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Alita: Battle Angel

Rating: PG-13

Length: 122 minutes

Genre: Action, Cyberpunk, Thriller,

                           Science fiction, Romance

Director: Robert Rodriguez
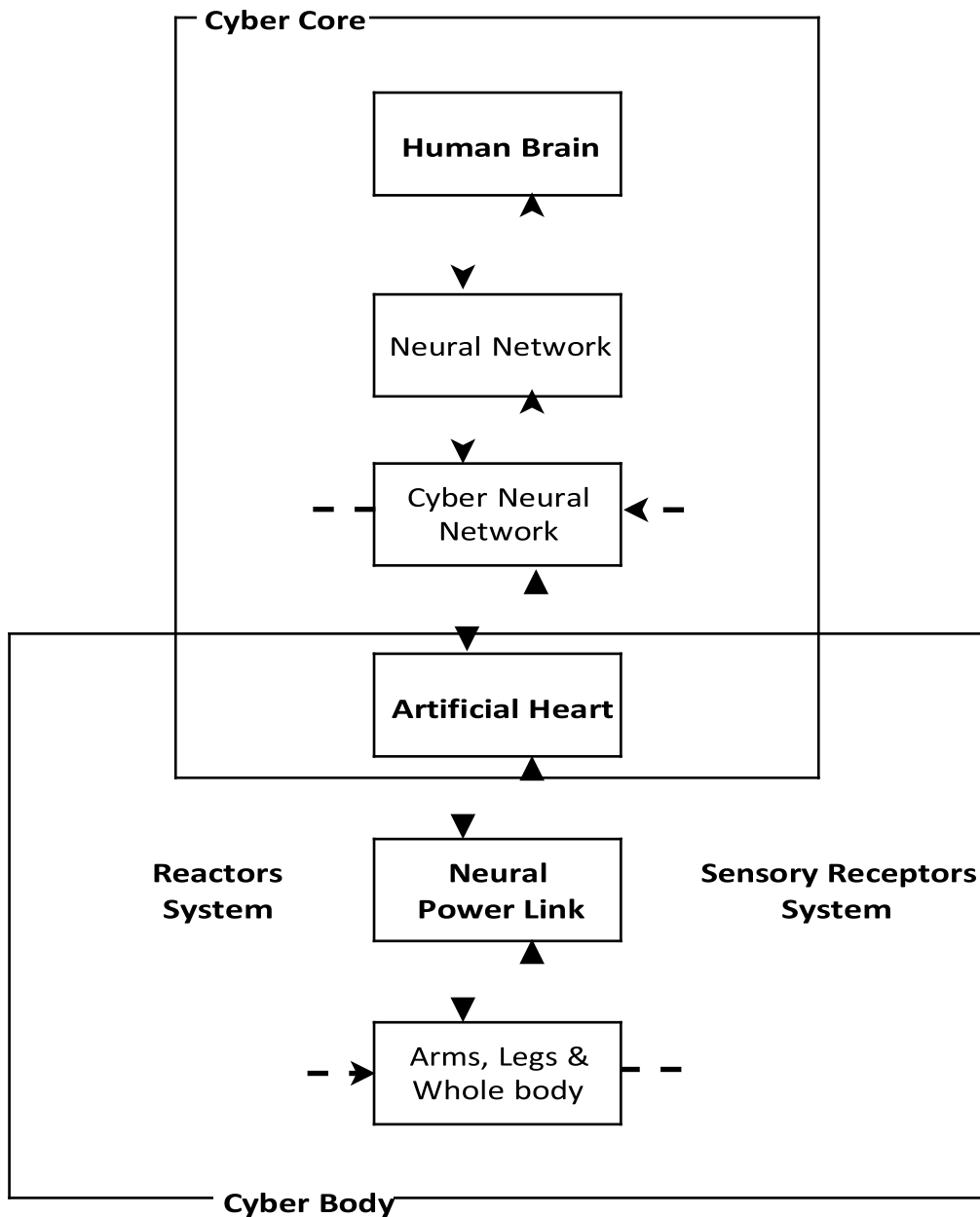
Writers: James Cameron (screenplay),

                           Laeta Kalogridis (screenplay),

                           Yukito Kishiro (original novel)

▲ Photo credit: Wiki (2019)

Based on the adaptation of **GUNNM**, an original cyberpunk graphic novel written by the Japanese manga artist, Yukito Kishiro, the background of the movie, **Alita: Battle Angel** is set in the 26th century. The story happened in Iron City and 300 years after the disastrous war, the Fall. In 2563, a well-known and enthusiastic cyborg scientist, Doctor Ido had rescued a damaged female cyborg which was suffered from amnesia, Alita from the junkyard. Alita had been repaired to have a full humanoid body back and revived by Doctor's outstanding technique. Under Alita's readapting to the new life in the sinister Iron City exploited by The Factory, Doctor tried hard to avoid the mysterious past of Alita to be awakened. Nevertheless, Hugo, her new friend in town had helped a lot with restoring her memories. Due to the accelerated and warmed-up relationship with Hugo, the intense argument of her free will with her Father (Doctor Ido) and the Factory's deadly threat against her loved ones, her strong fighting skills, and mysterious past had been awakened. These experiences had led the strong but pure Alita unwrapping the evil truth of society ruled by Zalem, the sky city, and fight against the injustices of the dark side. Alita's hidden power within her destined cyborg body had been finally discovered to change this unbearably corrupt world.

AI techniques, devices and applications mentioned in the movie

Alita: Battle Angel is the Sci-Fi movie that exploring the world with the creatures and existence which is the merger of AI with humanity with AI quality. For further discussion, we will explore the AI development mentioned in the movie below.

Figure1: Cyborg Body Structure of Alita

(a) Cyborgs with free will

Besides the humans, there was also another existence, the Cyborgs with free will and cyborg rights in the city, like **Alita**. They could live with their own free will. Alita had an entire human brain conserved in her artificial body (Magneter, 2019). Probably because of her cyber body connected to her intact human brain's neural network, she could have a strong free will, not obey to other's order and desire for survival like real

▲ Photo credit: Movie "Alita: Battle Angel" (2019)

humans. Cyborgs were like a new species in society. In that stage, the cyborgs have left the conflict on the definition between human and cyborg, if only a human brain or organ left within the artificial body.

(b) The Artificial Heart with Neural Power Link

Ben Proctor, the VFX supervisor, has also mentioned that the concept of Alita's cyborg artificial heart would be powered by the cyber core from the artificial body which would contain a reactor that could be capable of running the Iron City for a year(TE Connectivity, 2018). The conceptual technology of the cyborg artificial heart is called Neural Power Links. That could be a contactless technology which could deliver the energy from the cyborg artificial heart to the whole cyber body. That is quite obvious that the type of energy for the a cyborg would need to be powerful in this concept for imitating the complicated structure and operation of human body.

(c) Electronic Cyborg-surgical System

For the installation of the artificial body and repair for the damaged part, Doctor Ido utilized the robotic surgical arms with an electronic cyborg-surgical system in the story. The complicated and detailed cyborg surgery connecting the artificial body and human brain neural network must be a superb technique required since every connection needs to be perfect for ensuring the functions and operations of every part were enabled. The robotic surgical arms with the system installed with a surgical expert knowledge base would be an immense help for the detailed surgical moves and superior cyborg surgery.

▲ Photo credit: Movie "Alita: Battle Angel" (2019)

Figure2: Sensory Receptors and Response System & Emotional Systems of Alita

(d) Sensory Receptors and Response System & Emotional Value System

Because of her sensory receptors and emotional value system, she could tell she was hungry, shocked by food because of the bitterness detected by taste receptors from her artificial tongue. The sensory and taste receptors helped Alita to digest the external matters by using her human brain and cyber core and respond to what she absorbed with her emotional value system. Since she had her consciousness and feel like a human, she had cried in tears for the sadness and frustration she felt due to her amnesia and forgetting her original identity and memories of her past. The emotional value system had detected her thoughts and emotion from her human brain to reflect and send the message to her sensory response system and her artificial body

▲ Photo credit: Movie "Alita: Battle Angel" (2019)

reacting to express her emotion. For the situations she encountered, she could even feel the grieve and anger and decide to take revenge for her loved ones died due to her strong artificial consciousness and free will.

(e) Artificial Cyber Body with Cyber Core

The technology of Cyber Body with identity code activation mentioned before would be strengthening the probability of enabling humans to reconnect to their cyber body part automatically. The identity code would be able to be installed within every cyber core including the organic

human crucial organs, like her human brain

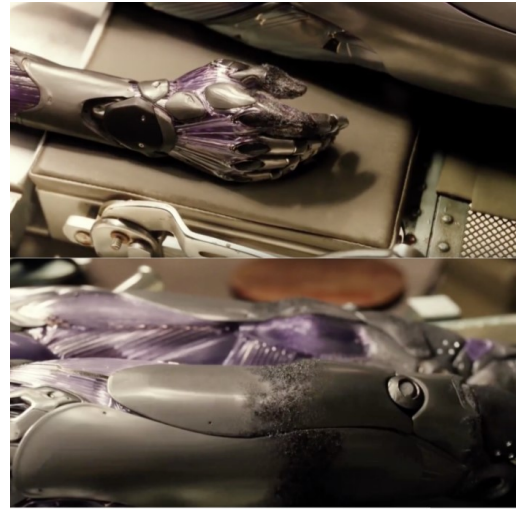preserved in the cyborg body (Magneter, 2019). If ▲ Photo credit: Movie"Alita: Battle Angel" (2019) that technique works, the cyber

core would be the most essential organic and artificial "organs" needed to be protected for reconnecting the suitable artificial cyber body. In the future, the Cyber Core could become the irreplaceable crucial survival conditions like the organic human brain, heart, and organs to keep the humans and cyborgs stay alive.

(f) Adaptive technology with Nanotechnology

There was an adaptive technology with nanotechnology in Alita's Berserker warrior body. The cyber body could reconnect the subconscious image of the body owner and the body would make the micro-adjustment throughout every system and the shell. The owner could then have a stronger, faster, and more sensitive body reacting to the external environment and threats. The adaptive technology had activated her cyber body that suits her warrior spirit with a lot more touch-sensitive and higher density of force feedback and texture sensors for the more accurate and nimble fighting movements, body gesture.

▲ Photo credit: Movie "Alita: Battle Angel" (2019)

The **Realistic Prediction of AI development** in the movie

Ouellette (2019) has mentioned that as the director and writers of the movie wanted to make this movie to be more grounded in the real world. The futuristic technology concepts have been deliberately grounded to the real-world (TE Connectivity, 2018) and the conceptual technology will also be introduced below.

(a) Artificial Muscular Cyber Body with **Nano Servo Motors**

Besides the real-world AI technology, the concept of cyborg or robots is no longer limited in just having the cold metal shell and components with programs. In this concept, the cyber body design imitating a human's organic muscle structure by using muscle-fiber-like material to become an artificial muscular body structure would facilitate the flexibility of cyborg's

▲ Photo credit: TE Connectivity (2018)

movements and gesture. The robots or cyborgs would no longer move stiffly with the Nano Servo Motors which is technology could help the cyborgs or robots to have a full range of motion that could bring the ability of the cyborgs into a full play (Ouellette, 2018). That could also enhance their capability of cyborgs in the future accomplishing the missions which need human-like creatures to work on.

(b) The Bio-haptic Sensors

Besides the artificial organs within the cyber body, there is another AI technology mentioned for the shell of the cyborg body. This futuristic technology of Bio-haptic Sensors is the sensory receptors system built on the artificial skin of the cyber body (TE Connectivity, 2018). This bio-haptic sensors system could allow the cyborgs to be capable to receive the touch sensation and feel the stuff they have touched. The cyborgs could be more sensitive to receive information and respond to the external environment more accurately like human beings. That could be the potential for cyborg or robots to finish the exploration task with higher accuracy and greater completion.

▲ Photo credit: Movie "Alita: Battle Angel" (2019)

(c) Technique installed into cyber core

As the Cyber Core we have mentioned above, we can see that the fighting technique could be inserted into Alita's memories even she had been suffered from amnesia. The instinctive reaction to the sense of dangers trained and the fighting technique used by Alita has shown that people or cyborg might have the chance to experience no more oblivion on the things people learned before and able to set the stimuli that activate or recall the technique saved in the cyber core even suffering from the amnesia. To twist the way of saying, the things people learned could become the data, be inserted into the brain or cyber core and the skills learned and become part of the subconscious. The technique learned by humans could no longer be forgotten.

(d) Space Force Cyborg Army

Alita was one of the United Republic of Mars(URM) cyborg warriors in the Lunar War. That warrior body was one of the weapons in space military use. We can foresee that the Space Force Cyborg Army could be part of the replacements for the Human Space Force in human society. The shell designed of the body could draw in air and then generate the arc plasma (TE Connectivity, 2018) and the highest temperature fire as part of the weapon for the more flexible and neat movements, accurate destination landing, and the more powerful fights in space and also brought the fighting technique into a full play. Even the Space Force Cyborg Army was damaged, they could still be

▲ Photo credit: Movie "Alita: Battle Angel" (2019)

repaired and replaced with no injuries of humans. That could be one of the realistic predictions of AI development in the future.

The **Philosophical issues of AI** in the movie

From AI movies, the negative development of AI can be frequently displayed. There are some philosophical issue of AI mentioned in the movie would be discussed below.

(a) The thieves of seizing Cyborgs' body parts

As we have mentioned before, the higher grade mechanical parts would be valuable as the replaceable cyber body parts could no longer be the threats of humans' survival. The high-quality mechanical parts of the cyborg would become the prey. There would potentially have thieves stealing other cyborgs' good quality arms and legs for different reasons like wanting better cyber body parts or helping the evil cyborgs to upgrade their cyber bodies. Some cyborgs might have their personal or tailor-made cyber parts which are well designed and high quality of functions, the thieves would take the risks for the better cyber parts to become stronger. These actions of stealing and seizing other cyborgs' body parts could potentially become a new type of criminal in the cyborgs' development future.

(b) Unclear State of pets' rights and will on its lives

As Matos(2019) said, there were Cyborg Dogs which were the pets from one of the Cyborg Hunter Warriors in the movie. We can see there were cyborg pets owned by the Humanoid Cyborg in the Iron City. That is for sure that we should save animals and live as much as we can do. However, Cyborg like Alita had her human brain well preserved in her artificial body, which might be the decision made by the human brain's original owner. In the same sorts of cases, for pets like dogs, they cannot express their decision or thoughts on whether they want their life being extended or their organs left being put into the artificial bodies and become a cyborg animal. Some might say that is just like the experiment of human scientists by using the bodies of animals, which is a long term controversy in human society. In the hypothesis which human beings could willing to become cyborgs in the future, human beings are still having rooms to consider whether we are having the rights to play the role of god and determine the lives of other existence.

(c) Social development went backwards

The humans and cyborgs no longer treasured their artificial bodies, even overpass the protection of their organic body parts as bodies can be repaired and replaced by the mechanical and electronic cyber body, even upgraded it. Just like the Motorball (as known as Deathball), the extreme game show in Iron City, even the bodies of cyborgs were damaged in the competition, they could still find the cyborg doctors to repair the damaged part or change to a completely new one. The bodies of them were no longer being treasured. The lives and injuries of creatures in their eyes became insignificant. That might cause more serious pollution of scrap irons and the universal values and social development went backwards among the society when the value of lives was forgotten and no longer be cherished in the cyborg-lifestyle developed society.

(d) The continuous disparity in the future

In the case of Alita's world, they were more similar to the rights inequality which was caused by the species, identity, or regional difference. Social Daily(n.d.) has mentioned that the unequal accumulation of wealth is the cause of economic inequality, like Zalem and Iron City. As the cyborgs' lives and bodies could be manufactured and replaced, which their life's value became lower in the eyes of "real humans" in Zalem. All the scrap iron garbage had been dropped from the sky city and the disposal works of scrap iron had been all assigned to the cyborg and human citizens in Iron City. That was like Iron City, the low-developed district had to bear the regional pollution and become the factory dealing with the pollution. That was because the poor human or cyborg citizens do not have the strength to resist the evil cyborg army and AI City-guardian enormously controlled by Zalem, the high-developed city. The similar disparity among species and cities could still be the serious social issues and crisis concealed in the future if the intention of humans among the AI development is based on rapacious and selfish ideas from some of the malicious parties.

Major modifications based on the current AI development

(a) The artificial body installed with sensors system

For the real-world AI technology, the robots now could only be able to finish the one narrow task and even the humanoid robots have been limited in the fields of AI voice assistants with rough facial expression and body movements. By referencing the Pressure and Force Sensors concept used in the movie, the shell of robots could be no longer limited by the material with no sensory equipped. They could be installed with a multisensors system, such as the existing AI technology with temperature and humidity detector and analyzer for evaluating the external environment and also the pressure sensors working with pain evaluators replacing humans to practice some immoral or cruel human examination and studies.

(b) The Ability of Human micro facial expression analysis

From the story, Alita had an amazingly exquisite micro facial expression system. Alita could even look at other people's facial expressions and be able to digest and react to the situation. If examining it as a reference, the recent AI could be advanced with the ability of human micro facial expression judgment. By observing human's face, the vision recognition for the life-guarding function of AI could be strengthened and extended the function and ability to analyze the micro-facial expression for the efficacy of lie detecting. Based on deep learning on the area of image classification and video recognition, the AI robots would be able to classify the current emotion and status of humans by using convolutional neural networks, such as sadness, agree, or even lying through the analysis of human's micro facial expression. More than that, the AI robots might also be able to find out the suspects who are lying and trying to escape from the crimes through the human micro facial expression judgment.

(c) Humanoid Astronaut Robots

Based on AI humanoid robot development like Sophia with the ability of natural language processing, facial expression, and simple body gestures, more abilities beyond that could be done by Humanoid Robots potentially. With the advanced imitation on humans, they could be inserted with the astronaut missions related knowledge into their expert knowledge base. The artificial body of humanoid robots with no lives threatened would be the best character replacing the human astronaut since every space mission recently still require human astronauts to take the risk of losing the lives to explore the space. By replacing by Humanoid Astronaut Robots, more instant analysis and space missions could be done with a body capably containing more systems, such as the material analysis sensors system on their body then analysis the space environment with the Yes/No questions and gather the data storing into their database and send back to Earth with the spaceship. They could become the imitator of human astronauts and even record the movements and mission procedures as their learning materials, which would be the best to preserve human astronaut experts' lives, continue and even upgrade the mission complexity which humans can not handle in the future.

(d) Technique Installation into the AI robot's memories

By referencing the fighting technique Alita used instinctively, maybe we could train the AI robots in our real-world to learn the fighting techniques and be capable of in charge of the AI guardian or security of humans. For the learning process, one set of the fighting gesture and movements and one set of attack gestures and movements prepared can be recorded by the artificial vision system of AI robots. After they gathered the data, they could make good use of the convolutional neural network for coding and pooling the images they recorded to analyze what defensive gesture or fight back movements they should use while facing the type of attack movements. The skills learning of them could then no longer a complicated task to imitate, people could simply display the actions the AI robots needed to know and help them install the skills like that. The skills they learned could then be useful for them to replace the risky works which might threaten human life or cause injuries.

To conclude, the Alita: Battle Angel's production of projecting the dystopian world like Iron City and Zalem has provided the rooms for the audience to reflect on the humanity and legitimacy of current human society development. The faster technology of human society developed, the more dangerous human society formed under the recent human state of mind. The evolving technology would be turned into the malicious use for their avarice, selfishness, and dictatorship like Zalem if human beings do not utilize the technology only on the mutual benefits of all humans on the Earth.

(3,098 words)

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Reference

Ouellette, J. (2019, February 17). Welcome to the cyber world: The real-world tech behind Alita: Battle Angel. Arstechnica. https://arstechnica.com/science/2019/02/welcome-to-thecyber-world-the-real-world-tech-behind-alita-battle-angel/

TE Connectivity. (2018, December 17). How it Works: Cyborgs | Alita: Battle Angel | TE Connectivity [Video]. YouTube. https://www.youtube.com/watch?v=M8zlyxXohM4&list=PLJA3JAiO7RguEzIcfIpIOJAaWquXnhUwl&index=2

Matos, C. (2019, February 20). Don't worry, the dog didn't actually die in Alita: Battle Angel. Hypertext. https://www.htxt.co.za/2019/02/20/dont-worry-the-dog-didnt-actually-die-inalita-battle-angel/

Magnetar. (2019). Why is Alita's heart part of her core? Reddit. https://www.reddit.com/r/alitabattleangel/comments/bb5ysm/why_is_alitas_heart_part_of_her_core/

Rawden, J. (2019, March 25). The Cool Reason Alita: Battle Angel Moved The Movie To Panama City. CinemaBlend. https://www.cinemablend.com/news/2468881/the-coolreason-alita-battle-angel-moved-the-movie-to-panama-city

Oxford. (n.d.). Meaning of cyborg in English. Oxford English Dictionary. https://www.lexico.com/definition/cyborg

Lofter. (2011, May 30). Introduction of the Hutchison Effect. LOFTER. https://web.archive.org/web/20151208064524/http://xhmgs-6464.blog.163.com/blog/static/1688273520114302196170/

Victoria, V. (2019, February 24). Alita: Battle Angel and the Integrity of the Human. Medium. https://medium.com/@victoriavouloumanos/alita-battle-angel-and-theintegrity-of-the-human-bc4c7aea97a9

Science Daily. (n.d.). Social inequality. ScienceDaily. https://www.sciencedaily.com/terms/social_inequality.htm#:~:text=Social%20inequality%20refers%20to%20disparities,the%20lack%20of%20wealth%20in

Wiki. (n.d.). The Hutchison Effect. Wikipedia. https://zh.wikipedia.org/wiki/%E5%93%88%E5%A5%87%E6%A3%AE%E6%95%88%E6%87%89

Wiki. (n.d.-a). Alita: Battle Angel. Wikipedia. https://en.wikipedia.org/wiki/ Alita:_Battle_Angel#Cast

Wiki. (n.d.-a). Nanorobotics. Wikipedia. https://zh.wikipedia.org/wiki/%E5%A5%88%E7%B1%B3%E6%A9%9F%E5%99%A8%E4%BA%BA%E5%AD%B8

Potts, R. (2019, June 12). Alita: Battle Angel [Photograph]. Alita: Battle Angel Is Coming to Blu-Ray. https://www.avsforum.com/wordpress/alita-battle-angel-coming-blu-ray/

Finecollection. (2019, August). Alita [Photograph]. In Alita: Battle Angel (2019) the Title Character Has Very Large Eyes. This Is a Reference to the Source Material in Which Alita Also Has Eyes.