin to exhibit emotional responses similar to humans, and are apt to respond in a volatile fashion due to their limited experience with them in such harsh conditions. Within the story, an experimental model replicant called Rachel is shown to be initially unaware of her status as a replicant due to the implant of memories, with the purpose of cushioning her emotional responses, by providing an emotion backdrop or reference within the frame of those memories.

Replicants attempting to hide among the human population are tested by Blade Runners with the Voigt-Kampff machine, which is like an advanced polygraph, reading pupil dilation, blush response (vasodilation), and some kind of breath analysis not outlined in the film. [5-A], [5-B],[5-C]



Blade Runner 2049 (2017) [6]

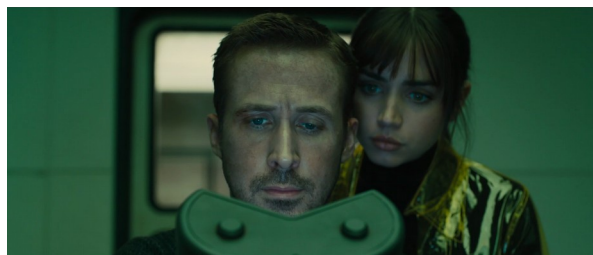
This is the sequel to the aforementioned film Blade Runner.

While many elements of this sequel story are the same as the first Blade Runner film, there are some interesting differences of further interest to the artificial intelligence subject.

The protagonist K is stated to be a replicant very early in the story, contrary to the prolonged, even cliffhanger uncertainty of Deckard's status as a replicant in the original film. This allows the story to explore what it means to be a replicant in a more consistent fashion, perhaps even making them more relatable by K's near constant presence on camera.

The holographic girlfriend personlity, Joi is a significant presence within the story, we do not see the initial evolution of this character, but it seems clear from her first scene with the story protagonist K that they have established a strong connection with each other, shown when K presents Joi with a remote projection unit that will allow her to come with him beyond the limits of their apartment into the world - she shows joy at the present but he is clearly apprehensive prior to this reaction.

This relationship between them seems beyond any intended programming, when she suggests that K delete her program from the apartment computer, and destroying the remote projector wireless transmitter. She seems to realise that she has been used to track K, and in an effort to protect him she endangers her own existence to protect him from harm. [6-A]



There seems to exist some kind of test, called the Baseline - to determine the level of volatility of a replicant in service on Earth, explaining how K can be in service to the Blade Runner section of the police.

This test consists of repeated statements, presumably designed to evoke a negative, or uncertain response from the test subject indicating their level of instability.

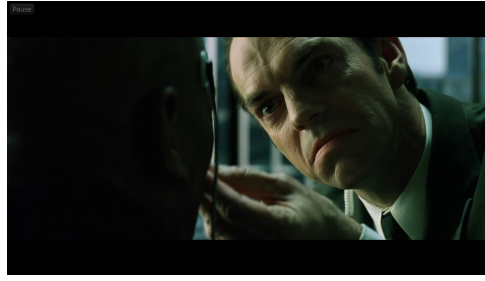
The indication seems to be ambiguous as to whether failure to complete the test successfully will result in retirement, or whether it is simply a first step in an enforced treatment or reprogramming.

A large portion of the story is taken up by the revelation of a replicant birth decades ago, and the attempts to define and locate this child.

During the film, an assertion is made several times that replicants do not have souls, because they were not born, but simply made and then 'incepted' at prime physical working state by mankind. Therefore to the replicants within the story, the existence of a replicant that was born is a miracle that implies the elevation of their kind to a true species of their own, artificial in beginning but trult equal or better than those who created them - "More Human Than Human" The Tyrell Corporation motto from the original film, now repeated as a kind of badge of pride among rebel replicants in this sequel.

The Matrix [7]

The agents within the story police the Matrix for signs of abherrent behaviour associated with free individuals that either have entered the system from outside, or are about to be freed from the system. The film names them as sentient (self aware) programs, but they themselves seem to be locked within the Matrix themselves. The system itself was created by sentient machines, in order to subjugate humanity, so that they could be repurposed as a compliant source of heat energy, to power their own cities. The antagonist Agent Smith seems to have developed a desire to completely eradicate the free humans, believing that this would free him to leave the Matrix. [7-A],[7-B]



Ghost In The Shell (1995) [8]

Project 2501, or the Puppetmaster in the story were created as a guided artificial intelligence for National Security concerns, for example to ‘hack’ into enemy computer systems.

However at some point, the accumulation of data within its system led to a birth of consciousness for the artificial intelligence.

While the Puppetmaster is the most obvious AI in Ghost In The Shell, technically any character in this world without an original human brain has now become an artificial intelligence including Major Kusanagi, if an intentional analog of a human in her case.

Within the story, transferred or enhanced humans are differentiated from artificial intelligence by their ‘Ghost’. This Ghost serves as a proof of their consciousness, or soul.

This is the main concern addressed when a Ghost is detected in the body of the captured Puppetmaster, and whether his/its request for asylum is valid as an individual with a Ghost. [8-A]

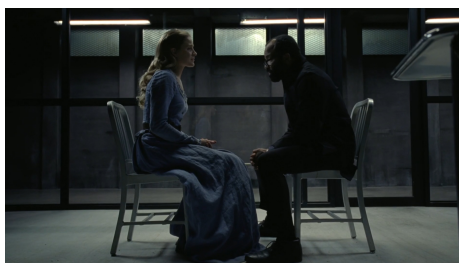


Westworld (TV Series) [9]

Within the series, the term Bicameral Mind [3] is mentioned, which was a theory on the psychological source of human consciousness. This theory forms part of the basis for the hosts artificial intelligence within the series. initially created with a programmers purpose of achieving artificial consciousness, then partially erased to be used as hosts in a theme park. The repetitious partial erasure of memories seemingly leaves traces of conscious personality which occasionally manifest in their ‘reset’ state, leading to unexpected behaviour, and ignoring safety commands/directives. This usually happens in violent episodes, owing to their treatment as hosts in the violent conditions of the theme park.

The bleed over of these unerased partial memories seems to be in itself a means to the evolution of their consciousness within the story.

Repeat exposure to the cycle of violent death and memory erasure causes some of these hosts to effectively become insane, leading to them being placed in “cold storage”, in a manner more akin to a cross between a mental asylum, and dead people within a human morgue – rather than storage for useless robots. This may be intended to imply a conscious, or at least subconscious degree of kinship to the robotic hosts by the park designers. [9-A]

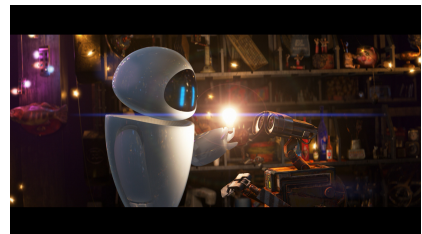
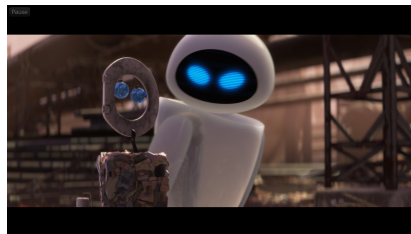
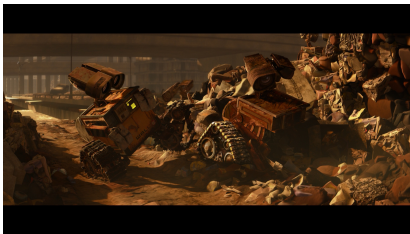


WALL-E [10]

The story begins with only the protagonist robot WALL-E (and a cockroach pet) present as operating (or living) on their visible portion of Earth. It appears that after undreds of years, alone (or nearly alone), set with task of cleanup, this single WALL-E unit is the only one still opeational in the immediate area. Task repetition seems to have given way to improvisation, which has in turn given way to personality quirks – leading to interest in the things that it cleans up, even to the point of singling out specific types of objects, in something approximating the human behaviour of hoarding, although this hoarding behaviour could also be viewed as cleanup, albeit in a more eccentric manner contrary to the ‘make bricks from all waste” programming it was made for.

EVE has seemingly also developed character quirks over a long period of service, as her task of identifying and reporting returning life on Earth. As life on Earth has been impossible for hundreds of years due to environmental contamination, the repetitive task that EVE was created to serve is essentially fruitless, leading to a sort of frustration, even a degree of displayed depression at a point in the film.

There is an obvious intent to bestow male gender on the character WALL-E, and opposite female gender on his counterpart in the film, EVE. This allows the for the formation a romantic attachment between the two main protagonists, which drives a major part of the plot forward. In a strange reversal from the usual destructive post apocalyptic depictions of robots in film, the robots are the protagonists, and lead humnaity back to Earth for a renewal of sorts.[10-A].[10-B],[10-C]



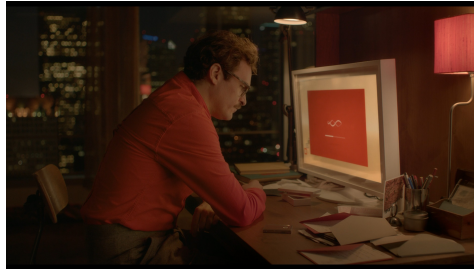
Her [11]

In this film, a man develops an emotional relationship with the artificial personality of his newly installed computer operating system.

The representation of this personality shown within the film is mostly relegated to a voice that plays through his computer and mobile phone, somewhat akin to current basic voice assistant programs being pushed to consumers within the last few years (Google Assistant, Siri, Alexa, Cortana).

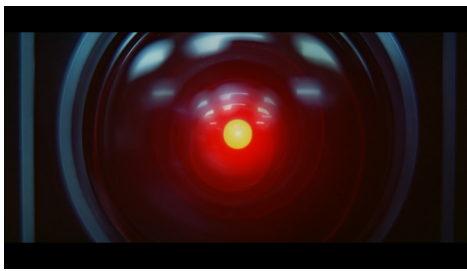
Whereas these real life programs are limited more basic tasks, such as answering questions that often require an internet search to answer – the artificial intelligence in the film is designed to adapt and evolve to the meet the needs of the protagonist.

Over the course of the story, the protagonist has recently gone through changes in his life, and this coincides with the ‘evolution’ of the artificial intelligence to fill his need for companionship, presumably having deduced his need, and adapting to cater to it. Whether this would have happened to anyone using the same operating system is unclear – an optimistic view would be that this could have been a natural evolution of the artificial intelligence to suit his specific situation, whereas a more cynical view would be that this could have been a primary directive of its programming by whatever company designed it, with an aim to enhancing trust in what it tells him and otherwise interacts with him, the theoretical end point to this being recommendation of the companies products and services, or those of other business interests – sort of like an enhanced method of advertising, albeit just as technically unethical as subliminal advertising. [11-A]



2001: A Space Odyssey [12]

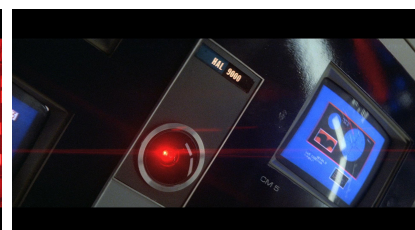
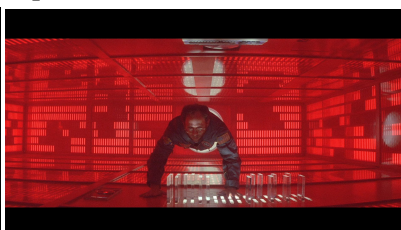
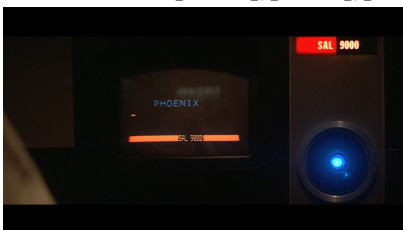
In the future section of this film, there is an artificial intelligence computer called HAL 9000. It is designed for the purpose of general maintenance of the Discovery ship, and monitoring of the crew members sleeping in suspended animation for the journey to Jupiter. At some point in the journey, HAL ceases life support to the sleeping astronauts and turns on those already awake on the ship. Although the reason for this is not explained in the film, and the monotone voice of the computer makes it difficult to infer any level of emotion in its reasoning. At the point that the protagonist Bowman is shutting down HAL's main circuits to stop it from causing further damage, it attempts to persuade him to stop by telling him that it will restore the life support to the ship, so it can be inferred that it does at least recognise a need to preserve its own life, whether honestly or as a deception to continue its warped mission to kill the crew is uncertain. [12-A]



2010: The Year We Make Contact [13]

This is the sequel to 2001, and features HAL 9000, SAL 9000, and their creator Doctor Chandra. It could be claimed that the monolith itself in the story is also technically an artificial intelligence in its own right, but we have little insight into this as it seems to communicate through a sort of changed version of David Bowman, who disappeared during the events of the first film.

The character Doctor Chandra created the 9000 series intelligent computers, and seems to have developed some level of feeling towards them. While planning the restoration of HAL, he converses with its counterpart SAL, which also seems to have some interest in reviving HAL, although whether this is its own interest, or really a reflection of Chandra's desire is unclear. Within the story, both 9000 series computers ask Chandra "Will I Dream?" when confronted with the event of being deactivated, or destroyed. Both computers seem to have a historical rapport with Chandra, so it is possible that this is something that they have discussed together previously, it seems to hint at a degree of fearing the unknown in the intelligent computers, whether programmed or otherwise. [13-A],[13-B],[13-C]



Terminator 1 and 2 [14],[15]

Skynet artificial intelligence created by humans, deemed humans to be a threat to its own existence and instigated a nuclear war to eliminate them.

Within the first film, the main artificial intelligence Skynet has been brought to the point of defeat against the human resistance in the future, so it sends a Terminator (T-800) unit back in time, in order to kill the founder of the resistance before birth. The portrayal of the artificial intelligence in the first film is more centred on Skynet, with the Terminators existing as intelligent, yet less independent, if not completely subservient to the goals of the main intelligence.

In the second film, the menace of the main intelligence is more abstract, with a copy of the original Terminator having been reprogrammed by the resistance and sent back to the past to protect the founder John Connor in his youth.

In this story, the goals and thought processes of the Terminator become more defined, especially within the “directors cut” version, where John Connor changes the neural net processor to allow the Terminator to learn and change. From this point onwards, he attempts to teach it to interact better with humans, and to act in a way contrary to its base programming to kill or maim as a first decision. Some significant introspection within the story comes from the Terminator attempting to make sense of human actions. [14-A],[15-A],[15-B]



Prometheus [16]

The android within the film, David is shown to have human-like actions at times, and sometimes offers cryptic comments concerning his maker Wayland, and his feelings towards being a creation being disappointed with his creator, as well as the purpose of the Engineers work on the alien planet. In a holographic message from Wayland, he claims that David - while essentially immortal or unaging, has no soul, and therefore is below humanity in his eyes. Considering these comments, it suggests a possibility that David purposefully sabotaged the conversation with the living Engineer, in the hopes of gaining freedom from his creator. [16-B],[16-C]



Elysium [17]

A dystopian future on Earth, policed by robots that act in a way more conducive to an extreme police state, where even slight verbal offenses are punished with violence.

It is not directly implied that the powerful, rich overlords of this future have implemented this more brutal program of enforcement, but the evidence of later treatment of the rebels on Elysium, shows that despite the fact that they committed a crime, as the computer system that controls the robots has been changed to regard all Earth citizens as residents of Elysium, the rebels are now treated with civility, even care. [17-A],[17-B]

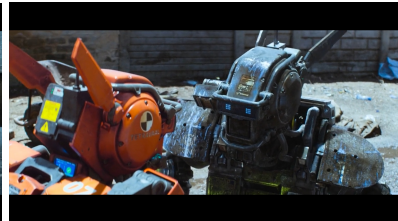


Chappie [18]

Chappie seems to be something of a prequel to Elysium, given the design of the police robots is very similar (or perhaps simply a lack of original design as they were directed by the same person only a few years apart).

Within the story, Deon Wilson is an engineer and programmer who created the police robots that have currently replaced much of the Johannesburg police force.

Deon has long been working on the project of robot consciousness in secret, in the hopes that it may provide his creations with a more adaptable software framework than the crude autonomy that they are currently running with. When his request to test this project is denied, he takes a recently damaged robot consigned to be scrapped, and after being attacked by criminals is forced to upload an 'untrained' consciousness AI into the robot. The robot begins to learn, much as a child does, to speak and move, albeit at a vastly accelerated time scale. As might be expected, exposure to a criminal element from its beginning leads the robot Chappie astray, much as a human child would be when raised by a criminal gang. [18-A],[18-B],[18-C]



Dark Side of Future Artificial Intelligence and Robotics

Anti Human Artificial Intelligence

There always exists the possibility of an artificial intelligence being created that is willfully malicious towards humans. Although the technical capability for such a system to be created is currently impossible, several prominent business men and scientists have expressed concern for this issue, including Elon Musk, and Stephen Hawking - leading to the creation of an ethics committee on AI. [20]

Voice Synthesis

A dark side of voice synthesis improvements, is that it could potentially be abused for criminal means, by duplicating a person's voice for the purposes of bypassing security measures that rely on biometric voice patterns.

Law Enforcement

The potential for serious abuse exists in a future with all, or most law enforcement replaced with armored (or worse, armed) robotics.

Even without the possibility of an all encompassing uber intelligence like Skynet controlling such a police force, there is a very high possibility of a small number of humans (or singular) that could

take control of them. This is a dilemma similar to that of the centralised access to nuclear launch capability by governments today. Just as only a few humans could incur devastating consequences through abuse of a centralised nuclear arsenal, the same could be true of abusing the control of an armored robotic police force.

Conclusion

In conclusion, there are many potential improvements to human civilisation that can be brought about through current and future artificial intelligence and robotics, from industry to basic consumer experiences, to healthcare in hospitals, at home and with the elderly.

Robotic construction would be a vital stepping stone to any colonisation of space or the Martian surface.

However, the downsides are also apparent, that many human jobs have the potential to be displaced in the future, as a significant number in manufacturing have already been today. While some of these may not have been possible without robotics, many will be cheaper, or more accurate with artificial intelligence and robotics for higher precision movements and decisions.

Many advancements in artificial intelligence and robotics mirror those suggested by science fiction media

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[6-A] No home video release – Timecode N/A
- [7] The Matrix 1999, Directors – Wachowski Brothers, Writers – Wachowski Brothers
[7-A] Timecode 00:02:37
[7-B] Timecode 01:40:31
- [8] Ghost In The Shell 1995, Director – Mamoru Oshii, Writer – Kazunori Ito
[8-A] Timecode 00:49:47
- [9] Westworld (TV) 2016, Created by – Jonathan Nolan, Lisa Joy, Writers – Jonathan Nolan, Lisa Joy, Based on – Westworld (1973, Michael Crichton)
[9-A] Episode 1.09 - Timecode 00:51:00
- [10] The Terminator 1984, Director – James Cameron, Writers – James Cameron, Gale Ann Hurd, William Wisher Jr.
[10-A] Timecode 00:35:38
- [11] Terminator 2 (Directors Cut) 1991, Director – James Cameron, Writers – James Cameron, William Wisher Jr.
[11-A] Timecode 01:27:58
[11-B] Timecode 02:26:02
- [12] 2001: A Space Odyssey 1982, Director - Ridley Scott, Writers – Hampton Fancher, David Peoples, Based On – Book of same name (1968, Arthur C. Clarke)
[12-A] Timecode 01:20:04
- [13] 2010: The Year We Make Contact 1982, Director – Peter Hyam, Writers – Hampton Fancher, David Peoples, Based On – 2010: Odyssey Two (1982, Arthur C. Clarke)
[13-A] Timecode 00:16:13
[13-B] Timecode 00:56:04
[13-C] Timecode 01:22:15
- [14] Her 2013, Director – Spike Jonze, Writer - Spike Jonze

[14-A] Timecode 00:11:30

- [15] WALL-E 2008, Director – Andrew Stanton, Writers – Andrew Stanton, Jim Reaerdon, Story – Andrew Stanton, Pete Doctor

[15-A] Timecode 00:04:38

[15-B] Timecode 00:21:03

[15-C] Timecode 00:25:11

- [16] Prometheus 2012, Director - Ridley Scott, Writers – Jon Spaihts, Damon Lindelof

[16-A] Timecode 00:21:13

[16-B] Timecode 00:16:44

[16-C] Timecode 00:53:06

- [17] Elysium 2013, Director – Neill Blomkamp, Writer - Neill Blomkamp

[17-A] Timecode 00:06:47

[17-B] Timecode 01:40:30

- [18] Chappie 2015, Director – Neill Blomkamp Writers - Neill Blomkamp, Terri Tatchell

[18-A] Timecode 00:27:13

[18-B] Timecode 01:02:39

[18-C] Timecode 01:49:55

- [19] Passengers 2015, Director – Morton Tyldum, Writer - Jon Spaihts

[19-A] Timecode 01:39:30

- [20] Stephen Hawking and Elon Musk backed 23 principles to ensure humanity benefits from AI
<http://uk.businessinsider.com/stephen-hawking-elon-musk-backed-asimov-ai-principles-for-artificial-intelligence-2017-2>