Saaif Ahmed
ahmeds7
661925946
5/4/2022

STS0 4100– PROFESSIONAL DEVELOPMENT 2 – TECHNICAL ISSUES AND SOLUTIONS

Using the articles provided in class, along with additional research articles and information, respond to the following questions:

1. A reoccurring theme in the second half of the course is that of systems failing because the system must continue to operate in new environments although built for a past, stable environment. Given this challenge, how might engineers intervene to help produce better societal outcomes? **Go beyond answers that focus on 'better training'.**

   The first way that engineers may intervene to help produce better societal outcomes starts with the education fed to engineers. Downey talks about this issue in "The Globally Competent Engineer …" to great effect. In the United States Downey observed that the engineering standard for education does not account for this global competency which he argues is crucial for the sustainability of the field. Analyzing why and how disasters like the Deepwater Horizon, or Three Mile Island happened, we can see that engineers did not plan for the way in which people work together. With education that aids in teaching this exact type of competency we can avoid these problems. A far-reaching goal could be as extreme as developing engineering standards that extend globally that we all follow. One in which we are taught about different cultures and societal issues to better employ technicians with the tools to prevent disaster. The Bhopal disaster was structured in a way where the company was able to blame the employees. Preventing this dynamic from occurring with design that supports the individual rather than the corporation may work to produce better outcomes especially in countries where the dynamic between manager and worker is different than the US.

2. What are some of the unintended consequences of Artificial Intelligence and Automation that we may need to be careful of? As an engineer, what tools do our collective professions have to address these issues? Cite material from earlier in the course to explain what tools we have or may need to develop.

   Some of the unintended consequences revolve around the replacement of humans in industries thereby reducing expenses on employees. An automatically controlled assembly line is an incredible investment for corporations as it allows them to drastically reduce maintenance costs by not hiring maintenance workers. This is related to the idea of affordances that Norman presents in "The Design of Everyday Things". The ability of an automated system to replace humans is an affordance that companies immediately can see. Interestingly the engineer must solve two issues, the aforementioned idea, and the dread risk of AI in the first place. Dread Risk is an idea introduced by Perrow in his literature about

the Three Mile Island incident. The public can look at this technology and raise concern over the idea of losing jobs, as this is a societal catastrophe. Thus, the engineers must use their collective tools to address these issues. Primarily the tool that we have is the ability to wield technology to grant power. Consider how Winner argues that design choices have politics with the idea of either separating classes or bringing them together. The tomato harvester example he uses is much like the ability of AI to replace human workers. Thus, engineers have the power to conceptualize protocols, devices, and other forms of infrastructure that attempt to mitigate these consequences of AI. Surely if we can bring about negative changes, we can use that same power to expand upon these problems and turn them into other ideas. The next tool is that of communication and organization. We already have institutions like the ASME that Wisnioski talks about that can use their power to spread education on these technologies. These organizations can also attempt to impose restrictions such that the ethics code of engineering is not broken.

3. Make a short list (at least three items) of some of the 'problems' that AI and Automation are meant to solve. Now, suggest some of the ways the problems are related. You may point to people who str implied by this problem (be specific); assumptions about the world each problem implies; larger societal systems at play; or any other relevant connection. This question will be graded on the basis of your ability to draw out interesting connections.

   AI attempts to solve a few problems. Primarily it aims to solve or search for optimizations, bring consistency to an inherently inconsistent field, and prevent human interaction with dangerous or obscene items. These are connected in a few ways. Firstly, the ability to search for optimizations and bringing consistency to medicine and the medical field are related by the nature of medical diagnosis. Operating medical tests can sometimes takes hours not because the test itself is large, but due to the sheer volume of tests being conducted. A doctor would very much benefit from a quick, accurate, machine learning model that can take an x-ray and predict the condition of the patient. This brings consistency as the model, if accurate enough, can catch diagnosis before it's too late, and the doctor themselves serve as a backup and additional layer of insurance. Another way these problems are related is how CPG Grey brings forth the argument that AI can alleviate humans from doing dangerous and repetitive tasks, as a form of optimization for companies. A benefit of AI and Automation that is commonly brought up is how mechanical devices cannot be harmed like humans can. Thus, in areas of toxic waste removal, dangerous construction areas, and much more, automation can serve as a great resource for human safety. It is also an optimization for companies in the business perspective as they do not need to hire trained people for this and can instead direct profits to other areas of the company that could use more infrastructure.

4. Refer to Gary Lee Downy's *Are Engineers Losing Control of Technology* to answer the following questions. How is the future of technology being shaped by people who do not hold engineering degrees? How might engineering respond to this development to remain relevant in the growing 21st century?

Technology is being shaped by the people who have the most money in the system according to Downey. Downey brings up the argument of the structure of engineering companies following the western American model throughout the world. The American model is one that emphasis maximizing profits and minimizing expenses by nature of low cost, low maintenance mass production of technologies. This is an inherently business decision rather than an engineering one. Downey brings up the German model for engineering that emphasized quality in a world built for low-cost mass production of goods. The American model, constructed by people who do not hold engineering degrees, has become the standard worldwide. Engineering does fortunately have a response to this and Downey argues it begins with engineering education. Downey states that the breadth of engineering curricula will be integral to the enterprise moving forward. Emphasizing what students are not learning rather than what they should be learning allows them to be aware of the potential ramifications of design choices.

5. Taking the whole breadth of the course in mind, what seems to be two (2) critical issues facing engineers when it comes to the future of your respective fields? Note what you hope to do in the future and where you might apply ideas from the course to redefine what kinds of problems your field might address.

   The first critical issue that my field of computer engineering faces is the morality of machine learning. I chose to bring this up as machine learning is the concentration within computer engineering that I am choosing to follow. The issue that I see with it comes from week 6's methods and observation videos. In "The Social Life of Small Urban Spaces" we see a way in which engineers can learn how to design for the public, at least in the context of urban spaces, simply by observing. Machine learning takes it to another level where that observation can be compiled at an incredible rate. And to be able to put the characteristics of something like social life into a soulless equation with weights learned from computer optimized observation does pose some ethical questions at the very least. This is very close to hitting disaster levels of automation and what computer engineers can do is attempt to learn from events like the Bhopal Disaster or the Three Mile Island Incident. Attempt to predict the problem and develop systems not for the current day but for the far future and develop systems that be easily iterated upon if our predictions are wrong. In the case of machine learning that is to educate engineers on these ethical problems. Showcase the appropriate places for this technology rather than placing it everywhere. Encourage engineers to develop machine learning to where it can truly help such as the medical field to accurately predict illness.

   The second critical issue that my field faces is with regards to the global climate crisis. Using computer engineering / electrical engineering to solve the global climate crisis is something that engineers need to take into consideration. The potential ramifications of this crisis are not to be understated. In the future I hope that engineers take into consideration of how we get the public to care about this. Through making renewable technologies "everyday things" as shown by Norman is an effective way to slowly solve this problem. The power of engineers extends beyond the work they do for companies and what I hope to do in the future is to stay informed and spread information surrounding the leaps in the

development. As an engineer I believe it is my responsibility to help other fields of engineering in solving their problems.