

The Race Against Technology

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Introduction

Technology is advancing at a rapid rate. Relative to the entire history of the world, humans have only existed for an extremely short period of time, and in that miniscule amount of time, we have managed to develop incredible technologies. From the primitive tools of the stone age, we have advanced to computers that can think for themselves, medicine that can adapt to any individual, and we are building and rebuilding the planet in ways never even attempted before on a huge scale. Big changes are coming for humankind that have the potential to change the entire world. From the consumer's perspective, new technology is almost always perceived as a good thing--faster computers, better cars, new forms of energy production.. However, often times, the consumer is not aware how these new technologies will produce new safety concerns or ethical dilemmas. For instance, the growing role of computers in society produces a whole new form of cyber-terrorism. Advancing aptitude in artificial intelligence could pave the path towards a robot revolution. Stem cell research could potentially save millions of lives, but it raises all kinds of ethical questions. Environmental technologies such as renewable energy and terraforming could give us the opportunity to completely reshape the planet to either rebuild it or utterly destroy it. Technology could potentially grow to the point that humans can no longer control it, and until we understand everything fully, a close eye should be kept on new technologies.

Stephen Kotler examines this idea in his book *Tomorrowland: Our Journey from Science Fiction to Science Fact*. Each chapter showcases a different invention and explains the practical uses and the arguments being made for and against each one. This book pointed to three main avenues which I am interested in researching more: the growing world of computers and the

impact it could have on society, the controversy behind the science of stem cell research, and some environmental technologies such as terraforming and renewable energy. It details several different examples of ways in which humans have invented incredible things which are nearer to science fiction than science fact, but many of them raise questions of safety and morality. There are a few main questions that I formed after reading the book. How is artificial intelligence being used in the present time and how effective is it? What are the dangers of continuing with stem cell research? Where else is terraforming being used to try and rebuild biomes that were damaged? And ultimately, is all of this new technology beneficial to society? Do the benefits outweigh the dangers? Or will we become consumed by our fiery need for new technology?

“It has become appallingly obvious that our technology has outweighed our humanity,” said Albert Einstein. The strange thing about technology is that it is completely different for every generation. Every generation remembers differently what the “big invention” of their time was. For some people it is the computer. For others it could be the iPhone or some other mobile device, and in the future, it will be some new invention yet to come. However, once these things are created it is hard to imagine a life without them. Albert Einstein lived in a time period in which computers were just starting to be created, yet he still believed that humans were starting to become too dependant on them. I wonder what he would have thought about life today where most middle school children have twenty times the computing power of any computer in Einstein’s day in their pockets. Technology is becoming centralized to our society and continues to lodge itself in more and more. People were already starting to criticize this idea when there was considerably less of it than there is today. This raises an important question; can our society reach a critical mass where our technology truly has surpassed our humanity and we have

become so dependant on our machines that we no longer live or interact as humans anymore?

Steve Jobs was co-founder of Apple and helped to create one of the biggest tech companies in the world. He dedicated his life to technology, and helped to create many of the products which are almost ubiquitous in many places. It was apparent that Jobs had a more optimistic opinion of the future of technology. He believed that "technology is nothing. What's important is that you have faith in people, that they're basically good and smart, and you give them tools, they'll do wonderful things with them." Jobs differend a lot of people because of his different approach he took to his business. Jobs focused more on design and marketing. His unique, quirky, yet intelligent mindset helped to form a company that created quality products that looks very different from his competitors.

Nikola Tesla said, "It is paradoxical, yet true, to say, that the more we know, the more ignorant we become in the absolute sense, for it is only through enlightenment that we become conscious of our limitations. Precisely one of the most gratifying results of intellectual evolution is the continuous opening up of new and greater prospects." Tesla seems like he understands the thirst for knowledge and growth in technology that we as humans have. This is why I picked Tesla as my third deceased person who I would want to talk to. Nikola Tesla is one of the best yet least known American inventors. I would want to talk to him about his inventions and how he feels about his inventions. I would also especially want to talk to him about how important he feels it is for technologies to continue advancing and for those "new and greater prospects" and whether the pros outweigh the cons.

Hugh Herr is a man who invented the most advanced prosthetic leg when previously there had been basically been almost no innovation in the field at all. Prosthetics were

uncomfortable and caused major problems for people later in life. Hugh Herr not only made a device that was comfortable, but mimicked the actions of the human body so much people often times forgot they were wearing a prosthetic leg. However, the most amazing part of Hugh Herr was his story leading up to this point of his life. From the time Herr was a young kid, he had been interested in climbing and was fairly well-known as he was the youngest person to climb several of North America's highest peaks. When Herr was 17 he, along with his friend Jeff Batzer, attempted to conquer Odell's Gully on Mount Washington which was an extremely difficult icy climb. Odell's Gully has gales reaching upwards of 70 mph; it is considered an extremely dangerous climb. A few hours into their climb the weather got too bad and they were forced to start a descent and come night time they had not returned. A rescue party was sent out and in the search a man was swept up in an avalanche and ended up being killed. After four days lost, Herr and Batzer were found, and they were distraught at the thought of having been the cause of another man's death. Herr and Batzner were sent to a hospital. Herr had such severe frostbite in his legs that he had to have them amputated 6 inches below the knee. Soon after the operation, Herr was determined to return to climbing. When his doctors left him alone, he would pull himself out of bed and do pull-ups on the ledge. Herr's first set of prosthetics were nothing more than attachable sets of pylons. They were awkward and uncomfortable. The doctors were wary of sending Herr home with the prosthetics because they did not want him to return to climbing. Their worries were not misplaced because when he left the hospital, only 10 weeks after his operation, Herr returned to a place called Safe Harbor where he completed a rather easy climb using only his upper body. This gave Herr an idea. In shop class in school, he spent much of his time designing himself new prosthetics. He realized he did not want uncomfortable

prosthetics designed to resemble human legs, he wanted climbing legs, so he designed his new prosthetics' feet to have a pointy at the end which got wider near the back to be able to fit into holes in the side of a mountain. With the help of his new feet, Herr not only became a better climber, he became one of the world's best climbers. After that, he devoted his life to developing better prosthetics and bionics limbs for people and went on to develop the BiOME, the world's most advanced prosthetic leg.

In addition to Hugh Herr, Stephen Hawking is another stakeholder in the field of science. Hawking believes that the advancements in artificial intelligences could lead to bad results. Stephen Hawking is one of the world's leading minds in science. Stephen Hawking is a physicist technically, but he is still one of the smartest men alive currently, and has spoken on the topic of artificial intelligence. Hawking believes that because technology keeps on advancing faster and faster at an exponential rate, technology will eventually outcompete human biology and it could spell the end of the human race all together. Hawking himself said, "humans, who are limited by slow biological evolution, would be superseded." Hawking does not deny the potential uses for artificial intelligence, especially since he himself uses a form of artificial intelligence in order to communicate. However, once artificial intelligence grows to the point where it can do jobs better than humans can, it means trouble for the job market. I would want to talk to Stephen Hawking because while a lot of people believe think that the ever advancing technology can be nothing but a good thing, Hawking is of the opposite belief being cautious for the future.

One final stakeholder in the field of technology and science is Elon Musk. Musk is one of the most influential and powerful entrepreneurs of the modern day. He was a co-founder of Paypal and has since gone on to create many huge companies and projects for the future

including Tesla and SpaceX. Also, he is invested in the production of a new type of transportation called Hyperloop. Musk is probably the most outspoken person on the subject of new technologies and what they mean for the fate of humanity. Musk's feelings on the subject are rather conflicted. He believes that if we continue on the track that we are currently on, the human race will burn itself out in a couple hundred years. This is why Elon Musk has taken the pilot seat in creating companies that promote a more sustainable future. Tesla Motors creates completely electric cars that are becoming more and more mainstream. SpaceX hopes to give common people access to space for the potential future of moving to another planet. In addition to actively participating in creating new technologies, Musk frequently talks about his thoughts on the future of humanity of technology and whether or not he thinks humans will be successful in finding the right balance. As humans, we will always want things stronger, better, or faster. The only questions that remain are at what rate will we continue to do so and how will humans adapt to it.

Elon Musk: America's Hope

Ashlee Vance's book *Elon Musk: Tesla, SpaceX and the Quest for a Fantastic Future* talks about the life of Elon Musk, his achievements and his role in the world of technology. As it turns out, Elon Musk is a very hard man to interview. I read a select few chapters which talk about Elon Musk in general and each of Musk's most notable successes. The first chapter that I read described the first encounter that Vance first had with Elon Musk. When Ashlee Vance initially asked Musk to do an interview, he declined. This led her to go months of prep work of interviewing various employees and former workers of Musk's companies until finally Musk and Vance made an agreement to chat. The book opens with discussing the first conversation that occurred between Elon Musk and Ashlee Vance, the author of the book. The many conversations that followed gave a brief insight into the mind of Elon Musk, one of the most influential inventors and entrepreneurs of the modern day.

"I would like to die thinking that humanity has a bright future. If we can solve sustainable energy and be well on our way to becoming a multi-planetary species with a self-sustaining civilization on another planet... then... I think that would be really good." This is what Elon Musk said when he was asked what his life purpose was. These are not hollow words, either. With companies like Tesla Motors and SpaceX well underway, that idea might not be far off. Tesla Motors are creating cars that run solely on electricity without any use of fossil fuels required. This means that as soon as the energy problem is solved, Tesla cars will be able to run sustainably with no need for gasoline. On the other hand, SpaceX looks to solve the problem of overpopulation and limited resources on Earth by aiming to make humans a multi-planetary species.

SpaceX is one of the most radical and innovative space exploring companies in the industry right now. The Falcon 9, the rocket designed by SpaceX, is used about once a month to carry satellites and equipment to the International Space Station or into orbit. On top of that, everything for SpaceX is manufactured in the United States bringing jobs and business back into America instead of overseas. Musk is not, however, only interested in the traditional way of launching rockets and intends to fly rockets which can carry their payload into space and then return back completely intact and land safely.

SpaceX has already made amazing progress. Rockets and space travel saw amazing progress in the 1950s and onward, but Musk wants to do better. He wants to make space travel as mainstream as possible. Generally, in the past, rockets have had a useful lifespan of one round trip. It would carry astronauts or cargo to their destination and back, and then due to the way that they worked, pieces would break off in space making it impossible to ever launch it again much less land it. Elon Musk saw this as a problem if space travel was ever going to advance, so he set it as his goal to solve the problem of rockets being able to launch and land themselves and remain completely intact. This will not only be more efficient materials wise, but will allow Musk to undercut his competitors to about a tenth of the prices. It is similar to airline companies where they dispose of their airplanes after every flight and create new ones for each subsequent flight, but Musk's company is the only one that can reuse its airplane. SpaceX will be able to save money on building new rockets for every launch which will lower the cost drastically. With SpaceX, Musk hopes to be the frontrunner to the second space and make space travel more realistic for the average person.

From reading the select chapters that I read, I gained an insight into one of the most

influential entrepreneurs of our time. Elon Musk is a brilliant and hardworking individual who is invested in trying and improve our world to be as sustainable and prepared for any future problem. This helped to further my research that I did about the current stakeholders in the field of technology. Elon Musk is frequently in the news for the incredible things he is doing whether it is revolutionizing the car industry to perfecting space travel, and from what I have seen it is well-deserved and hopefully Musk will continue to play a major role in the future of technology. From here I intend to research further into specific technologies such as artificial intelligence and sustainable energy.

Artificial Intelligence or Robot Revolution?

Nick Bostrom's "What Happens When Our Computers Get Smarter Than We Are" and "Robots with 'Soul'" by Guy Hoffman are two videos which give two introductions to the idea of artificial intelligence. Artificial intelligence is a broad term for something that is really rather vague and complex. The creation of artificial intelligence would involve creating a system of learning for the computer where it would be able to make its own decisions. For years, we have told computers exactly what to do and they would simply execute our instructions. However, this is simply not practical for what we want our machines to do now. We want our cars to recognize when we are going to hit another. We want our houses to know how to regulate temperature according to our personal preferences. We want our phones to know our schedule and remind us to do the important things. These are all examples of potential things which could utilize artificial intelligence.

Before beginning to understand artificial intelligence, it is important to understand how computers are programmed without it. Machines were given specific cases to watch out for, and when those cases were true, they would execute a given command. As an example, an alarm might be checking for the time of day, and when it is 7:00 am, it might start to ring. However, this proved less useful for a couple reasons. For one, programmers can only give a limited amount of cases to check for. It would be near impossible to manually program a car to recognize when it is about to collide with another. It would require a programmer to take a ridiculously large amount of pictures and "show" them to the computer as potential crashes so that it could learn when a crash could be imminent. This leaves computers at a state where you can really only get out what you put into them which makes them great at doing tasks that we

can explicitly tell them what to do in exact detail. This is where artificial intelligence comes into play.

The benefit of artificial intelligence is that programmers will not have to explicitly state every single situation. Instead, the computer will learn on its own the situations it needs to recognize and will learn how to react to each one. Nick Bostrom explained it best in his Ted Talk, “Rather than handcrafting knowledge representations and features, we create algorithms that learn, often from raw perceptual data. Basically the same thing that the human infant does.”

Nick Bostrom describes artificial intelligence as the “last invention that humanity will ever need to make.” Because after that, machines will be better at inventing than humans. This leads to potentially scary future. He describes artificial intelligence as an optimization process where the A.I. is being optimized to perform more and more like a human brain where instead of performing a given task, it would gather raw information and formulate a plan based on the collected data. Bostrom goes on in the video to describe different scenarios in which artificial intelligence might function in the future. One of those scenarios was to make a human smile. When the A.I. is imperfect, it might make jokes or do things that humans find fun and amusing to try and make a person smile. However, this is an imperfect solution. The only real solution that will make a person smile 100% of the time is to send electrical impulses into their face, essentially hijacking their muscular control. A super-advanced, optimized artificial intelligence might realize this and go that route instead when given the task of making humans smile. This is the main thing that many scientists and programmers are wary of when the debate over super machine intelligence is discussed. When machines become super intelligent, they might perceive humans as an obstacle in the way of completing their given task, and with technology becoming

more and more prevalent in society, it becomes a very real potential for disaster.

Nick Bostrom proposed a solution to this at the end of his video. He said, “The answer here is to figure out how to create superintelligent A.I. such that even if -- when -- it escapes, it is still safe because it is fundamentally on our side because it shares our values.” If the computer is programmed at a base level to share the same values as humans, then when it is completing its tasks, it would not see humans as threats or obstacles. This also could cause potential problems, however because, as stated before, it is extremely difficult and tedious to manually create a complete list of human values. If we were to define everything that we deem important to a computer, such as life, property, happiness, freedom, etc., the list would be excruciatingly long. The only realistic solution to the problem is to allow the artificial intelligence to learn on its own what humans find important. Bostrom thinks that in order to create an artificial intelligence that is safe to use, this problem has to be solved first.

Guy Hoffman does not quite take as serious of an approach to artificial intelligence than Nick Bostrom did. Bostrom anticipates a very serious, perfect artificial intelligence to be created which will search for the perfect answer and try and do everything it can to most efficiently solve a problem. Hoffman sees artificial intelligence differently. Hoffman views artificial intelligence as something that robots will use as personal assistants in ways that will be allowed to make mistakes and anticipate things which, as opposed to being perfect and omnipotent beings, will instead be more human-like.

Hoffman gained his inspiration for his work from a very unique source, *Luxo Jr.* by Pixar. He was inspired by how the animators could make a lamp convey so much emotion. It inspired him to create his own robotic lamp which uses artificial intelligence paired with

advanced motion capabilities which could seem to have emotions.

From what I have found through my research, I think it is certain that eventually we will have artificial intelligence that eventually matches and surpasses our own human intelligence. The promise of a perfect future is just too appealing to slow down the progress. Assuming that, there are a few different paths that artificial intelligence could take in the future. As Nick Bostrom warns, artificial intelligence could be present in nearly every object and every location on the planet, and if we are not careful it could consume our society in its perfect quest for optimization. However, Guy Hoffman took a less serious approach to artificial intelligence and demonstrated how it could be creative and beautiful. Whatever path artificial intelligence takes, either positive or negative, artificial intelligence will play a major role in the future and will have a substantial impact on people's lives.

To follow up on this research, I intend to research further on what a society would look like with artificial intelligence being used in many aspects of it. There are many speculations of how far artificial intelligence will go. Will robots go so far as to take control of every job in existence? It seems unlikely. It is hard to understand how robots could be political leaders or police without major safety/ethical concerns. Could robots handle being a part of the service industry where so many small intricacies make the job a difficult one? These things might be as far off as some people think. Some prototypes of these creations are already being created and tested. As robots and machines become more and more present, society will change drastically. A society like this opens up possibility for a jobless future, but there are many questions that this raises for the economy.

The Future of Artificial Intelligence

Historians have always been conflicted on whether or not the advancement of technology destroys jobs or not. The argument for the idea that technology destroys jobs is that the automation nullifies a need for many small, routine jobs and that those people are replaced by machines which are both faster and better in many cases. This idea has dated back all the way to 1821 during the Industrial Revolution in England. However, history has shown that even though these jobs have been lost, more jobs have been created that fill that hole in production, design, assembly, and mechanics. It is hard to pinpoint which factors go into job creation and destruction. Even as technology progress throughout history, it is hard to say which things created new jobs and which terminated them. For this reason, it is almost impossible to judge how developing technology will influence jobs. However, what people do believe is that the education level for entry-level jobs will increase. This means that as more and more of the mindless, manual labor gets taken by machines, the entry level jobs for many employees will require more education than in previous years. Jobs, however, are not the only problem that society faces.

One problem this causes is money. Many families rely on those lower end jobs and taking them away would cause lots of problems. One proposed solution was to create a basic guaranteed income from the government. The idea is that the government would give some amount of money to every citizen so that no person could ever fall below some financial threshold. The idea really fell out of favor in the sixties but has resurfaced and is even being tried in places such as Germany and Sweden. The idea has been suggested in the United States as well by some of the more extreme liberals, but the idea has not gained much traction for Americans.

Deep learning is one of the things that gets people most excited for the future of artificial intelligence. Deep learning, and the improvement of it over time, has potential to be the most powerful type of artificial intelligence. Deep learning is a “branch of machine learning based on a set of algorithms that attempt to model high-level abstractions in data by using multiple processing layers, with complex structures or otherwise, composed of multiple non-linear transformations.” The complex stuff and the nitty gritty details of how it works are way over my head, but from what I researched and understood, essentially deep learning works by storing representations of data instead of actual data. It observes the world and records via representations instead of an absolute entity. It might represent that data in a multitude of ways depending on the task at hand. For example, a face recognition system which uses deep learning might record faces by their shapes, edges, and vectors that compose their face. Other systems might use light patterns or distance measurements. The most important part about deep learning is that it can pick and choose by itself the representation/s that work best for the task at hand, and it will record tons of data and start to be able to make more abstract decisions because humans do not have to hard-code every single possible outcome because the computer is capable of recognizing and responding to unfamiliar stimuli.

The potential applications for deep learning are very diverse ranging from speech and image recognition, language processing, customer relation handling, to drug discovering and toxicology. With the obvious power that deep learning has, it is not the end all be all for artificial intelligence. There is still a long road to create truly intelligent devices, and deep learning has its shortcomings. As research psychologist puts it, “Realistically, deep learning is only part of the larger challenge of building intelligent machines. Such techniques lack ways of representing

causal relationships (...) have no obvious ways of performing logical inferences, and they are also still a long way from integrating abstract knowledge, such as information about what objects are, what they are for, and how they are typically used. The most powerful A.I. systems, like Watson (...) use techniques like deep learning as just one element in a very complicated ensemble of techniques, ranging from the statistical technique of Bayesian inference to deductive reasoning.” With all of that in mind, it goes to show that even though deep learning is truly the most advanced form of artificial intelligence we have, it is primal to what will need to be created in order to create a true, “sci-fi-esque” intelligent computer.

This fourth and final move really gave me what I have been building towards with my whole capstone. My entire capstone has really been slowing growing and growing until it reached this point where I finally talk about the (not so) distant future and what it may look like. The integration of computers and artificial intelligence into society will not be a small change, and it will probably change both the economy and home-life for many many people. In addition to that, the rate of technological advances is increasing at an exponential rate and the timeline for when this fantasy might become reality is growing smaller and smaller everyday. Deep learning and the advances in artificial intelligence are opening the gates to a completely brand new realm of computer science for people to explore, and it is a very exciting one at that.

The Future of Automation

For my fourth move, I researched the future of self-driving cars and how it will impact society. There are many concerns that the topic raises that are not directly obvious. Obviously there are the possibilities of glitches or faults in the cars driving system which could cause accidents. Ever since their creation, machines have never been perfect and there has always been mishaps and glitches in their processes. If machine intelligence was given to something as important as driving a car, a malfunction with the car or a bug in the code could lead to ending someone's life. The stakes of getting it perfect would be even more important. Also, there are the new legislature that will have to change to facilitate the new way of driving. The age of "driving" might change. Since there is no actual driving involved, could the minimum age to get your license change? Would we allow twelve year olds to program cars to drive them to their friends house? These questions are pretty obvious questions that many people come to when they are thinking about the idea of self-driving cars. However, there are much more nuanced things to consider, for instance, who has the liability in the case of accidents, how will the insurance companies adjust, and how will cost-practical will this innovation be.

Self-driving cars present a few moral dilemmas that might have to be preplanned in the case of an accident. I watched a Ted ED video on the topic of self-driving cars, and there was a situation that was presented which demonstrated one way in which self-driving cars might be morally impossible to have a correct solution. Imagine a situation in which a small sports car is driving behind a semi truck that is carrying some stuff such as haybales. On one side of the car is a motorcyclist who is not wearing a helmet and on the other side is an SUV with a family inside. Behind the car is another car with a businessman in it. Now imagine the hay bales in the back of

the semi truck start to fall out of the back of the truck and in the path of the car. If the car were a self-driving car, how would it react? If a person was behind the wheel, the person would simply react out of instinct and there would be no intent to hit anyone, but an accident would probably occur due to the setting. However, a self-driving car would be able to calculate and predict the outcome of every possible scenario, so how would it react? It really depends on how the programmer of that car instructs it to react, and this is where the moral dilemma occurs. How does the programmer decide which lives are more valuable. The car would have the option of veering either left or right, stopping suddenly, or just continuing to drive straight. There are a few ways the computer could make this decision: based on valuing the life of the driver above all else, deciding which direction would cause the least loss of life overall, or which person is most likely to get hurt the least. There are probably even more cases, but the video focused on these. If the self-driving car decided to value the life of the driver the most it probably veer in the direction of the motorcycle, endangering the life of the motorcyclist and potentially killing him. However, if the car had instead focused on the least loss of life in general it would probably just continue to drive straight into the hay bales which might only kill the one driver. Stopping suddenly would put the driver and the businessman at risk, and veering right would endanger the driver and the whole family in the SUV at risk. No matter what option the car chooses, some people's lives will be in danger. This is one situation in which a programmer will have to decide how it values life and death and who to put in danger. Deciding what to do in unavoidable cases such as this will be one major problem in the future of self-driving cars.

Google is one of the pioneers that is starting to develop driverless cars, and they have been for about a decade now. The software running on Google self-driving cars is called Google

Chauffeur. Four states have passed legislation allowing the operation of driverless cars. The self-driving cars are used to map out streets and take pictures for Google Maps street view feature, and they are surprisingly effective. A few different kinds of cars have been equipped to work with this technology including the Toyota Prius, Audi TT, and the Lexus RX450h. In addition to modifying other cars, Google has also developed their own car with the self-driving software installed into it. Also, Google's self-driving cars are much safer in comparison to other cars. Google cars have been involved in only fourteen minor collisions since their creation in 2009. After almost a hundred years in which driving has remained unchanged, it has been completely transformed in just the past half decade and it will continue to be changed as self-driving technology is improved.

Were I continuing with my research on self-driving cars, I would like to learn more about what specific features self-driving cars currently have, and where they are intending to go in the future. I would also like to research more specific companies such as Tesla and other automobile companies and see how far they have progressed.

Conclusion

My capstone started with the interest in new technologies and crazy they are. I started reading about artificial intelligence and learning about a lot of new technologies that were controversial to the public eye. The book that I first read, which really piqued my interest in the topic, had a lot of interesting chapters on various different things such as artificial intelligence, medicine, environmental sciences, and biological inventions. Each chapter presented the information and gave the arguments for and against each one. I was especially interested in the role of artificial intelligence and the growing influence that technology and computers would have in society moving into the future. In the early stages of my capstone, I anticipated that I would be spending each move researching a new form of technology and briefly researching the impact of each one, but as I started researching artificial intelligence, I became more and more interested in it. From that point on in my research I was basically only focusing on computers, artificial intelligence, and their growing ubiquity in today's society.

For my first move, I decided to look into the life of Elon Musk. Musk is a man who is at the forefront of almost every new, important technology out there. Musk is a very important and influential man in the world today, and I was hoping that I could gain some insight into his thoughts and ambitions for technology moving forward. I did not quite achieve what I was hoping for out of that move, but I decided that I would move on with my next move anyway which was the start of my journey into artificial intelligence.

My second move about artificial intelligence gave me a pretty broad view of artificial intelligence. I came into with an idea of what it was- just computers trying to mimic human thought and decision making- and left with more detailed knowledge of a lot of what AI really is,

how it could be used, and the design process behind it. Watching the two TEDTalks about the topic gave me two different insights into artificial intelligence from different angles which I believe helped me to gain a more complete understanding of the topic. But, those videos only really gave information on where artificial intelligence was currently in the design process. This was important to gain that base set of information, but I was more interested on where it was going in the future. This is what led me into my next move. I wanted to know the future of artificial intelligence and what a world would look like where computers were almost ubiquitous in everyday life. This move was probably one of the most interesting and thought-provoking because it was almost all speculation. It ended up getting a lot of economics which I had not thought of before researching it. Then, finally, for my last move I looked into the form of artificial intelligence that is most likely to come into mass popularity the soonest- self-driving cars. Tesla Motors, an Elon Musk company, is at the forefront of bringing self-driving cars to the general consumer. I started by wanting to research what the technology was capable of, but ended up moving on towards what could potentially be a controversial aspect of self-driving cars the moral conflicts that could come up in certain situations. This move was the move that really demonstrated the most how almost all new technologies could have some form of opposition because of potential imperfections or dangers they might present, and that caution is one of the key things that should be kept in mind moving forward.

Looking back on my capstone and thinking about what I have learned, I think I have really gained a lot of insight into the ever-expanding world of computer science and technology. Before this project, I was semi-aware that these things were going on, but I had never really taken the time to go as deeply as I have during the course of this project, and it all really started

with my summer reading book. This quote by Stephen Kotler really is one thing that can begin to summarize my capstone, “Life is tricky sport—and that's the emotional core of this story, the real reason we can't put Pandora back in the box. When you strip everything else away, technology is nothing more than the promise of an easier tomorrow. It's the promise of hope. And how do you stop hope?” Humans are blessed with the ability to use our brains in a way that almost no other life forms are capable of. Whether that is a good or bad thing, we as people will probably never stop innovating. Technology is an unstoppable force; I have been completely convinced of that. With that in mind, however, we must come to terms with the potential downsides of technology, as well. If we cannot stop innovation, we should at least try to control it and exercise caution when implementing these new technologies. That would have to be my thesis. Technology is a double edged sword which can be as sharp or as dull as we make it. The more crazy, risky technologies that we create, more chances for harm and error would be created as well.

Writing this capstone has really grown my interest in computer science and artificial intelligence. I intend to major in either computer engineering or computer science at the University of Minnesota next year where I will be learning about the inner workings of a lot of the technologies that I have researched here. Hopefully, I will be able to turn that into a fun career designing cool stuff and hopefully working with artificial intelligence to make smarter computers.

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