Assignment 1-3: Real world application of AI

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There is a myriad of ways that artificial intelligence could help in real world scenarios and many ways in which it already does. While there may be more public facing examples, I would like to highlight a considerably niche example of a situation in which AI can save time, increase productivity, save hundreds of millions of dollars, and help to solve a massive worldwide shortage of critically needed components.

In the spring of 2020, I was working as a field service engineer for a company that serviced and manufactured industrial vacuum pumps, temperature control systems, and gas abatement systems for the semiconductor manufacturing industry in Beaverton Oregon. Throughout my years in this position, I noticed that the manufacturing clients I worked for were losing millions in lost product, down time, and repairs on equipment that had onboard sensors and monitoring software but was not being utilized to any extent. Much of the data being generated by the sensors would sit locally on the onboard computer until it got automatically deleted. I also found that this data could predict these machine failures with a relatively high degree of accuracy compared to the current way in which the data was being used.

Over the course of the next few months, I taught myself how to code VBA macros in Excel documents and went about creating a proof of concept for this idea. Many, if not all, of the companies I serviced had technicians simply walk through their fleet of hundreds of vacuum pumps and other various systems, collecting temperature, exhaust pressure, and voltage draw readings and recording them on paper logs which would get filed away and forgotten. This exercise was done so that a technician could pull pumps that had out of spec sensor readings. In my program I decided to simply have the technician take their readings and put it in my excel document using a tablet and my prewritten macro would compare the inputted data to historical data and determine based a set criteria whether or not the pump should be replaced or not. This little program was given provincially to a customer in Texas to try out. Over the next few months, the program would go onto prove the concept worthwhile.

While this program wasn’t AI by any means since it could not change any of the parameters of the given task it did show that there was something there. If I had continued to develop it knowing what I know now after years of schooling and what I’ve learned in this class so far, I would have employed machine learning as it is primarily used to recognize patterns (Goel 2020) which could have been used to detect patterns in the sensor output just prior to a system failure.

Going further I would have developed an API which would communicate with the onboard software to pull the data at five second intervals to have a more accurate picture to feed and train the machine learning AI. This would have required extra equipment however since none of these pumps had the ability to communicate wirelessly. I would have used several port hubs in a tree system to help consolidate the connections due to manufacturers having hundreds of pumps in operation at any given site. I would also have to utilize processing in some form. This could be done with cloud service providers for storage of data, processing, and communication with outside agents. I would, however, think that a localized solution would reduce the cyber security vulnerabilities to the system. Going with a more localized solution would require a custom server stack with subsystems for data collection, processing via the AI, and then a subsystem for outbound communications and development operations.

When considering ethical concerns with this solution it is important to look at a few different aspects. The first of these is personally identifiable information, since this AI would not be dealing with any personally identifiable information this concern can be put aside. Another concern is regarding safety since this will be used in manufacturing that involves highly toxic and volatile substances. The only real control this system might have in exposing any persons or equipment to unsafe conditions would be to have control over the operations of the pumps and other systems. This can be easily resolved by disallowing any communication with those systems at the API level. Finally, the last ethical concern is environmental. Since this AI primary purpose is to reduce waste in the manufacturing process it actually serves to help reduce potential pollution waste via scrapped product and trace non-abated gases in the manufacturing processes.

References:

Goel, A., & Davies, J. (2020). Artificial Intelligence. In R. Sternberg (Ed.), *The Cambridge Handbook of Intelligence* (Cambridge Handbooks in Psychology, pp. 602-625). Cambridge: Cambridge University Press. doi:10.1017/9781108770422.026