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Four Reasons Why Machines Will Always Need A Human

JENNIFER KITE-POWELL, CONTRIBUTOR

Elizabeth Holm, a professor of materials science and engineering at the College of Engineering at Carnegie Mellon University and a computational materials scientist at Sandia National Laboratories says we're in the midst of an artificial intelligence (AI) culture shift.

She also says that machines won't replace human experts.

"Machines are great at handling things, like large amounts of data, but machines still need an expert, a human, to analyze the data, set parameters and guide decisions," said Holm.

"Engineering and science decisions are based on understanding how things work. How does a bridge support its load? How does an engine convert fuel into motion? In contrast, AI transforms data into decisions without understanding any underlying principles," said Holm. "Applying AI to engineering and science will require a culture shift: either we will learn to trust decisions that we do not understand, or AIs will evolve to base their decisions on principles that humans can interpret and control."

Holm says that currently, society is exploring how to balance those alternatives.

"AI software that drives autonomous vehicles is based on data, not pre-programmed principals of driving," said Holm. "Because we trust the AI to have learned the right things from the data, we give it access to our roads. However, when a pedestrian is struck and killed by a self-



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driving car, we pull the cars off the roads and ask the AI to explain itself – to formulate its decisions in terms of rules we can control."

Holm says the AI culture shift is a work in progress, but that there are four primary reasons why machines and humans will continue to work together.

Intelligent machines are great at handling lots of data.

Holm believes that processes like manufacturing that collect a lot of data, like 3D printing, will benefit from the principles

of AI like computer vision, which can sort through all that data.

"AI is an important area for additive manufacturing," adds Holm. "It's different from most manufacturing processes in that it really can collect the data on the fly, so there's a lot of room for data science."

Holm points out that AI applications being used at Facebook and Amazon, like facial recognition and targeted advertising, have made all of us aware of the power of integrating vast amounts of social data.

"3D printing generates copious visual, audio, and instrument data at every indi-

vidual step of the process. Our goal is to use the same AI concepts to optimize the additive manufacturing process concerning quality and cost,” said Holm.

Machines augment human capabilities.

“When we use computers to find flaws, it’s very much like when we use computers to read radiographs, x-rays, and CAT scans in medical imaging,” said Holm. “The idea is that the computer does the first look to find the areas of interest, but we’re in no way replacing the expert who looks at that flaw and says, ‘No, it’s nothing to worry about,’ or, ‘Oh yeah, that’s what happens when the oil gets old, and it’s problematic.’”

Holm says we’re already becoming aware of this from the medical imaging we’re exposed to.

“These days, for many routine radiological tests like mammograms, the first entity to examine the results is a computer. AI software locates normal and abnormal areas and passes the results to a human radiologist for further examination and recommendations,” said Holm.

Machines save humans time by performing tedious tasks in much less time.

Tedious and repetitive tasks could be a thing of the past.

“The first thing a graduate student wants to do is stop having to outline segmentation drawings, which can take multiple hours and cause a lot of angst; they vow when they graduate, they’re never going to do that again, and it’s going to be some other graduate student’s problem,” said Holm. “The computer doesn’t have that; the computer might do it forever without getting bored because there’s no boredom in a computer.”

“One example of this is a company [...] that performs quality control by microscopically scanning samples of each batch of its product. The vast majority of each sample is entirely normal and uninteresting, only the rare anomalies are important,” added Holm. “So this process makes the human expert spend a lot of time not



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using his or her expertise and an AI system can patiently scan samples and weed out normal results so that the human expert can focus more time and attention on the relevant and challenging findings.”

Intelligent machines are human-made.

“Each step of a convolutional neural network is just signal processing that we learned as undergraduates in engineering school,” said Holm. “Of course, there’s a feedback loop, a learning loop of how you develop the filters and the architecture of your signal processor. But it’s not magic, it’s just a set of simple things that all engineers already know.”

“I think it’s important not to attribute special powers to deep learning algorithms – at least no more special power than the human brain,” added Holm.

Carnegie Mellon University has been a pioneer in AI since the 1950s. Herbert Simon and Alan Newell created the Logic Theorist in 1955 which is considered the first AI program while they were both on the faculty at the University. Simon went on to win the Nobel Prize in Economics in 1978, and he and Newell won the

Turing Award in 1975.

In May 2018, the University’s School of Computer Science (SCS) added an undergraduate degree in AI in Fall 2018, which is considered the first degree of its kind offered by a US University.

Reid Simmons, research professor of robotics and computer science, at CMU SCS says courses like these will have an impact on developing the technology of the future.

“With the proliferation of data in society, it is becoming increasingly necessary to find ways to analyze and make sense of all that data, that is where AI can help,” said Simmons. “Whether it’s by better understanding the financial markets, by improving the safety and efficiency of transportation, or by making our lives more productive and enjoyable.”

“Students graduating with an AI major will not only understand how to employ AI to improve society, but they will have the skills and insight to help develop the next, more powerful, generation of AI tools,” added Simmons.

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