Assessing the Viability of Universal Basic Income To Address Job Displacement Caused by Artificial General Intelligence

A Research Paper submitted to the Department of Engineering and Society

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Spring, 2024

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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STS Research Paper

Introduction

We are living through what is perhaps the most important and consequential technological revolution in human history: the development of generally capable Artificial Intelligence (AGI) systems. Chatbot systems such as OpenAI's ChatGPT, Google DeepMind's Gemini, and Anthropic's Claude have captured the world's imagination and attention by displaying impressive capabilities and practical utility across a wide variety of domains such as education, software engineering (Achiam et al., 2023), law, and medicine (Saab et al., 2024). The aforementioned AI research laboratories are now engaged in a race to develop ever-more capable systems that can process multiple sensory modalities, take actions in digital and physically embodied forms, make long-term plans, and engage in complex reasoning.

AI scientists believe that these advanced capabilities could come to fruition within the upcoming decade, and possibly even sooner (Burns et al., 2023). What does the advent of such technologies imply for the global workforce? If advanced AI systems can perform all the tasks required of jobs cheaper, faster, and more effectively than their human counterparts, how will humans make a living?

This research paper aims to answer this question by assessing the need and viability of Universal Basic Income (UBI) to address job displacement that may occur as a result of the deployment of generally capable AI systems. For this analysis, Bruno Latour's Actor-Network Theory (2017) and the framework of Technological Determinism (Héder, 2021) will be employed to understand the increasing role that AI systems will play in socioeconomic systems.

Methods

To analyze the applicability and feasibility of Universal Basic Income (UBI) to address job displacement caused by the deployment AGI systems, a technical review of AI research developments (from premier AI research conferences such as NeurIPS, ICML, ICLR, etc.) is combined with the theoretical frameworks of Actor-Network Theory (ANT) and Technological Determinism. A review of economic and technical studies is conducted to understand the impacts that generative AI technology already has had on society. Additionally, an analysis of small-scale UBI pilot programs as case studies is performed to understand the positive and negative impacts of a potential large-scale UBI deployment, and determine whether such a program would be feasible in a world with advanced AI technology. Relevant keywords to guide the research for this paper include: artificial intelligence, AI agents, job displacement, universal basic income, social welfare, general-purpose technologies.

Background of Artificial Intelligence and Universal Basic Income

In his seminal 1950 paper "Computing Machinery and Intelligence", Alan Turing posed the question '*Can machines think?'* (1950) . In the decades since, AI has transformed from a line of philosophical inquiry into a concrete engineering and scientific discipline. With recent advances in subfields of AI known as deep learning and reinforcement learning, the answer to Turing's question seems to be a resounding yes. State-of-the-art AI systems such as OpenAI's GPT-4 have displayed an impressive range of capabilities across a variety of intellectual domains. Economists and social scientists have already begun to classify such AI systems as general-purpose technologies, a category including electricity and the internet (Elondou, 2023). They find that GPT's can already be used to accomplish tasks in jobs spanning a wide range of fields, including artists, mathematicians, scientists, authors, and politicians.

Eloundou states that such systems in their current form are unlikely to create significant job loss but will instead augment existing jobs so human workers can complete their tasks at a faster rate (2023). For example, generative AI systems such as ChatGPT have already been found to decrease the average time taken on occupation-specific writing tasks by 40% and increase quality by 18% (Noy & Zhang, 2023). Additionally, generative AI coding assistants have been found to decrease code iteration time by 6% (Tabachnyk & Nikolov, 2022). These productivity improvements are already impressive and it is likely that existing generative AI technologies will have a significant economic impact. However, these productivity improvements may only be the beginning of AI's societal impact. Many frontier AI research laboratories are working on imbuing existing systems with the ability to navigate computer interfaces, use tools such as web browsers and calculators, and engage in complex reasoning (Schick et al., 2024).

It is unclear when AI systems will obtain the capabilities necessary to completely automate certain jobs. However, given the eye-watering rate of progress and capital investment in AI R&D, it would be unwise to confidently state that such capabilities can never arise. The development of fully automated AI systems would have profound impacts on the economy. Given the pervasive use and utility of existing AI systems, such future AI systems could displace millions of jobs (Ford, 2015).

Universal Basic Income (UBI) has emerged as a potential policy solution that could be implemented to mitigate the negative impacts of such widespread automation. UBI is defined as a social welfare system in which all citizens of a country receive regular, unconditional payment from the government on a periodic basis. This money acts as a financial safety net so that individuals who are not actively employed can still maintain an acceptable standard of living.

UBI has already been deployed at small scales through pilot programs across the world. Studies have shown that when deployed in poverty-stricken countries, UBI can have substantial positive effects on the physical and mental health of its recipients and also lead to increased economic activity in underdeveloped economic regions (Farré et al., 2018). In developed nations, such as the United States, UBI has been found to decrease stress levels of its recipients and also lead to increased rates of entrepreneurship and pursuit of higher-education opportunities (Hasdell, 2020). However, it is not clear whether UBI is a large-scale practical solution in the modern-day economy. Quantitative analyses have demonstrated that the US federal government would not be able to sustain a UBI welfare program of $1,000-monthly check to all its citizens with its current revenue (Daruich & Fernández, 2019). There may also be significant political backlash to a large-scale implementation of UBI.

Actor-Network Theory and Technological Determinism

Like many previous general-purpose technologies, advanced Artificial Intelligence (AI) systems are poised to have a transformative impact across many industries. The STS frameworks of Actor-Network Theory and Technological Determinism are utilized throughout this research paper to effectively analyze and predict the effects of the deployment of this consequential technology and assess whether Universal Basic Income (UBI) can mitigate the potential job displacement that such systems may cause.

First introduced by sociologist and anthropologist Bruno Latour (2007), Actor-Network Theory (ANT) has been utilized to perform critical analyses of technologies within heterogeneous networks composed of humans, nonhuman objects, and organizations. ANT emphasizes the agentic role that non-human actors, such as AI programs, play in complex

sociotechnical systems. By prescribing agency to non-human actors, ANT provides an avenue to ascribe downstream societal impacts to technological systems themselves.

Furthermore, as introduced by Michael Callon (1984), ANT also offers analysis tools to explore different stages of the successful integration of new actors into existing socio-technical networks:

1) **Problematization** or identification of a problem by relevant actors in a network

2) **Interessement** or negotiation between actors to accept new roles

3) **Enrollment**, or the formal acceptance and adoption of roles by the involved actors

4) **Mobilization**, or collective action by the actors to ensure the stability and functioning of the network.

An adaptation of Callon's four-step framework for emerging AI technology will allow for a rigorous assessment of how future AI systems can be integrated into networks across different industries and help identify any sectors prone to destabilization by the introduction of such tools.

Although the aforementioned aspects of ANT have been widely utilized in many domains, the framework faces several criticisms. For example, Olga Amesterdamska criticizes ANT for its lack of emphasis on human social structures and power dynamics within socio-technical networks, which likely play a significant role in shaping the downstream impacts of a cohesive network (1990). Furthermore, Steve Fuller argues that ANT primarily offers tools to perform a descriptive analysis of existing networks but does not provide prescriptive tools to prescribe and evaluate actions that can be taken to alter and improve the ethical and moral dimensions of networks (2000).

Despite these drawbacks, ANT is a useful framework to analyze advanced Artificial Intelligence and its impact on the global economy because it provides a set of tools to understand

how technical systems with novel capabilities can enter and disrupt existing sociotechnical systems. This research paper will utilize ANT to forecast how future AI systems may be integrated into various industries and potentially disrupt human actors in their current professional roles. Furthermore, ANT will be utilized to contextualize the widespread economic impacts that advanced AI systems may generate and explore whether Universal Basic Income (UBI) can mitigate the displacement of human actors within current socio-technical networks.

In addition to ANT, the framework of Technological Determinism is employed to better understand the downstream impacts that AI systems will have on the workforce . Technological Determinism is the theory that technology is the sole driver of social change and that society mainly plays a reactive, rather than proactive role to technological changes. The main criticism of this framework is that it is an oversimplification of the many social, political, economic, and organizational factors at play throughout the course of technology development (Wyatt, 2008). However, the recent convergence of many of the world's leading technology companies to engage in a competitive race to develop similar chatbots suggests that Technological Determinism is a prevalent force in AI development.

As discussed by Mihaly Héder (2021), AI organizations are increasingly pursuing a race-like dynamic of training frontier models on ever more quantities of compute and data, which are the driving forces behind the advancement of modern-day AI systems such as ChatGPT. Furthermore, because all the companies involved in the development of frontier models have for-profit business models and strong economic incentives to pursue the development of more advanced models, it is unclear whether the development of future systems will be bounded by social control. Rather, it increasingly appears that society will be reacting to the shockwaves initiated by the deployment of AI systems in the next several years, as predicted

by the Technological Determinism framework. This research paper studies this question in greater depth and uses the analysis to understand how the AI systems may lead to widespread job displacement.

Results and Discussion

Overview

The analysis outlined below determines that forecasted trends in AI R&D suggest rapid technological gains in the next several years, transitioning AI from simple chatbots to more generally capable systems exhibiting agentic behavior across various domains. Technological Determinism, a theory positing that technological development drives societal change, suggests that society will primarily react to these technological advancements rather than actively shape their deployment. Network analysis based on Actor-Network Theory (ANT) indicates that as AI systems acquire capabilities comparable to human workers across many fields, they will likely replace these roles due to their cost-efficiency, higher productivity, and superior performance. These trends point towards significant job displacement as a consequence of widespread AI deployment. Analysis of previous Universal Basic Income (UBI) programs reveals that UBI can effectively provide a safety net for workers displaced by AI systems, although some uncertainties remain regarding funding, political feasibility, and societal acceptance of a large-scale UBI initiative.

Trends in Artificial Intelligence R&D

In recent years, generative AI technologies have captured the attention of mainstream media through products such as Stable Diffusion, DALL-E (image-generators), GitHub Copilot

(code autocomplete) and most notably, ChatGPT (general-purpose chatbot) (Gozalo-Brizuel & Garrido-Merchan, 2023). Professionals across a wide variety of industries have already begun to integrate these products into their own workflows, and this has led to increased productivity. For example, a study by Noy & Wang found that for writing tasks across a wide variety of domains, the use of ChatGPT reduced the average time to complete tasks by 40% and improved output quality by 80% (2023). Similarly, a study by Google on an internally-deployed AI code-completion system found that developers using the system achieved a 6% lower code iteration speed, and that the system is currently responsible for 3% of all new code in Google's codebase (Tabachnyk & Nikolov, 2022). These studies demonstrate the prevalent deployment of generative AI systems across a wide variety of domains and the impact they are already having by complementing the skills of human workers.

Although AI products are currently playing a complementary role to humans, current trends in research point to the development of increasingly autonomous, agentic systems capable of performing a wide range of tasks. For example, frontier AI labs are working on imbuing models with the ability to interact with external tools, such as code interpreters, web browsers, and theorem provers, to expand their capabilities (Schick et al., 2024; OpenAI, 2023). Furthermore, much research is being conducted on transitioning from chatbot assistants to agents that can autonomously take actions through computer and physical interfaces (Su, 2023). For example, Yang et al. (2024) find that introducing tailored agent-computer interfaces allows Large Language Models to more effectively write and edit code, navigate repositories, and execute tests. Additionally, Ahn et al. (2022) find that Large Language Models are capable of effectively controlling a robot to solve common household tasks expressed in natural language.

In addition to imbuing AI systems with more agentic behavior, AI labs are also making progress on imbuing superhuman intelligence to AI systems across various domains. For example, MuZero has demonstrated the ability to master any two-player perfect information game (Schrittwieser et al., 2020), while AlphaGeometry has shown proficiency in solving complex math problems (Trinh et al., 2024), and AlphaTensor has been used to discover new algorithms (Fawzi et al., 2022). Furthermore, GPT-4 scores at the top percentile across numerous academic benchmarks and domains (Achiam et al., 2023). Additionally, the compute power used to train state-of-the-art AI systems has rapidly increased in the previous decade, and will likely continue to do so for the foreseeable future (OpenAI, 2018).

Given these research directions and trends, it becomes evident that AI systems will only become more capable over time as new advancements occur. Modern-day AI systems can already be viewed as general-purpose technologies given their applicability to a wide range of domains (Bresnahan & Trajtenberg, 1995). When future AGI systems are imbued with improved reasoning capabilities, agentic behavior, and increased compute power, they will likely be able to cheaply perform many more intellectual and physical tasks that currently require human expertise.

Understanding the Plausibility of Job Displacement Using Actor-Network Theory and Technological Determinism

Technological Determinism posits that technological progress drives societal change and that society adapts to the advancements and implications of new technologies rather than shaping their trajectory. This framework implies that as AI systems become more advanced and capable, their integration into various sectors will inevitably lead to significant job displacement. The

societal adaptation to these AGI systems will likely involve a significant restructuring of the job market, where roles traditionally held by humans in many industries are replaced by AGI-driven solutions, due to incentives regarding cost, speed, and quality. The inevitable result, as per Technological Determinism, is a societal shift where human workers are displaced, leading to increased unemployment and the need for new forms of social safety nets, such as UBI, to support those affected.

Actor-Network Theory (ANT), which emphasizes the interdependent relationships between human and non-human actors within a network, also supports the idea that AGI systems will lead to job displacement. ANT suggests that technological artifacts, such as AGI systems, are not just passive tools but active agents that shape and are shaped by the network they are a part of. As AGI systems are integrated into various workflows, they will redefine the roles and functions of the human workers within these networks. For example, in knowledge-based industries, AGI systems will be able to analyze vast amounts of data and information and generate and iterate over task-relevant outputs (such as code, reports, and blueprints). As a result, these systems, which will be new non-human actors entering into professional workplace networks, will begin to encroach upon the roles previously occupied by human actors. Similarly in manufacturing settings, AGI systems equipped with advanced robotics will be able to handle complex tasks traditionally performed by skilled workers, leading to a reconfiguration of the manufacturing workforce where human roles become redundant, and consequently replaced by AI actors. ANT highlights that these changes will not be isolated but ripple through socioeconomic networks, affecting related industries, educational systems, and societal structures at large. This interconnected disruption highlights the need for proactive policy measures, such

as UBI, to mitigate the adverse impacts on workers displaced by the integration of AGI into these networks.

Advantages of UBI Program

Implementing Universal Basic Income (UBI) offers numerous advantages, particularly in addressing mental and physical health issues exacerbated by unemployment. Research indicates that poor economic conditions and lack of a safety net can significantly impact mental health during periods of economic stress. The American Psychological Association (2020) found that increased unemployment rates are associated with higher instances of anxiety, depression, and even suicide, with these effects being more pronounced during economic crises. Similarly, Farré, Fasani, and Mueller (2018) observed that during the Great Recession in Spain, areas with lower economic stability experienced more severe mental health issues following job loss compared to areas with better economic conditions. These findings highlight the importance of financial stability in combating the adverse mental health effects of unemployment. UBI can provide such stability, thereby reducing financial stress and improving both mental and physical health outcomes. For instance, a study by Chen et al. (2023) found that a liveable UBI in the UK could reduce the number of adults diagnosed with common mental health problems by over 120,000, highlighting the potential health benefits of financial security.

Furthermore, UBI serves as a crucial safety net for workers displaced by technological advancements, such as AGI systems. By providing a guaranteed income, UBI allows individuals to pursue further education, retraining, or entrepreneurial ventures without the immediate pressure of economic survival. Hasdell (2020) found that UBI programs support pursuits of higher education and entrepreneurial activities, enabling individuals to take on financial risks

without the constant pressure of immediate economic needs. Daruich and Fernández (2020) similarly noted that UBI provides financial security, encouraging people to explore new career paths and manage shocks to the labor market more effectively. The National Bureau of Economic Research (NBER) emphasizes that UBI can support skill formation and career transitions, which are crucial in a rapidly changing job market influenced by AGI (Caro-Gonzalez, 2023). Although it is unclear what specific skills will be relevant in a world with AGI, evidence from prior UBI case studies suggests that the financial safety net UBI offers will be instrumental in smoothing the transition to a post-AGI future.

In addition to addressing unemployment and job displacement, UBI is a more effective solution compared to other welfare programs due to its reduced social stigma, decreased bureaucracy, and lower incentives for fraud. Traditional welfare programs often carry significant social stigma, which can deter eligible individuals from participating. Celhay, Meyer, and Mittag (2022) found that stigma related to welfare participation leads to lower program take-up and increased misreporting. In contrast, UBI programs, by being universal and unconditional, normalize social assistance and reduce the associated stigma, encouraging higher participation rates and reducing the psychological burden on recipients. Furthermore, UBI can streamline the distribution of benefits, significantly reducing the administrative complexity associated with means-tested welfare programs. Wijngaarde, Vinanchiarachi, and Readman (2021) noted that UBI's simplicity eliminates the need for extensive bureaucratic oversight required for more selective welfare programs, which can lead to cost savings and more efficient resource allocation. Lastly, the unconditional nature of UBI reduces the incentive and opportunity for fraudulent activities. Hamilton and Martin-West (2019) argued that traditional welfare programs'

complexity and conditions create opportunities for fraud, whereas UBI minimizes the potential for fraudulent claims by providing an unconditional income to all.

Disadvantages and Uncertainties of UBI Program

One significant challenge facing the implementation of Universal Basic Income (UBI) is political opposition. UBI may become a highly politicized issue, with differing opinions on its feasibility and desirability. This divide is reflective of the partisan disagreements seen in current social welfare programs. For instance, the White House (2023) highlights that Democrats generally support maintaining and expanding programs like Medicare and Social Security, viewing them as essential safety nets for economic security. On the other hand, Republicans often advocate for reforms aimed at reducing federal spending, including proposals to raise the retirement age, transition Medicare to a voucher-like system, and privatize parts of Social Security. Such political disagreements can slow down the implementation and sustainability of UBI.

Another major concern is the substantial financial burden of funding a UBI program. Daruich and Fernández (2020) estimate that providing every adult U.S. resident with a UBI of $12,000 per year would cost approximately $3 trillion annually, which represents about 75% of the total federal expenditures as of 2017. This high cost raises questions about the feasibility of financing such a program without imposing significant economic strain. Luduvice (2024) also discusses the macroeconomic effects of UBI, noting that while it could reduce poverty and inequality, the challenge of financing it could potentially lead to adverse economic consequences, such as a decrease in national GDP due to reductions in labor supply and capital services. These financial concerns underscore the need for a thorough evaluation of potential

funding mechanisms and the broader economic impacts before a large-scale UBI program can be considered viable.

Rebuttals to the Disadvantages and Uncertainties of UBI Program

While the politicization of Universal Basic Income (UBI) is a legitimate concern, historical precedents suggest that in times of need, policies appealing to the broader American public can receive bipartisan support. Hulse and Cochrane (2020) discuss an example of this through the passage of the CARES Act and the Covid-19 Relief Bill during the early stages of the Covid-19 pandemic. These acts, which included stimulus checks for Americans, garnered bipartisan support despite the polarized political climate, as they addressed the immediate economic struggles of many citizens. The advent of AGI technology, with its potential to cause widespread job displacement, could similarly unite policymakers across party lines due to the profound and far-reaching impacts on the economy and workforce, fostering a cooperative effort to implement UBI as a necessary social safety net.

Regarding the challenge of funding a UBI program, advancements in AGI systems may offer a source of capital. In their aggressive timeline scenario, Korinek and Suh (2024) claim that the implementation of AGI within five years could potentially lead to a GDP growth of up to 100% within a decade. Even in less aggressive scenarios, AGI is projected to add a substantial boost to GDP, ranging from 30% to 50% over 20 years. Korinek (2023) further argues that the increased economic output generated by AGI systems could be strategically utilized to fund a UBI program. However, this would require careful policy planning to develop effective tax and redistribution mechanisms to ensure that the economic gains from AGI are equitably shared among the population.

Limitations and Future Work

The analysis in this work is based on the premise that AI technology will continue to advance in the upcoming years. Although this assumption was made after careful consideration of prior developments in the field and analysis of current research directions, AI research may very well run into roadblocks that prevent future advancements toward generally-capable artificial intelligence systems. In that case, society may not undergo the scale of job displacement that would necessitate the implementation of a UBI program. Furthermore, this analysis does not concretely explore how national policy implementing a UBI program would look like. As discussed previously, the success of a UBI program depends on this policy and effective execution. Future research in this area should involve the exploration of policy frameworks that could be used to distribute economic gains generated by AGI technology in an equitable manner.

Conclusion

This analysis forecasts the impacts that generally-capable AI systems, or AGI, will have on the workforce and the socioeconomic landscape. Due to the likely job displacement that will occur due to the deployment of AGI, UBI is considered as a potential mechanism to provide a financial safety net to those whose jobs are impacted by AGI. UBI is determined to be a feasible and practical solution, but is dependent upon proper policy and execution to be effective.

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