Artificial Intelligence Task Force

FINAL REPORT
January 15, 2020

This draft with edits was approved for submission to the Legislature by the Artificial Intelligence Task Force at its January 10, 2020 meeting.

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TRANSMITTAL LETTER

To the General Assembly, Senate Committee on Government Operations and the House Committee on Energy and Technology:

This final report is a presentation of the Artificial Intelligence Task Force ("A.I. Task Force" or "the Task Force") and was prepared in accordance with the Act Relating to the Creation of the Artificial Intelligence Task Force, No. 137 (2018) and An Act Relating to Boards and Commissions, No. 61 (2019).

The Task Force gathered information and research from various expert witnesses and members serving on the Task Force, as well as through a series of regionally-held public forums. The Task Force held 5 open and public meetings at various locations around the state – Burlington, Lyndon (Northern Vermont University), Norwich (Montshire Museum), Manchester and Essex Jct. (Tech Jam Conference) between July 2019 and December 2019 to enable members of the public to express their views on the topics and issues which the Task Force was mandated to report on. In addition, the full Task Force held fifteen meetings that were warned to the public.

The Task Force was mandated to report to the General Assembly on specific questions set forth in Act No. 137. The Task Force would like to emphasize that Artificial Intelligence (A.I.) is a massive subject matter with far more breadth and depth than a group of informed volunteer citizens can fully understand, or develop policy recommendations on, in a short period of time. Thus, the Task Force's foremost recommendation is that this report should not be the end of the State's consideration of and response to A.I. technology. The report recommends the establishment of a permanent A.I. Commission to continue where the Task Force ends, and to adopt a Code of Ethics for responsible development and use of A.I. in Vermont to provide a framework for future policy development in the area.

A.I. offers the opportunity for significant improvements in the operation and effectiveness of public institutions, and significant new economic opportunity and improvement of the operation and productivity of existing businesses. However, to achieve these benefits the State must confront the changing nature of work created by this technology, and the need for new education and workforce development programs to create an educated workforce ready to assume the jobs in this new economy. Like the internet, A.I. will bring great change in the everyday life of Vermont citizens, all who bear the responsibility to make that change as rewarding as possible.

The Task Force thanks the Vermont Agency of Commerce and Community Development and its Secretary for providing excellent administrative and drafting support throughout the meeting and deliberation process.

We thank the Vermont Legislature, and those who appointed the Task Force, for giving the opportunity to learn about this fascinating subject and to struggle with recommendations on how to create public policy that will harness its power for the greater good of Vermonters.

Sincerely,

Brian M. Breslend

Brian Breslend, Chair
On behalf of the Vermont Artificial Intelligence Task Force Members

EXECUTIVE SUMMARY

The Vermont Artificial Intelligence Task Force *("The Task Force" or "A.I. Task Force")*, established by Act 137 of 2018 and Act 61 of 2019, met from September 2018 through January 2020 to investigate the field of artificial intelligence (A.I.) and make recommendations for State action and policies with respect to this new technology. The Task Force found that this technology presents tremendous opportunities for economic growth and improved quality of life, but also presents substantial risks of loss of some jobs and invasions of privacy and other impacts to civil liberties. The Task Force further found that there are steps that the State can take to maximize the opportunities and reduce the risk, but action must be taken now.

This report makes a series of recommendations for the State and Legislature to consider that will guide responsible growth of artificial intelligence development and use, specifically:

- The establishment of a permanent commission on artificial intelligence to support its development and propose policy initiatives to make that development responsible;
- The adoption of an artificial intelligence code of ethics to set standards for responsible artificial intelligence;
- The creation of incentives for the further development of the artificial intelligence industry in the state;
- The support for the responsible use of artificial intelligence by agencies of state and local government.
- Enhancements in education and workforce development programs targeted to artificial intelligence, with the recommended involvement of Vermont's higher education community, in order to bring about a workforce trained in the development and use of artificial intelligence; and
- Greater education of the public on the power and opportunity of artificial intelligence and the risks created by it so Vermont has an informed citizenry on these issues;

The Task Force does not recommend the promulgation of new, specific State regulations of artificial intelligence at this time, however, the majority acknowledged that applications of A.I. are currently being regulated and that additional regulation will be needed in the future. Instead, the Task Force recommends the establishment of a Code of Ethics and a new/permanent oversight commission that can monitor the development of artificial intelligence in the state and propose specific regulations in the future if indicated.

Please see Recommendations Section of this report for full recommendations.

INTRODUCTION

Vermont is the first state to launch a formal investigation into the opportunities and challenges of artificial intelligence development and use.[1] However, despite its first-in-the-nation status, it is late to the process. The creation and use of artificial intelligence have grown rapidly in the state to the point where it already has an impact on the lives of all Vermonters. Experts in this field predict that artificial intelligence will be the engine of tremendous growth, but other experts predict its economic rewards will be unequal and it will undermine privacy and democracy.

The Vermont Artificial Intelligence Task Force was tasked with answering questions posed by the Vermont Legislature on what one small state can do to maximize the rewards of artificial intelligence and minimize the negative consequences of the deployment of this technology. The Task Force went through a process of learning about artificial intelligence, its creation and use in Vermont, and spent considerable time listening to the views of the public on how the state should respond to this technology. This report reflects the findings and conclusions of the Task Force.

We are at a time of great technological change, part of which is created by employment of artificial intelligence. While the term "artificial intelligence" has been in regular use since the mid 1950's; the first A.I. algorithm was created and used successfully to master the game of checkers. It was in this instance that a computer was programmed to react, predict future moves, and make decisions based on its opponents' decisions – mirroring human intelligence and thinking to win the game. Since then, the term has been loosely applied to many techniques ranging from classical optimization techniques and control theory to much newer techniques that learn and evolve on their own. A.I. is also often confused and conflated with more classical forms of automation (e.g. airplane autopilots) and robotics.

The Task Force reviewed and considered many definitions of artificial intelligence from numerous sources. Ultimately, the Task Force determined there was no one perfect definition, but what was important is that a common definition be used. Thus, the Task Force adapted the European Union Glossary definition[2] of "artificial intelligence" in the following way:

For purposes of this report, artificial intelligence is:

Artificial intelligence (A.I.) systems are systems (usually software) capable of perceiving an environment through data acquisition and then processing and interpreting the derived information to take action(s) or imitate intelligent behavior given a specified goal. AI systems can also learn/adapt their behavior by analyzing how the environment is affected by prior actions.

"As a scientific discipline, AI includes several approaches and techniques, such as machine learning (of which deep learning and reinforcement learning are specific examples), machine reasoning (which includes planning, scheduling, knowledge representation and reasoning, search, and optimization), and robotics (which includes control, perception, sensors and actuators, as well as the integration of all other techniques into cyber-physical systems)."[3]

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[1] Activities in other states and in New York City are described in Appendix E.
[2] https://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupMeetingDoc&docid=30466
[3] https://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupMeetingDoc&docid=30466

While the Legislature asked specific questions about A.I. development and the policies the state could adopt with respect to A.I., there was one large underlying question that was not explicitly raised – whether state-level policy can have any effect on the development and use path of a powerful new technology. While local understanding of forces impacting society is desirable, it is another issue whether local action can control those forces in international and national economies.

Over its time in existence, the Task Force came to conclude that there is in fact a role for local and state action, especially where national and international action is not occurring. Large scale technological change makes states rivals for the economic rewards, where inaction leaves states behind. States can become leaders in crafting appropriate responses to technological change that eventually produces policy and action around the country.

The following report presents a series of recommendations for policies and actions consistent with the limited role of Vermont to direct the path of artificial intelligence development and use in the state. Task Force concludes that Vermont *can make* a difference, *can* maximize the benefits of A.I., and minimize, or adapt to, the adverse consequences.

PART 1: ARTIFICIAL INTELLIGENCE IN VERMONT

With the recent creation of voice assistance applications, such as *Alexa*, *Siri* and *Google Assistant*, recommendation engines in online search and shopping and face recognition in social media, artificial intelligence applications have become ubiquitous in Vermont as well as in the rest of the country. In a very short time, artificial intelligence has affected the lives of all Vermonters, and those effects will grow dramatically in the future.

On a global scale, recent reports have concluded that deployment and use of artificial intelligence worldwide will create a three to sixteen percent increase in gross global product, yielding as much as $13T dollars to the world economy by 2030,[4] an increase at least double the increase brought about by the internet.

No technological advancement of this scale comes without risks and challenges. There will be dramatic effects on the nature and value of work, making many of today's occupations obsolete and creating new ones. Technological change can also contribute to the growth of inequality, and A.I. applications working with mass data about individuals and their activities and movements threatens their privacy.

During its first meetings and five public hearings, the Task Force looked at how artificial intelligence is impacting all major sectors of the Vermont economy: agriculture and natural resources, transportation and manufacturing, healthcare, law enforcement, government and services. For each, it found that there are artificial intelligence applications available that will improve productivity and the quality of results and products. For example, dairy farm management artificial intelligence applications automate all aspects of farming activity to improve the quality and quantity of milk production, while reducing the costs of production, particularly labor costs. In health care, artificial intelligence applications already examine patient x-ray and skin images to advise health professionals on whether particular areas warrant closer examination for the presence of cancer. These applications are being developed and sold nationally and are being purchased and deployed in Vermont – more so as funds become available for purchase, and the benefits of the applications become known.

During its input processes, the Task Force identified companies and individuals that are developing and/or using artificial intelligence applications in Vermont.[5] Based particularly on those companies who appeared at the five public hearings, the persons and companies engaged in artificial intelligence development locally are small businesses producing single applications. Up to this point, artificial intelligence application development has not been a substantial part of the Vermont economy. Users are more diverse ranging from large institutions like the University of Vermont Medical Center for screening for skin cancer to local towns like the Town of Manchester that live streams the video of high school and college soccer and lacrosse games from its Applejack Stadium using an A.I. system deploying an autonomous multi-camera system in a single fixed rig from which algorithms track the flow of play, identify highlights, create replays and insert ads without human intervention. [6]

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[4] https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-modeling-the-impact-of-ai-on-the-world-economy
[5] https://vtdigger.org/2019/11/10/as-artificial-intelligence-grows-in-vermont-task-force-mulls-state-policies/
[6] http://applejackstadium.com/live/

Acts of 2018, No. 137, § 1(a)(2) requires the Task Force to make recommendations on the use of artificial intelligence in state government. There are examples of where state and local governments have used artificial intelligence applications[7], but in general the Task Force has not identified many of these applications. To date, state and local governments have generally not implemented A.I. applications that have potential to threaten the privacy interests of individuals, or that will raise issues of racial or gender bias. As an example, there has been little use of artificial intelligence applications by law enforcement in Vermont, despite international trends in the use of such technologies. It was not possible in the limited time available for the Task Force to determine whether there are specific artificial intelligence applications that State Agencies should be using in their work and to fulfill their missions. Given the substantial benefits that are likely to be achieved by artificial intelligence, there are potential applications that exist that could increase and improve operational efficiency of State agencies. Identification of these opportunities is another important responsibility for the recommended permanent commission.

Section 1(d)(2) of Act of 2018, No. 137 contains a similar mandate to examine whether and how artificial intelligence should be used in State government and to provide an analysis of the fiscal impact of artificial intelligence to the State. The Task Force requested input from the Legislature's Joint Fiscal Office (JFO) on the expected fiscal impact. The JFO responded that it is too early in the development and adoption of artificial intelligence to provide an estimate of the fiscal impact. While the Task Force is mindful of adding to speculation, available studies indicate that artificial intelligence is likely to produce substantial improvements in the effectiveness and efficiency of government services while adding to the Vermont economy. The one caveat to this conclusion is that the income and job availability effects of artificial intelligence are unpredictable and may be substantially negative for some occupations and may require substantial new government funding for job training and retraining.

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[7] https://vtdigger.org/2019/11/10/as-artificial-intelligence-grows-in-vermont-task-force-mulls-state-policies/

PART 2: THE BENEFITS AND RISKS OF ARTIFICIAL INTELLIGENCE

A. POTENTIAL BENEFITS

Artificial intelligence has the potential to be a transformative technology to humankind. The benefits of A.I. to Vermont's economy can be seen as a continuation of the progress already made in using technology changes for improving both efficiency in product and service delivery, and in improving the quality of products and services.

There are already many examples of how A.I. is providing tangible benefits to humanity, and those benefits are likely to grow as the technology advances and is more widespread. Some of the advantages of A.I. include improved efficiency, an increase in public safety, increase in health and the potential for economic growth.

i. Improved Efficiencies and New Capabilities

Artificial intelligence is already helping to automate many labor consuming, tedious and/or dangerous tasks with better than human speed and accuracy. This frees up humans to focus on more demanding and rewarding tasks.

Examples in areas important to Vermont include precision agriculture which administers farm chemicals just where they are needed.[8] This technology improves yields and lowers environmental impact and labor costs. Similarly, automated dairy operations can enable higher milk output and larger herds managed per farmer. These factors can enable small farms to compete more readily with much larger operations in the rest of the country, which can help preserve Vermont's agricultural way of life.

Similarly, A.I. will increasingly enable the State's manufacturers to better monitor process flow and quality. For example, visual inspection of manufactured parts (such as semiconductors) improves product quality and reduces tedious hand inspection. A.I. controlled robotic assembly already improves output and reduces workers' direct exposure to dangerous environments like mining, machining, welding, and chemicals sprays. A.I. is also increasingly being used to do predictive maintenance on complex manufacturing equipment to reduce down-time. These techniques are essential in allowing Vermont's small manufacturers compete with larger operations in an increasingly competitive global market.[9]

There will be a shift in the labor market with the further integration of A.I. Certain functions of many jobs will change to improve productivity and reduce cost.[10] For example, a sales company may spend less time figuring out the price of a good or service and more time will be able to be

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[8] https://www.forbes.com/sites/cognitiveworld/2019/07/05/how-ai-is-transforming-agriculture/#65c215c24ad1
[9] https://www.mckinsey.com/~/media/McKinsey/Industries/Semiconductors/Our%20Insights/Smartening%20up%20with%20artificial%20intelligence/Smartening-up-with-artificial-intelligence.ashx
[10] https://workofthefuture.mit.edu

spent on managing customers, effective search engine optimization, and website design. Currently, the job market is already changing due to A.I. with job postings asking for administrative skills (such as scheduling and credential validation) appearing less frequently. However, while some jobs will disappear, new opportunities will also arise. Initially, there will be significant need to ensure that A.I. machines perform as intended (e.g., training the technologies to reduce damage/mistakes, ensure no/less bias, prevent people using the technologies for their own means). All of this will require the re-training of Vermont's workforce. Simultaneously, there will be a need to create opportunities for people to assume more complex roles as physical work shifts to more cognitive in nature. *Note that there are also potential risks to the labor force caused by these changes in the future of work **fully outlined under the 'Risks' section.***

ii. Better Environmental Stewardship

A.I. is being used to better analyze environmental health and predict the impact of short and long-term human behavior on the environment. For example, the University of Vermont (UVM) is already using A.I. analysis of satellite data to identify and eventually predict blue-green algae blooms in the state of Vermont. [11] [12]

iii. Increase in Public Safety

A.I. augmented transportation will save lives due to lower crash rates in cars, trucks and other forms of human transport. One report from Mckinsey[13] predicts that A.I. could reduce highway deaths by more than 90 percent. As incredible as that sounds, increased use of automation, including A.I., has already led to markedly improved safety of worldwide air travel.[14]

iv. Increased Improvements in Public Health

A.I. is already being used to improve healthcare worldwide. A.I. screeners are being increasingly used by Doctors to read x-rays[15] and other medical imaging for signs of early problems such as cancers, heart disease and Alzheimer's, and screeners are already better than most doctors at identifying early signs of disease. This advancement allows for more accurate triage and faster medical attention in some of the most serious cases. For safety, however, doctors must always make the final diagnosis.

The second application is the use of the large volumes of patient data in order to optimize the diagnosis and care for individuals. A.I. is also being used to better map therapy efficacy to a

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[11] https://www.usgs.gov/news/satellite-imagery-can-track-harmful-algal-blooms

[12] https://www.nationalgeographic.com/environment/2018/12/artificial-intelligence-saving-lake-algea-blooms-guatemala/

[13] https://ourworldindata.org/tourism#safety-of-aviation

[14] https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/ten-ways-autonomous-driving-could-redefine-the-automotive-world

[15] https://med.stanford.edu/news/all-news/2018/11/ai-outperformed-radiologists-in-screening-x-rays-for-certain-diseases.html

patient's personal genome.[16] Using A.I., doctors can quickly get access to the insights resulting from patient genetics, applied therapies and outcomes from millions of cases worldwide. Large databases on clinical testing results, combined with genetic markers, can help differentiate care but require the use of high levels of computing power.[17] Currently, diagnosis is an important function of the most highly trained medical professionals, and any displacement of these professionals will be challenging to adopt. However, to the extent that health care needs are continuing to grow, the use of A.I. may be available to increase the diagnostic services without increasing the number of medical professionals.

Prescription drug developers utilize A.I. to speed up and improve the drug design processes.[18] By using A.I. models, drug designers have the ability to more efficiently search for safe and effective chemical species that can be synthesized to attack an invading viruses, germs or rogue cancer cells.

v. Economic Growth Potential

Artificial intelligence is creating a wave of economic growth. Students are showing up in huge numbers to Computer Science, Math and Engineering programs at universities all over the country to learn the latest A.I. techniques. Starting salaries in A.I./Data Scientists in Vermont are estimated to be approximately $110K for a B.S., and approximately $127K for a new PhD.[19] Existing companies are hiring quickly to build their A.I. skills and new A.I. startups are forming every day, with more than 1281 new companies, which collectively raised more than $16 billion in the US alone in 2018.[20] [21] Overall estimates for the total economic value of A.I. to the world economy vary, but the Wall Street Journal[22] estimates total A.I. net new value to increase the world Gross Domestic Product (GDP) by 16 percent, which is about 13 trillion dollars by 2030. That works out to roughly a 1.6% growth in GDP per year.

A.I. deployment holds the potential to increase levels of productivity and create new products, which in turn lead to job creation and economic growth. PwC, a multinational professional services company, estimates that A.I. deployment could add $15.7 trillion to global GDP by just 2030. While all of this sounds positive, the benefits will not be widespread unless there is proper planning and execution of this technology.[23]

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[16] https://www.forbes.com/sites/bernardmarr/2018/11/16/the-amazing-ways-artificial-intelligence-is-transforming-genomics-and-gene-editing/#1b14abcb42c1

[17] https://www.csail.mit.edu/news/using-ai-predict-breast-cancer-and-personalize-care

[18] https://www.sciencedirect.com/science/article/pii/S1359644618300916

[19] https://www.payscale.com/mypayscale.aspx?pid=ac68d011-91e4-4ee1-bd4d-a8e690cbd281&surveyId=b6bc1a02-e5f6-4d7c-8c69-45b42e6b46e5

[20] https://www.forbes.com/sites/gilpress/2019/07/26/this-week-in-ai-stats-7-4-billion-invested-in-ai-startups-in-q2/#13852f8a1935

[21] https://venturebeat.com/2019/10/08/ai-startups-pace-break-funding-records-2019

[22] https://www.wsj.com/articles/the-worlds-that-ai-might-create-11571018700

[23] https://blogs.wsj.com/cio/2018/11/16/the-impact-of-artificial-intelligence-on-the-world-economy

B. POTENTIAL RISKS OF GROWING ARTIFICIAL INTELLIGENCE AND TECHNOLOGIES

While the potential benefits of A.I. are growing clearer by the day, there is a vast and growing literature on the potential risks and potential harms of A.I. technologies. These range from the practical challenges of regulating a rapidly evolving technology sector, to a variety of catastrophic and even apocalyptic scenarios.[24] In addition, the economic challenges and risks associated with implementing A.I. can be informed by prior applications of automation and information technologies.

The social implications of existing, emerging, and potential A.I. technologies are subjects of sustained research too voluminous to cover in any one report.[25] However, research points to the need for A.I. expertise to be developed in State government. Areas of concern addressed by the Task Force, and discussed by witnesses in some of the public hearings held, can be grouped into three parts, summarized as follows:

> ### i. Labor, Employment, and Economic Disruptions
>
> The economic challenges and risks associated with implementing A.I. can be informed by prior applications of automation and information technologies. The introduction of a new technology has, in many cases, resulted in the reduction of labor hours for accomplishing specific functions, and the application of new technology can also require additional training for workers. There is no question that in some industries automation has led to job loss and only by having an overall increase in economic activity can displaced workers find new jobs and new careers.[26] [27]
>
> In both Vermont and the United States overall, the manufacturing workforce has decreased in its proportion to overall employment, while manufacturing outputs have increased. This example is evidence of the employment dislocation that can occur when A.I. technologies are used for automation.
>
> A.I. also introduces new challenges for displaced workers because the technologies being deployed and created are a substitution of intellectual skills, rather than manual skills. A worker with manual skills and expertise will have the opportunity to move to a new job and new career relatively easily, while those that are employed to use applied intelligence may need a greater level of re-training to accomplish a similar wage position with similar intellectual challenges.
>
> Despite technological advances, many people are worried about the effect of A.I. on the job market. Elon Musk, CEO of Tesla, has even stated that A.I. is "summoning the demon."[28] Researchers from the University of Oxford and other institutions have worked hard to predict job displacement by A.I., but results have varied widely with estimates varying from 9 to 47 percent[29]. However, many of these models have bold assumptions. Most of these job loss predictions are not compared against current economic baselines and assume that

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[24] https://lawreview.law.ucdavis.edu/issues/51/2/Symposium/51-2_Calo.pdf

[25] https://ainowinstitute.org

[26] https://www.chronicle.com/article/Preparing-Today-s-Students/247310?utm_source=at&utm_medium=en&cid=at&source=ams&sourceId=197435

[27] https://ainowinstitute.org/discriminatingsystems.pdf.

[28] https://www.washingtonpost.com/news/innovations/wp/2014/10/24/elon-musk-with-artificial-intelligence-we-are-summoning-the-demon/

[29] https://www.americanactionforum.org/insight/understanding-job-loss-predictions-from-artificial-intelligence/

implementing A.I. systems is costless. This is not the case as companies, like Uber, are investing over $1 billion into its autonomous vehicle line. Some studies also rely on binary choice (either 0 or 1) for automation to estimate job loss, when jobs might be partly automated. This leads to predicted levels of job displacement that are likely inflated.

Automation and A.I. systems will continue to transform the nature of work, with profound implications for labor policy, employment, and working conditions across Vermont industries, including agriculture and farming, manufacturing, transportation, healthcare, and service industries. Vermont faces pressing questions about how to adapt its workforce to manage and keep pace with significant and rapid change. Lawmakers, members of state government, and workforce development partners will need to contemplate how to replace the jobs and associated tax revenue that will be lost to automation. Additionally, how to best educate future workers, and how to retrain existing workers to handle new technologies and participate in emerging industries will also need to be contemplated.

Given the potential for profound economic disruptions, Vermont will have to consider whether and how to ensure the economic impacts and benefits of A.I. technologies are distributed in a fair and just manner.

ii. Civil Liberties Concerns

The numerous threats to privacy and civil rights arising from the application of A.I. technologies in such critical areas as criminal justice[30], child welfare[31], health[32], housing[33], and finance[34] are well-documented. Among those concerns is the fact that A.I. systems and the algorithms are based on data—data that can reflect socioeconomic and historical biases, perpetuating those biases and resulting in outcomes that are both inaccurate and unjust[35]. One witness before the Task Force testified about the growing use of "CCOPS" (Community Control Over Police Surveillance) legislation to empower the public to decide if and how surveillance technologies are to be used.[36] Questions about online data privacy and security were also recurring themes in public hearings held by the Task Force.

As with other states that are starting to regulate uses of facial recognition software in order to protect privacy[37], Vermont will increasingly have to confront the growing impacts of A.I. technologies on Vermonters' civil liberties[38].

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[30] https://www.cnet.com/news/millions-of-surveillance-cameras-could-become-ai-security-guards-aclu-warns/
[31] http://kirwaninstitute.osu.edu/wp-content/uploads/2017/05/ki-predictive-analytics.pdf
[32] https://www.washingtonpost.com/health/2019/10/24/racial-bias-medical-algorithm-favors-white-patients-over-sicker-black-patients/
[33] https://www.theverge.com/2019/10/22/20925861/housing-algorithms-hud-landlord-discrimination-automated-tools-banks-lenders
[34] https://yjolt.org/sites/default/files/hurley_18yjolt136_jz_proofedits_final_7aug16_clean_0.pdf
[35] https://ainowinstitute.org/aap-toolkit.pdf
[36] https://www.aclu.org/issues/privacy-technology/surveillance-technologies/community-control-over-police-surveillance
[37] https://www.sacbee.com/news/politics-government/capitol-alert/article235940507.html
[38] https://vtdigger.org/2019/10/14/to-prevent-violence-vermont-schools-watch-what-kids-do-online/

iii. Difficulty of Comprehensive Regulation

A.I. technologies present enormous challenges to existing legal and regulatory regimes. A.I. raises new questions for traditional legal doctrine—including torts, intellectual property, and the First Amendment—as well as fundamental questions about how to apportion risk and assign liability. From a regulatory standpoint, A.I. policy is largely piecemeal, arising at the local, state, and federal levels in various forms. Whether and how different regulatory regimes can be harmonized to address complex or problematic A.I. applications remains an open question. Regulatory expertise is another challenge, as governments will generally lag behind the regulated industries that are rapidly developing the technologies to be regulated, and whose proprietary interests may be at odds with regulators' need for adequate information and transparency.

C. THE FUTURE OF WORK

As one can see in the previous section, the rise of artificial intelligence is associated with both benefits and risks to the nature of work in Vermont. Whether A.I. will create more jobs than it eliminates is a topic of great debate at this time as it has been in previous industrial revolutions such as the advent of steam power, electrification and computerization.[39] The most likely scenario is that A.I. will neither lead to widespread destruction of the working class, nor will it lead to economic bliss for a new leisure class. One thing that is certain is that A.I. will cause a major shift in the *type* of work that is done and commensurate job opportunities. Early studies[40] [41] indicate that A.I. will change the nature of tasks performed by nearly every class of worker. Interestingly, the data from several recent studies[42] indicates that the A.I. task content of both low and high-wage jobs will increase due to A.I. automation, while workers in mid-range jobs have the highest risk of job loss. For example, these referenced recent studies indicate that while most jobs involving manual labor will continue, the number of mid-level service jobs may well be reduced. At the same time the demand for high paying jobs - such as programmers and data scientists - will definitely increase as A.I. expands.

The Task Force found uncertain the extent to which A.I. will further contribute to wage and wealth inequality, either by causing unemployment or because the majority of the economic benefits will go to persons who already have the largest share of wealth and income. Addressing inequality, to the extent it is caused by A.I., will likely result in changes in tax and income maintenance policies that are beyond the competency of this Task Force, and no recommendations are made in this area. We note, however, that some states have established commissions to address the future of work as a result of new technologies, and the Legislature should monitor these initiatives to determine whether to focus on these issues.

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[39] Professor Stephanie Seguino, A.I. Task Force Testimony, February 22, 2019. *See Appendix D*.
[40] https://mitibmwatsonailab.mit.edu/research/publications/paper/download/The-Future-of-Work-How-New-Technologies-Are-Transforming-Tasks.pdf
[41] https://www.mckinsey.com/~/media/McKinsey/Featured%20Insights/Future%20of%20Organizations/The%20future%20of%20work%20in%20America%20People%20and%20places%20today%20and%20tomorrow/MGI-The-Future-of-Work-in-America-Report-July-2019.ashx
[42] https://www.brookings.edu/wp-content/uploads/2019/11/2019.11.20_BrookingsMetro_What-jobs-are-affected-by-AI_Report_Muro-Whiton-Maxim.pdf

What is clear is that the State of Vermont has a responsibility to help its current population understand how technology such as A.I. will change the skills needed for the jobs of the future work and give them the tools to train or retrain to meet those skills. Similarly, the State needs to help students who are in schools today understand the changing nature of work and help them understand both the promises and risks of these new technologies so they are prepared to take these jobs of the future. It must offer educational opportunities that will support the STEM economy and job opportunities in that economy. While the State may not be able to prevent or delay many of the job losses that will likely result from A.I. deployment, it can provide the infrastructure that can maximize job gains. The Task Force is making recommendations in the next part of this report that is intended to build that infrastructure.

PART 3: RECOMMENDATIONS

1. **RECOMMENDATION ON REGULATION**
   The Task Force does not recommend the promulgation of new, specific State regulations of A.I. at this time, however, the majority acknowledged that applications of A.I. are currently being regulated[43] and that additional regulation will be needed in the future.

Rationale

The Task Force has made recommendations which pertain to the need for regulation. The first is the creation of a permanent A.I. Commission that is charged with recommending legislative action, if any, to implement the Code of Ethics, or as a result of the Commission's study of A.I. and its effects. The second is the adoption of a Code of Ethics for A.I. development and use in Vermont. The Task Force concludes that the adoption of a Code of Ethics as a policy document to provide a roadmap for responsible and ethical development, and use of A.I. in Vermont, is an important first step to considering regulation. The permanent commission will be a better forum for recommending further regulation if any is necessary.

In reaching this recommendation, the Task Force believes that there are applications of A.I. that will require regulation; and is aware that there are already present proposals to regulate A.I. applications particularly with respect to autonomous vehicles – often known as driverless cars. While the Task Force was briefed on this regulation in general terms, it did not have time to get into the detail of such regulation.

2. **A PERMANENT ARTIFICIAL INTELLIGENCE COMMISSION**
   The Task Force recommends that the Legislature establish a permanent Artificial Intelligence Commission ("the Commission", "Commission") to study and monitor artificial intelligence development and use, and report to the Legislature and the Executive branches.

Rationale

As discussed above under "Part 2 of the report to the Legislature, artificial intelligence offers great opportunities for growing the economy of Vermont both from production and use of artificial intelligence applications. At the same time, it offers significant challenges particularly to privacy and to job availability. Like the internet, the nature and extent of the opportunities and challenges are not fully predictable, and it is critical that the State take steps along the way that support the positive results of A.I. and minimize the negative consequences. A commission of experts, stakeholders and citizens is needed to monitor and study A.I. growth, determine compliance with the code of ethics recommended below, and make recommendations to the Legislative and Executive branches on the adoption of policies, laws and regulations.

The Task Force recommends that the Commission have the following structure and responsibilities:

- The Commission should be approximately the size of the A.I. Task Force and contain a diverse membership of experts on A.I., stakeholders and citizens. Because the responsibilities of the

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[43] E.g.; testing of automated vehicles, facial recognition is currently banned from drone use.

Commission are broader than any agency of state government, with respect to A.I., the Commission should be independent and free standing. Like the Task Force, the membership should include representatives of state agencies that have some responsibility with respect to aspects and applications of A.I. in Vermont. It should include a Representative and a Senator.

- The Commission should be independent with an appropriation, and have a small staff; although it could be attached to an existing State Agency for administrative support and be funded, at least in part, by a direct appropriation; and it should be authorized to accept private or federal funding in support of its work if supported by an appropriation or approval of the Joint Fiscal Committee (JFC).
- The Commission should have a primary responsibility of publicizing and monitoring the code of ethics recommended below and making recommendations to the Legislative and Executive branches on policies, laws and regulations to implement and enforce the code of ethics.
- The Commission should be authorized to make other recommendations to the Legislative and Executive branch of policies, laws and regulations that its study and monitoring of A.I. indicate are necessary.
- The Commission should study and monitor all aspects of A.I. in Vermont. It should annually on or about January 1 of each year report to the Legislature, Governor and public on findings from its study and monitoring. The annual report shall specifically address the following:
    a. Economic opportunities that are and can in the future be available in Vermont and policies necessary to maximize those opportunities;
    b. The extent of use of A.I. applications by Vermont government and any actions needed to optimize that usage;
    c. The impact of A.I. usage in Vermont on the privacy interest of citizens and policies needed to protect the privacy and interests of Vermonters from any diminution caused by employment of A.I. by government or the private sector;
    d. The impact of A.I. on jobs and incomes in Vermont and policies needed to protect jobs and incomes from any adverse effects of A.I. usage in Vermont;
    e. The state of education on A.I. in the Vermont primary, secondary and higher education systems and the current level of such education, including education of A.I. ethics; and
    f. The Commission should issue such other reports it deems appropriate based on its work.

3. THE ADOPTION OF A CODE OF ETHICS

The Task Force proposes that the State of Vermont adopt the following draft Code of Ethics, based on the European Union Code of Ethics.[44] This Code of Ethics is intended to be a working, living document, that evolves over time to keep up with current practices in the field.

Rationale

In order to maximize the benefits and minimize the risks of artificial intelligence, there must be ongoing consideration of the principles that guide society's behavior in the development and use of this technology. Across the globe, scientists, ethicists, policy makers and many others have engaged in the important work of determining what is right and what is wrong in the creation and use of these new technologies. Vermont should join in this conversation. There have been various sources of proposed

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[44] https://ec.europa.eu/futurium/en/ai-alliance-consultation/guidelines#Top

Codes of Ethics for Artificial Intelligence.[45] We recommend that Vermont adopt the following Code of Ethics which is a summary based on the European Union's Code of Ethics, as a starting point for any future guidance or regulation in the field of artificial intelligence.[46] Vermont can be a leader in the responsible development and use of artificial intelligence by encouraging the community to constantly hold each other accountable to a common set of ethics.

The Task Force proposes that the State of Vermont adopt the following draft Code of Ethics, based on the European Union Code of Ethics.[47] This Code of Ethics is intended to be a working, living document that evolves over time to keep up with current practices in the field.

<div align="center">

PROPOSED CODE OF ETHICS

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A. Fundamental Rights: Adherence to the following fundamental human rights is the foundation of ethical A.I.:

i. **Human Dignity:** A.I. technologies should be developed such that it respects, serves, and protects humans' personal and cultural sense of identity, physical and mental integrity, and satisfaction of basic needs.

ii. **Individual Freedom:** Humans should have freedom to make life decisions for themselves, without sovereign intrusion, except to ensure that individuals or people at risk of exclusion have equal access to A.I.'s benefits and opportunities.

iii. **Respect for democracy/justice/law:** A.I. systems should serve to maintain and promote democratic processes, to honor the rule of law, and to respect the values and life choices of individuals.

iv. **Equality, non-discrimination and solidarity:** Equal respect for the moral worth and dignity of all human beings must be ensured, by development of A.I. systems whose operations cannot generate unfairly biased outputs.

v. **Citizens' rights:** A.I. technologies shall not infringe upon the wide array of citizens' rights, including the right to vote, the right to good administration or access to public documents, and the right to petition the administration.

B. Ethical Principles: The four A.I. ethical principles below are rooted in the fundamental human rights above and seek to improve individual and collective wellbeing, through the responsible development of A.I.

i. **Respect for human autonomy:** Humans interacting with A.I. systems must be able to keep full and effective self-determination over themselves and be able to partake in the democratic process.

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[45] https://www.privacyconference2018.org/system/files/2018-10/20180922_ICDPPC-40th_AI-Declaration_ADOPTED.pdf

[46] https://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai; http://www.europarl.europa.eu/RegData/etudes/BRIE/2019/640163/EPRS_BRI(2019)640163_EN.pdf

[47] https://ec.europa.eu/futurium/en/ai-alliance-consultation/guidelines#Top

ii. **Prevention of harm:** A.I. systems should neither cause nor exacerbate harm or otherwise adversely affect human beings, the natural environment, and all living beings.

iii. **Fairness:** The development, deployment and use of A.I. systems must be fair, ensuring equal and just distribution of both benefits and costs, and ensuring that individuals and groups are free from unfair bias, discrimination and stigmatization.

iv. **Explicability:** A.I. processes need to be transparent, the capabilities and purpose of A.I. systems openly communicated, and decisions – to the extent possible – explainable to those directly and indirectly affected.

C. Requirements of A.I.: The following technical and social requirements are recommended to support the implementation of the above A.I. ethical principles:

i. **Human agency and oversight:** Including fundamental rights, human agency and human oversight.

ii. **Technical robustness and safety:** Including resilience to attack and security, fall back plan and general safety, accuracy, reliability and reproducibility.

iii. **Privacy and data governance**: Including respect for privacy, quality and integrity of data, and access to data.

iv. **Transparency:** Including traceability, explainability and communication.

v. **Diversity, non-discrimination and fairness**: Including the avoidance of unfair bias, accessibility and universal design, and stakeholder participation.

vi. **Societal and environmental wellbeing:** Including sustainability and environmental friendliness, social impact, society and democracy.

vii. **Accountability:** Including auditability, minimization and reporting of negative impact, trade-offs and redress.

D. Use and Maintenance of the Code of Ethics: The Code of Ethics will be maintained by an Artificial Intelligence Commission (see *Recommendation 2* of this Part)**.** The A.I. Commission will work in regular collaboration with professional organizations and societies, businesses, educational institutions, and government agencies. The Commission will be an active partner in the national and global development of A.I. ethics and will consider ways to align state policy with national and international policy regarding the ethical and responsible development of A.I. technology.

Although no specific enforcement mechanisms are proposed at this time, the adoption of a Code of Ethics provides society with guidelines and creates opportunities for meaningful discussion about the ethical and responsible development of A.I. technology. A Code of Ethics, developed in a collaborative way, will influence decisions made by those working in the field as they consider ways to meet the standards that they have been engaged in creating.

The Commission will work with the education system on ways to implement the Code of Ethics throughout the educational curriculum.

4. BUSINESS AND ECONOMIC GROWTH INCENTIVES
The Task Force proposes that the Vermont Legislature explore incentives and mechanisms to promote

the growth of businesses engaged in the ethical development and use of artificial intelligence in Vermont. We find that immediate investment in this area would maximize potential economic benefits and help keep Vermont at the forefront of this technological revolution.

Rationale

One of the greatest benefits of A.I. is economic growth to the State. A.I. related jobs, like other high-tech jobs, can be high paying and environmentally friendly, and don't require significant investment in infrastructure. Vermont has been struggling to attract and retain the type of young talent needed by high-tech companies like A.I. startups. Vermont was recently rated as the state with the greatest likelihood that a highly educated worker in his/her/their thirties was likely to leave the State for better job prospects.[48] In an attempt to counter this 'brain drain', Vermont has recently initiated programs such as the *'Remote Worker Grant'*[49] program, which reimburses expenses up to $5,000 annually to remote workers relocating to Vermont. The Task Force feels that this type of incentive, though not specifically tuned to A.I. workers, is likely to succeed for the type of talent needed for A.I. startups in the State. In addition to these general measures, the Task Force proposes that the State engage higher education to develop pilot programs to increase the attractiveness of Vermont, specifically related to new A.I. startups.

A. The Task Force recommends that the State provide **access to accelerated computing.** The current 'training' phase of artificial intelligence can require access to accelerated computing. That type of computing can be cost prohibitive (e.g., $10K/month[50]) for small businesses. Access to local low-cost alternatives would be a powerful incentive to attract small A.I.-related business. The State already has resources that might be leveraged. For example, the State could work with institutions such as UVM which recently upgraded its *Deep Green* supercomputer[51] and already has a very affordable access program that is subsidized by the UVM for the entire state.

B. The Task Force recommends that the State **create co-working space(s) and provide mentoring support** for the community to develop and build artificial intelligence technology and associated businesses. For example, the State could work with Vermont colleges and Universities to explore the creation of an A.I. co-working and mentoring program for startups doing business in Vermont. The coworking space would allow managed access to a limited amount of space for early phase A.I. startups. Desk space would help the startups manage costs and would allow informal access to professors and graduate students for ad-hoc mentoring. It's also recommended that additional grants for development of hubs or co-location of other spaces be made available as well (e.g., generator spaces and places that offer businesses shared common amenities).

C. The Task Force recommends that **the Agency of Digital Services work with every State Agency and Department to consider ways to promote, measure, and assess the ongoing use of**

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[48] https://www.wired.com/story/how-smaller-cities-trying-plug-brain-drain/
[49] https://www.thinkvermont.com/remote-worker-grant-program/
[50] https://aws.amazon.com/ec2/pricing/on-demand/
[51] https://www.uvm.edu/uvmnews/news/uvm-completes-warp-speed-upgrade-its-supercomputer

artificial intelligence to improve efficiency and functioning of State Government. We propose that the Commission created above be tasked to initiate this effort and track its progress.[52]

D. The Task Force recommends that the State **experiment with a variety of small grants and competitions, administered by the Agency of Commerce and Community Development, to promote the development and use of artificial intelligence** to improve quality of life in Vermont. Here are some examples of possible categories of grants and competitions:

    i.   The State should **create a small grants program for towns and municipalities to promote the use of A.I. for the public good** in local government and town operations. For example, these grants can fund systems like that developed by the Town of Manchester which invested in a video system allowing actions in high school sports games to be streamed to the public.[53] Similar investments through small grants could make government and other public meetings more accessible through artificial intelligence throughout the state.

    ii.   The State should **create a grants program for small business innovation that promotes ethical use of A.I.** and identifies pressing issues for Vermont and it's A.I. solutions.

    iii.   The state should **create a regular cadence of A.I. competitions/"*hackathons*[54]", which incent the public to create innovative uses of artificial intelligence to solve state problems** and improve the lives of Vermonters. Examples would be to engage organizations like *'Code for Vermont'* to create A.I. Hackathons for public good.

5. INCREASED EDUCATION AND OUTREACH PROGRAMS

The Task Force proposes that the Vermont Legislature work with the Agency of Education to create programs to increase awareness of artificial intelligence among students, teachers and the general public.

Rationale

The Task Force believes that an educated populous is the best way to prepare the State for the growth of artificial intelligence. The Task Force therefore proposes that the State engage higher education institutions to develop pilot programs to increase STEM and A.I. outreach programs for each of the following populations. Specifically, the project will involve the following content for each target audience:

A. For **Vermont's K-12 students**, the Task Force recommends that the Vermont Agency of Education, working in partnership with Vermont higher education institutions, develop pilot programs (e.g., *First Robotics)* in local schools to increase the exposure of students to A.I. technologies, including the benefits and potential risks of A.I. technologies from a personal and societal perspective and the ethical standards for their development and use. The focus will be on building a passion and interest in STEM *(Science, Technology, Engineering and Math)* careers,

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54 https://www.techopedia.com/definition/23193/hackathon

while promoting responsible employment of the technologies involved. These projects will serve the double purpose to increase the skills of students interested in technology and expand the Vermont workforce of the future in new technologies including artificial intelligence.

B. For **Vermont K-12 teachers**, the Task Force recommends that the Vermont Department of Education working with the Vermont higher education institutions 1) organize outreach efforts to better serve Vermont's K-12 teachers involved in STEM education, and 2) provide additional training opportunities to help keep pace with rapidly evolving technologies such as artificial intelligence. The Vermont Agency of Education should be mandated, again working with higher education institutions, to create a training program specifically for those who teach Computer Science that includes maintained proficiency in A.I. and new computer science technologies. These specially trained teachers would enable students to acquire the relevant skill set for the STEM jobs needed in the state.

C. For the Vermont public, the Task Force recommends that the permanent Commission recommended in this report be charged with developing public events to educate the Vermont public on A.I. and emerging technologies including the benefits and risks and the ethical standards for their development and use. The commission should work with the State Government and civic organizations (e.g., Vermont Humanities Council; professional organizations, such as the Vermont Academy of Science and Engineering, the Vermont Bar Association and the Vermont Medical Society; makerspaces, libraries) to deliver these public events around the state reaching audiences of all ages. This outreach may include public talks, seminars, peoples' assemblies, demonstrations, debates, hackathons, websites, etc.

6. RETRAINING AND RESKILLING WORKERS

Recognizing that A.I. will change the nature of work nationally and in Vermont, there is a pressing need to retrain and train the existing and emerging workforce in the new skills that are needed to work with and on A.I. and other new technologies in a way that keeps pace with technological change. The Task Force recommends that the University of Vermont and the State colleges develop affordable and schedule appropriate courses for continuing education and worker retraining in to update technical skills in a way that is aligned with the 2019 Vermont Science and Technology plan and strategies.

PART 4: CONCLUSION

The Vermont Artificial Intelligence Task Force concludes that immediate action by the State of Vermont will maximize the benefits and minimize the risks of artificial intelligence. Artificial intelligence is a field that is growing and changing at increasing speeds, so fast that traditional structures of governance will eventually struggle to keep up. The State of Vermont should make investments in the promotion of the ethical development and use of artificial intelligence in Vermont through economic incentives, public/private partnerships, and the use of state resources through agency spending. A permanent Artificial Intelligence Commission, guided by a Code of Ethics, should cultivate ongoing research, outreach, engagement, education, and oversight through a public process. The ethical use and development of artificial intelligence can help to solve our greatest problems and improve quality of life while respecting the liberties and values Vermonters hold dear.

APPENDICES

A. STATUTORY CHARGE

No. 137. An act relating to the creation of the Artificial Intelligence Task Force. (H.378)

It is hereby enacted by the General Assembly of the State of Vermont:

Sec. 1. ARTIFICIAL INTELLIGENCE TASK FORCE; REPORT

(a) Creation. There is created the Artificial Intelligence Task Force to:

(1) investigate the field of artificial intelligence; and

(2) make recommendations on the responsible growth of Vermont's emerging technology markets, the use of artificial intelligence in State government, and State regulation of the artificial intelligence field.

(b) Definition. As used in this section, "artificial intelligence" means models and systems performing functions generally associated with human intelligence, such as reasoning and learning.

(c) Membership. The Task Force shall be composed of the following 14 members:

(1) the Secretary of Commerce and Community Development or designee;

(2) the Secretary of Digital Services or designee;

(3) the Commissioner of Public Safety or designee;

(4) the Secretary of Transportation or designee;

(5) one member to represent the interests of workers appointed by the President of the Vermont State Labor Council, AFL-CIO;

(6) the Executive Director of the American Civil Liberties Union of Vermont or designee;

(7) one member appointed by the Chief Justice of the Supreme Court;

(8) two members who are academics at a postsecondary institute, with one appointed by the Speaker and one appointed by the Committee on Committees;

(9) one member with experience in the field of ethics and human rights, appointed by the Vermont chapter of the National Association of Social Workers;

(10) one member appointed by the Vermont Society of Engineers;

(11) one member appointed by the Vermont Academy of Science and Engineering;

(12) one member who is a secondary or postsecondary student in Vermont, appointed by the Governor; and

(13) one member appointed by the Vermont Medical Society.

(d) Powers and duties. The Task Force shall study the field of artificial intelligence, including the following:

(1) an assessment of the development and use of artificial intelligence technology, including benefits and risks;

(2) whether and how to use artificial intelligence in State government, including an analysis of the fiscal impact, if any, on the State; and

(3) whether State regulation of the artificial intelligence field is needed.

(e) Meetings.

(1) The Secretary of Commerce and Community Development or designee shall call the first meeting of the Task Force to occur on or before

(2) The Task Force shall select a chair from among its members at the first meeting.

(3) The Task Force shall meet not more than 10 times and shall cease to exist on June 30, 2019.

(f) Quorum. A majority of membership shall constitute a quorum of the Task Force.

(g) Staff services. The Task Force shall be entitled to staff services of the Agency of Commerce and Community Development.

(h) Reports. On or before February 15, 2019, the Task Force shall submit an update to the Senate Committee on Government Operations and the House Committee on Energy and Technology. On or before June 30, 2019, the Task Force shall submit a final report to the Senate Committee on Government Operations and the House Committee on Energy and Technology that shall include:

(1) a summary of the development and current use of artificial

intelligence in Vermont;

(2) a proposal for a definition of artificial intelligence, if needed;

(3) a proposal for State regulation of artificial intelligence, if needed;

(4) a proposal for the responsible and ethical development of artificial intelligence in the State, including an identification of the potential risks and benefits of such development; and

(5) a recommendation on whether the General Assembly should

establish a permanent commission to study the artificial intelligence field.

(i) The update and report described in subsection (h) of this section shall be submitted electronically to the Senate Committee on Government Operations and the House Committee on Energy and Technology, unless otherwise requested.

Sec. 2. EFFECTIVE DATE

This act shall take effect on July 1, 2018.

B. TASKFORCE MEMBERSHIP

Jessica Vintinner	Agency of Commerce and Community Development Designee
Mark Combs	Agency of Digital Services Designee
Christopher Herrick	Department of Public Safety Designee
Joe Segale,P.E.	Agency of Transportation Designee
Jill Charbonneau	Vermont State Labor Council, AFL-CIO Appointee
James Lyall	American Civil Liberties Union of Vermont Designee
Justice (Ret.) John. A Dooley	Chief Justice of the Supreme Court Appointee
Professor Donna Rizzo	Post Secondary Institute Appointee of Senate Committee on Committees
Professor Eugene Santos, Jr.	Post Secondary Institute Appointee of the House of Representatives
Rep. Brian Cina	National Association of Social Workers Appointee (VT Chapter)
Brian Breslend,P.E. Chair	Vermont Society of Engineers Appointee
Dr. John Cohn	Vermont Academy of Science and Engineering Appointee
Milo Cress	Secondary/Postsecondary Appointee of Governor
Trey Dobson, MD	Vermont Medical Society Appointee
Kayla Dewey & Ryan Flanagan	Legislative/Administrative Support

C. FULL TASK FORCE MEETING AGENDAS & MINUTES

All Task Force meeting minutes and agendas can be found here:
https://accd.vermont.gov/economic-development/artificial-intelligence-task-force

D. PUBLIC HEARING ATTENDENCE LISTS & SUMMARIES; Written Comments on Proposed Final Report

Meeting #1: 5/30/19 - *Generator Makerspace (Burlington, VT)*
 Attendees: Nick Gingrow; John Burton; Maureen McElaney; Brie Hoblin; Joe O'Brien; Taylor Smith; Emily Piche; Addie Herbert; Matthew Silvia; Ben Allen; Tom Lyle; Davis McCarthy; Doug Webster; Leisa Fearing; Grace Ahmed; Sergei Serdyuk; Oddlie Cress; and Erin Hicks-Tibbles.

 Themes identified at meeting: Transparency issues, using A.I. as an economic development tool, eliminating bias, and future of task force's efforts.

Meeting #2: 6/25/19 - *Northern Vermont University (Lyndonville, VT)*
 Attendees: Christian Bradley Hubbs; Marty Feltus; Kim Hemmer; Ken Linsley; Mark Whitworth, Senator Jane Kitchel; Representative Kitty Toll; Representative Scott Campbell; and Jody Prescott.

 Themes identified at meeting: Autonomous vehicles, privacy concerns, effect on taxes, and different applications.

Meeting #3: 10/1/19: *Montshire Museum (Norwich, VT)*
 Attendees: Peter Rousmaniere; Grace Elletson; Jeff Chu; Paige Greenfield; Marcos Stafne; Devin Bates; Keith Tookey; and Chico Eastridge.

 Themes identified at meeting: Current definition of A.I., ensuring equity in A.I. use, net job gain/loss, and how to best regulate this technology.

Meeting #4: 10/10/19 - *Park House Activity Room (Manchester, VT)*
 Attendees: Jon Mathewson; Dave Potter; Emmett Stahl; Andrew McKeever; Ryan Van Meter; and Mike Cole.

 Themes identified at meeting: Manchester's autonomous streaming system, ownership of A.I. systems, use of A.I. in healthcare and law enforcement, and effects on democracy.

Meeting #5: 10/17/19 - *Champlain Valley Exposition (Essex Junction, VT)*
 Attendees: Michelle Weissman; Jeremy Huckins; Anselm Bradford; Eric Stormfield; Craig Roskam; Angelo Dorta; Eric Bronson; Christopher Pepe; Polly Mangan; Monique Bogue; Tom Dinitz; Paul Garrett; Fred Thodal; Sherra Bourget; Henry Amistadi; Michael Rooney; Chris Miller; John Villere; Benny Boas; Mike Veruxi; Alexana Wolf; Maureen McElaney; John Burton;

Dongdong Lin; Henry Wu; Coumba Winfield; George Eget; Brandon Mattiolo; Spencer Thomas; and Michael Bradshaw.

Themes identified at meeting: A.I. education, A.I. *vs.* machine learning *vs.* neural networks, and how to best ensure security/consumer protection with this technology.

Written Comments

From: Mike Cole (Vermont STEMcorps LLC)
Sent: Tuesday, January 7, 2020 6:27 PM
To: Flanagan, Ryan
Cc: Keefe, John
Subject: *Re: AI Task Force's Final Report*

Hi Ryan,

Thanks for sending out the draft report.

First, regarding the definition of AI on page 5: While I appreciate that the Task Force was faced with numerous definitions from numerous sources, the Merriam-Webster definition is undoubtedly the lowest common denominator, and isn't adequate.   Instead, I recommend that the Task Force use the AI definition that's in the Glossary Section of the EU Guidelines.

"Artificial intelligence (AI) systems are software (and possibly also hardware) systems designed by humans78 that, given a complex goal, act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured or unstructured data, reasoning on the knowledge, or processing the information, derived from this data and deciding the best action(s) to take to achieve the given goal. AI systems can either use symbolic rules or learn a numeric model, and they can also adapt their behaviour by analysing how the environment is affected by their previous actions.
As a scientific discipline, AI includes several approaches and techniques, such as machine learning (of which deep learning and reinforcement learning are specific examples), machine reasoning (which includes planning, scheduling, knowledge representation and reasoning, search, and optimization), and robotics (which includes control, perception, sensors and actuators, as well as the integration of all other techniques into cyber-physical systems)."

I also think the definitions section in the report needs to be expanded.   The Vermont Legislature and the public would benefit greatly from the Task Force differentiating different types of "AI" by defining (at least) these 3 categories:

* Artificial Narrow Intelligence (ANI)
* Artificial General Intelligence (AGI)
* Lethal Autonomous Weapons Systems (LAWS)

Doing so will help progress move forward in areas where AI is (or can be) "good", without being stymied because of problems/concerns in areas where AI is (or can be) "bad".

Second, looking at the report's proposed Code of Ethics (CoE), while it generally follows the EU Guideline's, it also abbreviates many of them, to a degree that important points are lost. For example, the following section was in the EU Guidelines on Democracy/Justice/Law but were edited out in the Commission's draft CoE:

"AI systems must not undermine democratic processes, human deliberation or democratic voting systems. AI systems must also embed a commitment to ensure that they do not operate in ways that undermine the foundational commitments upon which the rule of law is founded, mandatory laws and regulation, and to ensure due process and equality before the law."

In my opinion, this should in Vermont's CoE. Similar editing happens in several other sections of the draft CoE. I recommend that the proposed CoE more closely/thoroughly follow the EU Guidelines, and only exclude those sections/parts that are specifically for Europe and contrary to principles/practices in Vermont/USA.

And third, I recommend the Task Force consider adding an Appendix to the report of recommended additional reading. While I don't expect the Legislators will have the time to dig into it, the Task Force is a diverse team of highly skilled individuals from industry, government, and academia. By starting a recommended reading list now, the Task Force will be setting a standard that hopefully a permanent oversight commission on AI will continue to follow. There's lots of discussion already happening worldwide on AI, and lots of resources are available. (Isaac Newton's quote about him seeing further because he stood on the shoulders of giants applies here).

Overall, kudos to you and the Task Force on the draft --- you've all done a great job with it, and you deserve much thanks and credit for it!!!!

With kind regards,

Mike Cole
Vermont STEMcorps LLC

From: Stephanie Seguino (Department of Economics University of Vermont)
Testimony on the Impact of AI and Robots on Employment, Wages, and Inequality
February 22, 2019

Good afternoon, Members of the Task Force. I am testifying in my capacity as Professor of Economics at the University of Vermont. My area of specialization is labor markets and the macroeconomy with a focus on trends in inequality. I have prepared a PowerPoint presentation and here highlight the main points I would like to make regarding the impact of trends in the use of artificial intelligence (AI) and robots on labor markets, in particular wages and unemployment. I will share with you a synthesis of the research on this topic, as well as my assessment of it and thoughts on policies to mitigate negative effects of coming technological changes.

The central question that has been raised in the current debate about AI and robotization relates to whether these technological changes risk creating widespread unemployment, falling wages, and worsening income and wealth inequality. The context in which this debate takes place is the growth of inequality in the US and globally since the mid-1970s. The share of national income going to the very

rich has increased dramatically over that the last 40 years to a level not seen since the year prior to the Great Depression. Further, the labor share of income—that is, the share of national income going to workers—has declined as wages have failed to keep up with productivity growth. These trends affected low-wage workers first—particularly those with a high school education or less and, more generally, blue collar workers. However, more recently, we also observe that even for the college educated, wages have stagnated since 2000. These trends have been accompanied by a decline in the labor force participation of working age adults, rising insecurity of work, and an increase in the share of workers with multiple jobs due to short hours. This brief summary underscores the anxiety with which new forms of TC are taking place, reflecting concerns about job shortages and rising inequality in the future.

In this context, I would like to make the following points:

• AI and robots are a newer form of technological change (TC) but TC has been a fact of life in capitalist economies since the 1800s. Until now, TC has been accompanied by the growth of productivity and employment, despite the fact that much TC has been labor-saving (i.e., labor-replacing). The newer types of technological change differ from the past, however, in that they not only substitute for routinized tasks and brawn; they also supplant cognitive tasks, with a greater potential for affecting middle- and high-income workers.

• Recent studies have emphasized the potential loss of entire occupations due to TC. Frey and Osborne (2013), using data on 700 occupations, find that 47% of US employment is at risk of elimination in the next 10-20 years due to computerization. This is a theoretical paper that evaluates the probability occupations will be computerized based on the problems engineers need to solvein order for jobs to be automated. The characteristics of those problems are matched to different occupational characteristics. Jobs that are least susceptible to computerization are those that demand dexterity and manipulation, creative intelligence, and social intelligence. The authors find that the most vulnerable jobs are in office and administrative support, sales and related occupations, and production jobs. Those with the least exposure are jobs requiring social intelligence (education, healthcare, arts, media, management and business) and creative intelligence (STEM).

• The outcome of these and other processes (such as globalization) has been job polarization. Middle-income jobs are in decline, especially those in manufacturing. At the two extremes, there has been a growth of knowledge-intensive jobs as well as low-wage service jobs.

• A key question regarding the impact of new forms of TC is whether the quantity of jobs is fixed or not. One view is that TC will replace workers (or at least some tasks of workers), lowering overall labor demand and driving up unemployment. This prediction assumes that the number of jobs is fixed and thus any TC that replaces workers will lead to increased unemployment. This is a not necessarily the case since TC is likely to stimulate job growth in other occupations. Also, government policy can influence the impact of TC on unemployment and wages.

• More detailed analyses, including those by David Autor and others, emphasize that every occupation includes a variety of tasks, not all of which are susceptible to elimination from AI and robots. Predictions of entire occupations being eliminated are, as a result, overstated. A more likely scenario than the complete elimination of occupations is that the range of tasks performed will change with TC, as they have, for example, with bank tellers, administrative assistants and even radiologists. Moreover, evidence from history shows that the effects of TC on productivity growth in some occupations can spur increases in demand for labor in other occupations.

• How the benefits of productivity growth are distributed will affect how TCaffects workers and employment opportunities. TC in theory should raise productivity (that is, increase output per worker). There are four possible ways to distribute the benefits of productivity growth from AI and robots.

1. Firms could lower prices of the goods they sell. This would stimulate demand and employment.

2. Firms could also share the gains of productivity growth with workers in the form of higher wages, again stimulating demand and job growth.

3. Firms could reduce worker hours, without reducing wages.

4. Or firms could retain the benefits of productivity growth in the form of higher profits. This would widen inequality and would be likely to lower demand and employment. The latter outcome has been the trend since the mid-1970s, contributing to the growth of inequality. The key factor in how the benefits of TC are distributed is the relative bargaining power of workers and firms as well as how competitive markets are. The greater the degree of concentration in industries, the more likely firms are to retain the benefits of TC in the form of higher profits rather than lowering prices or raising wages. More than 75% of US industries have experienced an increase in concentration levels over the last two decades. This factor, along with globalization, a declining value of the minimum wage, and the decline of unions have weakened the bargaining power of workers over the last 3 decades. These factors, more than TC, have contributed to the growth of inequality and downward pressure on worker wages.

• Government can attenuate these negative effects on wages and unemployment, including negative effects of TC, through a variety of actions:

1. Implementation of robust worker retraining programs for displaced workers

2. Increase in the minimum wage to boost worker bargaining power

3. Improvement and equalization educational outcomes across groups (particularly by class and race)

4. Support for lifetime learning,

5. Use of tax policy to insure fair distribution of benefits of TC, such as by taxing robots, raising the top marginal tax rates, and adopting a Universal Basic Income.

E. ARTIFICIAL INTELLIGENCE INVESTGATIONS BY STATE AND LOCAL GOVERNMENT; FEDERAL POLICY

ARTIFICIAL INTELLIGENCE INVESTIGATIONS IN STATE AND LOCAL GOVERNMENT

As the text states, Vermont was the first state to launch a formal investigation into artificial intelligence and recommended policies with respect to development and use. It was preceded by one City investigation in New York City and has been followed by two state investigations by New York State and the State of Alabama. The following is a description of these activities and more narrowly focused investigations in other states, along with one report from a quasi-state agency in California. It also describes a new proposed policy from the United States Office of Management and Budget.

1. New York City – The New York City Automated Decision Task Force was created by New York City Local Law 49 of 2018. The Task Force was required to investigate and make recommendations with respect to New York City Agency automated decision systems. The law defines an automated decision system as "automated decision system used by an agency to make or assist in making decisions concerning rules, policies or actions implemented that impact the public." New York City Local Law 49 of 2018, § 1(a).[55]

    The Task Force was appointed by the Mayor and must include, among others, two types of members: (a) "persons with expertise in fairness, accountability and transparency relating to automated decision systems" and (b) "persons affiliated with charitable corporations that represent persons in the city affected by agency automated decision systems." See New York City Local Law 49 of 2018 § 1(a)(2). In fact, most of the members are officials in the New York City Government.

    The Task Force reported in November of 2019. The report is on the New York City website at https://www1.nyc.gov/site/adstaskforce/index.page.

    Note that the mandate of this Task Force is much narrower than that of the Vermont Artificial Intelligence Taskforce because the inquiry was only into the effects of use of A.I. by New York City Agencies.

2. New York State – Act No. 110 of 2019, adopted and effective July 24, 2019 created the New York state artificial intelligence, robotics and automation commission "to study and make determinations" on the following list of subjects[56]:

    "(a) current law within this state addressing **artificial intelligence**, robotics and automation;

    (b) comparative state policies that have aided in creating a regulatory structure for **artificial intelligence**, robotics and automation, and whether such measures would be similarly effective in this state;

    (c) criminal and civil liability regarding violations of law caused by entities equipped with **artificial intelligence**, robotics and automation;

    (d) the impact of **artificial intelligence**, robotics and automation on employment in this state;

    (e) the impact of **artificial intelligence**, robotics and automation on the acquiring and disclosure of confidential information;

    (f) potential restrictions on the use of **artificial intelligence**, robotics and automation in weaponry;

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[55] https://www1.nyc.gov/site/adstaskforce/index.page.
[56] https://www.nysenate.gov/legislation/bills/2019/s3971

(g) the potential impact on the technology industry of any regulatory measures proposed by this study; and

(h) public sector applications of **artificial intelligence** and cognitive technologies.

The commission has thirteen members, appointed generally by the Governor and Legislative leaders, plus one member appointed by the Chancellor of the State University of New York, and one appointed by the Chancellor of the City University of New York. The Commission must report by December 1, 2020.

A Governor's announcement of his signing of the bill and what is expected from the commission is at https://www.governor.ny.gov/news/governor-cuomo-signs-legislation-creating-new-state-commission-study-artificial-intelligence.

3. Alabama -- 2019 Alabama Laws Act 2019-269[57] established the ALABAMA COMMISSION ON **ARTIFICIAL INTELLIGENCE** AND ASSOCIATED TECHNOLOGIES. It is charged with reviewing and

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[57] The Act commences with a list of WHEREAS clauses relating to the impact of technology development on the Alabama economy:
WHEREAS, technology and **artificial intelligence** have the capacity to improve the lives of the citizens of this state; and
WHEREAS, the resources that are invested into Alabama's technology industry and **artificial intelligence** are critical to creating the industries of the future, including autonomous cars, industrial robots, and algorithms for disease diagnosis; and
WHEREAS, maintaining the nation's global leadership helps insure that technology is developed in a manner that is consistent with the nation's values, policies, and priorities; and it is important to have skilled workers and businesses in Alabama who are on the forefront in leading the country's development of technology and **artificial intelligence**; and
WHEREAS, as technological innovations take place, the quality of life improves; and
WHEREAS, in 2018, net technology related employment in Alabama increased by nearly 1,900 new workers, a 1.3 percent increase over 2017; since 2010, net technology employment has grown by over 10,000 new jobs with more than 147,000 workers; technology jobs account for approximately 7.1 percent of Alabama's workforce; and the technology sector had an estimated direct economic impact of $13.4 billion, which is about 6.8 percent of Alabama's total economy; and
WHEREAS, tens of thousands of people rely on technology in the Alabama workplace; and the broad-based impact of the technology industry touches every community, company, and industry across Alabama; and
WHEREAS, Alabama has seen a 57 percent increase in the number of job postings related to emerging technologies, smart cities, drones, **artificial intelligence**, virtual and augmented reality, and blockchain; and
WHEREAS, by the year 2026, net technology employment is projected to grow by 6.8 percent in Alabama; and
WHEREAS, multiple technology occupations in Alabama have experienced yearly growth, including over 3.7 percent for software and web developers, over 3.1 percent for computer support specialists, and over one percent for network architects, administrators, and support specialists; and
WHEREAS, Alabama's technology industry, including **artificial intelligence**, has a positive impact on the state's workforce and economy now and in the future; and
WHEREAS, our nation urgently needs workers and businesses skilled in **artificial intelligence** and capable of leading our country's development and application of **artificial intelligence** into the future; and
WHEREAS, it is imperative that **artificial intelligence** be developed in a way that does not compromise our American values, civil liberties, and freedoms; and

advising the Governor and the Legislature "on all aspects of the growth of artificial intelligence and associated technology in the state and the use of artificial intelligence in governance, health care, education, environment, transportation, and industries of the future such as autonomous cars, industrial robots, algorithms for disease diagnosis, manufacturing, and other rapid technological innovations and their effect on society and the quality of life in a manner consistent with our American values and for the benefit of Alabama citizens. The commission shall consider whether the Legislature should establish a permanent commission on artificial intelligence."

The Commission has 18 members, all of which, other than legislators, must have one or more of the following qualifications: Expertise in matters relating to artificial intelligence, workforce development, technology, ethics, privacy, or computer science. Of the 18 members, 10 are appointed by the Governor; 4 are appointed by the legislative leaders; two are appointed by the Lieutenant Governor, at least one of whom shall be an employee, board member, or trustee of an Alabama public community college or a four-year public institution of higher education; 1 is the Secretary of Commerce, or his or her designee; and 1 is the Secretary of Information Technology, or his or her designee.

Not later than May 1, 2020, the commission shall submit to the Governor and Legislature a report on the findings of the commission and recommendations as the commission may have for administrative or policy action relating to artificial intelligence. The report shall be available electronically and posted on the website of the office of the Governor.

4. Washington – Some states have looked at aspects of the effects of artificial intelligence rather than the whole subject. Washington created the Washington Future of Work Task Force, Revised Code of Washington Annotated, § 28C.25.010 (2018), to look at the future of work, motivated by forces that are changing the nature of work, including A.I. Its charge is to:

(a) Inventory and periodically assess trends and factors that are current or potential drivers of transformation of industries and work in Washington;
(b) Identify policies and practices that will help Washington's businesses, workers, and communities thrive economically, while responding to rapid changes in technology, workplace practices, environmental and security issues, and global interdependence;
(c) Recommend mechanisms and structures for sustainable industry sector partnerships through which employers and workers can collaborate to support their sector's growth in Washington; and
(d) Create a policy framework that supports a talent development pipeline and lifelong learning structure that:
(i) Prepares Washington's young people to navigate careers and workplaces of the future;
(ii) Helps workers keep their skills up-to-date or retrain for new careers when needed;

WHEREAS, understanding and preparing for ongoing development of **artificial intelligence** and the development of a well-educated workforce in these technologies are critical to the economic prosperity of Alabama and the nation; now therefore,

(iii) Enables attainment of credentials that are portable, transferable, and cost and time efficient;
(iv) Provides opportunities for instructional staff to keep pace with changes in their disciplines and related occupations; and
(v) Allows for collaborative applied research between businesses, instructional staff, and students to learn concurrently about new technology and assist companies with adoption**.**

The task force is made up of two members of the House of Representatives, two members of the Senate, six labor representatives and six business representatives.

The Task Force issued its report in December, 2019. It can be found at Future of Work Task Force, 2019 Policy Report, https://www.wtb.wa.gov/wp-content/uploads/2019/12/Future-of-Work-2019-Final-Report.pdf.

5. California – The Governor of California, by Executive Order N-17-19 at https://www.gov.ca.gov/wp-content/uploads/2019/08/Future-of-Work-EO-N-17-19.pdf, in August of 2019 established the California Future of Work Commission made up by 15 to 22 members appointed by the Governor. Its mandate is similar to that of the Washington Task Force. The Commission has a website at https://www.labor.ca.gov/labor-and-workforce-development-agency/fowc/. It must report by May 1, 2020.

6. Other reports are cited and described in the body of the report. Also, although not official state bodies, like the Vermont Artificial Intelligence Task Force, at least one other body has issued recommendations for state action with respect to artificial intelligence. See the report of the California Little Hoover Commission, Artificial Intelligence, A Roadmap for California at https://lhc.ca.gov/sites/lhc.ca.gov/files/Reports/245/Report245.pdf.

7. A few days before the Vermont Artificial Intelligence Task Force met to finish and vote on its report, the United States Office of Management and Budget issued draft Guidelines for Regulation of Artificial Intelligence , Jan.7, 2020, which can be found at https://www.whitehouse.gov/wp-content/uploads/2020/01/Draft-OMB-Memo-on-Regulation-of-AI-1-7-19.pdf. The purpose of the document is to present guidelines on regulation of A.I. By federal agencies, but some of the guidelines read like ethics standards. Because of the timing of their release, the Task Force did not have the opportunity to consider these draft guidelines.