**ACADEMIC SENATE**
**OF**
**THE CALIFORNIA STATE UNIVERSITY**

AS-3360-19/AA (Rev)
March 14-15, 2019

# CALL FOR THE ESTABLISHMENT OF A WORKING GROUP ON THE IMPACT OF ARTIFICIAL INTELLIGENCE (AI) ON HIGHER EDUCATION

**RESOLVED**: That the Academic Senate of the California State University (ASCSU) receive the white paper on "Artificial Intelligence: And Its Impact on Career Preparation, Reorientation and Lifelong Learning" which draws attention to the transformation that AI will likely bring about in the employment landscape and the consequences for the structure and the nature of higher education with important impact on student and alumni success through career preparation and lifelong learning; and be it further

**RESOLVED**: That the ASCSU request that the Chancellor's Office (CO) establish a working group that includes CO staff, CSU faculty, students and staff, subject matter experts, and other relevant constituencies to further elaborate and develop the implications of the themes identified in the white paper and propose possible actionable recommendations that might be needed to address these challenges; and be it further

**RESOLVED**: That the ASCSU distribute this resolution and the associated white paper to the CSU Board of Trustees, CSU Chancellor, CSU campus Presidents, CSU campus Senate Chairs, CSU Provosts/Vice Presidents of Academic Affairs, CSU Career Advisory Centers, California State Student Association (CSSA), CSU Alumni Association, and the Emeritus and Retired Faculty and Staff Association (ERFSA).

***RATIONALE**: Artificial intelligence (AI) may transform the employment landscape dramatically. According to a 2015 study by McKinsey, a management consultant, 60% of jobs have 30% of their activities that could be replaced by AI technology already then in existence. Because AI particularly facilitates the automation of cognitive tasks, rather than manual tasks that prior waves of innovation have automated, the jobs most affected will be knowledge related. Arguably, precisely those in the kinds of careers towards which we have been guiding people for the last 30 years.*

*A university education is not simply about the acquisition and application of knowledge; an emphasis on developing learning as a capability in and of itself is, in part, what distinguishes universities from trade schools. This aspect of a university education is only going to become more important as the half-life of job-related knowledge shortens.*

*If AI transforms or even eliminates many of the "knowledge economy" jobs for which we are preparing our students, the role of institutions of higher education will need to adapt. Some programs may need to make adjustments to adapt to the new employment landscape; but that is a curricular matter for the faculty and not the central subject of the white paper. It focuses more on the complementary activities the CSU provides to its students, namely career services, counseling and the cultivation of a strong alumni network.*

*The aim of the white paper is not to propose solutions but rather to encourage discussion and engagement with the potential challenges (educational, social and economic) that such a transformation would present. While the paper offers some tentative suggestions, these should be seen only as suggestive of the possible ways the CSU might choose to respond to these challenges.*

**Approved - May 16-17, 2019**

# Artificial Intelligence:

## *And its impact on Career Preparation, Reorientation and Lifelong Learning*

May 2019

**White paper sub-committee**

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## Table of Contents

## Prologue

“Last year, I began getting fundraising cold calls. The caller would always start the conversation ‘I'm so glad I reached you. You know, you're harder to get hold of than my grand-kids’. After three or four calls, when it was clear that the script and the voice were exactly the same each time, I began to wonder whether I was actually talking to a person. It seemed unlikely that a) the fund-raising organization had only one person making calls, or b) that all the people making calls sounded exactly alike or c) that by chance I was contacted by exactly the same person four times in a row over the course of six months. Was I actually interacting with a computer program, an AI application with speech recognition capability and a limited ability to comprehend meaning that was guiding its responses and questions? So when I recently received another similar call, I decided to ask. The conversation went something like this:

Thank you for calling. I am doing research into artificial intelligence, and I hope you don't mind my asking, but are you a person or a robot?

"I am a live agent but I am using pre-recorded responses".

Thanks, but that doesn't quite answer the question: are you a robot or a person?

"I am a live agent but I am using pre-recorded responses".

I really don't think that unambiguously answers my question. So, are you a robot or a person?

"I'm sorry I don't understand the question. Let me get my supervisor".

Alan Turing suggested that the test of machine intelligence[1] is when a human could no longer tell that she was interacting with a machine. If indeed I was talking to an artificial intelligence application on those calls, until our last exchange, it seems to have passed Turing’s test.”

[1] https://en.wikipedia.org/wiki/Turing_test

## Introduction

The CSU, as an institution, fulfills a variety of societal needs. It imparts knowledge, both broad and discipline-focused. It broadens minds, prepares students to think carefully and critically about the world and to play an engaged role in civic life. It helps students transition from the directed learning they had in high school to help them become self-directed learners for life. It helps students if they are sick or hungry. And it provides financial support to those in need.

Understanding that the CSU plays a very broad role in the lives of the students it admits, this white paper focuses on just one aspect of the university's mission[2]: to provide opportunities for individuals to develop professionally and prepare significant numbers of educated, responsible people to contribute to California's economy. Simply put, professional development and contributing to California's economy is about helping students find jobs and helping them establish them in careers that will sustain and enrich them over the course of their lives. And while this is only one aspect of the CSU's mission and understanding that higher education is more than just professional development, it is one that understandably matters a great deal to our students.

This paper draws on research into the way the careers may be affected by artificial intelligence and then speculates as to what the might mean for our university. The emphasis here is not on curricular change – that is the preserve of campuses and programs – but while acknowledging that some programs may be affected, the purpose here is to stimulate thinking more broadly about what these changes might mean for the various ways in which the CSU as an institution serves its students.

It should also be noted that in some areas the CSU may not currently be adequately resourced to fulfill the kind of role the paper speculates might be needed. However, these suggestions are intended as a starting point for deeper consideration at the end of which, if it is concluded that some areas of the institution's operation require additional resources, then decisions about resource allocation may be better made, both within the CSU and at the California State level.

It is also worth noting that some of the ideas offered for consideration in this white paper are broader than simply as response to the impact of artificial intelligence. But while enhancing career counselling and alumni engagement are examples of ideas that are by no means new, they are made more pressing with the forces of change identified here. The central idea being advanced is that students may need to be prepared for more flexibility in their careers. Helping

[2] https://www2.calstate.edu/csu-system/about-the-csu/Pages/mission.aspx

them in that respect depends on programs being forward looking; the paper also acknowledges that as in institution, we support students both inside and outside of the classroom. The paper's intent is to draw attention to the accelerating pace of change AI is widely thought to be ushering in and to ensure that its implications are explored and any response that may be needed is initiated in a timely manner.

## How AI is Changing the Employment Landscape

Artificial intelligence (AI) might be thought of as the ability of a machine to make inferences and choices by learning from large quantities of data. It can predict what movies we are likely to want to see on Netflix, what products we will want to buy on Amazon, and what advertisements might appeal on Google. AI recognizes objects and people, steers self-driving cars, detects uncharacteristic spending patterns that might signal fraudulent activity on our credit cards, and chooses what items to show us in our social media feeds. It might even be persuading us to make donations to charity.

It has been over 20 years since Deep Blue, an IBM chess-playing computer, beat chess grandmaster Gary Kasparov[3]. The victory of 'AlphaGo', an AI program developed by Google, over the world's top Go player[4] provides more recent, and perhaps more compelling evidence that AI can solve highly complex strategic problems of a kind that had been considered analytically intractable and therefore amenable only to human intuition. Activities that require computation and the application of knowledge will almost certainly be supplanted by AI; and it is no longer just routine repetitive information processing tasks that AI will replace. White-collar jobs requiring years of training could, in the not-too-distant future, be performed by a computers, possibly with greater accuracy than by humans. By way of example, medical diagnostics, once considered a job that required years of experience and human judgment, is becoming much more automated[5] [6] [7] [8]. More importantly perhaps, in addition to mimicking human judgment that some would say is as much art as science, AI may soon prove to be capable of a variety of creative tasks. As BusinessWeek recently reported, AI is beginning to generate creative artifacts that could easily be mistaken for the work of little known Impressionists[9].

In a 2015 study by McKinsey[10] designed to better understand AI's impact in the workplace, the authors looked not at jobs but at the activities within them. In summarizing their findings, the authors noted that: "about 60 percent of all occupations have at least 30 percent of activities that

[3] ttps://www.scientificamerican.com/article/20-years-after-deep-blue-how-ai-has-advanced-since-conquering-chess/
[4] https://www.nytimes.com/2017/05/23/business/google-deepmind-alphago-go-champion-defeat.html
[5] https://www.technologyreview.com/the-download/610853/fda-approves-first-ai-powered-diagnostic-that-doesnt-need-a-doctors-help/
[6] https://www.technologyreview.com/s/610397/ai-could-alleviate-chinas-doctor-shortage/
[7] https://arxiv.org/pdf/1703.02442.pdf
[8] https://static.googleusercontent.com/media/research.google.com/en//pubs/archive/45732.pdf
[9] https://www.bloomberg.com/news/articles/2018-05-17/ai-made-incredible-paintings-in-about-two-weeks
[10] https://www.mckinsey.com/featured-insights/employment-and-growth/technology-jobs-and-the-future-of-work

are technically automatable, based on [*then*] currently demonstrated technologies". The impediments to a significant degree of automation in white collar jobs are institutional rather than technological.

The extent of the disruption AI will bring about is perhaps unprecedented not only in its scale, but in the speed with which change may occur. Google's Director of Strategic Planning for People Operations, Harlan Findley, believes it quite possible that self-driving trucks will replace all manually-operated long-haul trucks within two to three years. The revenues per employee of 'digital' firms like Google, Amazon, Facebook is three times that of firms operating principally in the physical domain[11]. In part, this is a function of the non-rival nature of software and computer algorithms. Only a few people are needed to write a program that The World Economic Forum's "The Future of Jobs Report"[12] presents a variety of indicators showing how the world of work is likely to change for in the next five years. It notes that "no less than 54% of all employees will require significant re- and up-skilling" by 2022, suggesting a rapid rate of change in the workplace.

This is only a very brief account of the way AI is changing the employment landscape. If the jobs that landscape comprises are changing, so are career paths. This has implications both for what preparation we should be providing for our students to meet their shortterm goals, and how institutions of higher education such as ours might support them in the longer term over the entire course of their lives. Indeed, as a state institution there may be things the CSU can provide that no other entity would be able or willing to.

## Implications for Higher Education

Higher education is likely to be impacted by the changing nature of jobs the in the knowledge economy in three ways. First, some programs may need to alter what they teach to continue to properly equip graduates for the job market as the nature of work changes. Second, new technologies may change the way education itself is delivered and the balance between the public and private sectors. And third, as the nature of work and career paths evolve ever more rapidly, the need for people to go back to further their education, either for professional reasons or for personal growth, will occur at more frequent intervals over the course of their careers.

## Career Preparation

Since jobs may comprise activities that are differently vulnerable to replacement by AI, not all programs will be equally affected. If they are not already doing so, faculty might begin to consider which of the activities they are helping their students master are most susceptible to AI replacement, and thus how their programs may need to change and adapt. Indeed, in a worst case, some of the jobs in which their graduates find work may disappear completely. By the same token, we need to be aware of emerging new fields and create programs that meet those new needs as

[11] Makridakis, S. (2017). "The forthcoming Artificial Intelligence revolution: Its impact on society and firms." Futures 90: 46-60.
[12] https://www.weforum.org/reports/the-future-of-jobs-report-2018

they arise. Business Analytics is a recent example of a program that recently came into existence in response to technological change. Program planning processes should be forward-looking rather than simply an extrapolation of past trends. Career preparation involves both adapting existing programs and creating new ones in response to evolving technological trajectories. While this should best be left to faculty on individual campuses, the CSU might be able to facilitate change and curricular innovation by helping sharing of best practice and providing resources that accelerate locally inspired curricular transformation.

### AI in Educational Delivery

Enthusiasm for technology-based alternatives to the traditional model of faculty and students interacting in relatively small groups continues unabated. Amid calls for cost savings and greater efficiency, the allure new technology seems to appear irresistible to many outside the profession. Online solutions per se don't necessarily change the cost model, but when AI is harnessed to allow classes of hundreds or thousands of students, the educational landscape changes dramatically. While the Udacity experiment at San José State was widely regarded as unsuccessful[13], the promise of 'something for next to nothing', leveraging new technology to reduce the cost of delivering education by an order of magnitude, remains. Anticipate renewed calls for MOOC[14]s, supported by AI tools to "assist" in tasks like grading large numbers of papers or blockchain-based micro-credentialing where elements of a few hours each are "assembled" by the student-consumer into self-directed tailor-made qualifications. There will be no shortage of for-profit entrepreneurial start-ups[15] looking to bring new (untested and unregulated) educational offerings to venture capitalists for funding and to the market as an alternative to more institutionally established models.

Nevertheless, one should not dismiss the potential of AI to assist faculty in their mission. Useful applications of new AI-based technologies and tools are likely to emerge. The challenge higher education faces is in the judicious adoption of novelty. We should consider the ways in which AI might augment and enhance teaching. The CSU faculty is best placed to investigate, develop and carefully experiment with the ways in which AI might help faculty members in their jobs and help students develop skills, gain knowledge, and become better critical thinkers.

### Beyond the Classroom - Career Reorientation and Lifelong Learning

In addition to career preparation and educational delivery, a third implication of the changes AI will usher in relates to the accelerating pace of workplace change. In addition to reconfiguring, eliminating or creating new jobs, AI may not cause just one discrete discontinuity in the labor market, but become a permanent driver of continuous change. Jobs may no longer remain stable in terms of their activities over the span of a person's working life; they may appear, change or disappear in a matter of years rather than decades. This increasing rate of change may affect the

[13] https://www.insidehighered.com/news/2013/07/18/citing-disappointing-student-outcomes-san-jose-state-pauses-work-udacity
[14] Massive Open On-line Course
[15] e.g., https://odem.io/images/ODEM.IO-Technical-Whitepaper.pdf

longevity, the "half-life", of the knowledge and capabilities students acquire as they earn their degrees. Student success[16] is about more than the proportion of incoming students who complete their degrees and how quickly and efficiently they graduate. Can the CSU as an institution play a more active, useful and ongoing role in students' lives after they graduate from our bachelor's and master's programs? Can we be better partners in our students' lifelong-learning journeys?

One implication of the shorter half-life of certain sets of knowledge may be that higher education beyond a four year degree may need to be more granular. Shorter knowledge half-life changes the cost-benefit calculations students make when considering a degree program. Prospective students may calculate that the likely time over which they can exploit the benefits of a four or even a two year program is too short to compensate for the cost. In cases where large 'chunks' of education (120 unit bachelor's or 48 unit master's programs) are no longer ideal, lifelong learning may involve many more frequent but much smaller dips into the well of knowledge. For example, many much shorter 'micro-certificate' programs may be more appropriate in such instances[17]. Smaller "chunking" not only reduces the up-front cost, but affords greater flexibility and would allow students to build their education in as their need for knowledge changes and evolves.

Whether career reorientation and re- and up-skilling are accomplished in many small bites at the apple or whether it is swallowed whole, the CSU might play in increasing role in student success and lifelong learning by providing our alumni not only with access to whatever new knowledge they need, post-graduation, but with counseling on what courses they might best choose and help with making the choice to come back for additional education. Where careers are disrupted by AI, requiring frequent pivots and substantial re- and up-skilling, lifelong learning will be an increasingly important part of our students' working lives. Indeed a study published by the McKinsey Global Institute suggests that re- and up-skilling aren't enough. "Instead, employers, employees, educational institutions, and public-sector leaders need to start talking about 'lifelong employability': helping people continually and successfully adapt as the economy evolves[18]." While we talk frequently about lifelong learning, often that means trying to provide students with the skills and mindset in their bachelor's degrees that we hope sets them up to learn independently as they progress through their careers. But another way of thinking about lifelong learning is that we continue to engage with students in several ways after they graduate. Here we suggest three things that the CSU might consider; expanding the work of our career centers, building a more vibrant and active alumni network and providing knowledge in a more granular fashion.

Career Centers

The CSU might provide lifelong career services. Currently students only have access to Career

[16] http://www.calstate.edu/AcadSen/Records/Reports/documents/ASCSU_White_Paper_on_Student_Success.pdf
[17] https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/enabling-seamless-lifelong-learning-journeys-the-next-frontier-of-digital-education
[18] https://www.mckinsey.com/featured-insights/future-of-work/competitive-advantage-with-a-human-dimension-from-lifelong-learning-to-lifelong-employability

Center services for a year after graduation. This is not uncommon "One of the flaws of the American higher-education system is that once you cross the graduation stage, we largely sever the relationship with you—with the exception of viewing you as a donor[19]".

Moving forward, a Career Center's role might be expanded in two ways. The easiest is that it continues to provide advice to students and connect them with potential job opportunities throughout their working lives rather than just as they leave the University. When students finds themself at a career discontinuities, Career Centers, in addition to helping them find another job, might also provide advice and guidance on re- or up-skilling. In conjunction with academic advising, Career Centers could help students better understand the evolving employment landscape, help them think through different alternatives, suggest suitable programs (masters, bachelors, certificates or micro-certificates), and help them evaluate the costs, benefits and risks associated with each.

More fundamentally, as a society we may need to change the way we think about who we are; currently we tend to ascribe identities, to ourselves and to others, based on a profession and often, by extension, our educational specialization (e.g. electrical engineer, computer scientist, accountant, and art historian). This makes moving from one domain to another seem more daunting than it might actually be. For example, an English major, with an understanding of the structure of language, may find a transition into programming, with its syntactic rules, less traumatic than were they to try to take up accounting as a new career. Understanding peoples' skills and experience at a more granular level might help career counselors ease people, whether freshly-minted graduates or alumni looking to pivot from their current career path, onto a new trajectory. It might also require rethinking the way we pigeonhole and categorize ourselves as a society, though that is a much more daunting cultural challenge. Using a more granular task-oriented approach in career counseling (much as McKinsey did in their 2015 study) might increase the ease of transition between jobs and careers and help them achieve long term success.

Alumni Engagement

At the risk of stating the obvious, the lifelong learners we often talk about are also our alumni. Many universities have developed vibrant alumni communities. While alumni associations are often seen important for fundraising, an engaged alumni network provides its members with communities of shared professional interest and a network of potential access to career opportunities. A lively alumni network would provide a channel through which the CSU could reach students to help them with career choices and the educational opportunities the CSU offers as their careers evolve. This, in conjunction with the expanded role of the Career Centers, would allow the CSU to continue to support student success over the course of their careers. The CSU might therefore consider investing additional resources in developing a more robust alumni

[19] Betsy Ziegler, chief innovation officer, Kellogg School of Management, https://www.mckinsey.com/business-functions/organization/our-insights/learning-innovation-in-the-digital-age

network, perhaps with communities centered on campuses, colleges or programs and disciplines to create a sense of identity and deliver tangible value.

Rethinking educational granularity – from one-time fire-hose to on-demand drip-feed[20]

Currently, we generally deliver education in one almost continuous block from Kindergarten through graduation, either at the bachelor's or master's level. There are two drawbacks with this model. First, some of the knowledge acquired in that block will be out of date before it is needed. Second, some knowledge may not seem relevant at the time it is delivered and so will make less of an impression than were it acquired once its utility had become clearer. Being told how to deal with a problem I've not yet faced may be interesting; finding out how to solve a problem I'm struggling with is compelling. For example, teaching ideas about strategic management to 19-year olds may be premature given that they may not be in a position to worry about these kinds of issues for another twenty years or more. And, because they have never encountered these kinds of questions, these ideas may seem (and indeed may be) of little immediate practical value.

Could we then re-imagine education if we think of it as being a lifelong commitment both on the part of the students and the educational institution? If, once enrolled, the CSU committed to remain actively engaged with each of its students for life, the urgency of delivering everything all at once goes away. A learning plan could be developed for each student that matches the delivery of particular content to the evolution of their careers, a plan that evolves as they progress along their chosen career paths. Lifelong learning wouldn't then, post-graduation, be left to the student to make good on; it becomes a shared endeavor, in which the University plays a role. The CSU in this model becomes, in part, a curator of a lifelong learning community, guiding students in their acquisition of knowledge and skills with relatively few geographic and disciplinary boundaries.

## Conclusion

AI is set to transform the employment landscape. The ASCSU believes that at the program level, faculty should begin to consider the way AI may alter the set of skills students develop. At the campus level, the anticipated changes create an opportunity for the CSU to contribute to student success in a variety of ways: for example, by cultivating ongoing engagement between our students and alumni with the CSU, and by augmenting ancillary service such as career centers and academic advising so that these services might be offered in perpetuity to those who we help educate. And at the system level, there is an opportunity to gather and disseminate information and on new AI-based tools, to provide a locus for collective learning about their use and efficacy, and to use the System's bargaining power to provide commercial tools to students and to the faculty at as low a cost as might be negotiated.

[20] With thanks to Michael Berman, Chief Technology Innovation Officer, CSU Office of the Chancellor for this idea.

## Appendix

### Some AI-related quotes[21]:

"If a computer can do one-third of your job, what happens next? Do you get trained to take on new tasks, or does your boss fire you, or some of your colleagues? What if you just get a pay cut instead? Do you have the money to retrain, or will you be forced to take the hit in living standards? It's easy to see that finding answers to these questions is incredibly challenging" Technology writer James Vincent.

"Of the things that worry me about AI, job displacement is really high up. We need to make sure that wealth we create [through AI] is distributed in a fair and equitable way. Ethics to me isn't about making sure your robot doesn't turn evil. It's about really thinking through, what is the society we're building? And making sure that it's a fair and transparent and equitable one." Andrew Ng, co-founder of Google Brain and former chief scientist of Baidu.

"If you can dramatically increase productivity and make more goodies to go around, that should be a good thing. Whether or not it turns out to be a good thing depends entirely on the social system, and doesn't depend at all on the technology. People are looking at the technology as if the technological advances are a problem. The problem is in the social systems, and whether we're going to have a social system that shares fairly, or one that focuses all the improvement on the 1% and treats the rest of the people like dirt. That's nothing to do with technology. . . . I hope the rewards will outweigh the downsides, but I don't know whether they will, and that's an issue of social systems, not with the technology." Geoffrey Hinton, computer scientist and "Godfather of Deep Learning".

"AI will increasingly replace repetitive jobs. Not just for blue-collar work but a lot of white-collar work. Basically chauffeurs, truck drivers anyone who does driving for a living their jobs will be disrupted more in the 15- to 20-year time frame and many jobs that seem a little bit complex, chef, waiter, a lot of things will become automated, we'll have automated stores, automated restaurants, and all together in 15 years, that's going to displace about 40 percent of the jobs in the world." Kai-Fu Lee, venture capitalist and an AI expert.

"I'm concerned about the concept of automation. Many jobs will be automated; a lot will be. This will have benefits for people but it also has a huge cost. I worry that 'Made in America' will become 'Made by robots in America.'" Brian Chesky, co-founder and CEO of Airbnb

"With regard to health care and education, I think there's a huge ethical question for society at large. We could build those systems to complement and work with physicians and teachers, or we could try to save money by having them replace people. It would be a terrible mistake to replace people." Barbara J. Grosz, the Higgins Professor of Natural Sciences at Harvard University and the first woman to serve as president of the Association for the Advancement of Artificial Intelligence.

It's going to happen, these vehicles driving by themselves. Change is good, some change aint good.

[21] https://www.cbinsights.com/research/ai-threatens-humanity-expert-quotes/

They'll be a lot of outrage, a lot of people out of work. Me I want to die the truck. I've told my friends, I've told my family, when I retire is when I die in a truck. I've been doing it for too long. It's in my blood." Don Schrader, owner operator, DSW Trucking[22].

"Most of us walk around with this implicit rule of thumb in our heads about how we should divide up all the work that needs to get done between human beings and machines. It says 'look machines are better than us at arithmetic, they are better at transaction processing they are better at record-keeping, they are better at all these low-level detail stuff then we are'. Awesome. Then give all that work to the machines. Let the human beings do the judgment jobs, the communication jobs, the pattern-matching jobs. When I think about the progress that we're making with AI and machine learning right now that progress is calling into question that rule of thumb in a really profound way because what we are seeing over and over is that computers are better at pattern-matching, even the expert human beings, and actually they've got better judgment." Andrew McCafee, co-director of the MIT Initiative on the Digital Economy

"The system looks at the text, understands the meaning behind the text, very similar to how human lawyer would review it, the only difference is the AI system never forgets, it doesn't get tired, and at AI doesn't need to drink coffee." Noory Bechar, CEO Lawgeex.

"The domestic investment in workforce retraining is so small and the impact automation is going to have is not going to be equitable. It's largely people of color, largely women who are in the current low-wage occupations that are going to be displaced. They really should be some critical thinking and action that legislators are taking to invest in programs like this." Kelly Richardson, managing director and Newark and New York, Per Scholas.

[22] https://www.hbo.com/vice/special-reports/vice-special-report-the-future-of-work