

Autonomy and Economic Pressures to Minimize Costs are in Conflict with a Consumer Economy

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Abstract—Companies have conflicting objectives, the desire to minimize costs, and the desire to sell their goods and services. Automation can reduce costs by replacing humans, but, if widely adopted, it threatens to substantially reduce the pool of companies' potential customers. This document highlights some tools that can be used to address the fallout of these competing desires.

I. INTRODUCTION

A fundamental tension in the economy is that people with capital require people's labour in order to effect growth of their money, and people who work require capital's money in order to satisfy their needs by purchasing goods and services. Automation represents a disruption of this arrangement, permitting capital to own both money and work by creating sources of work that can be treated as property.

Infrastructure to support those whose jobs are automated does not exist. As automation progresses more people will be removed from the labour pool and will consequently lose access to basic needs. We argue that this is a likely outcome of the interplay between the economic pressure to maximize shareholder value and the goals of the project of automation.

This conclusion is based on the following premises: First, that Artificial Intelligence (AI) and the automation it enables, removes labour's monopoly on work. Second, that the drive to maximize shareholder value forces companies to save labour costs through automation. Given an economy that is largely sustained by consumption, this may have deleterious effects on the entire economy, not just those who are rendered unemployed. We will briefly explore some tactics that can be used to forestall this undesirable outcome.

II. ARTIFICIAL INTELLIGENCE BREAKS LABOUR'S MONOPOLY ON WORK

The project of Artificial Intelligence is built on the premise that human intelligence can be replicated by machines. If this is true, then it stands to reason that there is no task that humans can do that machines cannot. Rejecting this premise not only rejects the concept of AI, but it also demands an explanation of what is special about animal intelligence that it cannot be replicated by physical processes. But to pose a substantial risk to employment we need a weaker premise than General AI, we simply need machines that replicate human capabilities at a level of quality that mitigates legal risk for the company employing it.

This is not a guarantee that humans capabilities can be replicated *efficiently* by machines. For example, advancements in image classification have come at considerable

expense. Not only did it require the development of convolutional neural networks[1], and automatic differentiation[2], but also the development of the internet, to collect sufficient volumes of data for training, as well as the specialized hardware for training the networks. Further, the ecological costs of that training is not negligible[3].

Frey and Osborne[4] estimated that at least 47% of US jobs can be automated. That automation can profitably replace workers is an opinion presumably shared by those who continue to invest in it. Algorithms are making inroads into complex tasks, including stock trading[5], law[6], computer chip design[7] and custodial work[8]. The progressive reach of autonomy can be viewed as a natural progression of deskilling - turning skills into mechanisms. Once satisfactory algorithms are developed they can be owned and replicated as needed. Human sources of training data can be let go or subsumed by other algorithms, as in [9], [10]. The end result is a source of work that can be owned by an organization, independently of its employees.

III. ECONOMIC AGENTS MUST AUTOMATE EVERYTHING THAT MINIMIZES COSTS

Economic agents (companies) have pressure to maximize shareholder value. The predominant choice for companies to buy back stocks after the 2017 Tax Cut and Jobs Act in the US is an example of a response to these pressures[11]. Once the cost of deploying an autonomous technology, including the costs of adhering to or violating regulations, is less than the company-lifetime cost of employing humans to do the same work, the rational choice is to automate. If human workers can be profitably replaced by automation then either they will be replaced or else the company will become a target for a take-over and restructuring.

The cost of developing autonomous systems can prevent small organizations from adopting autonomy. However, the subsidization of technology by government spending[12], and its public communication in research venues reduces the development costs for individual organizations. Likewise, the commercialization of a technology by one organization¹ can reduce the cost of deployment for others.

Although, rational agents are vulnerable to bad information. Inaccurate cost/benefit analysis of autonomy may result in premature adoption, bringing unexpected delays and costs, or delayed adoption with missed rewards. We should

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¹Google's Tensorflow and Facebook's PyTorch machine learning frameworks are distributed at no cost to the user.

expect that the deployment of automation will not progress smoothly², but with time it should progress.

IV. AUTONOMY AND COST-CUTTING PRESSURE THREATENS CONSUMER ECONOMIES

The problem arises when economic pressures force the replacement of jobs with automation in economies largely based on consumption, and that use jobs as a means of wealth redistribution. In the United States, personal consumption makes up somewhere between 60% and 70% of Gross Domestic Product[14]. If a large portion of employees are made redundant, then not only will the economy be negatively affected, but individuals' ability to attain basic needs will also be threatened. New technologies may create new jobs, but if AI really can replicate human capabilities, then any work created because of these technologies should also be subject to automation by these technologies.

We are left with the problem that companies have the conflicting objectives: the desire to lower costs, in some part by replacing humans with automation, and the desire to maintain revenue from a population of humans, many of whom may lose their spending power because of their employer's decision to automate. Each company must make a choice to deploy automation, but if every company makes it, it may lead to substantially reduced economic participation and perhaps ultimately, collapse.

V. PREVENTING UNDESIRABLE OUTCOMES

In countries where the quality of one's life is conditional on employment, widespread automation could create an underclass of people. Assuming this is undesirable, there are a number of actions that can be taken, which are discussed below.

a) Do Nothing: Possible outcomes include: the exploitation of the unemployed, civil unrest on the part of the unemployed, or those without access to food, shelter, and healthcare dying. Alternatively, we may find that automating jobs to minimal levels of quality is cost-prohibitive, incompatible with mitigating climate change, more expensive than offshoring work to other countries³, or is otherwise infeasible, avoiding the problem altogether.

b) Population Reduction: Reducing the population would mitigate the effects of having an excess pool of unemployed people. This could be achieved through reproductive control methods, e.g. enacting a one child policy. Uniformly applied, it would not disadvantage those who had the poor luck to have their job eliminated, but one would need to guard against an unjust distribution of reproductive rights. If gradual population reduction could be achieved humanely, there still remains the currently living unemployed people to maintain.

²Consider the Government of Canada's deployment of the Phoenix payroll system [13].

³See the Kiwi Campus autonomous navigation system[15].

c) Regulate Autonomy: The regulation of autonomous systems may forestall the collision of autonomy with jobs-based wealth distribution. Mechanisms could be introduced to make autonomous systems cost-prohibitive - e.g. paying people for their training data, taxing the carbon footprint of autonomous systems, sharing revenue with governments that have invested in autonomous systems, or taxing the corporations employing autonomous systems. However, national level arrangements may not be sufficient, since the revenue to countries will not be globally distributed, but job losses will be. Further, relying on national-level action creates an unstable situation, countries may compete for companies' tax revenue with more relaxed regulatory and taxation schemes, something already seen with tax inversion manoeuvres, like Apple's acquisition by an Ireland-incorporated entity[16]. If there is to be a regulatory regime, it will need to be global or it will likely be unenforceable.

d) Maintain Jobs-as-Wealth-Distribution: A jobs-based wealth distribution mechanism could be supported through the introduction of so-called *bullshit jobs* [17]. We could generate jobs to occupy individuals when all necessary work has been automated. To do this, there will need to be some mechanism of transferring money to workers so they can satisfy their needs and wants. It seems unlikely that a private sector that eliminated jobs for cost-saving measures would then create an artificial job market to balance out the effects of autonomy. Enforcing anti-trust regulation may be advisable for other reasons, but the number of new companies would probably not produce sufficient jobs to approach full employment.

e) Abandon Jobs-as-Wealth-Distribution: Decoupling work from one's quality of life would resolve the tension between companies' pressure to automate and their need for paying customers. A universal basic income, along with the necessary taxation, are technologies that could mitigate the effects of autonomy-induced unemployment without the need for creating superfluous jobs. Similarly, social safety nets that provide universal access to basic necessities may sufficiently sustain people adapting to ubiquitous autonomy.

VI. CONCLUSION

Widespread unemployment undermines consumption-based economies. The economic pressures to cut costs, and the increasing capabilities of autonomous systems promises widespread unemployment. We reviewed some tools that could be used to address the problem of autonomy-induced unemployment, but they may be frustrated by international competition. While some of the tools mentioned are not technologies in the more standard sense of devices or computer programs, they do conform to the definition used by W.B.Arthur, "a means to fulfil a human purpose" [18]. Perhaps through a concerted application and innovation with these technologies, humans can develop and deploy tools to improve the quality of life of our fellow humans.

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