State Chapter

Kansas Society of Professional Engineers
825 S. Kansas Avenue, Suite 500
Topeka, KS, 66612
Phone: (785) 233-2121
Email: info@kansasengineer.org

Student Chapter

University of Kansas Student Chapter
Faculty Advisor: Robert Lyon, P.E.
Email: blyon@ku.edu

Authors

Anh Le
Email: anhle138@ku.edu

Juan Bernal
Email: jbernal024@ku.edu

Jacob Hammil
Email: jhammil@ku.edu

Ethical Issue #1: Artificial Intelligence - How will artificial intelligence influence the work performed by professional engineers in the years ahead? What are some of the engineering ethical issues that will emerge as professional engineers begin to design facilities, systems, structures, and products using artificial intelligence?

NSPE Code References:

Section I.1: Hold paramount the safety, health, and welfare of the public.
Section I.2: Perform services only in areas of their competence.

Discussion

The adaptation of artificial intelligence (AI) technology in engineering continues to raise many ethical concerns, specifically most problematic with NSPE Code of Ethics Canon 1 and 2. While engineers must hold paramount the safety, health and welfare of the public (I.1), the degree of acceptable risk to human life when implementing AI needs to be discussed. The question becomes if an AI system is found to be very efficient at saving human lives, but there is also a marginal chance of causing lives to be lost, is such an AI system acceptable for public use? One example that pertains to this issue is Tesla's "Autopilot" AI system, which exists in all of their car models[1]. The "Autopilot" system would control the car automatically when activated, requiring no inputs from the driver. According to Tesla's data, their AI is 9 times safer than human driving[2]. However, the ethical dilemma comes in situations where the AI has to make decisions between one life and another (i.e, avoiding a car at the front by swerving into pedestrians on the side). Tesla's solution is that the AI's priority would be to save the pedestrians, regardless of other factors[3]. This means the AI would not try to avoid a vehicle collision if it detects that pedestrians could be in harm's way. The drivers of the vehicles involved could be seriously injured, and Tesla decides that it is an acceptable risk. The case of Tesla shows that the code of ethics is inadequate in addressing risks associated with AI. It can be argued that the engineers at Tesla had ethically followed Cannon 1 (I.1) by creating an AI system that can drive much safer than humans. And the data from Tesla's road incidents does support that. However, in order to protect pedestrians, the AI can make decisions that could injure drivers and passengers inside the car. Would it be fair to say that the engineers who created this AI are responsible for these injuries? Should an AI system be allowed to knowingly harm the users at the expense of protecting others? No engineered system is perfect or risk-free. With the prevalence of

[1] "Autopilot | Tesla." https://www.tesla.com/autopilot. Accessed 11 Apr. 2020.
[2] "Tesla Autopilot safety almost 9x safer than average ... - Electrek." 23 Oct. 2019, https://electrek.co/2019/10/23/tesla-autopilot-safety-9x-safer-than-average-driving/. Accessed 11 Apr. 2020.
[3] "Here's How Tesla Solves A Self-Driving Crash Dilemma - Forbes." 5 Apr. 2017, https://www.forbes.com/sites/patricklin/2017/04/05/heres-how-tesla-solves-a-self-driving-crash-dilemma/. Accessed 11 Apr. 2020.

AI, engineers should begin to discuss the safety regulations of AI and how to approach ethical dilemmas related to artificial decision-making.

Another area where the code of ethics may fail to address is when engineers use AI to assist in technical designs. Engineers at Buro Happold, the firm responsible for the design of the Museum of the Future, Dubai, utilized an AI algorithms to assist with designing the complicated diagonal steel structure[4]. The results were an innovative, 250-ft tall building with a very uniquely-curved shape.

The Museum of the Future, Dubai
(picture provided by Buro Happold)

It is no doubt that the building, now under construction and planned to open in 2020, is a marvel of structural engineering. The AI that was used to design this building was developed in-house by engineers at Buro Happold. It closely follows a set of pre-defined parameters to ensure that the structure design is safe and sound and then computes several design possibilities. However, there are many ethical questions related to the use of an AI in assisting the design of this building. First, if the design of

[4] "AI at the heart of building design - Buro Happold." 27 Sep. 2018, https://www.burohappold.com/thought-leadership/ai-meets-architecture-exciting-future-construction-technology/. Accessed 11 Apr. 2020.

the museum is found to be flawed, who would be found responsible? Would it be the computer engineers who created the AI, who also had had no education in civil and structural engineering? Would it be the structural engineers who failed to check for design flaws, even though those checks may not exist in any code or structural standards due to the complexity of the design? Secondly, Cannon 2 of the code of ethics (Section I.2) restricts engineers to work only in the fields that they are competent in. Using AI to assist in design is a very new approach, and one could make an argument that the engineers had to step out of their field of expertise to experiment with such a new concept. Are the engineers, therefore, unethical? Had they not stepped out of their comfort zone to discover new knowledge, buildings such as the Museum of the Future may have never been built. Therefore, the code of ethics should be revised to address engineers who are attempting to discover and dwell into new areas of knowledge such as artificial intelligence.

Besides the ethical problems described above, AI can cause ethical issues that are closer to home. Ever since the steady technical increase of artificial intelligence, The technology has made its way into our daily life by having it at arms reach and as technology kept improving, the need for landlines was reduced dramatical; therefore, the creation of smart cell phones and home devices with integrated artificial intelligence assistants at onces voice command became popular. The University of Electro-Communications in Tokyo and University of Michigan were able to create vocal commands from a distance with a laser which allowed vocal commands such as unlocking doors, online purchases, and gathering private information. Meanwhile, the lesar hits the microphone of the google home device while it creates a frequency similar those of voices[5]. This ethical issue disregarded Cannon 1 & 2 since the safety and welfare of the public was at risk due to the competence of AI's engineers. Google's spokesperson stated that system code was patched and assured that it would not happen in the future [6]. If third party companies or universities do not challenge the competence of AI engineers' work, how else could we verify the safety and credibility of AI's?

Conclusion

In conclusion, the code of ethics is only applicable to well-established areas of engineering. Artificial intelligence is certainly not within that category. It is a new frontier

[5] "Amazon Alexa Can Be Hacked By A Laser From 100 Meters—Is It Time To Hide Your Echo?" 5 Nov. 2019, https://www.forbes.com/sites/thomasbrewster/2019/11/05/amazon-alexa-google-home-hacked-with-a-laser/#4dd80ead27d2 Accessed 12 Apr. 2020.

[6] "Amazon Alexa and Google Home's voice assistant were vulnerable to hackers" 21 Oct. 2019 https://fox2now.com/news/amazon-alexa-and-google-homes-voice-assistant-were-vulnerable-to-hackers/ Accessed 12 Apr. 2020

of engineering knowledge and should be studied and implemented carefully. The code of ethics should be revised to cover new ethical uncertainties. Alternatively, a new set of ethical codes should be proposed for engineers working with artificial intelligence. Because now, there is not only a human decision-making factor but also an artificial one.