Too Much Automation?

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A recent New York Times op-ed by Thomas Friedman titled "Average is Over" reminds us that stubbornly high unemployment is due not only to a drop in demand that followed the destruction of wealth by reckless financial experiments, but also due to globalization and information technology revolution. "Being average just won't earn you what it used to" because in the age when computers can drive cars and outplay humans in Jeopardy, average jobs can be either automated or outsourced. Clearly, one needs to find their unique superpower that distinguishes them from the pack.

One might reason that the EDA industry is providing a unique service—replacing expensive manual IC design work and verification with high-performance software. Hence, EDA jobs should be shielded from overall trends. Indeed, EDA jobs are still paying quite well, but the industry did go through a round of layoffs and is generally not what it used to be only six years ago. For a more detailed look at the trends, one may consult thoughtful economic studies, such as "The New Division of Labor: How Computers Are Creating the Next Job Market" by Levy and Murnane (2005) or the freshly published "Race Against the Machine" by Brynjolfsson and McAfee. The two books illustrate how much has changed in the last seven years in terms of technology and how the thinking about the trends has developed. For starters, "The New Division of Labor" (TNDL) was mailed to me as a nicely printed paperback, whereas "Race Against the Machine" (RATM) was delivered to my Kindle in seconds at one-third of the cost. Clearly, new technology creates both winners and losers.

TNDL points out that economic imbalances created by new technologies varied dramatically throughout the history. For example, the industrial revolution displaced some of the most skilled workers (weavers, clock makers, etc.) with unskilled workers that manned and serviced machines. In comparison, President Kennedy welcomed globalization and new technology by claiming that "a rising tide lifts all the boats," and he was substantially correct for his time. But this logic soon became inapplicable. Under Reagan, the US GDP grew, but
earnings of high school graduates declined, and continued declining under Clinton. The TNDL predicted in 2005 that the technological bias against the less-skilled workers would continue for at least ten years and may lead to political tensions. This motivates questions about teaching, the availability of education, and whether our expectations about the quality of education are too high. In fact, Part III (out of three) in this book is titled “How Skills Are Taught” and is preceded by Part II “The Skills Employees Value,” which is preceded by Part I “Computers and the Economy.” Based on detailed case studies, the authors conclude that automatable tasks can be captured by sets of rules, and related skills should be losing value in the long run. In this context, outsourcing is not very different from automation, as both require tasks that are clearly defined and encapsulated. In contrast, valuable job skills can be summarized as expert thinking and complex communication. These skills will grow in importance, but are not represented by specific subjects that compete for slots in standard school curricula.

Fast forward to 2012, where RATM starts by reviewing the high unemployment and anemic job growth in 2011, pointing out that the rate is not sufficient to keep up with population growth. It then asks “Where did the jobs go?” and reviews common answers, quoting a lineup of Nobel-prize-winning economists. Cyclical low demand is one explanation. Intellectual stagnation is another—we have been living off low-hanging fruit for too long, which is now disappearing, or moving to India and China. The third explanation is excessive technological progress and too much automation, resulting in “end of work” for humans, which harkens back to Bill Joy’s “the future does not need us” and can be traced all the way to John Maynard Keynes in the 1930s. However, the authors claim that the impact of specific digital technologies on skills, wages, and employment has not been studied with sufficient focus. This is what their book is about. The race against the machine is the race to identify, learn, and exercise the skills that cannot be easily automated.

In the remaining part of the book, Chapter 2 takes a shot at the same fundamental questions addressed in Part II of the TNDL book—which skills are easy to automate and which skills are not. Brynjolfsson and McAfee show that the very categories identified by Levy and Murnane as difficult for computers have been recently invaded by Google’s automation for driving cars (expert thinking) and IBM’s Watson (complex communication). Computers and networks have also developed distinct advantages of so-called general-purpose technologies that allow companies to continually reorganize and restructure. However, humans still hold an edge in high-level pattern-matching (especially based on experience), problem-solving strategies, and intuition, but computers are advancing quickly.

Chapter 3 “Creative Destruction: The Economics of Accelerating Technology and Disappearing Jobs” focuses on the imbalances created by advancing technology—skilled versus unskilled workers, superstars versus others, and capital versus labor. They point out the paradox between value creation and decreasing living standards, and explain it by the growing income inequality. Apparently, studies by Nobel-prize-winning economists demonstrated the fallacy of Kennedy’s “a rising tide lifts all the boats” in general. While unskilled workers could theoretically work for lower wages, they cannot go below the subsistence minimum. As an illustration of this principle, we are told that the population of horses (viewed as unskilled workers) in the United Kingdom dropped by 30% in 20 years since it peaked in 1901. More recently, postrecession spending on capital equipment has grown by 26%, while payrolls have remained flat. Therefore, it is not surprising that capital is responsible for a growing share of GDP, thanks to growing corporate profits. Several more subtle arguments show that these trends do not bode well for the overall economy and people’s well-being. This chapter concludes by discussing human skills that seem difficult to automate for the next ten–twenty years—vision, fine motor skills, and locomotion. Apparently, VLSI chip design is not one of these skills.

Chapter 4 takes the discussion up a notch. It is titled “What Is To Be Done? Prescriptions and Recommendations.” Drawing on the recent history of computer chess, the authors concede that the race cannot be won. But they point out that the strongest chess players today is achieved by teams of human players using computers. In other words, rather than race against the machines, we should learn to race with them. Emphasizing symbiosis with computers rather than competition has been productive in areas like medicine, law and finance. Of course, electronic design automation is essentially built on this idea. But where the book starts getting really
creative is in its suggestions for organizational innovation to encourage productive symbiosis with computers. Unlike in the Levy and Murnane's book, education is only one of several aspects of the problem.

Chapter 5 “Conclusion: the Digital Frontier” is somewhat predictable, yet an interesting read. Compared to the gloomy opening of the book, the conclusion is “hugely optimistic” on the impact of technology on people's lives. Perhaps, this can rub on the EDA industry as well. Hopefully, sometimes a rising tide does lift all the boats. Or, perhaps, professional organizations in EDA can hire trained economists to study the recurrent problems of the EDA industry.

While the RATM book is shorter than the TNDL book, its arguments are more convincing, and “stands on the shoulders of giants” very effectively. I fully agree with the 30+ glowing customer reviews on Amazon.com—you should read this book, and this won’t take long. The Kindle aside, Amazon’s cloud reader worked well for me on Windows, and the $4 price (with electronic delivery) is hard to beat.

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