

# AP<sup>®</sup> RESEARCH 2016 SCORING GUIDELINES

## AP Research Performance Task Rubric: Academic Paper

Content Area	Performance Levels		
<b>1 Understand and Analyze Context</b>	The paper identifies the topic of inquiry.  2	The paper identifies the topic, and describes the purpose and focus of the inquiry.  4	The paper explains the topic, purpose, and focus of the inquiry and why further investigation of the topic is needed by connecting it to the larger discipline, field, and/or scholarly community.  6
<b>2 Understand and Analyze Argument</b>	The paper identifies or cites previous works and/or summarizes a single perspective on the student’s topic of inquiry.  2	The paper summarizes, individually, previous works representing multiple perspectives about the student’s topic of inquiry.  4	The paper explains the relationships among multiple works representing multiple perspectives, describing the connection to the student’s topic of inquiry.  6
<b>3 Evaluate Sources and Evidence</b>	The paper uses sources/evidence that are unsubstantiated as relevant and/or credible for the purpose of the inquiry.  2	The paper uses credible and relevant sources/evidence suited to the purpose of the inquiry.  4	The paper explains the relevance and significance of the used sources/cited evidence by connecting them to the student’s topic of inquiry.  6
<b>4 Research Design</b>	The paper presents a summary of the approach, method, or process, but the summary is oversimplified.  3	The paper describes in detail the approach, method, or process.  5	The paper provides a logical rationale by explaining the alignment between the chosen approach, method, or process and the research question/project goal.  7
<b>5 Establish Argument</b>	The paper presents an argument, conclusion or understanding, but it is simplistic or inconsistent, and/or it provides unsupported or illogical links between the evidence and the claim(s).  3	The paper presents an argument, conclusion, or new understanding that the paper justifies by explaining the links between evidence with claims.  5	The paper presents an argument, conclusion or new understanding that acknowledges and explains the consequences and implications in context.  7
<b>6 Select and Use Evidence</b>	Evidence is presented, but it is insufficient or sometimes inconsistent in supporting the paper’s conclusion or understanding.  2	The paper supports its conclusion through the compilation of relevant and sufficient evidence.  4	The paper demonstrates a compelling argument through effective interpretation and synthesis of the evidence and through describing its relevance and significance.  6
<b>7 Engage Audience</b>	Organizational and design elements are present, but sometimes distract from communication or are superfluous.  1	Organizational and design elements convey the paper’s message.  2	Organizational and design elements engage the audience, effectively emphasize the paper’s message and demonstrate the credibility of the writer.  3
<b>8 Apply Conventions</b>	The paper cites and attributes the work of others, but does so inconsistently and/or incorrectly.  2	The paper consistently and accurately cites and attributes the work of others.  4	The paper effectively integrates the knowledge and ideas of others and consistently distinguishes between the student’s voice and that of others.  6

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<b>9 Apply Conventions</b>	The paper's use of grammar, style and mechanics convey the student's ideas; however, errors interfere with communication and/or credibility.	The paper's word choice and syntax adheres to established conventions of grammar, usage and mechanics. There may be some errors, but they do not interfere with the author's meaning.	The paper's word choice and syntax enhances communication through variety, emphasis, and precision.
	1	2	3

**NOTE:** To receive the highest performance level presumes that the student also achieved the preceding performance levels in that row.

**ADDITIONAL SCORES:** In addition to the scores represented on the rubric, readers can also assign scores of **0** (zero).

- A score of **0** is assigned to a single row of the rubric when the paper displays a below-minimum level of quality as identified in that row of the rubric.

# AP<sup>®</sup> RESEARCH 2016 SCORING COMMENTARY

## Academic Paper

### Overview

This performance task was intended to assess students' ability to conduct scholarly and responsible research and articulate an evidence-based argument that clearly communicates the conclusion, solution, or answer to their stated research question. More specifically, this performance task was intended to assess students' ability to:

- Generate a focused research question that is situated within or connected to a larger scholarly context or community;
- Explore relationships between and among multiple works representing multiple perspectives within the scholarly literature related to the topic of inquiry;
- Articulate what approach, method, or process they have chosen to use to address their research question, why they have chosen that approach, and how they employed it;
- Develop and present their own argument, conclusion, or new understanding;
- Support their conclusion through the compilation, use, and synthesis of relevant and significant evidence;
- Use organizational and design elements to effectively convey the paper's message;
- Consistently and accurately cite, attribute, and integrate the knowledge and work of others, while distinguishing between the student's voice and that of others;
- Generate a paper in which word choice and syntax enhance communication by adhering to established conventions of grammar, usage, and mechanics.

Running head: Artificial Intelligence Introduction into Society

Artificial Intelligence Introduction into Society and the  
Reactions of the Progress of Acceptance of Technology

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**Introduction**

Starting this project, I knew that research had already been done. The research for the creation of AI was already being discovered and questioned on its own terms. But I wanted to know how people would react to the discovery and upbringing of these advanced computers. Most of my groundwork comes from ‘Autonomous Military Robotics: Risk, Ethics and Design’ by Patrick Lin, George Bekey and Keith Abney, ‘The Construction of ‘Reality’ In the Robot: Constructivist Perspectives on Situated Artificial Intelligence and Adaptive Robotics’ by Tom Ziemke, and ‘Machines Without Principals: Liability Rules and Artificial Intelligence’ by David C. Vladeck. From this conducted research, I was able to gain some base knowledge on the already found information of AI and how it was being used and explored, and then I was able to determine where I was going to find a gap in the research and create my own research. Since an AI has not been created yet, this research is mostly hypothetical until an actual AI is created and studied. Vladeck gives a statement that makes a very good point with, “They [supercomputers] pilot sophisticated aircraft; preform delicate surgery; study the landscape of Mars; and through smart nanotechnology, microscopic machines may soon deliver targeted medicines to areas within the body that are otherwise unreachable” (p.118).

We’ve already been outdone by computers who can do our jobs faster and without complaint or failure to comprehend the task given. Now the time is coming when we need to be able to decide if we’re going to step aside and let computers do all our tasks for us, or if we’re going to use technology instead of letting it use us. The progression of machines and the upcoming rise of computers and its software have been an increasingly discussed topic in the technological circles in our society. Many times we ponder about the existence of machines with self-awareness, but not with ability to control itself, or if the program itself will develop human like characteristics, or if it will become a machine of destruction. Many times we lose the

importance of having control, or the need or desire to have freedom; this creation will be nothing but a household item to help around the house, or being a creation that would help assist the law in protection, or rather in offense like many people have predicted it would be. The opinions we gain from the media might sway our choice on if we accept the future evolution of technology, and use it to help our daily lives as well as other aspects; or if we choose to fear the up rise of technology and use it to only benefit ourselves in the world and move up in the food chain. Finding ways to choose how these machines will be used, even before they develop self-awareness can be the key to deciding how effective they will be in the future. Deciding the usage of technology daily for people, and how influenced they are because of the media has influenced if the next evolutionary advancement of technology will benefit us or not.

### **Abstract**

This paper is exploring the dependency of people on their technological devices to determine if the future creation of Artificial Intelligence (AI) will help humanity or if the creation of AI will create our demise. Many people use their devices in various ways and it creates an unknown atmosphere when considering the future of technology and its evolution. Through many questionnaires and surveys it has been a reoccurring theme that the majority of people are not dependent on their technological devices, but with this information and my personal observations of these individuals and how they sometimes lack the ability to do certain tasks without technology creates the false or unknown results that will help determine the future of technology and what it hold for us. This paper examines people of all ages, as well as other research articles that suggest the creation of AI is near and the situations that might arise with this technological advancement. Thus undergoing the research to help understand the influence

our modern technology has on us, and how the future technology will impact us and our daily lives.

### **Literature Review**

Many instances have occurred that the progression of technology in the work place has only helped the progress and productivity of the work. The scientific advancement of having AI helping scientists with theories, completion of work without human implication that usually happen with research. But with this in mind if our advancements of technology become too advance for us to understand or too much for us to control we can have implications of using AI for military uses. George Dvorsky discusses the implications that arise with “‘thinking’ machines [that] are unleashed on the battlefield” (Dvorsky). He even goes into the conversation in saying that people “both inside and outside of the Pentagon” aren’t liking this idea of sending killing machines out. A fellow researcher, Alejandro Rojas was able to interview Dr. Wolfgang Fink, the founder and director of Visual and Autonomous Exploration Systems Research Laboratory at Caltech as well as at the University of Arizona. In their interview it is discussed that the probability of an AI being created is possible, but “not with the current [AI] approaches” (Rojas). Dr. Fink goes into detail about AI and the possible worries that come with this idea in saying that “We have systems that play chess better than humans, and that is only a number crunching exercise. Not to diminish those systems, but just to bring it down to the basics. So, while that is impressive, it is not a threat to humanity. Where it becomes dicey is when you get a system which can move about and can take action, weaponized or not, and is able to react to its environment based on a non-deterministic algorithm. Mean, it is not scripted. You cannot predict how the system is going to react. If you have such a system, which I think will be possible that it will happen in our lifetime, then, yes, it is something which is a threat to humanity. Especially, if

you can't get control of it (Rojas)." Another use for this advancement of technology is the cultural bonuses of having AI help the elderly; although many caretakers do good jobs it would be more reliable to have a helpful assistant that wouldn't let human faults get in the way of progressing work. But with all this advancement we aren't looking far enough into the future, when our computers and other devices become self-aware, such as the robot created and developed by Justin Hart, a Computer Science Ph.D. candidate (Suterwala). 'Nico' is the created robot who "looks less like R2D2 and more like a jumble of wires with eyes and a smile" (Suterwala). Nico is a possible breakthrough with self-aware machines, if he passes the self-awareness test, "the technology could have important implications for the field of robotics" (Suterwala). Justin Hart claims that "A self-aware robot is not a thinking or feeling robot — instead, it is a robot programmed to know itself" (Suterwala). Even Google is on the bandwagon of trying to create self-aware machines. Ray Kurzweil, an Artificial Intelligence Expert, as well as a top executive at Google, predicted that "robots would 'outsmart humans' by 2029. "By 2029, computers will be able to do all the things that humans do. Only better." reported The Guardian. (Adams) That isn't so far away with you think that we're already in 2016. Although Kurzweil has been viewed for being a bit insane for his ideas about 'merging with the machines' and uploading your mind into a supercomputer. Beside his 'crazy claims', many scientists won't dismiss his ideas because he is such an intelligent and outspoken scientist and has been correct about many predictions in the past (Adams). How will the public react to this advancement? Will we still be able to control our machines if they have a will of their own? Kurzweil discusses that "Google is piecing together the technology needed to deploy a literal army of highly intelligent, armed, 'self-aware' and self-mobile machines. Their uses are, of course, incredibly diverse. They could be servant robots for homeowners or they could be Terminator-style battlefield soldiers.



There's no limit to their application, and whatever company owns this technology will, without question, dominate our world" (Adams). I've found these troubling examples a reoccurring theme in the media when developing on the theme of AI. Although our Hollywood movies don't always paint a very accurate or truthful picture, it is something to consider when we do start developing tasks for our machines.

### **Approach**

To answer whether or not the upcoming rise of technology will be for better or for worse, I shall use a combination of surveys to determine if the outcome of those advancements of technology will be worth it, or will the dangers the media has been trying to warn us of are what we should really fear. This study does require both quantitative and qualitative research to fully answer the research questions. If Artificial Intelligence (AI) were to become self-aware, what would be its purpose? How would the public react to a self-thinking machine? The quantitative research method would be utilized to gather as much data as possible by surveys. This study would be attempting to uncover the effects of technology in modern times and its creation, as well as the effects on the people and how they will feel about this transition of technological evolution. This study will also be focusing on the reactions to self-aware machines, people and their ideals about the transitions, how much technology is in their lives, how people would feel if AI did become a real aspect in their lives and who would benefit from it, and thus attempting to being able to predict if the creation of said machines will have a positive or harmful effect on society; while also deciding if the machines will only be used to gain power over others or will they be used to help with living conditions at home or in the workplace.

### **Method**

The qualitative research method would be using questionnaires to get a better understanding of how the participants might feel with certain machines, such as whether they like Roomba machines and how they silently help clean, or the possibility of more interactive and help with social transitions, or having automatic cars that self-driven, or using drones for military advantages, or the use of police machines to help uphold the law. The questionnaires would be used as an extension of a survey to help the participants so they could share comments that might not necessarily be reflective throughout the experiment; all information will be anonymous unless otherwise stated.

Artificial intelligence is highly known by most everyone, but reactions may be different for each person, so by using resources and questioning participants I can decide if the outcome of artificial intelligence will have a positive effect or a negative one. Many times the media will give us this fearful as well as misunderstood and confused outlook on robots and them becoming self-aware, some examples of this would be *Metropolis (1927)*, *The Jetsons (1962)*, *A Space Odyssey (1968)*, *Demon Seed (1977)*, *Star Wars (1977)*, *Wargames (1983)*, *Terminator (1984)*, *D.A.R.Y.L. (1985)*, *The Machines (1999)*, *The Iron Giant (1999)*, *The Matrix (1999)*, *A.I. (2001)*, *I, Robot (2004)*, *Transformers (2007)*, *Wall-E (2008)*, *Moon (2009)*, *Her (2013)*, *Transcendence (2014)*, and *Chappie (2015)*; just to name a few movies that involve robotics developing self-awareness and humanity within their systems. It has been a very popular theme to create movies with robotics that either are threatening the lives of humanity, or are trying to save humanity. With this in mind, I have conducted surveys to determine if the dependency of technology and the effect an AI would have on our society within the different age groups and genders, how they already feel about their use of technology, as well as the future of technology and how good it would be to have an AI in their life. Without surveys and questionnaires, the

research might have misinformed data for the known or assumed reactions of the public. With this study being conducted, the different situations can be manipulated to see how the participants may react. Thus, creating the environment to start collecting data and beginning to see how people will react and see if they can become accustomed to the evolutions of technology and the advancement of humanity and how they can adapt.

### **Process**

By manipulating variables and seeing what has the greatest effect on the reactions to Artificial Intelligence and would hopefully reveal the outcome. A factor to consider while discussing this, would be media representation. Something that will need to be taken into consideration will be the overall influence of media on the participants. The participants would be questioned on the type of movies they watch, and then listing the movies they had watched that involved robotics and if watching those movies changed their ideas or thoughts on machines. Having different movies be a theme for each conversation, to indicate if it changes their thoughts on the matter or if it would it dissuade them from acceptance. The already-made assumptions about machines will help in identifying the overall atmosphere around the feelings towards self-dependent machines and self-aware machines.

I want to be able to studies and use these reactions to see whether or not the outcome of technology and its advancements will help or hinder humanity in the future. Since this possibility will be taken into consideration, this provides a unique perspective concerning how children might learn in the future, how the military may advance, and how to clean up the ecosystems and other possibilities of what will happen in the future. While taking this into consideration, I will be taking volunteers for the surveys and interviews, however this will not be necessarily

determined to find this study's answers but believing that the focus is not on creating a negative or positive image on machines just the thoughts and opinions on technology today.

I believe a main concern for the creation of artificial intelligence is having the machines become stronger than humans. Already we face humanity's decision of laziness when we choose to ask Siri what our answers are instead of figuring them out ourselves or remembering them on our own. But if we make them stronger than us, smarter than us, more advanced than us, then what can be done to stop them if we are no longer at the top of the food chain? This is what I believe our fear is when we think of creating robots, let alone those that can think for themselves. Vladeck goes into discussion about the concerns and questions people have when thinking about self-aware machines. We begin to question religions because of science and some believe that by creating life that is not 'living' can be perceived as 'playing God' and thus making the debate of creating A.I. or not since the "concerns over the existential threat posed to humankind by artificial intelligence reached a fever pitch in 2014. Are the fears justified or are there more pressing concerns? (Gent). Edd Gent discusses that in history man has tried to build something in his own image, from "the animated statues of Greek myths, to the clay Golem of Jewish folklore, to Mary Shelley's Frankenstein" but now "its billionaire tech entrepreneurs who are tinkering where only gods should pry" (Gent). Sean OhEigartaigh, a manager of Cambridge Centre for the Study of Existential Risk (CSER), states, "We can design a system that looks pretty sensible, but because of interactions that we didn't expect or assumptions embedded in the system that didn't hold, it ends up doing something unexpected," (Gent). Viktoriya Krovovna, a founder and statistician for FLI, comments "A robot uprising, I don't think that's very realistic. What is more realistic is a misspecification of an AI that is trying to do good." (Gent). Gent also states that in our history we can look at many examples that show us that unintended harm is done by

prohibition, and not some menacing force we can't describe or control. A way to avoid having machines over power us is to not let the military have control over the creation of those machines, or making the programming unable to defy direct orders to not harm humans, or humanity. Or making it unable to harm anything, but then it goes into the discussion of robotic police officers. Making robotic soldiers isn't a safe and steady answer to a question about war. Elon Musk, a technological 'geek hero' tweeted that artificial intelligence would be more dangerous than nuclear weapons, that it would be similar to "summoning a demon" (Tucker). But, the whole point of this research is to find out how others feel about this advancement, and if in the future should this choice arise, should we make the decision to create military A.I. or not or just have AI be for the dependability of humans? The liability that humans have by creating these machines, and having the creation make actions no longer instructed or directed by us, makes this liability of machines a questionable subject that Vladeck has taken into his own hands: "[AI] are tools, albeit remarkably sophisticated tools, used by humans" (Vladeck).

### **Procedure**

When this study was conducted the participants were instructed to answer honestly to the questions in the survey. The purpose of these surveys is to gather data about the opinions towards technology and its advanced machines and how the participants will react to this. Each individual is different and their responses may vary due to age and sex; those factors were also taken into consideration and were on the survey itself. Once the survey is complete and returned to myself, I calculated the numbers of each question, took into account the invalid answers, and also put the results into 3 different gender results, 5 different age groups, and 8 different groups of information. Although I couldn't find a functioning AI to test, there have been scientific breakthroughs of AI becoming self-aware. But as my procedure goes I was unable to find a self-

functioning, and self-adapting Artificial Intelligence Computer to have my participants question and have conversations with. But I was still able to gather data and record and calculate the dependability of people on their technological devices; this is helping calculate whether or not the next evolution of technological assistants such as Siri and Cortana are going to be helpful in the future.

I had planned on discussing movie types and movie themes with the surveyors but in the time crunch I was unable to do so with each all of the participants, but with a few participants I was able to ask how they felt about the AI in movies and how it affected their choices on deciding if they were for the idea of AI or not. In one response, an anonymous surveyor said “it came out that it all depended on how the robot [AI] was portrayed in the movie, for example in Wall-E, he is a small robot who wants to help clean up the Earth and clean up other messes but in like I, Robot it made it dark. It’s all in the way it’s perceived because most times people don’t know that much about robots in the first place so they can’t know if it will be bad or good.” In another anonymous response it was stated, “If I were to have a robot, I would prefer a robot that is similar to a servant, like Wall-E. Someone to clean my house, cook my meals, and drive my car. I would not want to own or be surrounded by robots with souls, having human-like emotions and characteristics. However, I understand why people would want a robot as a companion, like how Chappie was portrayed in the movie, and it may be beneficial to some people to have a robot companion. These are two examples of robotic portrayal in the media and how it influences their choices and views on AI and robotics in general, even though they do have their own ideas on robotics and AI that do not determine how they would feel about if these advancements were to come into play.

## **Discussion**

While discovering this importance of the development of technology and the way the society will work in tandem with artificial intelligence and other evolutions of technology. The creation of such technology might already be among us; it could be that the Mars Rover is getting an upgrade pretty soon. For instance, many machines have already been built to do precise and delicate tasks that can ultimately decide the work method for some machines and their proceedings. We control these machines and make them tools. We use them as calculators, calendars, alarm clocks, reminders, cameras, communication devices, flashlights, and it can all come in a small package of a phone. We carry these tools with us every day and we don't consider them to be a threat. We spend money to make them look nice, to protect them, make sure they last as long as they can, or until we can get an upgrade. We put so much of ourselves and our personal lives on these devices and typically we only see them as tools. But if given a voice, would these tools remain tools? Would we rather have companions that remind us about events, give us information, know that if the area is dark to put on a light, focus using a camera for the best picture, know that if the person on the other end of the line is quiet to turn up the volume automatically, to correct your mistakes, to know what you're going to say even before you do? If you could give your phone a personality, would you? 1 in 5 people would take the personality phone.

The overall opinion was that the device that had the personality on it, would in time become a best friend, depending on the personality. But, the ones who disagree say that they don't need to give their phone or any other device in their life more human characteristics. It should be choice. But upgrades in technology aren't going to be up to choice, companies are going to come out with devices that have features we may or may not want. It won't be up to us

if we want these investments or not, it is going to happen and our only choice will be if we want the item or not.

My findings will help companies in the future, in deciding how to create devices for the public, they're reactions to those products and how often the use will be. The size of the device won't matter but the uses it can have will help the buying process, or the need and demand. The creating of AI will be a common and everyday occurrence, as well as the future for our choices and what we decide to do with our technology. There may come a day when policemen are replaced with robotic officers, our phones know what we want before we do, our homes have technological companions, and maybe eventually, our machines will learn to think for themselves. In the future we may have situations that remind us of the fears that Hollywood movies have put in our brains, but we can also live in peace with machines and coexist with them.

## **Results**

Through my collection of surveys I have been able to see the significance that technology has for people today. Although I have collected research about the future impact that machines will have on the modern people, I did encounter a few inconclusive results of data with my surveys whether it be the participant not reading the whole question or having a non-serious response to my survey I have taken these invalid responses into consideration while calculating my data. To begin, I was eager to find out that people were dependent on technology, but as I was gathering data it seemed that people aren't as attached to their electronic devices as one might think. The ratio of those that feel uneasy without an electronic to those that do not feel uneasy without an electronic device is 16:21 with only 3 invalid responses. But, a main reason



behind the uneasiness of not having their phone with them, it that many claim that they would only feel uncomfortable because of an emergency that might occur if they didn't have their phone and would prefer to be informed rather than set back by communication. Others feel like they hold a lot of personal information on their phones and having that in someone else's hands or not in their own is why they would feel uneasy without their phone.

Next, the ratio of those that find it harder to focus with or without a phone is 21:8 with 11 invalid responses. It seems that the majority of people find themselves perfectly capable of their usage of technology and don't feel set back by it, even though more than half of the results were invalid. Although this is different from my original theory of people being too dependent on technology, it seems they can work in tandem with technology and not feel the hindrance that only a minor amount of people may feel. I did place my results into separate categories: Age and Gender. It seems that the age difference has come into play with people taking the survey, it seems those who are under the age of 18 do not find themselves under the influence of technology and it seems that they do not take paper surveys seriously, although the majority of those who did take the survey and were also 18 and under did take the survey and had most of the answers valid. But in the future an electronic survey might serve best to approach the younger survey takers, compared to those over the age of 18. But for those over the age of 18, it seems that people take the survey more seriously, since their answers seem to be more thought out and descriptive.

Most females who took the test, gave answers that were more serious and conclusive than males who took the survey. 60% of males who took the survey had invalid responses, and 70% of females who took the survey had invalid responses, but for every 1 male survey there was 3 female surveys. I did not in fact ask the participants their religion which can play a factor into

their answers of the approval of AI; in future research I can ask if the surveyor is willing to answer what religion they follow and if it does impact their choice. Also in the future, culture and ethnicity can be taken into consideration since the availability of technology and usage of it can be dependent to race as well. A challenge that I came across was invalid responses, but those percentages were calculated and deducted from the valid responses.

## Bibliography

## Works Cited

- Adams, Mike. "Rise of the Machines: Google Robots." *NaturalNews*. N.p., 26 Feb. 2014. Web. 11 Apr. 2016.
- Bibel, Wolfgang. "Artificial Intelligence in a Historical Perspective." N.p., n.d. Web. 11 Apr. 2016.
- Carafano, James Jay. "Autonomous Military Technology: Opportunities and Challenges for Policy and Law." *The Heritage Foundation*. N.p., n.d. Web. 11 Apr. 2016.
- Choi, Charles Q. "Automaton, Know Thyself: Robots Become Self-Aware." N.p., 24 Feb. 2011. Web. 11 Apr. 2016.
- Cook, Rich. "Will Computers Become Self Aware?" N.p., n.d. Web. 11 Apr. 2016.
- Cristianini, Nello. "On the Current Paradigm in Artificial Intelligence." N.p., n.d. Web. 11 Apr. 2016.
- Dvorsky, George. "The Case Against Autonomous Killing Machines." N.p., 21 June 2012. Web. 11 Apr. 2016.
- Farkas, I. "Use of Artificial Intelligence for the Modelling of Drying Processes." *Taylor & Francis*. N.p., n.d. Web. 11 Apr. 2016.
- Gent, Edd. "AI: Fears of 'playing God'" *ResearchGate*. N.p., n.d. Web. 11 Apr. 2016.
- Ingrand, Felix, and Malik Ghallab. "Robotics and Artificial Intelligence: A Perspective on Deliberation Function." N.p., n.d. Web. 11 Apr. 2016.
- Markoff, John. "Brainy Robots Start Stepping Into Daily Life." *The New York Times*. NewYorkTimes, 18 July 2006. Web. 11 Apr. 2016.
- McMillan, Robert. "We Can Now Build Autonomous Killing Machines. And That's a Very, Very Bad Idea." *Wired.com*. Conde Nast Digital, 06 Feb. 2015. Web. 11 Apr. 2016.
- Megill, Jason. "Emotion, Cognition, and Artificial Intelligence." *Emotion, Cognition, and Artificial Intelligence*. N.p., 11 Sept. 2013. Web. 11 Apr. 2016.
- Prepared For: Us Department Of Navy, Office Of Naval Research, Ph.d. Prepared By: Patrick Lin, Ph.d. George Bekey, and M.a. Keith Abney. "Autonomous Military Robotics: Risk, Ethics, and Design." (n.d.): n. pag. 20 Dec. 2008. Web. 11 Apr. 2016.

- Rhea, John, and Barclay Ward. "The next 'new Frontier' of Artificial Intelligence." N.p., 1 Nov. 2000. Web. 11 Apr. 2016.
- Rojas, Alejandro. "Is a Self-Aware Robot Like Chappie Possible?" *The Huffington Post*. TheHuffingtonPost.com, n.d. Web. 11 Apr. 2016.
- Sampson, Patsy. "Microsystems Technology Laboratories." *MTL News*. N.p., 20 Dec. 2011. Web. 11 Apr. 2016.
- Suterwala, Anisha. "First." N.p., 25 Sept. 2012. Web. 11 Apr. 2016.
- Szolovits, Peter, Ramesh S. Patil, and William B. Schwartz. "Artificial Intelligence in Medical Diagnosis." *Artificial Intelligence in Medical Diagnosis*. N.p., Jan. 1988. Web. 11 Apr. 2016.
- Tucker, Patrick. "The Military's New Year's Resolution for Artificial Intelligence." *Defense One*. DefenseOne, 31 Dec. 2014. Web. 11 Apr. 2016.
- Vanderbilt, Tom. "History, Travel, Arts, Science, People, Places | Smithsonian." *History, Travel, Arts, Science, People, Places | Smithsonian*. Smithsonian, Dec. 2012. Web. 11 Apr. 2016.
- Vergun, David. "Autonomous Vehicles to Exploit Capabilities of Machines." *Autonomous Vehicles*. Army, n.d. Web. 11 Apr. 2016.
- Vladeck, David C. "Machines without Principals: Liability Rules and Artificial Intelligence." N.p., n.d. Web. 11 Apr. 2016.
- Wa, Kevin, and Huma Shah. "Assumption of Knowledge and the Chinese Room in Turing Test Interrogation." N.p., n.d. Web. 11 Apr. 2016.
- Ziemke, Tom. "The Construction of 'Reality' in the Robot: Constructivist Perspectives on Situated Artificial Intelligence and Adaptive Robotics." N.p., 2001. Web. 11 Apr. 2016.

# AP<sup>®</sup> RESEARCH 2016 SCORING COMMENTARY

## Academic Paper

### Sample: D

**Content Area: Understand and Analyze Context — Row 1 Score: 2**

**Content Area: Understand and Analyze Argument — Row 2 Score: 4**

**Content Area: Evaluate Sources and Evidence — Row 3 Score: 2**

**Content Area: Research Design — Row 4 Score: 3**

**Content Area: Establish Argument — Row 5 Score: 3**

**Content Area: Select and Use Evidence — Row 6 Score: 2**

**Content Area: Engage Audience — Row 7 Score: 1**

**Content Area: Apply Conventions — Row 8 Score: 2**

**Content Area: Apply Conventions — Row 9 Score: 2**

### LOW SAMPLE RESPONSE

"Artificial Intelligence Introduction into Society and the Reactions of the Progress of Acceptance of Technology"

#### **Content Area: Understand and Analyze Context — Row 1**

The response earned 2 points on this row because it identifies the topic of the inquiry: social acceptance of artificial intelligence (AI). It did not earn 4 points on this row because there is no clear purpose or focus for the inquiry. The research question is too broad to yield an effective investigation: essentially, "Will AI help humanity or create our demise?" (p. 3).

#### **Content Area: Understand and Analyze Argument — Row 2**

The response earned 4 points on this row because it discusses multiple applications of and perspectives on AI. It did not earn 6 points on this row because the relationships among the various applications and ideas are not explored, and those perspectives are not directly connected to the student's inquiry.

#### **Content Area: Evaluate Sources and Evidence — Row 3**

The response earned 2 points on this row because most of the sources are not shown to be credible. It did not earn 4 points on this row because most of the sources are popular news sites (e.g., *Huffington Post*) and websites of unknown origin, and the paper provides no justification for using them.

#### **Content Area: Research Design — Row 4**

The response earned 3 points on this row because it states a method (questionnaires about AI) and provides examples of some questionnaire topics at the top of p. 6. The paper did not earn 5 points on this row because there is no explanation of how or to whom the questionnaire would be distributed, nor how the responses would be analyzed. The paper indicates at the bottom of page 8 to the top of p. 9 that the questionnaire data "will not necessarily" answer the research question.

#### **Content Area: Establish Argument — Row 5**

The response earned 3 points on this row because the conclusion — that people are not as dependent on their technological devices "as one might think" — is oversimplified. It did not earn 5 points on this row because the conclusion is not connected to the research question about AI and is not sufficiently supported with survey/questionnaire data.

# AP<sup>®</sup> RESEARCH 2016 SCORING COMMENTARY

## Academic Paper

### **Content Area: Select and Use Evidence — Row 6**

The response earned 2 points on this row because some of the survey/questionnaire data are reported, but they do not support the conclusion about dependence on electronic devices and do not address the research question about acceptance of AI. The paper did not earn 4 points on this row because the data are not relevant to the research question and are erratically reported. See the last two paragraphs of the paper for examples of inconsistent evidence.

### **Content Area: Engage Audience — Row 7**

The response earned 1 point on this row because organizational elements of titled sections are confusing. For example, the information at the end of Process (pp. 9–10) is not about the research process and seems to belong in the Literature Review. The Discussion section appears before Results. The paper did not earn 2 points on this row because the organizational elements (section headings) do not contain what they promise and therefore interfere with communication.

### **Content Area: Apply Conventions — Row 8**

The response earned 2 points (instead of 4 points) on this row because it cites the work of others with some inconsistency. It did not earn 6 points on this row because the ideas of others are not integrated with each other (e.g., Literature Review is one long paragraph that rambles) and are not distinct from the student's voice.

### **Content Area: Apply Conventions — Row 9**

The response earned 2 points on this row because the grammar is correct most of the time and the paper's meaning is adequately conveyed. It did not earn 3 points on this row because several long sentences, with multiple prepositional phrases (see p. 7 for examples), are difficult to follow.