The Competition for the Future of Employment in the Age of Artificial Intelligence

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by

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Will computer eventually automate all jobs? As we enter the age of artificial intelligence (AI), the threat seems much more plausible. Research in AI began around 1956, but it was not until the mid 1990s that the field began growing exponentially (Anyoha, 2017). In just the past decade, AI systems have beaten humans in image identification tasks, defeated world champion go players, and enabled self-driving vehicle algorithms (Dormehl, 2017). With this explosive growth comes a fear that AI will automate human tasks, displacing jobs and exacerbating unemployment (Acemoglu & Restrepo, 2018). While tech companies and employers welcome AI as a means to increase productivity and profit, many workers fear being replaced by machines. They resist the trend through labor unions and professional associations (Brynjolfsson, Rock, & Syverson, 2017; TWU, 2018; Licitra, 2019). National governments are taking steps to prepare workforces for AI and to regulate it (White House, 2019; Tambiama, 2019; European Commission, 2018; Chinese State Council, 2017). Companies, workers, and governments are competing to influence how AI shapes the future of employment. If we can understand how these opposing forces interact, we can better anticipate the future of employment, and perhaps better mitigate any unemployment effects of AI. Companies generally welcome AI as a means of increasing productivity. Workers, mostly through labor unions and professional societies, want to ensure that AI develops equitably, without causing mass unemployment. Governments are primarily concerned with harnessing the full potential of AI in benefiting their economies, while also passing initiatives to mitigate unemployment.

Review of Research

A main concern people have regarding AI is its potential to cause mass unemployment as jobs become automated. Fast and Horvitz (2016) conducted a review of New York Times articles

from 1956 to 2016 to analyze how views towards AI has changed over time. They found that society generally become more optimistic about the capabilities of AI, but also wary of losing control of it and losing their jobs to robots. They also found that AI has seen significantly more media attention in the 2010s, becoming a major concern for the public. Chui, Manyika, & Miremadi (2016) found that "as many as 45 percent of the activities people are paid to perform can be automated by adapting currently existing technologies." Frey & Osborne (2013) found that 47% of jobs in the United States are at risk of being phased out by computerization. Bowles (2014) performed a similar study, finding that 54% of jobs were at risk in Europe. Arntz, Gregory, & Zierahn (2016) claim these previous studies as fundamentally flawed, stating that they should have focused on tasks at risk of being automated rather than entire jobs. They found that only 9% of jobs in Europe were at risk. The World Economic Forum (2018) found that although 75 million jobs were at risk of displacement, they anticipated 133 million new jobs would be created because of AI, leading to a net increase in employment.

The variation in numbers is caused by the difficulty of predicting the future effects of AI due to its novelty and uncertainty. Frank et al. (2019) isolates potential barriers towards predicting the future effects of AI on the economy. They specifically note the lack of granular labor data, the possibility that past technological trends are not predictive of AI's trend, and the disparity of AI's effects on different geographical regions. Satyavarapu (2018) studied the factors related to the risk of automation from AI in different countries and found that the concentration of industrial jobs compared to service-oriented jobs, level of education, and level of technology all affected the percent of jobs at risk. In addition to these factors, social norms and consumer sentiment towards could affect the rate of adopting AI. The American Automobile Association found that 71% of respondents in their annual automated vehicle survey were afraid

to ride in self-driving vehicles (Edmonds, 2019). Longoni, Bonezzi, & Morewedge (2019) found that consumers preferred to be treated by humans rather than an automated machine, even if the machine was shown to be more accurate. Auxier et al. (2019) found that 79% of adults are "very or somewhat concerned about how companies are using the data they collect about them," which could slow the progression of AI because of how data-driven its decisions are. In order to more accurately anticipate the future of our global economy, we need to understand how these factors interact to influence the future of AI.

AI for Productivity and Profit

Companies, particularly tech companies, embrace AI as a means to become more productive and more profitable. Some of the most innovative and successful AI groups are a part of tech companies. The research groups at Google AI, Facebook AI Research (FAIR), Microsoft Research AI (MSR AI), and Amazon AI regularly publish papers at the top AI conferences in the world (Chuvpilo, 2019). AI has also powered many vastly successful products at these companies, including Google's search engine algorithms and Amazon's Alexa voice assistant (Clark, 2015; "Amazon Alexa"). Because of the visible success of these products, even non-tech companies from various sectors are actively incorporating AI into their products. Macy's, a retail company, has introduced an AI-powered shopping assistant (Arthur, 2016). GlaxoSmithKline, a pharmaceutical company, has created an AI system which automatically discovers potential drug structures (DeArment, 2019). As more companies follow their lead, any companies that do not invest in AI are at a competitive disadvantage.

To address the concerns regarding the potential ethical problems of AI, including its exacerbation of unemployment, tech companies that actively develop AI have begun establishing

ethical guidelines and committees. Some of Google's AI principles include making sure their applications are socially beneficial, unbiased, and safe (Google). Microsoft is similar, aiming to make applications which are fair, inclusive, and transparent (Microsoft). Despite these publicized initiatives, some people doubt their effectiveness because, for the most part, companies are expected to provide ethical oversight for themselves (Madiega, 2019). This is especially true of companies based in the United States, which has less strict ethical oversight by the government compared to other countries under the EU's policies. Moss & Metcalf (2019) studied employees who were tasked with "doing the work of ethics inside these companies." The main problem they found for these employees was balancing external pressures to challenge unethical practices of their company and internal pressures to find solutions which serve the bottom line of the company. As a result, ethical issues behind the technology being developed are often overshadowed by the primary goal of increasing profit.

Workforce Perspectives on AI

As the impacts of AI on labor become more tangible, labor unions and professional societies are advocating for workers' representation in the development direction of AI, often questioning the propriety of allowing machines to make decisions for us without human input. The Transport Workers Union (TWU), a global union supporting workers in the transportation industry, is one of the more vocal advocates of the regulation of AI, largely due to the development of self-driving vehicles (TWU, 2018). The TWU worries that someday, autonomous vehicles may offer a cheaper and safer alternative to paid drivers. In its campaign against the spread of self-driving vehicles, the TWU argues that AI still cannot perform many tasks that trained drivers can perform, such assisting elderly passengers in boarding, and

handling emergencies, for example by performing CPR or calling 911. They warn that displacing drivers with AI algorithms would cost many drivers their jobs, harming thousands of families who depend on drivers' incomes. The TWU fights the influence of AI on its field, stressing the importance of putting "humans before robots" (TWU, 2018).

In contrast, the American Federation of Teachers (AFT), acknowledges the usefulness of AI in various disciplines, even accepting the inevitability of change, but continues to push other unions to fight for human representation in AI policy (Licitra, 2019). In particular, the AFT insists that AI is built to serve people, rather than exploit them. The AFT urges unions to demand contracts that protect people against corporate and government AI projects. AFT president Randi Weingarten seeks human participation in AI's development, warning "if we don't participate, it will be technology, not humanity, that runs the world" (Licitra, 2019).

The UNI Global Union, which represents workers in the "skills and services" sector, similarly demands workers' inclusion in AI development. It has proposed ten ethical principles to govern how AI should continue to develop ("10 Principles for Ethical AI"). In essence, these principles emphasize transparent and unbiased AI decisions, making sure AI is created fundamentally to serve society, establishing global governance systems for AI, and ensuring humans take responsibility for their robots' actions. In its efforts to promote these ideals, the UNI Global Union has called for a global AI ethics conference to facilitate discussion on how AI can continue to develop ethically. The union has also actively worked with European governments to ensure AI enhances the quality of life for workers, rather than displace them (UNI Global Union, 2017).

The Alliance for Artificial Intelligence in Healthcare (AAIH), a society of AI developers, pharmaceutical companies, and research organizations, favors using AI in medicine. Despite its

optimism, the AAIH also demands ethical standards in the implementation of AI in healthcare ("AAIH – Alliance"). The AAIH sees AI as an essential tool for medicine as the knowledge base for healthcare continues to grow, making it infeasible to analyze using humans alone. Their focus, in contrast to other unions and societies, is to make sure the AI used in medicine is safe, robust, and trustworthy because of how damaging a wrong decision could be for patients using these systems. They stress the importance of continuously evaluating any AI models and the need for constant human interaction with these models to catch mistakes (Kremliovsky, 2019). Because of this need for human oversight, the AAIH does not express concern towards the possibility of job displacement caused by AI within the medical sector. Consequently, the AAIH is generally a strong proponent for the continued integration of AI in society.

Although many labor unions and professional societies are presenting a resistance to the spread of AI, many workers doubt that AI can replace their jobs, limiting resistance to AI. Doraiswamy, Blease, & Bodner (2020) conducted a study which measured the opinions of 791 psychiatrists from 22 different countries regarding the likelihood that AI would replace their jobs. While the majority of participants acknowledged that AI would be able to help automate routine office tasks such as updating medical records or synthesizing information, only 17% believed AI could replace them in providing empathetic care and 3.8% were worried that their jobs would become obsolete. The feeling of safety largely stemmed from the belief that machines would not be able to provide the empathetic care human clinicians are able to provide.

Even radiologists and pathologists mostly disregard AI as a threat to their profession, even though AI has achieved results surpassing humans in diagnostic tasks. For example, Google has already created an AI system capable of detecting lung cancers with higher accuracy than human doctors (Shetty, 2019). Despite these breakthroughs, Sarwar et al. (2019) found that 75%

of 487 radiologists and pathologists from around the world showed excitement and interest in incorporating AI to increase efficiency and quality assurance. Only 17.6% of the respondents reported being concerned about potential job displacement, with only 2.1% reporting being extremely concerned. Instead of displacement, many doctors believe that AI will change the way people are trained for these jobs. Langlotz (2019) claims that radiologists and pathologists will be "trained to recognize AI's shortcoming and capitaliz[e] on its strengths."

Lawyers also doubt the ability of AI to automate their profession. Markovic (2019), a Professor of Law, asserts that AI, although effective in automating routine tasks with well-established rules, is not nearly as adept when it comes to tasks requiring creativity and abstract problem-solving. He notes that more routine office jobs in law such as loan underwriting are easy to automate because of their reliance on predetermined procedures. Law, in comparison, requires "intuition, creativity, and persuasion... as well as written and verbal communication," making it difficult to automate. Additionally, Markovic argues that employment in the legal sector has increased as automation increased in the past decade, suggesting that automation has not had an adverse effect on employment in law. Watkins & Simon (2019) from the American Bar Association emphasize that even if AI can make decisions, law requires the ability to interpret why each decision is made in case there are any disputes. Consequently, they assert that AI algorithms are fundamentally unsuitable for use in many law applications since they are usually extremely difficult to interpret.

There are a minority of lawyers, however, who do see AI as a potential threat to their profession. Watkins & Simon (2019) warn that AI automation may make it more difficult for young attorneys to enter and succeed in the profession. Namely, law firms will not require as many young attorneys to perform the mundane tasks typically assigned to them, thus making it

more difficult to obtain a entry-level law job. These tasks typically involve legal research and drafting briefs. Additionally, they anticipate that as law firms gradually adopt AI, young attorneys will have fewer of these tasks assigned to them. This prevents them from learning the essential legal knowledge gained from performing these tasks, putting newer generations of lawyers at a disadvantage. Although these concerns exist, most lawyers do not see AI as a legitimate threat to their job security.

Governance of AI

National governments are pushing for more control over the direction of AI development and are attempting to prepare the workforce for the employment changes caused by AI. In early 2019, the President of the United States, Donald Trump, signed an executive order which implemented a "whole-of-government strategy in collaboration with the private sector, academia, the public, and like-minded international partners" for the advancement of AI (White House, 2019). In general, the order aims to use AI to its fullest potential for the advancement of the United States economy, making sure it develops safely, ethically, and as quickly as possible. The White House acknowledges the "possibility of lost jobs" due to AI, but emphasize that people in these positions need to adapt to the new technology. To accomplish this, one of the key pillars of the order focuses on making sure the American workforce is prepared for the changes brought by AI through expanding "education, training, and reskilling opportunities for American workers." Through this order, the United States government is in a position where it can influence the direction of AI development to aligns with the country's economic benefit.

The European Union (EU) also hopes to support innovation while also respecting fundamental human rights. Contrary to the United States which involves private-sector initiatives, the EU takes a much more human-centric approach in hopes of creating a trustworthy

AI system. The EU describes their approach towards accomplishing this with a set of ethical guidelines for AI (Madiega, 2019). In its core, these principles require AI systems to not violate any fundamental human rights, be transparent in decision-making, and always have human oversight. As shown by these comparably stricter guidelines, the EU is interested in much heavier government involvement regarding the development and deployment of AI compared to the United States. In a separate document, the EU acknowledges the possibility of unemployment caused by AI and hope to mitigate it through retraining opportunities, similar to the United States (EU Commission, 2018). However, they are much more concerned that falling behind other countries in AI development will put them at a competitive disadvantage, which would have potentially worse economic effects. The EU hopes that their unique human-centric approach will provide them a competitive advantage compared to other countries in the long run.

The Chinese government is interested in accelerating the growth and integration of AI within their country in hopes of becoming an AI superpower. To help accomplish this, they outline their plan for AI up to 2030 (Chinese State Council, 2017). In this timeline, China is interested in heavily investing in industry and academia to catch up to and eventually surpass the AI prowess of other countries. Similar to both the United States and EU, their main method for combating job displacement is by vigorously strengthening the training of an AI labor force, which includes reskilling opportunities for industrial workers who may have their jobs automated. In contrast, China plans to take a much more active role on shaping AI's development. They have created a new department within their Ministry of Science and Technology to take charge in implementing the outlined plan, established an AI Strategy Advisory Committee to research the strategic development of AI, and also created an AI think tank to promote innovation.

Despite the different agendas for each of these governments, they all agree on the necessity of AI investment and changes in the labor force to ensure their country's economic advantage. As such, their policies have no intention of delaying or preventing the onset of AI like some labor unions may want, instead dealing with unemployment by providing as many re-employment training opportunities as possible.

Conclusion

Given the large number of groups competing to influence the future of AI, it is unsurprising that there is a large amount of uncertainty regarding AI's potential future economic effects. Companies all generally embrace AI as a way to increase workplace productivity and drive profits with little consideration for the resultant unemployment. Labor unions and professional societies have varying degrees of acceptance towards the influence of AI, with stances ranging from complete rejection of AI to controlled optimism towards the potential capabilities. Governments recognize the importance of investing in AI to maintain their competitive advantage in the global economy, but focus on retraining their workforces at risk of job displacement to alleviate unemployment. Notably, none of these groups has a clear advantage over any other group, making it difficult to predict how they will compromise. People, represented through labor unions and professional societies, guide the actions of companies and governments. Governments can enforce policies which people and companies must follow. Companies provide invaluable products and services to people and governments. Given that the age of AI has only just started, the interactions between these different groups have the potential to completely change the course of the development of AI. This underscores the importance of

understanding these interactions so that we, as a society, can be prepared for the eventual economic ramifications.

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