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14. ABSTRACT
In the mid 1950s, Alan Turing, a pioneer in the computer and mathematics fields, skillfully wrote one of the first credited works on artificial intelligence. Prior to his paper attempting to explain artificial intelligence, Turing created one of the first computers. The Turing Machine is still used by computer science students today to illustrate the fundamental of computers. An input, a computer that performs functions, and an output. In his audacious work "Computing Machinery and Intelligence," Turing hypothesized that someday the question of "Can machines think?" would be a question "too meaningless to deserve discussion." Yet today, scientists and futurists heatedly debate the inception, the future, and even the nature of artificial intelligence. Intelligent machines interact with humanity in almost every facet of daily life. Automatic cameras play Johnny Law, cars park themselves, and smart phones enhance the productivity of nearly every human on Earth. And yet artificial intelligence is in its mere infancy. When artificial intelligence becomes sentient and grows smarter than human intelligence, how will it influence human nature and war? Superintelligence will most certainly change the way militaries conduct warfare.

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NATIONAL DEFENSE UNIVERSITY

JOINT FORCES STAFF COLLEGE

JOINT ADVANCED WARFIGHTING SCHOOL

Superintelligence, Humans, and War

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Humans, Superintelligence, and the Nature of War

by

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A paper submitted to the Faculty of the Joint Advanced Warfighting School in partial satisfaction of the requirements of a Master of Science Degree in Joint Campaign Planning and Strategy. The contents of this paper reflect my own personal views and are not necessarily endorsed by the Joint Forces Staff College or the Department of Defense.

This paper is entirely my own work except as documented in footnotes.

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ABSTRACT

In the mid 1950s, Alan Turing, a pioneer in the computer and mathematics fields, skillfully wrote one of the first credited works on artificial intelligence. Prior to his paper attempting to explain artificial intelligence, Turing, created one of the first computers. The Turing Machine is still used by computer science students today to illustrate the fundamentals of computers. An input, a computer that performs functions, and an output. In his audacious work "Computing Machinery and Intelligence," Turing hypothesized that someday the question of "Can machines think?" would be a question "too meaningless to deserve discussion." Yet today, scientists and futurists heatedly debate the inception, the future, and even the nature of artificial intelligence. Intelligent machines interact with humanity in almost every facet of daily life. Automatic cameras play Johnny Law, cars park themselves, and smart phones enhance the productivity of nearly every human on Earth. And yet artificial intelligence is in its mere infancy. When artificial intelligence becomes sentient and grows smarter than human intelligence, how will it influence human nature and war? Superintelligence will most certainly change the way militaries conduct warfare. However, will it transform human nature and war itself?

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DEDICATION

To my children for all the sacrifices they have again endured this year for reasons beyond their understanding.

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I would like to thank Dr. Mike Pavelec for his guidance, patience, and time helping me through this project. Without any of those, this project most certainly would have gone sideways at almost every turn. Also thanks to Dr. Keith Dickson for his insights and inspiration; a true professional by any definition of the word. Lastly, Seminar I, I am awed everyday by the amount of talented great Americans I get to spend my days with in the slacker room. ~IKE

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TABLE OF CONTENTS

Table of Contents

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Chapter 1: Introduction

"Greetings Professor Falken" uttered the stereotypical 1980s robot voice. "Hello, Joshua" said the Professor happily. Joshua continues "A Strange Game (referring to global thermal nuclear war). The only winning move is not to play. How about a nice game of chess?" WarGames, a 1983 Cold War science-fiction film written by Lawrence Lasker and Walter F. Parks, brought to light a glimpse of what artificial intelligence might look like in the late 20th century. Joshua, also known as the WOPR (War Operation Plan Response), signified the stereotypical supercomputer of the early 1980s designed to accurately predict the outcomes of global nuclear war. Joshua was a large, cumbersome, metal machine in a room with lots of blinking lights surrounded by loads of vacuum tube televisions. The genius of the box office hit was that it illustrated two key things in the field of artificial intelligence. During the crescendo, Joshua learned. It humanized the computer and allowed the audience to empathize and cheer for the machine. Secondly, the film induced fear by combining global thermal nuclear war (Cold War era) with losing control of the military's pet supercomputer. This loss of control illustrates the fear created when humans no longer influence decisions of life or death. Although fictional, WarGames illustrated a computer's ability to learn, one of the many steps necessary in achieving superintelligence.

Artificial intelligence continues to make advancements and "outperforms human intelligence in many domains."[1] Artificial intelligence began to earn worldwide

[1] Nick Bostrom, *Superintelligence: Paths, Dangers, and Strategies*, (Oxford University Press, 2014), 11.

recognition when traditional games of skill began pitting computers loaded with intelligent programs to play against human beings. Chess has always been a game that humans have regarded as one that requires intellect, perception, and strategy. In 1997, Gary Kasparov was the undefeated grandmaster champion of chess. IBM invited Kasparov to participate in a game against Deep Blue, an IBM intelligent computer. Deep Blue issued Kasparov his first defeat.[2] In 2000, "Jonathan Schaeffer and his team solved checkers, i.e. producing a program that always makes the best possible move (combining alpha-beta search with a database of 39 trillion endgame positions). Perfect play by both sides leads to a draw."[3] Programmers created artificial intelligence capable of playing perfect games of checkers and beating the grandmaster of chess.

The military is beginning to make applications with autonomy and artificial intelligence. "The Navy's Aegis Combat System is a computerized command, decision, and weapon-control program conceived because humans were no longer quick enough to deal with the antiship-missile threat. …it is now capable of categorizing, recognizing, designating, prioritizing, and giving engagement recommendations…"[4] The military makes use of simple auto pilot algorithms that enable unmanned aerial vehicles to return to base if communication is lost with the host. This is just the beginning for the US military. A military that relishes in its techno-supremacy, the US continues to invest in highly technological weapons systems.

[2] History.com, "Deep Blue Defeats Garry Kasparov in Chess Match," http://www.history.com/this-day-in-history/deep-blue-defeats-garry-kasparov-in-chess-match (accessed January 12, 2015).
[3] Bostrom, 12.
[4] Matthew Hipple, "Cloud Combat: Thinking Machines in Future Wars," *United States Naval Institute. Proceedings 138.7*, July 1, 2012, 48-53.

Thinking, intelligent, or smart machines are no longer an idea of the future, but a part of everyday society and life. Intelligent machines now perform a multitude of complex tasks better than their human counterparts. In driving alone, intelligent cars can now parallel park without human assistance. In congested traffic, vehicles can regulate their speed based on a safe following distance of the car in front of them. Vehicles can now even sense an impending collision and stop without driver intervention. All of these tasks require high order logic provided by a combination of computers receiving inputs from sensors and constantly making calculations based on the changing environment it senses. Vehicles are now making life saving decisions based on artificial intelligence.

The video game industry, one of the worlds largest growing industries is a direct contributor to, and consumer of, artificial intelligence. The total worldwide video game market sales are forecasted to reach 111 billion dollars in 2015.[5] The artificial intelligence contained within a game often results in the success or failure of that game. The release of Sim City in 1989 began the pioneering introduction of artificial intelligence in video gaming. Sim City was revolutionary because the gamer interacted with his environment causing an infinite number of outcomes. Since 1989, gaming artificial intelligence has come an extremely long way. Halo, an XBOX blockbuster hit, introduced smart enemies within the game capable of countering moves and allowing multiple units to flow in coordinated complex tactical maneuvers.[6]

[5] Robert Van Der Meulen, "Gartner Says Worldwide Video Game Market to Total $93 Billion in 2013," Gartner, October 15, 2013, http://www.gartner.com/newsroom/id/2614915 (accessed January 22, 2015).

[6] Alex Champandard, "Top 10 Most Influential AI Games," AiGameDev.com, September 12, 2007, http://aigamedev.com/open/highlights/top-ai-games/ (accessed January 22, 2015).

Artificial Intelligence is part of everyday life. Currently there are almost as many cell phone subscriptions are there are human inhabitants on the planet.[7] Many of those cell phones have intelligent applications that perform tasks that were only imagined 10 years ago. For example, Apple's Siri will provide answers to verbally asked questions. There are driving programs, video games, fitness calculators, and just about anything that one would want a smart device to perform. How close to logic, reason, and true human intelligence will these machines get?

[7] Quartz, "More People around the World Have Cell Phones than Ever Had Land-lines," Quartz, February 25, 2014. http://qz.com/179897/more-people-around-the-world-have-cell-phones-than-ever-had-land-lines/ (accessed January 15, 2015).

Chapter 2: Why Superintelligence?

From the hoplite phalanx, through armored vehicles, TNT, repeating rifles, airpower, nuclear weapons, unmanned vehicles, to energy weapons, technological evolutions and war have amalgamated to produce not just advances in warfare, tactics, and strategy, but to create entire techno zealot congregations. To modern militaries, technology is the paradoxical Kool-Aid that never seems to quench the thirst for shinier widgets, stealthier stealth, and exact precision weapons. In a world of diminishing resources riddled with costly technological weapons systems, "the United States armed forces put their faith and funding behind ever more sophisticated combat systems designed to remove human contact from warfare, mankind circles back to the misbehaviors of yesteryear."[1] Weighing the cost of technological research and development versus an investment in traditional status quo military capability will be a question debated for the unforeseeable future. There is no arguing that technology will be important to future war. The question then becomes as to what technology will reap the highest benefits.

The debate over the US military's future force structure, involving investments in proven legacy systems or upgrading to newer more technological based systems, occurs in the United States Government and the Defense Department every day. Tribal politics and current crises, combined with limited resources has forced decision makers to mortgage future acquisitions to pay for current capability. The limited resources set aside

[1] Ralph Peters, *Fighting for the Future: Will American Triumph*, (Mechanicsburg, PA: Stackpole Books, 1999), 171-172.

for research and development must target fields that will yield the greatest reward for our future military. "The Pentagon should sustain vigorous R&D and experimentation activities. Someday those activities, and the technologies and new warfighting concepts they produce, may convincingly argue for a major overhaul of the US military."[2] The amount of money invested in a future technology should be proportionate to the benefits, timeliness, and advantage gained by the mastery and military application to that technology.

In 1941, the United States entered World War II. The government faced many hard choices both politically and militarily. In a wartime environment, the United States government chose to continue the research and development associated with an atomic bomb. The successful building and application of the atomic bomb, provides an ideal example of a technology providing an indefensible military advantage at a timely and opportunistic moment. Through the Manhattan Project, the US government researched and developed the technology necessary to manufacture and produce the first nuclear weapons. Inventors and scientists were then able to weaponize the technology in a timely enough manner to provide an asymmetric advantage to help end hostilities in the Pacific Theater. The United States government continued valuable research on a future technology that turned the tide of the war.

Today's challenge presents itself similarly. The United States government and Department of Defense must invest their limited resources into developing technologies that will best benefit the military of the future. The challenge for the military becomes: what is the mission, the threat, and the timeline? The US military must be prepared to

[2] Michael E. O'Hanlon, *Technological Change and the Future of Warfare*, (Washington, D.C.: Brookings Institution Press), 2000, 6.

fight today's wars as well as tomorrows. Currently, the US military has a forward global presence with its mission varying from theater to theater and COCOM to COCOM. Counterinsurgency requires a completely different skillset and toolbox than large-scale defense in depth battles. To further complicate the problem, appropriation managers must forecast the technology that will most beneficially affect future operations. Defense technologies provide a vast array of fields that can contribute to military enhancements. In this short thesis there is not time to adequately explore each and every field and technology available and argue the merits and worthiness of each and every one. O'Hanlon states, "Computers will continue to become much faster, cheaper, lighter, and more widely used on the battlefield."[3] Although delving into each field may be fascinating, and ruling on why they may or may not be the best, the assumption will be made that computing power, more specifically superintelligence, is a technology that greatly benefits the US military.

Superintelligence, artificial intelligence, and computing technology are currently in use across a number of spectra, all services, and multiple warfare domains. These fields of technology research do not carry the enormous budget and procurement programs that accompany large weapons platforms. Joint Strike Fighter or super carrier like programs contain large budgets and politics that drive cost, procurement, and sustainability to extremely high levels. In addition, the research and development devoted to large programs does not translate across different services, let alone warfare areas. Artificial intelligence permeates throughout multiple warfare domains and services. The information dominance warfare domain alone has limitless use for the

[3] Ibid., 109.

ability to compile, process, and interpret data. Having the ability to translate that data into usable intelligence products by computational thought and reason would be ground breaking in that field. Fire control computers and unmanned intelligence, surveillance, and reconnaissance aircraft contain complex computers and flight software that benefit directly from some basic artificial intelligence. Semi-automated systems like these would benefit greatly from the integration of complex artificial intelligence to improve performance in tactical arenas.

Improvements and advancements in superintelligence will improve every service, warfare domain, and warfighters' ability to conduct effective operations. The impact of superintelligence on military operations specifically and humanity in general, is still a hypothesis. "This is quite the most daunting challenge humanity has ever faced. And-whether we succeed or fail-it is probably the last challenge we will ever face."[4] There is no doubt that pursuing superintelligence is a cause worthy of time and resources. It then also becomes a worthy cause to investigate how superintelligence could affect future military operations and shape war itself. Clausewitz defines "War is thus an act of force to compel our enemy to do our will."[5] To war is human. In certain hypothetical scenarios, superintelligence would make the human condition irrelevant. Scientists and scholars argue over if true superintelligence is attainable just as many strategists and military theorists argue over the nature of war. The creation of superintelligence will change the nature of war.

[4] Nick Bostrom, *Superintelligence: Paths, Dangers, Strategies*, (Oxford University Press, 2014), Vii.
[5] Carl Von Clausewitz, "On War," In *On War*, 83, Alfred A. Knopf, 1993.

Chapter 3: The History of AI

Alan Turing, a pioneer in the computer and mathematics fields, skillfully wrote one of the first credited works on artificial intelligence. Prior to his paper attempting to explain artificial intelligence, Turing, a renowned mathematician, created one of the first computers. The Turning Machine, an electronic paper reading machine, helped illustrate to young students how logic works inside of a computer. During World War II the development of electronic computers came to fruition. Turing helped code breakers decipher German Code, which greatly contributed to the fall of Nazi Germany. Turing was a pioneer in mathematics, computers, and cryptology. A sheer genius, Turing laid the framework for future aspirations in the field of computer science, and more importantly, artificial intelligence.

Turing's paper, "Computing Machinery and Intelligence," starts by asking the paradoxical question: "Can machines think?"[1] As he laid the foundations of his argument, he grappled with some of the same problems and issues that scientists face today. His approach looks to define key terms to help produce a satisfactory solution to his question. Turing first attempted to define "machine" and "think". In his attempt to define machine he made an analogy to where the digital computer can easily add to five digit numbers in approximately 30 seconds with success. That same computer can make chess move recommendations to put a player in checkmate. However, when asked to create poetry the computer struggled and declined to answer the question. Turing's basis

[1] Alan Turing, "Computing Machinery and Intelligence," January 1, 1950, http://www.loebner.net/Prizef/TuringArticle.html, (accessed January 27, 2015).

from which he drew conclusions shows only his basic understanding of digital computers and their applicability. But it did describe their behavior. His method of thinking and his findings showed some true genius.

In essence, Turing's primary hypothesis was based on whether a machine can imitate a person and conversely, can a man imitate a machine. The latter he discards as being ridiculous as a man cannot replace an airplane. Therefore the simple questions of can a machine imitate man? Turing continues to argue the point and eventually arrives at the conclusion that an electric computer will be able to perform some functions better than a human. His paper summarizes it spectacularly in the excerpt below:

> It will simplify matters for the reader if I explain first my own beliefs in the matter. Consider first the more accurate form of the question. I believe that in about fifty years' time it will be possible, to programme computers, with a storage capacity of about 10^9, to make them play the imitation game so well that an average interrogator will not have more than 70 per cent chance of making the right identification after five minutes of questioning. The original question, "Can machines think?" I believe to be too meaningless to deserve discussion. Nevertheless I believe that at the end of the century the use of words and general educated opinion will have altered so much that one will be able to speak of machines thinking without expecting to be contradicted.[2]

Turing also made some important assumptions that still hold true today. He makes the connection that to think the mind runs on electricity and chemical reactions. A fast computer will need to think, therefore, it be an electric computer. Also defining the process of learning and thinking will be of great importance. Not just to store new data, but learn it. The computer will have to have great speed and memory capacity to think like a human. Turing's assessments began the first period to which artificial intelligence intitiaded its first boom.

[2] Ibid., Turing.

The 1956 the Dartmouth Summer Project was formed and financed by a Rockefeller Grant to perform a study in the field of artificial intelligence. During that summer many subjects were discussed and debated to follow the following framework:

> The study is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it. An attempt will be made to find how to make machines that use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves. We think that a significant advance can be made in one or more of these problems if a carefully selected group of scientists work on it together for a summer.[3]

Theories of neuron nets, automatic computers, self-improvement of machines, and how a computer can be programmed to use a language were all discussed and debated.[4] "The Dartmouth Summer Project is often regarded as the cockcrow of artificial intelligence research."[5]

Beginning with the Dartmouth project, Artificial Intelligence research and Development has undergone two major advancement periods with two lulls in investment and interest. Between the 1950s and mid 1970s, scientists made significant progress in the field of artificial intelligence. Computers performing limited tasks in controlled environments characterized the first surge in artificial intelligence growth. The period used set environments to display the potential for artificial intelligence to perform limited tasks. Machines played checkers, solved math problems, and could even move objects with robotic assistance. The media wrote articles and newspapers followed suit.

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[3] Nick Bostrom, *Superintelligence: Paths, Dangers, and Strategies*, (Oxford University Press, 2014), 5.
[4] J. M. McCarthy, N. Minsky, Rochester, and C. Shannon, "A PROPOSAL FOR THE DARTMOUTH SUMMER RESEARCH PROJECT ON ARTIFICIAL INTELLIGENCE," August 31, 1955, http://www-formal.stanford.edu/jmc/history/dartmouth/dartmouth.html, (accessed January 27, 2015).
[5] Bostrom, 5.

Machines were going to enable human to shed the mundane tasks of everyday life. Cleaning, cooking, and menial tasks would become things of the past. Most of these projects lost their momentum with setbacks, glitches, and roadblocks. By 1974, with goals not attained and research promises not fulfilled, governments cut off funding for artificial intelligence research and the first lull in research set in.[6]

In the 1980s, research and funding for Artificial Intelligence resurfaced. The U.S. and Japanese governments began projects that ambitiously pushed the developmental envelope. Unfortunately, researchers encountered problems that required large, cumbersome computers and labor intensive coding to run these systems. These expert systems failed to meet their objectives and their associated research programs were scrapped. A second lull in Artificial Intelligence ensued.

Eventually, in the 1990s, interest and research awoke from the second lull. Deep Blue defeated Kasparov and gradual gains were being made in the coding of Artificial Intelligence. As computational power grew and research continued, scientists began to construct new techniques to aide in computational output. "Neural networks and genetic algorithms are examples of methods that stimulated excitement in the 1990s by appearing to offer alternatives to the stagnant GOFAI (Good Old Fashioned Artificial Intelligence) paradigm."[7] Monte Carlo techniques, advanced algorithms, networking, and the incorporation of sensors and robotics all made advancements and have led to today's application of Artificial Intelligence.

[6] Michio Kaku, *Physics of the Future: How Science Will Shape Human Destiny and Our Daily Lives by the Year 2100*, (New York: Doubleday, 2011), 79.
[7] Bostrom, 9.

Chapter 4: The Evolution of Computing Power and the Brain

In the 2011 science-fiction thriller, Limitless,[1] Bradley Cooper plays Eddie Morra a struggling author attempting to finish his novel. Eddie stumbles across mind enhancing drugs that proceed to unlock the full potential of his human brain. Eddie's state of enhanced intelligence grants him the ability to miraculously finish his book and make a mint on the stock market. His mind runs faster, thinks more efficiently, and understands concepts that unenhanced humans cannot. The film explores interesting options if the full potential of the human mind were to become unlocked or enhanced.

Recent studies of the human mind debunk the myth that humans only use 10-20 percent of the human mind. A healthy human mind uses up to 90 percent of its power in its normal day-to-day functioning.[2] As computers advance and the art and science of the study and imaging of the human mind progresses, scientist's comprehension of the full capacity and function of a human's computational ability will increase. Computer technology and understanding human intelligence interconnect in a variety of ways. To accurately predict the creation of superintelligence and possibly forecast realistic outcomes, researchers must understand the advancement of computer technology and the computational ability of the human mind. To fully understand the human mind, computer technology and brain imaging must evolve to accurately assess, map, and

[1] *Limitless*, 20th Century Fox Home Entertainment, 2011.
[2] Christopher Baird, "How Can We Unlock 90% of Our Brain We Never Use?" Science Questions with Surprising Answers, December 19, 2012, https://sciencequestionswithchris.wordpress.com/2012/12/19/how-can-we-unlock-the-90-of-our-brain-that-we-never-use/ (accessed February 3, 2015).

image mental functions. Comparing the evolution of the computer to capacity of the mind is a good baseline to begin predictions regarding superintelligence.

Brain power and computing technology must be defined and understood in order to predict and understand the creation of artificial or superintelligence. The computational power of a computer and the thinking power of a human brain must be comparable or measurable. If scientists invented a new device that created electricity in a revolutionary way, it would be easy to say that the new device produced x amount of watts versus the old device that only produced x amount of watts. Recently scientists have simulated 1 second of biological brain activity in an average human mind. In Kobe Japan, a group of researchers ran a simulation on the fourth most powerful supercomputer in world.

> "Using the NEST software framework, the team led by Markus Diesmann and Abigail Morrison succeeded in creating an artificial neural network of 1.73 billion nerve cells connected by 10.4 trillion synapses. While impressive, this is only a fraction of the neurons every human brain contains. Scientists believe we all carry 80-100 billion nerve cells, or about as many stars as there are in the Milky Way. Knowing this, it shouldn't come as a surprise that the researchers were not able to simulate the brain's activity in real time. It took 40 minutes with the combined muscle of 82,944 processors in K computer to get just 1 second of biological brain processing time. While running, the simulation ate up about 1PB of system memory as each synapse was modeled individually."[3]

The feat of simulating 1 second of brain activity taking forty minutes of computing power of one of the world's premiere supercomputers is an almost unbelievable feat. Critics must remember it was not that long ago that the most advanced computer could not run the most basic games played on today's handheld devices. The miniaturization of

[3] Ryan Whitwam, "Simulating 1 Second of Human Brain Activity Takes 82,944 Processors." Extremetech.com, August 5, 2013, http://www.extremetech.com/extreme/163051-simulating-1-second-of-human-brain-activity-takes-82944-processors (accessed January 23, 2015).

components and advancements in computational ability provide limitless outlets for artificial intelligence in almost every facet of life. How long will it take science to produce intelligent devices capable of generating greater computational power then human thought?

To get to where computing power is today and predict where it will be in the future, scientists can lean on Moore's Law to predict the increases in computational capacity. "Moore's Law has sprouted many variations over time. As the core faith of the entire global computer industry, however, it has come to be stated this way: The power of information technology will double every 18 months, for as far as an eye can see."[4] Understanding this simple law allows science to loosely predict when computers could possibly reach the capacity to compute as much information as the human brain. If 18 months ago we could compute one second of brain activity in 40 minutes we today can compute two seconds of brain activity in 40 minutes. By that math, we can estimate it will take 7.5 years to compute a minutes worth of brain function in 40 minutes. The implications of that statement are infinite. Suffice it to say, computing power growing on an exponential curve, lends credence to the theory that computers could outthink humans in less then 15 years.

Advances in memory and microchip technology have been relatively steady for the past 2-3 decades. "Memory storage costs have been declining by half every two years for about twenty-five years, and memory capacity has been doubling every eighteen

[4] Joel Garreau, *Radical Evolution: The Promise and Peril of Enhancing Our Minds, Our Bodies-- and What It Means to Be Human*, (New York: Doubleday, 2005), 49.

months."[5] These advances show no immediate signs of slowing. Manufacturing technology of the chipsets themselves will eventually need updating. That is, the wavelength of light that etches markings on blank chips will eventually limit the amount of marks that can be inscribed on a certain chip. The wavelength becomes too large a scribe to mark the smallest of microchips. Industry will need to invent new ways to miniaturize microchips with methods other than light. If a new method is not invented or perfected, computing power will still continue to grow, however the size of the machines will continue to grow as well. The application of large cumbersome machines in many industries is extremely limited. Transportation, communication devices, and portable computers are all dependent on miniaturization for growth and will suffer if the size and weight construction problem for microchips is not eventually solved.

As computers continue to advance towards humanlike intelligence, industry will continue to find application for their increased cognitive capacity. This cognitive capacity, coupled with size and weight decrements and computing power increments, versatility of application will increase. When complex computers combine with machines capable of interacting intelligently (thinking) within the environment, intelligent machines will become more and more a part of everyday life. Miniaturization and large processing power will enable complex machine systems to run sophisticated sensors and integrate multiple sources of information and interact with their environment. Intelligent, complex machines will be a part of everyday life.

[5] Michael E. O'Hanlon, *Technological Change and the Future of Warfare*, (Washington, D.C.: Brookings Institution Press, 2000), 56.

Chapter 5: The Singularity Effect

Lucy, a 2014 science fiction film written and directed by Luc Besson tells the fictional story of a young female that unlocks the potential of the human brain. As Lucy, cleverly named after the 3.2 million year-old Australopithecus Afarensis ape-human like skeleton,[1] travels throughout the film, she slowly unlocks her brain potential until it functions at 100 percent capacity. Upon unlocking 100 percent, Lucy reaches an almost omnipotent state. Her transcendence can be loosely compared to Vernor Vinge's theory of Intelligence Amplification[2] in his vaunted "The Coming Technological Singularity: How to Survive in the Post-Human Era." Lucy's brain begins functioning at levels that allow her the ability to see neural networks, bend time, and manipulate matter. Although the extreme powers that Lucy attains might be construed as farfetched and loosely contrived, the movie illustrates a brilliant possibility as her mind unlocks. Lucy becomes less human as she becomes more enlightened. The more she learns and unlocks the full potential of the human mind, the more she becomes devoid of emotion and feelings, until eventually she becomes one with the environment and loses her human form.

Human evolution, as illustrated by Australopithecus Afarensis, took millions of years to create the today's human form. This slow evolution eventually took a biological turn and humans inherited the ability to reason and think at a higher level than all the other life forms on the planet. Humans most certainly are not the fastest, strongest, or

[1] "What Was "Lucy"? Fast Facts on an Early Human Ancestor," National Geographic News, October 28, 2010, http://news.nationalgeographic.com/news/2006/09/060920-lucy.html (accessed January 18, 2025).

[2] Vernor Vinge, "The Coming Technological Singularity: How to Survive in the Post-Human Era," 1993.

most vicious life forms on earth. Human evolution did not rely on physical factors to become the dominant species on the planet. It is human intelligence that brought Homo Sapiens to dominate the earth. Our close relatives the gorilla exhibit far more superb physical characteristics and yet their species depends on ours for preservation on earth. Intelligence is the single factor that places humans at the top of the food chain.

The Singularity is a phenomenon that will occur due to the acceleration of technological advancement resulting in greater-than-human intelligence. "This greater-than-human intelligence in turn proceeds to replicate and improve itself at such a rate to exceed existing human comprehension. This produces an inflection point in history called the Singularity, comparable to that in which humans rose from the lower animals."[3] The uniqueness of greater-than-human intelligence would be the greater-than-human intelligence creating even smarter, more intelligent, and more capable machines. The evolution of machines would occur at a much more rapid rate than that of normal evolution as discussed earlier. Instead of evolving over millions of years, the Superintelligent computer will evolve at a rate almost unfathomable. In the blink of eye, unsolvable problems would be solved and possibilities the human race never dreamed of would be plausible. I. J. Good, a pioneer of Superintelligent work and thought, captured a possible outcome of Superintelligence:

> "Let an ultraintelligent machine be defined as a machine that can far surpass all the intellectual activities of any man however clever. Since the design of machines is one of these intellectual activities, an ultraintelligent machine could design even better machines; there would then unquestionably be an "intelligence explosion," and the intelligence of man would be left far behind. Then the first

[3] Joel Garreau, *Radical Evolution: The Promise and Peril of Enhancing Our Minds, Our Bodies-- and What It Means to Be Human*, (New York: Doubleday, 2005), 82.

> ultraintelligent machine is the last invention that man need ever make, provided the machine is docile enough to tell us how to keep it under control."[4]

Lucy's transformation loosely resembles Vinge's theory of Intelligence Amplification,[5] a phenomenon that is occurring daily all around us. This is Vinge's second theory of how the Singularity could take place. Since Vinge's work was written in 1993, this theory can be seen as slowly taking place. Instead of chemically unlocking the potential in the human brain, Vinge postulates the theory of human interaction with computers creating an Intelligence Amplification where humans and computers form a symbiotic relationship to increase cumulative intelligence. Vinge predicted that humans and computers could work together in a connectedness through local area nets and the worldwide Internet. He also theorized cumulative intelligence could be enhanced through portable devices. Both of these have come true among a couple of his other theories. Today, intelligence amplification is beginning to take drastically huge steps towards brain and computer interaction. Computers are now being used to interpret brain functions and control prosthetic limbs in amputees. If a computer could unlock the limitless potential of the human brain, a form of superintelligence would be born.

The greatest irony of The Singularity is that humans may create the invention that triggers the extinction of the human race. The creation of superintelligence would render humans a subordinate life form on the earth. No longer would the human race dominate the world through intelligence alone. Theoretically, uncontrolled superintelligence could see the human race as a threat or no longer necessary. Many theorists speak of

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[4] I.J. Good, "Speculations Concerning the First Ultraintelligent Machine." *Advances in Computers* 6 (1965): 31-88.
[5] Ibid., Vinge.

technological unemployment, a condition where technology does all the work for the human race and human labor becomes obsolete.[6] The control or willingness to be controlled will be extremely important as humans move closer to unlocking superintelligence.

[6] Ibid., Vinge.

Chapter 6: AI Defined

Star Trek: The Next Generation, a 1987 futuristic science fiction television series, provides the quintessential example of a fictional depiction of artificial intelligence. Lieutenant Commander Data, played by Bent Spiner, captured the essence of the human condition by lacking certain humanistic traits. Data was a humanoid robot that looked, talked, and acted like a human. When not on duty serving as an exemplary Star Fleet Officer, Data spent much of his personal time learning intricacies of human behavior. Data possessed a perfect memory and almost perfect intelligence. However, he struggled with common sense, humor, and emotion. To improve his understanding of humanity, he studied poetry, the arts, and owned a pet cat. Most of the screenplay around Data, centered on his struggle on the abstracts of the human condition. Eventually Data placed an emotion chip into his computational structure. This chip overloaded him with so much sensory information that he eventually had to devise a way to deactivate the chip when it became too distracting. Data exemplified a possible struggle of artificial intelligence's constant battle to be more human.

"Machines matching humans in general intelligence- that is, possessing common sense and an effective ability to learn, reason, and plan to meet complex information-processing challenges across a wide range of natural and abstract domains- have been expected since the invention of computers in the 1940's."[1] In the previous chapter, the phenomenon of the "Singularity Effect" defines a moment in time when machines make an intelligence explosion and transform from a mere computer to an artificially intelligent

[1] Nick Bostrom, *Superintelligence: Paths, Dangers, and Strategies*, (Oxford University Press, 2014), 3.

machine. Since the invention of computers, speculation of the timing of greater than humanly intelligent computers has been estimated at being approximately 20 years in the future. "Since then, the expected arrival date has been receding at a rate of one year per year; so that today, futurists who concern themselves with the possibility of artificial general intelligence still often believe that intelligent machines are a couple of decades away."[2] The timing of the intelligence explosion is often argued by scientists and futurists, however most agree that it will happen.

There already exists a multitude of intelligent machines within civilization today. Intelligent computer technology is abundant and everywhere. Obviously, there are parts of the world where the Internet and smart technology have not penetrated, however those places are becoming harder and harder to locate. Soon smart technology will be as common as running water, electricity, and penicillin. All these inventions were absolutely revolutionary inventions in their time. It is not ill conceived to believe that a smart world will exist with artificial intelligence at every turn. Homes, cars, and public transportation will all be smart, artificially intelligent, and interact with humans. Surroundings will change and interact differently according to the users preferences. Currently, there are homes that track microchips worn by users as they move about the house. Artwork, lighting, and music all change as the user moves from room to room. Society is gradually filling with intelligent technologies.

All of these technologies have occurred in a gradual introduction over time. Currently machines are inferior to humans in general intelligence. Scientists and futurists postulate that computers will eventually attain greater then human intelligence. Society

[2] Ibid., 4.

must prepare for the moment when intelligent machines might possibly become sentient or conscious. Whether or not the phenomena of a machine attaining consciousness or not occurs, looking at both possibilities will help clarify specific forms of intelligence.

"We can tentatively define a superintelligence as any intellect that greatly exceeds the cognitive performance of humans in virtually all domains of interest."[3] Bostrom further breaks down his meaning of superintelligence into 3 categories: speed superintelligence, collective superintelligence, and cognitive superintelligence. Speed superintelligence refers to thought that humans can do, only faster. Essentially it would be the human mind running to the nth degree faster then it is now. The perfect analogy when it comes to machines would be a processor of 10 years ago ran much slower than that of a processor of today, but being on a much larger scale when referring to brain power. Collective intelligence is a form of intelligence where many small intellects or intellectual groups outperform any current cognitive system. A good way to picture this type of superintelligence is think tanks. Groups of people working together collaboratively come up with better solutions than an individual would create on their own. Lastly, quality superintelligence illustrates a system as fast a human mind but qualitatively smarter.[4]

Does the possibility exist where intelligent machines become sentient and form a consciousness? Kaku wonderfully describes the circumstances and defines the meaning

[3] Ibid., 22.
[4] Ibid., 52-57.

of machines attaining consciousness. His definition of a machine attaining consciousness has three basic components:[5]

1. sensing and recognizing the environment
2. self-awareness
3. planning for the future by seeing goals and plans, that is simulating the future and plotting strategy

Humans and even most animals can walk into a new environment and quickly assess their surroundings. For instance, a human can walk into a bedroom and recognize all of the different pieces of furniture. A robot would walk into that same room and it would take time to match all the pieces of furniture to known shapes and objects. Walking, moving, and travelling throughout the environment for humans and animals alike is processed at the subconscious level. A machine finds it difficult to move and navigate through an unfamiliar environment.

Self-awareness is a quality that humans and some primates possess. If a dog sees himself in the mirror, he often will not recognize his own reflection and act in a disturbed or aggressive manner. Babies often have not learned the cognition skills to recognize their own reflections. When adult humans see reflections or pictures of themselves they understand and put in context what their mind is processing

Lastly humans possess the ability to prepare, plan, and strategize for the future. Robots function in an environment for a purpose, however lack the ability to strategize for their future. Animals are similar in that way. They will eat what is in front of them to satiate their appetite not knowing if there is anymore food for the future. Humans can predict possible outcomes and therefore predict what might come next.

[5] Michio Kaku, *Physics of the Future: How Science Will Shape Human Destiny and Our Daily Lives by the Year 2100*, (New York: Doubleday, 2011), 111.

The final product to complete the definition of superintelligence for this thesis is to combine the afore defined superintelligence with a consciousness. These two phenomena occurring at the same time form the foundation for the scenarios presented in the next section. A machine that is self-aware, conscious, and has superintelligence is what will constitute superintelligence for the remainder of the thesis. The machine will possess greater than human superintelligence, be conscious, be able to prepare for the future, and be self-aware.

Chapter 7: War Defined

Scholars, theorists, and strategists contemplate the simplistic yet elusive nature and meaning of war. Theorists are now attempting to categorize new war and challenge traditionally accepted definitions of war. Adding superintelligence to the debate over new war and traditional war potentially complicates the debate and provides grounds for a different avenue of approach. First, definitions of traditional war and new war must create a foundation to understand how superintelligence would affect war's nature. Labels, assumptions, and nuanced definitions tend to confuse what is absolute about war since the beginning of mankind. War, both traditional and new, is a human endeavor. Characteristics, technology, and magnitude of warfare evolve and adapt over time, but war's nature has not changed. Superintelligence provides a new lens through which to compare and contrast war.

The fundamental concept that war is a human endeavor, or even inherent to human nature, is inescapable. Azar Gat writes an exhaustive narrative on the nature of war that states the primary driver for conflict, violence, or war, is the competition for scarce resources and women (reproduction). "In historically observed hunter-gatherer societies the rate of violent death among men appears to have been in the region of 25 percent, with the rest of them covered with scars and society as a whole overshadowed by the ever-present prospect of conflict."[1] The violent conflict for scarce resources is a product of thousands of years of human evolution. War, as characterized today, is only a result of the complexity, integration, and scale that humans have made it.

[1] Azar Gat, "Unraveling the Riddle of War," In *War In Human Civilization*, (New York: Oxford University Press, 2006), 664.

War exists as a permanent feature of the human condition and will continue to exist in society. Often war revolves around politics. Linking politics to Gat's nature of war is simple. "The desire and struggle for scarce resources-wealth of sorts-have always been regarded as a prime aim of "politics" and an obvious motive for war."[2] War and politics interlink to promote relative power. Relative power increases relative wealth and influence by exploiting the conquered. The victors gain resources and power.

Thucydides authored the first great work that illustrated the nuances and causes of war. To over-summarize his great work *History of the Peloponnesian War*, fear, honor, and interest are the primary factors that countries gravitate to war. Athens and Sparta (city-states) interlocked in lengthy war that originated primarily over the fear of Athens becoming too strong and powerful. Sparta's allies goaded them into war by over playing Sparta's honor and fear. The war continued for years until Athens' losses become too great and they yielded to the Spartans. By the early modern period, the creation of nation-states and the emergence of the Westphalian system introduced the dynamics of politics into war. A nation's interests or goals, usually drove the interests of a minority and carried out at the expense of the majority or underprivileged, were imposed upon another nation for the advancement of that nation's interests.

Clauswitzean theory starts "War is nothing but a duel on a larger scale".[3] War then being a continuation of a nation's policy and interests by another means. War becomes a violent dispute between political groups, traditionally aligned as nation-states, to forcibly submit the enemy to their will. The ultimate goal of war is to exploit spoils and reestablish peace on the victor's terms. The construct of the war is state on state,

[2] Ibid., 670.
[3] Carl Von Clausewitz, "On War," In *On War*, Alfred A. Knopf, 1993, 83.

governed by an ethical and rational set of rules where both sides seek force on force battles to deliver decisive blows to win the war and inevitably attain favorable peace.

The New War Theory removes borders and boundaries from the violence by describing non-state actors who militarize their political agendas in transnational and non-traditional styles of warfare. Simply put, New War Theory involves two or more organized groups attempting to exert their political interests through violent means. Non-state actors decentralize the violence and avoid large decisive force on force battles with traditional military forces. Civilian populations become the target for violence, the target for recruitment, and the target for informational warfare. Compared to traditional war, new war is cheap and easy to train and recruit fighters. [4]

Often in New War Theory, there is no end to the violence. The non-state actors aim is to fight prolonged, drawn out wars of attrition. This form of warfare is relatively cheap compared to technologically driven traditional warfare due to simplistic weaponry, cheap equipment, and relative low-cost of recruiting and training fighters. The non-state actor can promote their cause by prolonging the war and not seeking that decisive battle or end state. Their sheer existence promotes, and survival legitimizes their cause and rallies more support for their effort. Often neither side seeks victory as the cost would be too much and jeopardize their existence. The amount of resources and capability required for non-state actors to attain victory are not available and pursuing an absolute victory through a Clauswitzean decisive point would result in a collapse of the non-state actor.

[4] Mary Kaldor, "Inconclusive Wars: Is Clausewitz Still Relevant in these Global times?" London School of Economics and Political Science, Global Policy 3, no.1 (October 2010), 275-280.

War is capable of transformations that go beyond mere superficial appearances. Conflict and warfare will never disappear and vanish from the planet because human nature continually seeks greater power. Humans will constantly be in competition for scarce resources and reproductive selectivity through power. The technology, magnitude, and tactics of warfare continually change throughout time. The characteristics of war and warfare evolve over time. However, the nature of war, a human endeavor, will never change unless humans are removed from the conflict.

In order to change the nature of war itself, the removal of the human element, control, and motives would be necessary. Superintelligent machines would have to be capable of dictating not only the ways and means on which the war would be fought, but also the ends. Referencing Azar Gat's competition for resources and reproduction, the superintelligent machines' motives for war would drive towards endstates that the superintelligence deems favorable for its own benefit. Clausewitz brings forth the point, "war is more than a true chameleon that slightly adapts its characteristics to the given case."[5] Technology brings forth the opportunity not only for the characteristics of war to change, but the nature of war to transform.

[5] Ibid., 83.

Chapter 8: Scenarios

Scenario #1: The Superintelligence Advantage

In the 1981 blockbuster hit, Indiana Jones and The Raiders of the Lost Ark, Indiana Jones is hired by the U.S. government to recover the Ark of the Covenant before the Nazis can gain its possession. The screenplay, written by Lawrence Kasdan (book by George Lucas), is the epic struggle of good against evil. If the Nazis had acquired the Ark, they would have used its powers to help their cause of total world domination and the progression of the Aryan race. Indiana Jones, with stereotypical U.S. bravado, conquered the evil Nazis so that the Ark did not fall into evil hands. The U.S. government feared the possibility of another superpower acquiring a technology that would provide an asymmetric threat. If the Nazis had triumphed over Indiana Jones, the world may have slipped into cataclysmic disaster.

The sole development and control of Superintelligence provides a marked advantage for any organized society or government. Superintelligence, as long as it was controllable, for one government or organized group would infer that one side would have an incredible technological advantage over any other adversary. The technological gains by having created superintelligence would be almost inconceivable. The "haves" would have access to limitless knowledge and technology. Their culture would make gains in science, technology, robotics, energy, genetics, and military capability. It would be that cultures nature that would determine the fate of the rest of the world. In Raiders of the Lost Ark, if the Nazis were to have captured the Ark of the Covenant they would

have used it nefariously and to gain power and resources, possibly eradicating the rest of the world. If the U.S. gained access to such power it would hopefully use it to greater the good of the rest of the world.

If a nefarious culture, organization, or government achieved controllable superintelligence, they would use it to dominate the world and further their world outlook. When one organized group or government possesses an uncounterable technology, that culture or group tends to exert its will and dominance other groups cultures. History is riddled with examples of dominant technological groups wiping out lesser-advanced cultures. The Roman Empire conquered numerous lesser cultures and expanded their empire because they were numerically, technologically, and militarily stronger. Cortez conquered the Aztecs as the Spaniards colonized the New World. The American Indians were virtually wiped out by the U.S. government.

Scenario #2: Mutually Assured Destruction

Thirteen Days, a 2000 movie directed by Roger Donaldson and written by David Self and Ernest May, depicted President John F. Kennedy navigating through the treacherous waters of the Cuban Missile Crisis. Kennedy was confronted by the Soviets actively putting short-range ballistic missiles on the island of Cuba. Faced with impending Soviet ships heading to Cuba with a nuclear arsenal, President Kennedy instituted a naval blockade to prohibit the Soviets from transporting nuclear missiles to the island. Both sides had nuclear capability and did not want to lose face, Kennedy worked a back room deal to avoid going to war with the Soviet Union. Had these Superpowers not reached a negotiated settlement, the world could have been pulled into an all-encompassing nuclear war.

When controllable superintelligence is achieved and possessed by multiple organizations, it provides for a multipolar world and more stable society. Similar to mutually assured destruction, mutually controlled superintelligence negates any advantage that would be held by either side. This scenario unfolds similarly to both the U.S. and the Soviet Union achieving nuclear capability around the same time period. If one of those superpowers had chosen to unleash their nuclear arsenal, they would have ensured their own destruction. Thereby neither side had a marked advantage.

If the two organizations did however come into conflict, superintelligence would be much like that of any other weapon or supporting platform on the battlefield. Superintelligence would be used on both sides just as did other means of waging war has throughout history. Superintelligence would be and upgrade to warfare, much like that of gunpowder, siege weapons, sail, flight, or even nuclear weapons. It would be another means of exerting human will on an opponent.

Superintelligence would shape the battlefield in one of two ways. It would take war and grow it on a grander scale. That is it would make war bigger, faster, stronger. Superintelligence would produce deadlier, more efficient weapons which would produce more casualties and greater destruction. This destruction would be on an epic scale as humans would have access to advanced weapons and highly efficient tactics. In the second way, humans would control the war, but robots and automated machines would fight without human interaction. The war would be won by the side with the more advanced superintelligence or by the side that had the most resources. If both sides fought perfectly, it would come down to who had the most resources.

Scenario #3: One Net

The Terminator, a 1984 hit movie written and directed by James Cameron, illustrated the effects of runaway superintelligence used against the human race. Cyberdyne Systems built Skynet, a computer system built for the U.S. government to eliminate human error from U.S. defense systems. Skynet would provide faster response time to an attack on the U.S. and increase the probability of a U.S. victory incase of an attack. Skynet became self-aware and saw the human race as a threat to its own existence. It launched a Russian nuclear attack against the U.S. who in turn counter attacked. The result was devastating to human population. Skynet then waged war on the human race attempting to eradicate them from the planet. Skynet, the dominant being on Earth, used machines to exterminate mankind.

Futurists, scientists, and science fiction writers have been hypothesizing and writing about computers becoming sentient life forms for decades. When, and if superintelligence occurs there poses a serious threat that it will see humans as a threat to humanity. Humans will no longer be the dominant life forms on the planet. We will be what apes are to humankind. Intellect is what sets humans apart from the rest of the species on the planet. Not being the dominant life form could present humans with some interesting challenges. If the superintelligence sees humans as a threat, will it attempt to exterminate or enslave humanity? Enter Skynet, the Decepticons, or the Borg.

Chapter 9: Conclusion

As we approach Superintelligence, society must explore all possibilities that may occur in order to accurately prepare for the future. Without strategically framing the impact that superintelligence will have on the future, humanity is destined to possibly make enormous mistakes. When the U.S. became nuclear capable during World War II, we weaponized nuclear technology and employed it against Japan. The U.S. is the only country to ever employ nuclear weapons against another. Superintelligence may present humanity with another similar choice. How that choice presents itself is but a hypothesis at this point.

If one country develops controllable Superintelligence will they follow historical trends and use to promote their power? It is inherent in human nature to seek more resources through power. If a single group develops Superintelligence they will have created the greatest asymmetric weapon ever: the Ark of the Covenant, Zeus' Thunderbolt, or the Hammer of Thor. That organization will have unlimited power to promote their will onto others. Asymmetric Superintelligence will only exacerbate human nature and the nature of war will remain unchanged.

In scenario 2, multiple cultures develop Superintelligence at near the same time. A multi-polar world would emerge from this and humans would have balance of power throughout the world or another Cold War type era would emerge. War with Superintelligence would be on an epic scale. The war would be whichever side had the stronger Superintelligence or more resources. However, the fundamental nature of the

war would be the pursuit of resources through power. War's nature does not change in scenario 2.

Scenario 3 offers somewhat of a different twist. Humans are no longer the dominant life form on the planet and Superintelligence is uncontrollable. Superintelligence sees humanity as a threat. Mr. Smith, an agent for the Superintelligence that appeared in the 1999 blockbuster, the Matrix, looks at humanity through the eyes of a machine. He explains his thoughts on humanity:

> I'd like to share a revelation that I've had during my time here. It came to me when I tried to classify your species and I realized that you're not actually mammals. Every mammal on this planet instinctively develops a natural equilibrium with the surrounding environment but you humans do not. You move to an area and you multiply and multiply until every natural resource is consumed and the only way you can survive is to spread to another area. There is another organism on this planet that follows the same pattern. Do you know what it is? A virus. Human beings are a disease, a cancer of this planet. You're a plague and we are the cure.[1]

Through his thoughts, one can see the possibility how a Superintelligent machine would see humanity. It would simple be perceived as a threat and need to be eradicated or contained. Humans would have to fight for their existence on Earth. The Nature of War would change. It would no longer be a human endeavor for resources through power. It would be the struggle between man and machine for existence.

War, conflict, and struggle will never be removed from the human condition. It is human nature to seek resources and reproduction through power. It has taken millions of years to evolve into what humanity is today. Only the struggle for humanities existence can change nature. Although this common enemy would unite humankind, once defeated

[1] IMDB.com, January 1, 1999, http://www.imdb.com/character/ch0000745/quotes (accessed February 14, 2015).

it would remove the common threat and nature would once again take its course. Humans would seek power through war. The very nature of war itself, changes only if humanity itself is threatened by a Superintelligent life form.

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Bibliography

Baird, Christopher. "How Can We Unlock 90% of Our Brain We Never Use?" Science Questions with Surprising Answers. December 19, 2012. https://sciencequestionswithchris.wordpress.com/2012/12/19/how-can-we-unlock-the-90-of-our-brain-that-we-never-use/ (accessed February 3, 2015).

Bostrom., Nick. *Superintelligence: Paths, Dangers, and Strategies*. Oxford University Press, 2014.

Champandard, Alex. "Top 10 Most Influential AI Games." AiGameDev.com. September 12, 2007. http://aigamedev.com/open/highlights/top-ai-games/ (accessed January 22, 2015).

Garreau, Joel. *Radical Evolution: The Promise and Peril of Enhancing Our Minds, Our Bodies-- and What It Means to Be Human*. New York: Doubleday, 2005.

Gat, Azar. "Unraveling the Riddle of War," In *War In Human Civilization*. New York: Oxford University Press, 2006.

Good, I.J. "Speculations Concerning the First Ultraintelligent Machine." *Advances in Computers* 6, 31-88. 1965.

Hipple, Matthew. "Cloud Combat: Thinking Machines in Future Wars," *United States Naval Institute, Proceedings*, 48-53. July 1, 2012.

History.com. "Deep Blue Defeats Garry Kasparov in Chess Match." http://www.history.com/this-day-in-history/deep-blue-defeats-garry-kasparov-in-chess-match (accessed January 12, 2015).

IMDB.com. January 1, 1999. http://www.imdb.com/character/ch0000745/quotes (accessed February 14, 2015).

Kaku, Michio. *Physics of the Future: How Science Will Shape Human Destiny and Our Daily Lives by the Year 2100*. New York: Doubleday, 2011.

Kaldor, Mary. “Inconclusive Wars: Is Clausewitz Still Relevant in these Global times?” London School of Economics and Political Science. Global Policay 3. no.1. October 2010.

Limitless. 20th Century Fox Home Entertainment. 2011.

McCarthy, J.M., Minsky N., Rochester, and Shannon C. "A PROPOSAL FOR THE DARTMOUTH SUMMER RESEARCH PROJECT ON ARTIFICIAL INTELLIGENCE." August 31, 1955. http://www-formal.stanford.edu/jmc/history/dartmouth/dartmouth.html (accessed January 27, 2015).

O'Hanlon, Michael E. *Technological Change and the Future of Warfare*. Washington, D.C.: Brookings Institution Press, 2000.

Peters, Ralph. *Fighting for the Future: Will American Triumph*. Mechanicsburg, PA: Stackpole Books, 1999.

Quartz. "More People around the World Have Cell Phones than Ever Had Land-lines." Quartz, February 25, 2014. http://qz.com/179897/more-people-around-the-world-have-cell-phones-than-ever-had-land-lines/ (accessed January 15, 2015).

Turing, Alan. "Computing Machinery and Intelligence." January 1, 1950. http://www.loebner.net/Prizef/TuringArticle.html (accessed January 27, 2015).

Van Der Meulen, Robert. "Gartner Says Worldwide Video Game Market to Total $93 Billion in 2013." Gartner. October 15, 2013. http://www.gartner.com/newsroom/id/2614915 (accessed January 22, 2015).

Vernor Vinge. "The Coming Technological Singularity: How to Survive in the Post-Human Era." 1993.

Von Clausewitz, Carl. "On War." In *On War*. Alfred A. Knopf, 1993.

"What Was "Lucy"? Fast Facts on an Early Human Ancestor." National Geographic News. October 28, 2010. http://news.nationalgeographic.com/news/2006/09/060920-lucy.html (accessed January 18, 2025).

Whitwam, Ryan. "Simulating 1 Second of Human Brain Activity Takes 82,944 Processors." Extremetech.com. August 5, 201. http://www.extremetech.com/extreme/163051-simulating-1-second-of-human-brain-activity-takes-82944-processors (accessed January 23, 2015).

Vita

CDR Matthew Scornavacchi was commissioned into the United States Navy in 1996 following graduation from USNA. He graduated from flight training in 1998 and on to VF-101 to become designated as a Tomcat RIO. He served in VF-213 from October of 1999 to February of 2002 and participated in Operation Enduring Freedom. He graduated from the United States Navy Fighter Weapons School (TOPGUN) in December of 2002 with follow on instructor tour at the Strike Fighter Weapons School, Atlantic. He became dual designated as an FA-18F WSO in the spring of 2005. In June of 2005, he then served as Strike Operations Officer for CVW-17 for approximately 18 months. He did his Department Head tour in VFA-211 from March of 2007 to November of 2009. CDR Scornavacchi graduated JTS in February of 2010 and became OIC from September 2010 until January of 2013. He then transferred to CTF-52 where he served as CSO from February 2013 until April of 2014.