

Chapter 76

Artificial Intelligence, Machine Learning, Automation, Robotics, Future of Work and Future of Humanity: A Review and Research Agenda

Weiyu Wang

Missouri University of Science and Technology, USA

Keng Siau

City University of Hong Kong, Hong Kong SAR

ABSTRACT

The exponential advancement in artificial intelligence (AI), machine learning, robotics, and automation are rapidly transforming industries and societies across the world. The way we work, the way we live, and the way we interact with others are expected to be transformed at a speed and scale beyond anything we have observed in human history. This new industrial revolution is expected, on one hand, to enhance and improve our lives and societies. On the other hand, it has the potential to cause major upheavals in our way of life and our societal norms. The window of opportunity to understand the impact of these technologies and to preempt their negative effects is closing rapidly. Humanity needs to be proactive, rather than reactive, in managing this new industrial revolution. This article looks at the promises, challenges, and future research directions of these transformative technologies. Not only are the technological aspects investigated, but behavioral, societal, policy, and governance issues are reviewed as well. This research contributes to the ongoing discussions and debates about AI, automation, machine learning, and robotics. It is hoped that this article will heighten awareness of the importance of understanding these disruptive technologies as a basis for formulating policies and regulations that can maximize the benefits of these advancements for humanity and, at the same time, curtail potential dangers and negative impacts.

DOI: 10.4018/978-1-6684-6291-1.ch076

INTRODUCTION

With the rapid advancement in artificial intelligence (AI), machine learning, automation, and robotics, many jobs are at risk of being replaced by AI and AI-based automation technology. Job replacement, however, is not a new phenomenon. The loss of jobs caused by technological change is termed “technological unemployment” (Peter, 2017). Some jobs, that have disappeared as technology has advanced, include switchboard operators, elevator operators, and typists. The disappearance of obsolete jobs that have been replaced by technologies, is referred to as “technological job obliteration,” each time an industrial revolution has occurred, people have been concerned about technological unemployment and technological job obliteration.

The steam engines in the first industrial revolution resulted in the transition from manual production to a machine industry. Many manual agricultural jobs were replaced by machines. The second industrial revolution enabled mass production by employing electric power and improving job automation, while the third industrial revolution further improved automated production by using electronics and information technology. With the development of AI and machine learning, as well as a fusion of technologies (such as the Internet of things, big data, robotics, virtual reality, 3-D printing, and quantum computing), the fourth industrial revolution has arrived (Bloem et al., 2014). These technologies are blurring the lines between physical, biological, and digital spheres. Further, the speed of technological breakthroughs has no historical precedent. What are the differences between this time and the past industrial revolutions? What about the future of work and humanity? In the past technological revolutions, the physical strength and speed of humans were overtaken by machines. In the fourth industrial revolution, not only are a human’s physical strength and speed inferior to machines in certain jobs, but a human’s cognitive abilities in some fields are also surpassed by machines. The latter makes the fourth industrial revolution particularly disturbing and unsettling.

According to a Pew Research Center survey, 63% of participants were hopeful that the expanding role of AI would leave us better off, but they worried that AI would negatively transform and affect society at the same time (Mack, 2018). The focus of this research is to analyze the impact of AI, machine learning, automation, and robotics, and their effect on the future of work and humanity. This article is structured as follows: the next section provides introductions to AI, machine learning, automation, and robotics. Then, we analyze the promises and benefits provided by these technologies. Challenges posed by these technologies are also discussed. Finally, a research agenda is proposed that emphasizes the need for academia, industry, and government to pay attention to and prepare for these rapidly advancing technologies.

Artificial Intelligence (AI)

AI is an umbrella concept that influences and is influenced by many disciplines, such as computer science, engineering, biology, psychology, mathematics, statistics, logic, philosophy, business, and linguistics (Buchanan, 2005; Kumar et al., 2016). AI can encompass anything from Apple Siri to Amazon Go, and from self-driving cars to autonomous weapons. Generally, AI can be classified into weak AI and strong AI. Weak AI, also known as narrow AI, excels in specific tasks. Most advancements in AI, that have been achieved to date, can be classified as weak AI, such as Google Assistance and Alpha Go. Researchers from different domains are, however, competing to create a strong AI (also called human-level artificial general intelligence or artificial super intelligence), which will process multiple tasks proficiently. A strong AI is the controversial and contentious concept. Many transhumanists believe that a strong AI

20 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/artificial-intelligence-machine-learning-automation-robotics-future-of-work-and-future-of-humanity/307521

Related Content

Crowdfunded Assassinations and Propaganda by Dark Web Cyber Criminals

Danish Nisar Ahmed Tamboli and Shailesh Pramod Bendale (2022). *Dark Web Pattern Recognition and Crime Analysis Using Machine Intelligence* (pp. 74-84).

www.irma-international.org/chapter/crowdfunded-assassinations-and-propaganda-by-dark-web-cyber-criminals/304202

Power Consumption Prediction of IoT Application Protocols Based on Linear Regression

Sidna Jeddou, Amine Baina, Najid Abdallah and Hassan El Alami (2021). *International Journal of Artificial Intelligence and Machine Learning* (pp. 1-16).

www.irma-international.org/article/power-consumption-prediction-of-iot-application-protocols-based-on-linear-regression/287585

Bias in Data-Informed Decision Making

Harini Dissanayake and Paul J. Bracewell (2023). *Encyclopedia of Data Science and Machine Learning* (pp. 1173-1186).

www.irma-international.org/chapter/bias-in-data-informed-decision-making/317521

Model Optimisation Techniques for Convolutional Neural Networks

Sajid Nazir, Shushma Patel and Dilip Patel (2022). *Handbook of Research on New Investigations in Artificial Life, AI, and Machine Learning* (pp. 269-298).

www.irma-international.org/chapter/model-optimisation-techniques-for-convolutional-neural-networks/296808

Unlocking the Future of Healthcare: Biomarkers and Personalized Medicine

Samiksha Garse, Divya Dalal, Sneha Dokhale and Shine Devarajan (2024). *Applying Machine Learning Techniques to Bioinformatics: Few-Shot and Zero-Shot Methods* (pp. 159-180).

www.irma-international.org/chapter/unlocking-the-future-of-healthcare/342723