The Detrimental Impact of Artificial Intelligence on The Workers in The American Job Market in The Next 40 Years and How They Can Be Protected

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Introduction to How AI will Affect Society

"AI and Automation Will Replace Most Human Workers Because They Don't Have to Be Perfect—Just Better Than You" (EST, "AI Will Replace Most Human Workers Because It Doesn't Have to Be Perfect—Just Better than You."). Advances in artificial intelligence (AI) have enabled machines to perform tasks such as object detection, motion planning, data manipulation and data analysis, and AI will continue to grow to the point where machines are capable of replicating any task a human can perform to the point where human work will become disposable (Garimella, "Job Loss From AI? There's More To Fear!"). Automation of the workplace with the help of artificial intelligence has already begun, with trading floors being replaced by smart algorithms and driving-related jobs to be replaced by autonomous vehicles (Kishan, Son, and Rojanasakul, "Robots Are Coming for These Wall Street Jobs"; Rapier, "Self-Driving Cars Could Wipe out 4 Million Jobs — but a New Report Says the Upsides Will Be Easily Worth It | Markets Insider."). This change, however, is the beginning of the age of artificial intelligence, where all jobs will be performed autonomously and human aid will not be needed (Drum, "You Will Lose Your Job to a Robot—and Sooner than You Think.").

This paper studies the impact of artificial intelligence on the American job market. The introduction of artificial intelligence into the workplace shifts how the job market currently functions. The change will cause a *paradigm shift*, as defined by Thomas Kuhn (Kuhn and Hacking, The Structure of Scientific Revolutions.). In this paper, when and how artificial intelligence will be implemented is discussed, as well the careers that are at highest risk, and the

policies that can be implemented to ease the effects of the introduction of artificial intelligence into the American job market. The paper addresses the question of how artificial intelligence will impact the American job market in the next 40 years, as that is the period during which people will begin to lose their jobs, without alternative training.

Research Question and Methods

How will the rise of artificial intelligence effect the American Job Market in the next 40 years? In order to answer this research question, discourse analysis and, documentary research methods are employed. The conjunction of discourse analysis and documentary research is used because the novel topic requires analytical research as well as opinion from economic and computer science experts, bloggers, and philosophers. Articles from economic scholars, such as David Autor, Kevin Drum, and Erik Brynjolffson, articulate that jobs in America in the next 40 years will deplete and that only immediate action can safeguard the Americans who will lose their jobs first. Online sources, such as blogs and news articles, are used further this discussion and analyze different approaches that can be taken. The paper first discusses some background on AI, ML and the policies that can be introduced ease the effects of AI in the workplace. Then, the framework that is used a s a lens to view this problem is dicussed. Lastly, the paper demonstrates AI based job displacement, leading into job replacement, and then discusses certain policies that can be introduced to help those who face such replacement.

Background Information on AI, ML and Policies

Artificial intelligence (AI) is simply defined as the computer systems that can perform tasks that are considered to require human level intelligence ("Artificial Intelligence | Meaning of Artificial Intelligence by Lexico."). Machine learning (ML), a subset of AI, gives computer systems the ability to learn how to perform tasks without explicitly being programmed to do so,

either driven by data or experience (Team, “What Is Machine Learning?”). The twenty first century has seen a remarkable rise in AI largely due to ML, particularly in the 2010s, where machines have become capable of detecting objects from images, processing natural language and performing complex computations. This growth in AI has led to technological innovations such as autonomous vehicles, live speech translation, and medical applications such as cancer detection.

For the purposes of this paper, Artificial intelligence is sorted into three categories: artificial narrow intelligence, artificial general intelligence, and artificial super intelligence. Artificial narrow intelligence (ANI) systems are trained to do a specific task, such as self-driving, but do not generalize well. Artificial general intelligence (AGI) refers to the artificial intelligence that can comprehend any task of information a human can. Artificial super intelligence (ASI) is the theoretical next step after AGI, that some scholars believe might occur instantaneously and be singular in terms of intelligence. This statement means that once AGI is achieved, the systems will improve at such a rate that an infinitely more intelligent system might be created almost instantaneously.

The rise of AI has already displaced certain occupations, such as traders on trading floors, check out cashiers and factory workers (Harris, “9 Human Jobs That Have Been Taken over by Robots.”). The trend will continue in the same direction in the future, as AI becomes more capable and can perform complex tasks such as driving, cooking and providing medical care. While certain politicians, such as Andrew Yang, discuss job loss in America due to automation and bracing the country for a dramatic technological shift (“What Is Universal Basic Income? - Yang2020 - Andrew Yang for President.”), there are few policies in place that would safeguard the American society from displacement due to AI. While the Trump administration is aware of

the rise of AI and has released an executive order discussing how America must continue to lead the race in AI research and development (Trump, "Executive Order on Maintaining American Leadership in Artificial Intelligence."), the EO fails to discuss the impact it will have on the American workforce, and what can be done to ease the impact on the American workers.

Policies such as Universal Basic Income (UBI) and Universal Healthcare are often discussed with regards to job displacement due to AI (Kletzer, "The Question with AI Isn't Whether We'll Lose Our Jobs — It's How Much We'll Get Paid."). UBI is a policy that permits people to live a certain standard of life by issuing them certain funds every month. Universal Healthcare safeguards citizens from high costs of medical emergencies. Other policies that can be implemented include wage protection, which means when a worker is displaced, his salary is maintained (Kletzer, "Why the U.S. Needs Wage Insurance."), or a policy that prohibits companies from firing human workers with AI replacements and rather only using AI in addition to human workers to increase productivity.

Viewing the Effect of AI with the Lens of Paradigm Shift

The rise of AI in the workforce, as a means of replacing employees, changes how the workplace is perceived and currently functions. The framework used to analyze this topic is the paradigm shift theory, as described by Thomas Kuhn in the book *The Structure of Scientific Revolution.* Thomas Kuhn describes paradigm shift as a phenomenon that "arises when the dominant paradigm under which normal science operates is rendered incompatible with new phenomena, facilitating the adoption of a new theory or paradigm." ("Paradigm Shift.") While Thomas Kuhn originally intended paradigm shift to be a concept for natural sciences, it has been expanded to describe the shift caused by the adoption of a new theory or paradigm in any field. Paradigm shift theory states that any radical introduction to a known system changes how the

system functions, eventually becoming completely different from what the system was prior to this introduction. Kuhn also argues, at least in the case of natural science, that the system that replaces the previous system is not only different, but also better (Kuhn and Hacking, The Structure of Scientific Revolutions.). If a system is not objectively better, it would not be put in place. Thus, Kuhn's argument, in a simplified manner, holds true for systems in the society as well. Carlota Perez, in *Technological revolutions and techno-economic paradigms*, introduces the concept of techno-economic paradigms and explains that when technologies diffuse, they impact the economy and social structures. The technical view of a paradigm shift links closely to how AI will affect the job market when it is introduced to replace workers. Critics of paradigm shift argue against the claim that "there are no facts," and while this criticism holds some ground to sciences, as there are some universal facts, it does not apply to societal changes, as society is malleable (Cohen, Paradigm Shift.). Critics also claim that the overuse of the term on smaller scales has left the paradigm shift devoid of meaning (McFedries, The Complete Idiot's Guide to a Smart Vocabulary.). A change so dramatic that it replaces all workers in the society certainly has an impact of a magnitude that it must be considered a true paradigm shift.

The paradigm shift theory has five phases. The original system is called the natural sciences phase. Introduction of a novel phenomenon, such as AI, to the system, which the system is unprepared to handle, shifts the system into the model shift phase. This change then leads into the model crisis phase, as the model shifts so far from the original system, that the rules of the system are shattered. The model revolution phase appears after the model crisis, as the model figures out how to deal with the novel phenomenon. Finally, the paradigm changes completely, and thus now becomes the new "natural science." ("The Kuhn Cycle - Thomas Kuhn's Brilliant Model of How Scientific Fields Progress.")

The Effects of AI: Careers at Risk, Displacement Process, Important Policies

The rise of AI induced automation in the workplace will displace workers into lower income brackets while increasing the gains of those who benefit from this rise exponentially. The first jobs in the American job market to disappear will be those that involve less creative thinking, such as book keeping, driving vehicles and telemarketing, but the jobs that require creative thinking will follow suit. Indefinite displacement from the workplace leaves people with too much time on their hands and no income to support their needs. Thus, policies such as universal basic income, wage insurance, and prohibitions on labor saving technologies will need to be implemented.

The impact of AI on employment happens on several different levels. Displacement and replacement of current workers in the American Workplace is the focus of this paper. However, AI impacts the hiring process as well. Recruiting has been a major cost to companies for decades. Thus, companies have decided to automate the first step of the process, which is usually a resume review, and resumes are now submitted online. Additionally, human bias is unavoidable, and these systems are aimed to reduce the manual hiring process to help minimize this bias. Machine Learning relies on datasets that are used to train AI systems, and this leads to the AI systems having the same biases as those present in the dataset. Due to the gender and racial biases in the hiring process present in society at present, AI built based on the datasets hurt applicants from minorities in their work fields, such as women and people of color in the technology industry, effectively defeating part of the intention of implementing such systems. Historically, facial detection software has been a known example of such a phenomenon, as the

accuracy of those systems has varied from 99% for light skinned men, to 65% for dark skinned women, as witnessed in the paper *Gender Shades* (Buolamwini and Gebru, "Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification."). The process of AI affecting the hiring in the job market has already begun, and has started shifting the paradigm of the American workplace, as per the Kuhn cycle, from natural science to the model drift phase.

Automation in the hiring process does not only hurt the applicants, but also recruiters. AI might seem like a boon to recruiters at first, but they will eventually see the larger effect of AI on the workplace. This part of the process of AI induced displacement is the third phase of the Kuhn cycle, taking the model of the American workplace into a phase of crisis. If there is a recruiting team of 5 people, of which each recruiter spends 10 hours a week screening resumes, the size of the team will fall to 4 with the help of AI (assuming a 50-hour work week). The replacement effect of AI will start on the American job market in such a manner, where it first displaces only a few individuals, rather than the entire field itself. As the AI agents continue to learn from their work through research in ML, they will eventually displace the entire field, as is claimed with driving professionals in the coming decade (Rapier, "Self-Driving Cars Could Wipe out 4 Million Jobs — but a New Report Says the Upsides Will Be Easily Worth It | Markets Insider."). The process of replacement has already begun in certain fields, with financial investments in AI soaring, tripling from the year 2013 to 2014 (West and Allen, "How Artificial Intelligence Is Transforming the World."). The financial industry was hit by AI this decade, with the disappearance of stock floor traders in favor of intelligent AI systems ("Can Robots Replace Day Traders on Wall Street? | Finance Magnates."). Tasks that have documented information on them, such as bookkeeping, are the easiest for AI systems to replicate.

For the purposes of this paper, work is divided into two categories, physical work and cognitive work. These two categories can be further divided into two sub categories each, routine tasks and non-routine tasks (Drum, "You Will Lose Your Job to a Robot—and Sooner than You Think."). The easiest work to automate is physical routine work, a known area of replacement since the start of the industrial age that does not necessarily require AI. However, the misconception is that the routine cognitive tasks are much harder to automate and far from automation. The first jobs that AI will displace will be cognitive routine work, such as bookkeeping, telemarketing and couriers (Bernazzani, "10 Jobs Artificial Intelligence Will Replace (and 10 That Are Safe)."). While these tasks are more complicated than basic machine work, there is a clear line between success and failure, and the methods of achieving success is straightforward using pattern recognition. Additionally, regular curation of datasets and recordings of these tasks make the automation process easier, as data collection is usually considered the biggest obstacle in building AI using machine learning.

One of the first large fields to disappear in the coming decade is the field that relies on transportation. In 2020, there are 4,000,000 workers in USA employed in driving-related jobs, which include taxi and ridesharing, delivery, and trucking (Rapier, "Self-Driving Cars Could Wipe out 4 Million Jobs — but a New Report Says the Upsides Will Be Easily Worth It | Markets Insider."). Front runners Waymo, a sister company to Google, recently signed a deal with UPS to start the process of automation of delivery services, using self-driven drones and cars to deliver packages (Hawkins, "UPS and Waymo Team to Accelerate the Future of Delivery - The Verge."). Nuro, a delivery startup, partnered with Walmart, and became the first company to receive National Highway Traffic Safety Administration (NHTSA) approval to remove windshields, backup cameras and mirrors, and deploy 5,000 such electric vehicles to start

delivery (Bigelow, “Milestone in Driverless Delivery.”). Replacement of the workers in the driving industry is imminent before the next decade, and journalist Kevin Drum claims as early as by 2027.

According to surveys, people in the wage bracket of less than $50,000 are aware of the likelihood of their jobs disappearing. 34% of the people with income under $50,000 fear that AI will replace their jobs in the next 5 years. While the wage brackets already reinforce the work field, the survey also reported that 45% of people in advertising and marketing, and 42% people in business support and logistics are aware of the rise of AI and the impact it will have on their jobs (Douglas, “These American Workers Are the Most Afraid of A.I. Taking Their Jobs.”). The statistics show the awareness of American workers, but states nothing regarding the preparedness. The data matches the reality, as people and governments are unprepared to deal with the changes AI will cause to their lives.

In the next 40 years, the world will get quite complex. Economist David Autor has noted “Even if automation does not reduce the quantity of jobs, it may greatly affect the qualities of jobs available” (Autor, “Why Are There Still So Many Jobs?”). He claims that while the employment numbers might not be affected by automation, the quality, in terms of working hours and income, of employment worsens, leading to the polarization of the American Economy. Before artificial general intelligence is achieved, and after a few systems with artificial narrow intelligence have started to replace entire work fields, the economy will not be prepared to deal with the large gap between the economically stable and the economically disadvantaged. As the gap between these two sections of society widens, as well as an increase in the size of the population in the lower classes, a state of anarchy might ensue. The middle class is already shrinking, as per Autor’s paper, and AI will only further the gap between the two. Some

will live exponentially more leisurely lives than they currently do, and others would have their lives shattered and their standards of living drastically fallen. This phenomenon is called the superstar effect of automation by Erik Brynjolfsson, Director of the MIT Initiative on the Digital Economy (Brynjolfsson and McAfee, The Second Machine Age.). Brynjolfsson is wary of the superstar effect, and warns that the age of AI will lead to a disproportionate economy, citing the example of Intuit. With the creation of Turbotax, several hundred thousand tax preparers lost their jobs, claims Brynjolfsson, and the wage they would earn has been redirected to the "superstars" at Intuit, with the CEO making $4 million alone.

When enough systems with artificial narrow intelligence have flooded the American job market that there is an evident crisis, the model will enter the revolution phase as per the Kuhn cycle. There will be too many people left without occupations, or even income, for society to continue functioning in the same way as it currently does. New policies and changes to the society's functioning will take place and change the paradigm in its entirety, entering the last phase of the Kuhn cycle, the paradigm change. Following the final changes, society might not base itself on economy anymore, and be limited only by resources. In a seemingly utopic system, no one will need to do any work, and humans can work in their leisure on what they want to work on, focus on their passions and interests, explore the planet and the universe, and not have a work-centric life. While this seems impossible to imagine, this might be our future, and one that we might have to adjust to. An economy and work independent society is not entirely novel, as society was not always driven by work or economy. But, the change will require a more dramatic adjustments as there is a far greater amount of knowledge and resources, and survival is no longer the main goal (Adam C. Uzialko, "Workplace Automation Is Everywhere, and It's Not

Just About Robots."). The time period between now and the utopic future is where most concern lies as there is effectively no protection for employees displaced by AI.

There is a need for introducing policies that protect the displaced workers from the introduction of AI. The Universal Basic Income policy is a frontrunner because it works on the concept of equality. The policy gives all Americans a certain amount of money to offset the cost of living. The policy helps those in the lower classes with jobs improve their conditions of living, while providing a base income to those who have been displaced by AI. While there is some wastage, in terms of funding that goes into assisting those in the middle and upper classes, this system is the most impartial and has many proponents. Usually, funding for UBI is received from tax money, and universal healthcare is considered an add-on, as it goes along the same principle of equality. Barack Obama advocated for another popular policy: wage insurance. Stephen Wandner summarizes: "Wage insurance is a program that attempts to help permanently displaced workers transition to employment rapidly, effectively, and equitably" (Wandner, "Wage Insurance as a Policy Option in the United States."). The policy, as proposed by Obama, would cover half of a permanently displaced worker's lost wages for two years, to allow them to transition into a new role. This payment is in addition to the wages of a new job to make up for the gap in pay between the lost role and the new role. Unemployment Insurance, which varies from Wage Insurance in that it is provided during a worker's transitioning phase, specifically the time of involuntary unemployment between losing a role and finding a new one, is already in place, and could be modified to help workers displaced by AI (McKenna and McHugh, "Is Wage Insurance a Worthwhile Option for Displaced Workers? - National Employment Law Project."). Lastly, a policy that prohibits the use of AI from fully replacing workers from the field could be implemented in order to protect workers and encourage researchers to make AI that improves the

quality and effectiveness of workers rather than replacing them altogether. Such a policy would slow down the progress, but provide workers the time to adjust to the new societal changes and prevent an age of mass unemployment.

Limitations and Future Work

The research completed in this study was limited by the amount of time frame available for research. The topic of this paper is novel, controversial, and seldom talked about, and thus it requires excessive time to research evidence from scholars writing on the subject. Another limitation is that this research is driven by predictive models and opinions, rather than historical case studies and facts, which are unavailable due to the novelty of this niche subject.

This topic should also be seen through the scopes of other STS Frameworks, such as Co-Production as defined by Sheila Jasanoff which would help devise plans for how to create AI while keeping the society in mind, and Risk Analysis, by Ulrich Beck, which would focus more on how to deal with risks associated with the rise of AI. Interviews with CEOs such as John Krafcik and Eric Meyhofer, who are leading self-driving technology at Waymo and Uber ATG respectively, should be conducted to get insight into whether such companies are thinking about the economic impact of their work, and what they think of it. Additionally, opposing perspectives, that disagree with the belief that AI will replace human workers should be studied and examined. This research and future work on the subject should be used to educate software engineers and computer science researchers on the impact of their work so they are aware of what they are building. This would allow them to focus on not only how to build such systems, but also on whether such systems need to be built and how they should be deployed in a responsible and ethical way. Case studies on several different policies to protect workers from

being displaced or after the displacement should be conducted and studied to device a concrete recommendation for such an issue. Policies should be studied and lobbied for, and the public should be aware of the paradigm shift that they will face in the future.

Tread with Caution: Creators of AI and Workers

The introduction of artificial intelligence to the American workforce will displace large sections of the society into unemployment or lower income brackets in the next four decades, and will create a disproportionate economy, with the winners of AI based automation getting richer. Policies must be introduced to protect the workers whose conditions are worsened due to this paradigm shift. Continued research must study different policies, analyze them in greater depth, and attempt to perform real case studies with small groups. The research shows that all jobs in the American workforce will disappear eventually, but the order in which the jobs are displaced will negatively impact those who are employed in the respective fields. People looking for work in America must consider the aspects that make their career paths automatable, and think about how long they will be able to hold their job before AI takes over. Politicians must discuss and study certain policies, and readers should consider the discussion of such policies before voting for candidates.

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