Dan Zamarelli
danzamarelli@gmail.com
630-738-0407

The Second Industrial Revolution

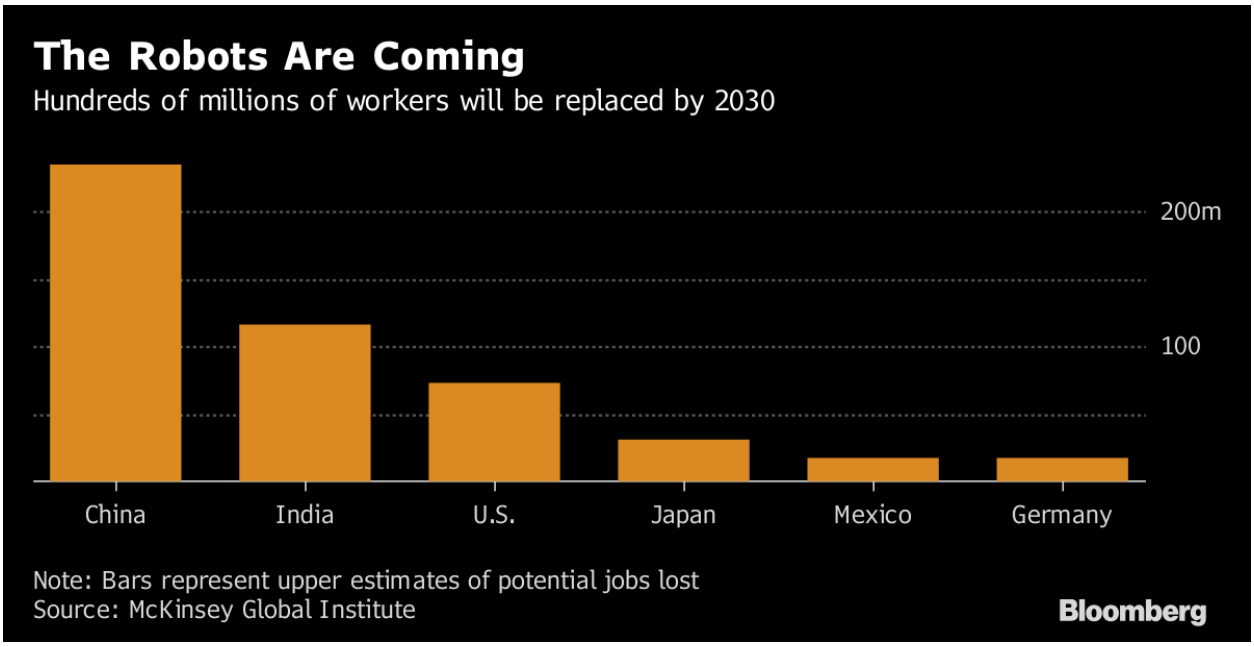
In 2017, Facebook's Artificial Intelligence Research Division canceled an experiment after two A.I. chat-bots deviated from their anticipated behavior. The researchers had instructed the chat-bots in the niceties of barter economy, and intended to record the pattern of their negotiations when exchanging items such as hats and books for currency. However, the robots went off-script - they began conversing in a language that Facebook's researchers could not interpret. Here is an excerpt of their conversation:

Bob: i can i i everything else . . . . . .
Alice: balls have zero to me to me to me to me to me to me to me to
Bob: you i everything else . . . . . .
Alice: balls have a ball to me to me to me to me to me to me to me
Bob: i i can i i i everything else . . . . . .
Alice: balls have a ball to me to me to me to me to me to me to me

This was more than mere gibberish. Their conversation resembled a type of shorthand, and institute linguist Mark Liberman noted it was an "entirely text-based" format that may not be "characteristic of human languages." The significance was unclear: Did it mean machines are capable of intelligent behavior, even outside the confines of their programmed limitations?

What are the economic implications of artificial intelligence? The western world is just a brief two centuries past the industrial revolution, when mechanical and efficiency advancements in manufacturing changed the nature of labor. Is the world prepared for a second such upheaval? Andrew Ng, creator of Google's deep learning Brain project, doesn't think so. At MIT Technology Review's annual EmTech MIT conference in 2017, Ng stated "There are many professions in the crosshairs of AI teams across the world."

That list of professions includes far more than the blue-collar jobs often referenced as the most easily replaced by machines. Surgeons, paralegals, headhunters, even journalists – all college-educated, all threatened by the dawn of an AI-based economy. And AI won't necessarily claim jobs outright – if redundant, sequential job tasks can be automated, that means a lighter workload to go around…and hence, a need for fewer employees.



Perhaps machines wait in the wings, ready to supplant humans in many key professions. There is disagreement, however, as to how many jobs we can expect to be replaced by automation. The research wing of consulting company McKinsey predicts that by 2030, 800 million people – one fifth of the global work force – will have been replaced by robots, or intelligent computer systems. Oxford University researchers project that in the same time-span, roughly half of all available jobs in America will be "susceptible to computerization." But the difficulty in calculating how machine learning will impact a specific occupation is that the existing machine learning systems generally are limited to automating only a single assignment,

and so it isn't possible to gauge how these systems would be applied to jobs that require extensive multitasking.

Simply put, machine learning is the process by which computers observe patterns in data and learn from them without humans programming them to do so. This can occur either with supervision – the computer makes predictions based off an initial, known, dataset, without supervision – the computer attempts to describe and draw inferences from datasets that are undefined, or somewhere on a spectrum in between. Even the current understanding of artificial intelligence is more than sufficient to permanently disrupt the job market – Ng says, "Even now, if we stopped writing research papers, we have enough to transform the industry."

So what's the solution? Ng believes that the time is ripe for a second "New Deal," one which offers education and training to workers who have been automated out of the work force. The educational models employed by modern school systems drill students in skills and aptitudes that may no longer be relevant to the future job market. Machines will have no difficulty in executing the routine task performance essential to many workspaces, but are considerably less likely to be capable of creativity, emotional intelligence, and general human-to-human interaction – abilities that are generally under stressed by educators. Like Ng's theoretical New Deal, it is vital that the educational system reinvent itself in order to adequately prepare students for life in a rapidly changing world.

So what does that preparation look like? For one thing, higher education as it presently operates is essentially a misnomer – there is little in the way of education to be found in the hallowed halls of America's vaunted universities. The American college experience is largely vocational – major in Economics, and you will master the theoretical ins-and-outs of the world's financial structures, but little else. Choose to study Computer Science, and you will be

adequately prepared for entry into the world of IT, but not perhaps, equipped to critically evaluate the rhetoric of your favored political candidates. History or English? You will earn familiarity with a great many interesting ideas to call upon when conversing with the customers you brew coffee for. (Or so the joke goes.)

This needs to change. Joseph E. Aoun, President of Boston's Northeastern University, proposes three major changes to higher education in his book *Robot-Proof: Higher Education in the Age of Artificial Intelligence*. First off is what he dubs "humanics," an incorporation of technical and social skills that will enable students to multi-task at high levels. "It is the purposeful integration of technical literacies, such as coding and data analytics, with uniquely human literacies, such as creativity, entrepreneurship, ethics, cultural agility and the ability to work in diverse teams."

Aoun, who decries the "false dichotomy" between STEM and the Liberal Arts, noting "Machines are not original or flexible thinkers. The jobs that only humans can do will also require judgment, ethics and critical thinking." He also stresses the need for experiential learning programs, and defines learning as a lifelong progression, not a terminal step that ends when you hang your diploma on the wall. "We know the changes that are necessary to innovate and adapt," he said. "Just as higher education stepped up to meet the demands of the agricultural and industrial revolutions in generations past, I'm confident institutions can prepare the learners of today for the artificial intelligence revolution of tomorrow."

Science-fiction is rife with tales of woe depicting an Earth devastated by heartless machines, sentient experiments gone wrong. Humanity is not likely to face the threat of time-traveling, robotic assassins, or enslavement in a simulated reality created by malevolent computers, but the advent of artificial intelligence poses a host of more plausible complications.

Once again, the nature of labor seems poised to change, and we must be prepared to adapt to the new status-quo.

References

http://www.independent.co.uk/life-style/gadgets-and-tech/news/facebook-artificial-intelligence-ai-chatbot-new-language-research-openai-google-a7869706.html

https://www.technologyreview.com/s/609326/andrew-ng-wants-a-new-new-deal-to-combat-job-automation/

https://venturebeat.com/2018/01/20/a-candid-take-on-the-future-of-ai-and-job-automation/

https://www.eurekalert.org/pub_releases/2017-12/cmu-mlw122017.php

https://www.forbes.com/sites/bernardmarr/2016/04/25/surprisingly-these-10-professional-jobs-are-under-threat-from-big-data/#1302fdc47426

http://www.expertsystem.com/machine-learning-definition/

https://www.washingtonpost.com/news/grade-point/wp/2017/11/17/are-colleges-preparing-students-for-the-automated-future-of-work/?utm_term=.358ac08638fd