

Artificial Intelligence Asia-Pacific Case Competition 2018 Top 10 Case Submissions



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About APRU and The New York Times



APRU is a network of 50 leading universities connecting the Americas, Asia and Australasia. Chaired by UCLA Chancellor Gene Block, we bring together thought leaders, researchers, and policy makers to collaborate on effective solutions to the challenges of the 21st century.

As the voice of knowledge and innovation for the Asia-Pacific region, we have the responsibility to understand the risks of powerful new technologies.

APRU is:

- Partnering with APEC on policies for data science education
- Advancing projects which address the social implications of new technologies, the future of work, and technologies for aging societies.

APRU is committed to ensuring:

- that our societies are equipped educationally for changes in employment, social interaction, and the role of citizens
- that the benefits of new technologies reach those who need them not only those who can afford them
- that we pursue the application of A.I. in achieving the United Nations Sustainable Development Goals
- that rights to privacy and academic autonomy are protected.

Further, we seek to strengthen our collaboration across the borders of nation, sector, institution and discipline in order to build trust for the challenges ahead.

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Introduction

The rapid evolution of artificial intelligence promises social, economic and environmental benefits. Governments, businesses and researchers are also focused on the risks and ways to mitigate them.

The 2018 APRU-New York Times Student Case Competition on Artificial Intelligence attracted entries from 114 students representing 24 universities in 12 countries or economies.

The competition required students to write an 800-word policy brief for a political leader or public official on the best ways to ensure that social goals are built into A.I. research and development, and that the benefits of A.I. are shared equitably for sustainable development, demonstrating how risks might be mitigated.

I wish to congratulate the winning team from the University of Auckland, Marcus Wong, Jaffar Al-Shammery Bui, and Tomu Ozawa; the runners-up from the National University of Singapore, Samuel Lim Tien Sern and Marissa Chock Kay-Min; and, in third place, the team from Nanyang Technological University, Lim Zhi Xun and Tan Ghuan Ming Nigel. Their submissions demonstrate the fundamental importance of having a diversity of voices in shaping an A.I. world which works for the benefit of all.

I also wish to acknowledge the entrants from other universities. It was a privilege to have such a talented field from which to select. Participants posed important questions to our region's leaders and provided practical recommendations for the inclusive and sustainable development of A.I.

As an association of leading research universities around the Pacific Rim, we believe it is our responsibility to engage our societies in understanding and addressing the ways A.I. will impact social equity in its many forms (e.g. race, gender, class, religion), environmental sustainability and public accountability for effective forms of governance.

We are most grateful to The New York Times for its partnership and for publishing extracts from the winner's article in its International Edition.

I would also like to thank the judges from The Times's award-winning newsroom, Phillip Traynor and Jim Hollander, and academic judges from the APRU network: Professor Kar Yan Tam, Dean of HKUST Business School; Professor Jiro Kokuryo, Vice President for International Collaboration, Keio University; and Dr. Sabrina Lin, Vice President for Institutional Advancement, HKUST.

As the voice of knowledge and innovation in the Pacific, APRU will continue to use its unique geographical reach to bring together the region's brightest minds to focus on the key challenges faced by our societies.

Christopher Tremewan

Secretary General
APRU

Winner

1st Runner-up

2nd Runner-up

Winner

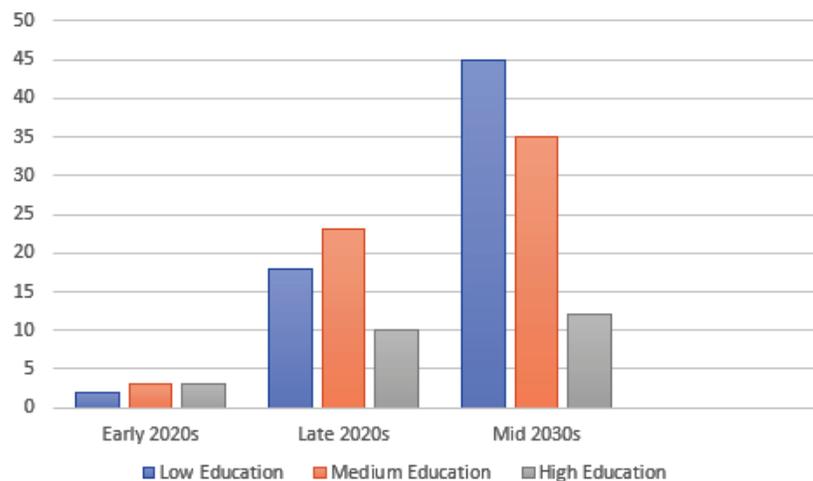
Artificial Intelligence: How A.I. is Edging Its Way into Our Lives

University of Auckland

Marcus Wong, Jaffar Al-Shammery Bui, Tomu Ozawa

The growing application of A.I. in society brings a plethora of benefits, from boosting productivity to reworking processes to reduce error. However, A.I. also poses some serious risks to our current social structure. The potential for this technology to cause inequitable distribution of benefits is highly probable without proper policy (Specialty, 2017).

Expected Job Automation by Education Level in OECD*



*Extrapolated from OECD PIAAC data

While the risks are real, this should not come as a surprise. As with any innovation of great magnitude, change represents risk. Previous eras of innovation, such as the industrial revolution, were often contentious in its time regarding its potential threat to society (Choi, 2017).

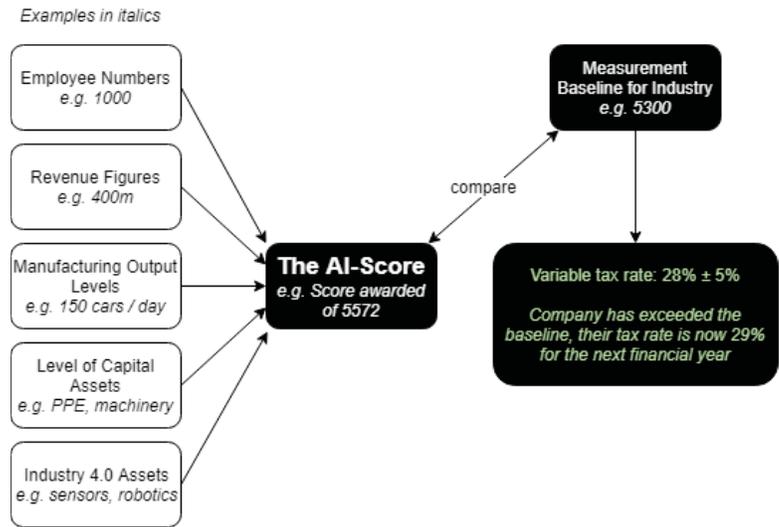
This brief posits that it is not A.I. itself that poses a risk to society, but rather the careless application of A.I. The challenge lies in finding the best ways to guide socially mindful utilization of A.I. to ensure risks are mitigated, while encouraging technology adoption in a healthy manner. To accomplish this, the brief provides three cohesive recommendations that seek to ensure sustainable practice of A.I.:

- (1) Implementation of an A.I.-Score metric to guide enterprise taxation
- (2) Building the infrastructure of a Universal Basic Income system
- (3) Facilitating communication streams between regulators, researchers and businesses

Recommendation 1: The A.I.-Score

To promote the healthy growth of A.I. in the workplace, we propose an A.I.-Score metric. This score would be calculated for businesses and depend on the ratio of productivity output from automated/intelligent systems versus human work. Agreed target baselines will be established for different industries, and company tax rates for the following year will vary based on whether a company has met its target.

A.I. as it currently stands is a pure productivity boost for businesses; a one-off cost with little upkeep relative to a human wage. By implementing a variable tax rate instead of the flat 28% in New Zealand, profit-minded businesses are incentivised to think twice before completely automating operations in their company.



The approach can be adopted in New Zealand by engaging in negotiation with the International Organization for Standardization (ISO) to develop a process for businesses to follow to report their scores. Pacts akin to the environmental treaties held by the United Nations (UNFCCC, 2012) should be explored to ensure that open discussion is maintained between countries, unions and researchers.

The ISO is no stranger to adopting metrics to nurture public policy. Successes in the adoption of greenhouse gas accounting standards (ISO, 2006), such as ISO14064, have already allowed

for the implementation of effective emissions trading scheme policies. This is a testament to the potential a scoring approach has for ensuring that the benefits of A.I. are shared equitably and sustainably.

Recommendation 2: UBI

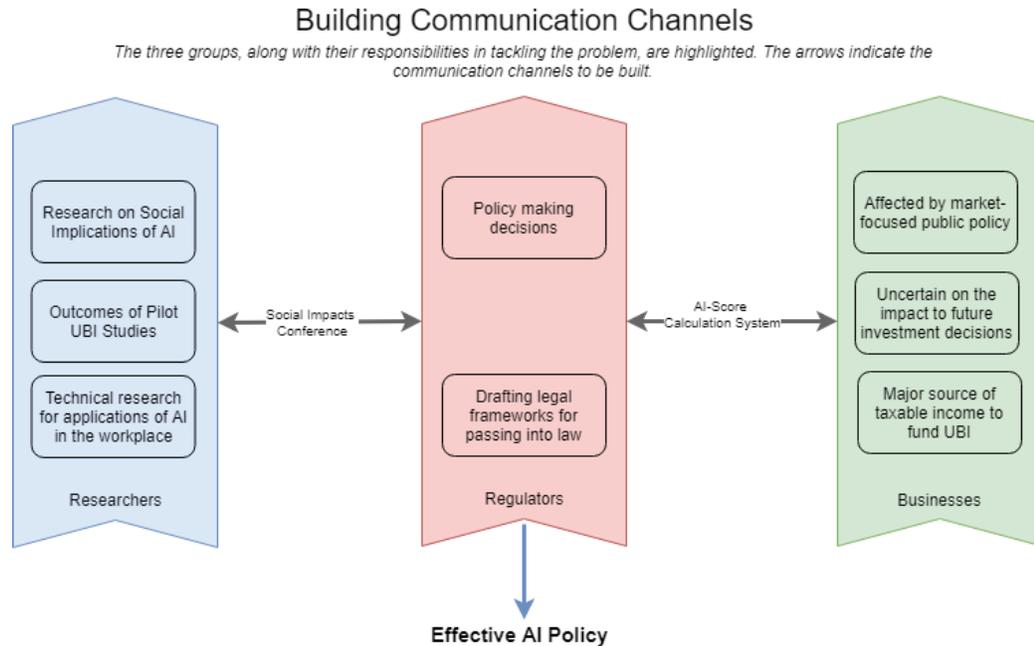
Universal Basic Income (UBI) is an initiative that shows evidence of constructing a future with minimal income inequality. UBI involves an indiscriminate issuance of a fixed amount of money, per month, to every individual in a country. This allows a basic social “floor” to be established. Research dating as far back as 2001 has shown that an unconditional annual income can assist with reducing the poverty gap (Wright, 2001) and coincides with modern sustainability theories indicating UBI’s effectiveness in balancing human, financial, natural and manufactured capital (Paul Ekins, 2008).

New Zealand is a perfect test subject for universal basic income. With a safe political structure and subsidized education systems, UBI provides a buffer for underprivileged citizens to upskill in the face of automation, while still fulfilling their basic needs. It is of absolute importance that such policy is discussed and engaged with before the private entities take the idea of “productivity maximization” to extremes with no recourse.

The residual income from A.I. score-based taxation can assist in the initial funding of Universal Basic Income. This allows us to safely shift from welfare-based systems to UBI with limited risk.

Recommendation 3: Open Channels

Our final recommendation aims to connect researchers, regulators and businesses together with open communication streams. We propose the establishment of a conference focused on the Social Impacts of Artificial Intelligence, which aims to combine policy-based discussion and the latest published research. We also propose a state-developed online system for businesses to calculate the impacts of investment decisions on their A.I.-Score, to aid decision making. Transparency between these three groups is of utmost importance for our measures to be successful, and for agility to change in the face of technological evolution.



We have proposed three policy suggestions that New Zealand can adopt, to lead the world in tackling these universal issues. Building the infrastructure for a sustainable society is difficult; the rise of automation and A.I. in the workplace can potentially cause disastrous effects on lower socioeconomic groups. Thus, it is a necessity to establish policy which will build social goals into the use of A.I. before it is too late.

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1st Runner-up

Artificial Intelligence: A Policy Proposal

National University of Singapore

Samuel Lim Tien Sern, Marissa Chok Kay-Min

Introduction

The application of Artificial Intelligence (“A.I.”) has accelerated in the recent decade due to improved data storage, streamlined algorithms and more powerful computers. However, these developments pose new social, economic and political challenges. This proposal sets out three recommendations that aim to assist Singaporean policy makers in navigating these uncharted waters.

Recommendations

A. The Ministry of Manpower should cooperate with corporations and educational institutions to implement professional reskilling programmes

Although A.I.-enabled automation will generate new jobs, it will also displace existing ones. McKinsey Global Institute estimates that by 2030, 24% of work activities in Singapore will be displaced by automation.¹ Workers employed in labor-intensive, repetitive and low-skilled vocations are particularly vulnerable.²

Efforts should be made to prepare these workers for the inevitable transition. For a start, the Ministry of Manpower should provide monetary incentives to companies that reskill workers for new roles within the organization. Research shows that such companies adapt most effectively to change as fresh hires can only partially compensate for the expertise gap.³ Active efforts to retrain employees diminishes resistance to structural change while reinforcing the company’s commitment to its people. Companies also retain the training investments made in their existing employees, thereby saving on termination packages and recruitment costs.

¹ McKinsey Global Institute. (2007). *Jobs lost, jobs gained: Workforce transitions in a time of automation*. Manyika, J., Lund, S., Chui, M., Bughin, J., Woetzel, J., Batra, P., Ko, R., Sanghvi, S.

² Graetz, G. and Michaels, G. (2015). *Robots at Work*. IZA Discussion Papers from the Institute for the Study of Labor, 8938. <http://econpapers.repec.org/paper/izaizadps/dp8938.htm>

³ Lin, D.Y. (2018, June 20). *Reskilling is smart way forward*. *The Straits Times*, retrieved from <https://www.straitstimes.com/forum/letters-in-print/reskilling-is-smart-way-forward>

Simultaneously, the Ministry of Manpower must cooperate with educational institutions to provide unemployed individuals with the financial incentives and training courses necessary for reinventing themselves. This safeguards against the destabilizing effects of a widening intellectual and income disparity while paving the way for a smooth economic transition when A.I. fully matures.



B. The Ministry of Education should promote the study of A.I. among a broader profile of students to ensure representation and fairness in A.I. systems

A.I. is notoriously susceptible to bias arising from unrepresentative data sets.⁴ Unfortunately, demand for cheap, crowd sourced data tends to produce data that over-represents those population segments that frequently interact with data-aggregating software, namely the socioeconomically advantaged.⁵ Consequently, it is no surprise that Amazon's delivery service consistently bypasses certain minority communities,⁶ or that the use of predictive policing systems strongly correlates to greater police harassment incidents involving persons from minority-dominated neighborhoods.⁷ Additionally, biases in A.I.-healthcare applications can potentially result in misdiagnosis or wrongful treatment of individuals from underrepresented groups.⁸

⁴ Misra, I., Zitnick, C.L., Mitchell, M., & Girshick, R.B. (2016). Seeing through the Human Reporting Bias: Visual Classifiers from Noisy Human-Centric Labels. 2016 IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2930-2939.

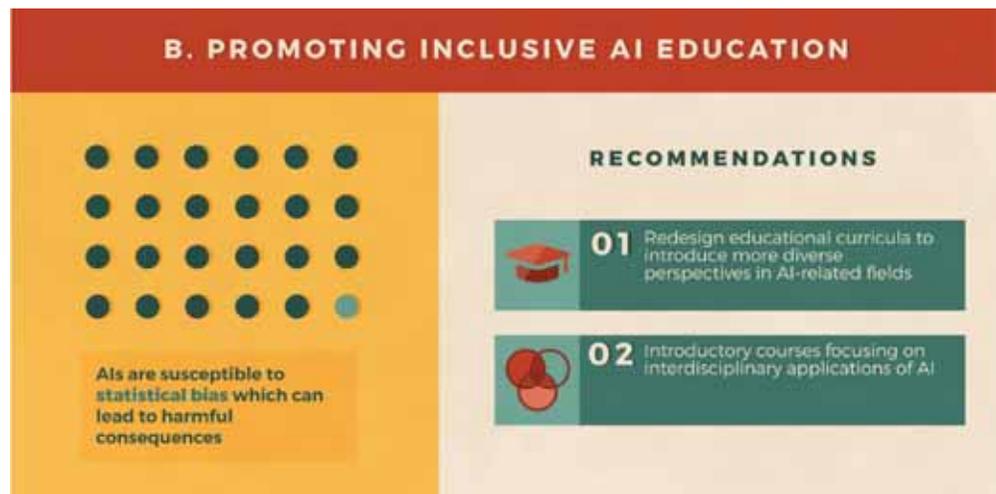
⁵ Levendowski, A. (2017). How Copyright Law Creates Biased Artificial Intelligence. *Washington Law Review*, 579. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3024938##

⁶ Ingold, D. and Soper, S (2016, April 21). Amazon Doesn't Consider the Race of Its Customers. Should It? *Bloomberg*, retrieved from <https://www.bloomberg.com/graphics/2016-amazon-same-day/>

⁷ Solon, O. (2017, March 13). Artificial Intelligence is Ripe for Abuse, Tech Researcher warns: "A fascist's dream". *The Guardian*, retrieved from <https://www.theguardian.com/technology/2017/mar/13/artificial-intelligence-ai-abuses-fascism-donald-trump>

⁸ Caruna, R., Yin, L., Gehrke, J., Koch, P., Sturm, M., Elhadad, N (2017). *Intelligible Machine Learning for Critical Applications Such As Health Care*. 2017 AAAS Annual Meeting. Retrieved <http://people.dbmi.columbia.edu/noemie/papers/15kdd.pdf>

Crucially, these selection biases cannot be extricated from the social biases (conscious or otherwise) of the largely homogenous group that designs A.I. systems. This underscores the need to promote diversity in A.I.-intensive fields, starting with a revision of educational curricula. For example, the Ministry of Education should initiate a program similar to that adopted by Princeton University, which offers both an engineering and a Bachelor of Arts (“BA”) degree in computer science.⁹ An education in both fields introduces more diverse perspectives to what is presently a predominantly homogeneous concentration. Alternatively, introductory courses focusing on interdisciplinary applications of A.I. can improve access to the STEM (Science Technology Engineering Math) fields and attract a diverse group of potential A.I. enthusiasts.¹⁰ Notably, an education-based approach has been shown to level the male-female divide in STEM fields without requiring A.I. innovators to practice affirmative action.¹¹



C. Regulators should articulate industry-specific standards for the use of A.I. based on principles of accountability and transparency

Big data and A.I. have brought into focus the ways in which aggregated personal data can be used to influence, exploit or oppress individuals through abuses of privacy. Online advertising companies like Facebook have occasionally leveraged data on users’ emotional states to target emotionally vulnerable individuals.¹² Recently, the Cambridge Analytica scandal demonstrated how A.I. systems could be used to manipulate political beliefs. Similarly, A.I. management systems have been developed to monitor employee work performance.¹³

⁹ Rexford, J. (2018, April). *The Role of Education in AI (and vice versa)*. McKinsey & Company, retrieved from <https://www.mckinsey.com/featured-insights/artificial-intelligence/the-role-of-education-in-ai-and-vice-versa>

¹⁰ *Ibid.*

¹¹ *Ibid.*

¹² Levin, S. (2017, May 1). *Facebook told advertisers it can identify teens feeling 'insecure' and 'worthless'*. The Guardian, retrieved from <https://www.theguardian.com/technology/2017/may/01/facebook-advertising-data-insecure-teens>

¹³ Greenwald, T. (2017, March 10). *How AI Is Transforming the Workplace*. Wall Street Journal, retrieved from <https://www.wsj.com/articles/how-ai-is-transforming-the-workplace-1489371060>

Accordingly, there is a pressing need to remedy the power imbalance between entities that gather data and individuals who create that data. To tackle this issue, regulators in A.I.-intensive sectors should create sector-specific transparency and accountability guidelines with a view to distilling these principles into legislation. Specifically, public service sectors (e.g. law, healthcare and education) should be prohibited from utilizing opaque A.I. algorithms.¹⁴ After launching an A.I. system, companies should be required to monitor their algorithms through a periodic, transparent and rigorous process.¹⁵ Public consultations should be held regularly to ensure that the accountability and transparency guidelines remain consistent with prevailing standards of conduct. Finally, data protection impact assessments should be made compulsory so as to compel those creating and buying A.I. systems to expressly disclose the nature, purpose and scope of their programs.¹⁶ To avoid impeding innovation, these guidelines should ultimately be tailored to industry-specific needs.



Conclusion

As A.I. systems are integrated across multiple sectors, the effects of A.I. will continue to expand. History shows that the unregulated use of technology without regard for its broader implications can completely destabilize society. Unless decisions are made to prepare for the future, society may find itself overtaken by A.I.'s inexorable movement into the unknown.¹⁷

¹⁴ Campolo, A., Sanfilippo, M., Whittaker, M., Crawford, K., *AI Now 2017 Report*. New York. Retrieved from https://ainowinstitute.org/AI_Now_2017_Report.pdf

¹⁵ *Ibid.*

¹⁶ See EU General Data Protection Regulation 2016/679

¹⁷ Icons Used in Infographics:

Book by Himmah Kamil for The Noun Project. Retrieved from <https://thenounproject.com/search/?q=book&i=1869463>

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2nd Runner-up

Policies for The Next Digital Revolution: “01000001 01001001”

Nanyang Technological University
Lim Zhi Xun, Tan Ghuan Ming Nigel

Artificial Intelligence (A.I.) promises to become an important driver of economic growth, and to provide solutions for pressing problems such as healthcare¹. While governments study how their citizens will be affected, the industry continues to develop rapidly.

As an early adopter, Singapore has invested heavily to be the world's A.I. hub, committing US\$110 million across five years for A.I. research² and establishing A.I. Singapore as the research coordinating body. In 2016 alone, US\$1.98 billion worth of contracts were awarded³ to expand A.I.-ready infrastructure under its Smart Nation initiative. Additionally, the government supports and collaborates with A.I. incubators⁴ and accelerators.

In the coming decades, A.I. could create better jobs, augment productivity, and double Singapore's economic growth⁵. However, it could also worsen inequality⁶, destroy many more jobs, and replace half⁷ of today's work⁸. Service-sector and low-skilled⁹ jobs are most vulnerable. As A.I.'s sophistication and impact grow beyond the scope of existing policies, legal and ethical concerns such as data bias, discrimination and privacy become increasingly critical.

Singapore is well-positioned for A.I.'s growth, but there is a need to begin preparing for potential disruptions without hampering innovation. To ensure equitable benefit and sustainable growth, this policy brief provides four recommendations:

- (1) **Legal and Ethical Systems:** Current ethical and legal systems are inadequate for A.I.'s growing implications. “Light-touch” regulations promote growth¹⁰, but regulatory foundations are necessary to guide ethical development. In anticipation of prevalent robot ownership, South Korea drafted its Robot Ethics Charter¹¹ in 2007 and Intelligent Robots Development and Distribution Promotion Act¹² in 2008; Germany recently drafted the world's first ethical rules for self-driving cars¹³.

Singapore is setting up an advisory council¹⁴ to help develop ethical standards and governance frameworks for A.I. and data, which will also issue advisory guidelines and codes of practice that companies can voluntarily adopt. It is also reviewing its Personal Data Privacy Act¹⁵ with regards to A.I. We recommend introducing a compliance system to complement existing efforts. The system will build on A.I. Singapore's findings and rollout research-backed ethical guidelines and regulations to deter ethical breaches. The guidelines encourage diversity and checks to manage data-bias, while the system disincentivizes unethical outcomes and damages.

- (2) **Participative Growth:** Robust upskilling schemes currently exist as part of Singapore's promotion of productivity and lifelong learning¹⁶. In addition, Singapore's tripartite^a partners work together to develop Industry Transformation Roadmaps, which guide PMETs^b and improve job mobility. Non-PMET jobs are unpopular¹⁷ and face the highest risk of replacements. Yet, low-skilled workers often have few alternatives. Although well-instituted education systems make the low-skilled a shrinking demographic, ensuring equitable participation entails larger commitment to this vulnerable group.

We recommend building on current tripartite efforts by defining foundational skills proficiency standards based on forecasted job requirements, and creating a simplified platform to prescribe courses to help non-PMETs meet these standards. Accessibility should be enhanced by expanding course subsidies and absentee payrolls, especially for non-PMETs. Lastly, union officers should strengthen outreach and offer personalized employment advice, to help vulnerable workers benefit from the initiatives and participate in the future economy.

- (3) **Strengthen Social Safeguards:** Singapore's existing social safety nets (i.e. supplemented wages and mandated retirement savings contributions) build on the premises of self-reliance and full-time employment¹⁸. While reskilling measures outlined in recommendation (2) improve employability, A.I.-led disruptions may still cause lasting unemployment¹⁹. Singapore must future-proof its social security. While Universal Basic Income or Flexicurity are not immediately feasible, social security systems must be expanded to include part-time jobs and the gig-economy, and review existing means-testing in preparation of widespread unemployment. Singapore should begin researching sustainable funding sources for increased social spending. Fruitful avenues might include scalable taxes on A.I., automation, pollution, financial transactions and extreme wealth. Once viable sources are identified, these taxation systems must be implemented progressively, to allow Singapore's economy to remain competitive and reactive for the medium-to-long-term horizon.
- (4) **Foster Growth:** To promote interest and digital literacy, Singapore should incorporate programming into its early education. In 2014²⁰, England became the first country to mandate coding classes in primary schools. Currently, coding is offered as optional primary-school enrichment programs in Singapore. While crowded curriculums may not accommodate additional subjects, Singapore could emulate Estonia's rollout of coding in early education²¹, where teachers are required to integrate technology into their syllabus. We recommend that the education ministry evaluate existing curriculums to integrate coding into relevant subjects (e.g. math), while the National Institute of Education begins to train more teachers capable of teaching programming. Additionally, grants and challenge competitions can incentivize and encourage interest and innovations in targeted areas of A.I.-development, for students and public alike.

In sum, these recommendations work on strengthening Singapore for A.I.'s growth and its potential disruption to the economy, through policy guidance, and preparing social institutions and future generations for the next digital revolution.

^a Tripartism is a unique institution of Singapore, where committees constituting equal representations between the government (Ministry of Manpower), employers (Singapore National Employers Federation) and employees (National Trades Union Congress) are consulted on labor policies, employment trends and other concerns.

^b Professionals, Managers, Executives and Technicians, generally middle-to-highly skilled labor.

Figure 1: Infographic - A.I. Industry Growth

Data source: <https://towardsdatascience.com/15-artificial-intelligence-ai-stats-you-need-to-know-in-2018-b6c5eac958e5>

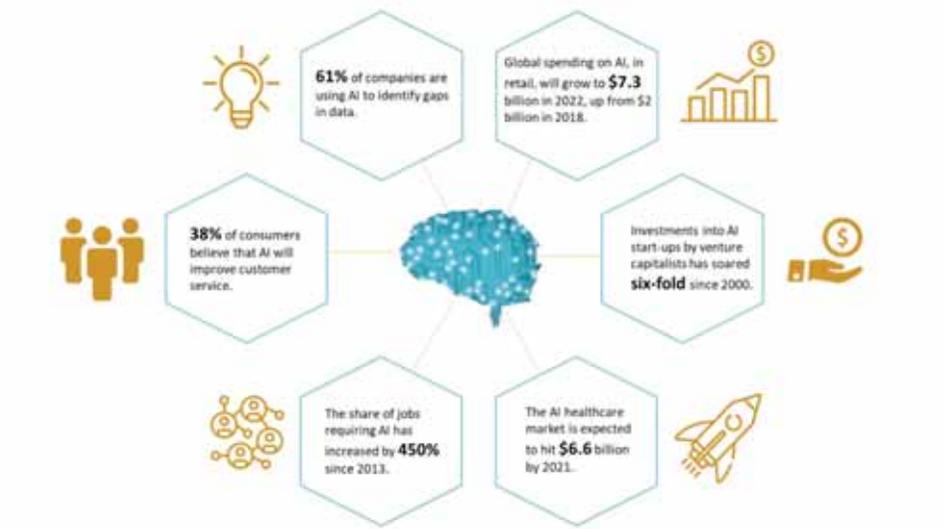


Figure 2: Bubble Chart - A.I. and Automation Job Risk by Education Level

Recreated from job probabilities and industry employment figures from <https://www.bloomberg.com/graphics/2017-job-risk/> and http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf

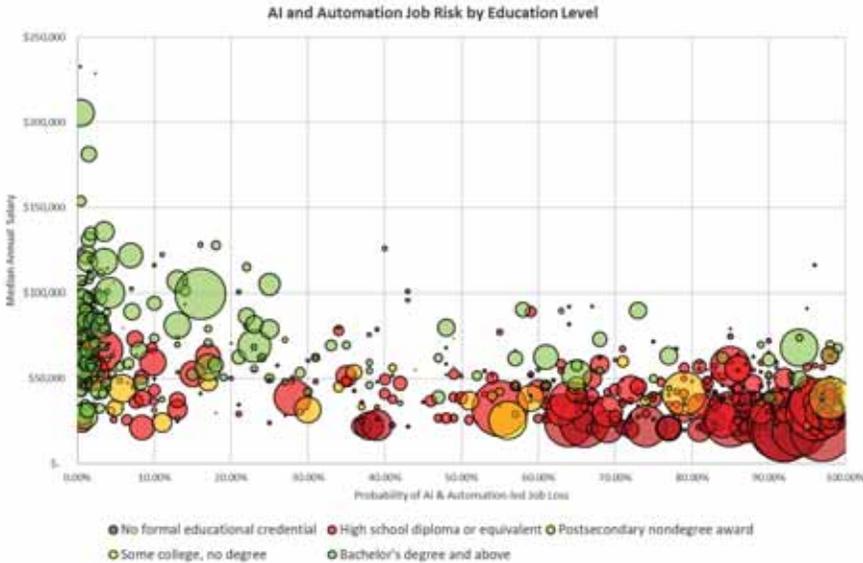
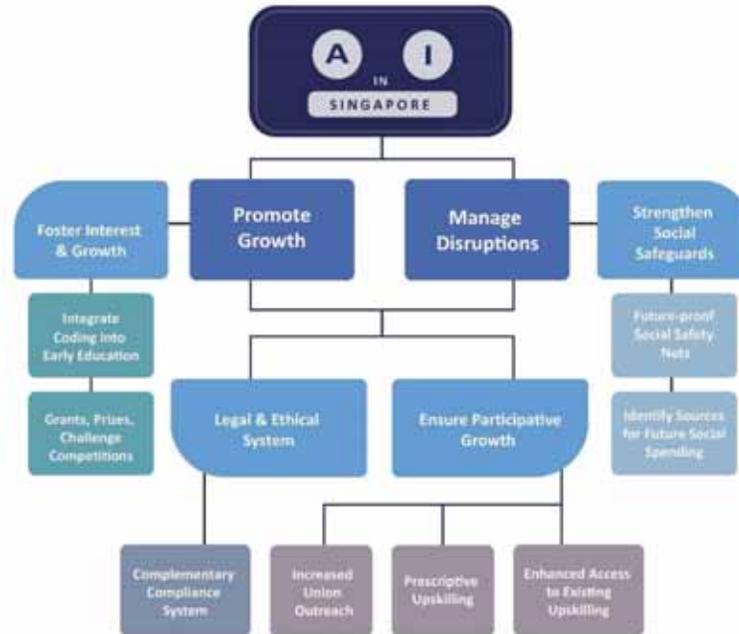


Figure 3: Policy Recommendation Framework - Promoting Growth and Managing Disruption

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Other Entrants

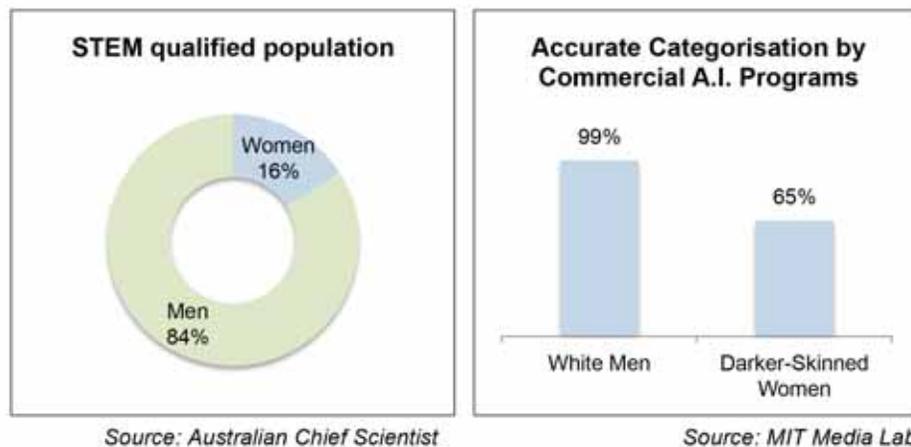
Artificial Intelligence Developed Intelligently

Lena Wang

University of Sydney

Executive summary

A.I. algorithms are quickly gaining prominence in social interactions, dictating how people communicate, take transport, and make decisions. Algorithms are a product of their programmers' biases, therefore it is vital that biases are eradicated when such algorithms are enscathed in social paradigms. However, the largest gender disparity in fields of study is in STEM – where men drastically outnumber women. Disparity in class, sexuality, and race are also apparent. This will inevitably and inadvertently result in powerful but biased algorithms, further entrenching social inequality, and narrowing the output of innovative research.



We recommend firstly, the establishment of an autonomous, female working group tasked specifically with A.I. education policy, secondly, incentives for female STEM teaching and mentoring roles, thirdly, to make computer science and its ethics mandatory in schools, and fourthly, to implement social, inter-school technology networks and outreach programs.

Current policy

The 2018 budget committed \$4.5m to a 'girls in STEM' toolkit and the placement of a 'women in STEM' ambassador. Concurrently, it committed \$29.9 million to upskill Australian workers in

A.I. and to establish an A.I. ethics framework. While these initiatives are to be lauded for their recognition of key issues, they are limited in recognizing the systematic complexities in the underrepresentation of women in STEM and A.I. development.

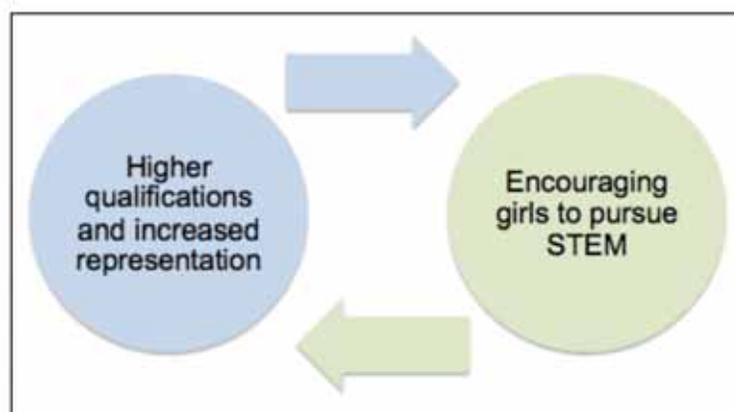
The 'girls in STEM' toolkit, firstly, includes as one of its key objectives "assist[ing] girls to understand the diverse types of careers... including nontechnical and non-traditional roles". Combined with the government's attempt to 'feminize' the high school physics syllabus this year by replacing a focus on mathematics with essays, this demonstrates a lack of meaningful engagement with girls' STEM education. Not only does it entrench existing stereotypes, it results in a reduction in the quality of a rigorous scientific education for girls, and conflates systematic barriers to girls' interest in STEM with their lack of technical ability.

Secondly, while upskilling Australian workers in A.I. now is necessary, it is an ad hoc solution to the lasting impacts of A.I. on employment and living conditions. Computer literacy must begin from a young age such that the development of A.I. in the future will not result in displacement or biases. Thirdly, an education in STEM for girls must focus more on A.I. and computer literacy as that is the field in which the algorithms governing our future are developed. Their presence in this specific industry in the future must therefore be ensured early.

Recommendations

Firstly, we recommend the implementation of an autonomous, female-only A.I. education policy working group. The group should include established educators and engineers alike, such that a successful synthesis of education and well-grounded technical skill can be developed. Secondly, while the policy appoints one women in STEM ambassador, we recommend the offering of incentives for highly qualified female mentors and teachers with backgrounds in STEM to establish mentor relationships with girls in schools. The amount offered should correlate with the education level of such mentors, to encourage both the attainment of higher education for graduated women and also the resources to pass that knowledge down to younger girls. This creates a positive feedback cycle of education and representation, where girls can interact meaningfully and personally with role models and propel their participation along the pipeline.

Effects of Incentivization



Thirdly, we recommend that computer science and its ethics are made mandatory subjects in schools. Computer literacy is progressively important and future employees need to know how to operate efficiently within the paradigms of an increasingly data-driven world. Essential to this education is realising that scientific progress is never independent from sociological impact and teaching critical reflexivity to children from an early age such that potential impacts like entrenching biases are mitigated pre-emptively.

Fourthly, we recommend establishing social, inter-school technology networks and outreach programs to low socioeconomic schools. This will build technological empathy in regards to mitigating algorithmic biases, as children learn how to interact and lead in technical fields, as well as engage a diverse population of future innovators thus widening the number of positive contributions.

Benefits and limitations

Implementation will take time, and noticeable results will only emerge after a few years. However, this long-term approach will not only prevent entrenching systematic inequality, but also propel the economy and future innovations by widening the research pool. This therefore requires the support and commitment of many iterations of governmental leadership. With a data-driven paradigmatic shift comes the risk that negative consequences are ignored in favor of rapid progress. Regulation must therefore continue to be updated over the long term to take this into account.

Shaping a Human-Centered Artificial Intelligence Framework

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University of Hong Kong

Artificial Intelligence is now deeply intertwined with how we interact with information technology, the government, and one another. Tech companies face a crisis of trust in misusing their data and technology capable of unprecedented surveillance and absolute censorship, requiring a delicate balance between regulation and freedom of expression in our technology. The issues of data and algorithmic biases that generate discrimination remain unresolved. A.I. thrives in regulating the content and information underlying many of our products and services, and yet the question remains: how do we evaluate the effects of A.I. on humans across a spectrum of rights?

The first step is to establish a human-centered institute framework to continue developing do-good, responsible A.I. technology fully vested in human interest. The best A.I. technology fulfills its potential to serve humanity, enhances human ability, and displays collaboration between human and machine. We require an acceptable and universal framework for conducting such support, which can be achieved by expanding upon existing infrastructure that remains universally applicable. Incorporating the Human Rights Framework and the United Nations Declaration of Democracy with the more abstract Asilomar principles and Google's Equality of Opportunity principles can altogether provide a rich practical basis for ensuring A.I. goals are aligned with human interests, and in protection of our rights: to work, to privacy, and most importantly, to civil political rights such as free expression.¹

Framework Components

1) Establish Interdisciplinary Teams

While developing a review framework to focus A.I. on a human-centered approach, we require social dynamics, regulatory checks, and outcomes to be taken into consideration. The review framework should be flexible and adaptive, consisting of interdisciplinary collaboration across a diverse community of humanists and scientists. These interdisciplinary teams oversee that A.I. technology is responsibly integrating social dynamics and evaluating social outcomes.

¹ Stanford GDPi and Stanford, "Human-Centered AI: Building Trust, Democracy and Human Rights by Design," Medium, July 09, 2018, accessed July 31, 2018, <https://medium.com/stanfords-gdpi/human-centered-ai-building-trust-democracy-and-human-rights-by-design-2fc14a0b48af>.

2) Identify Potential Threats, Account for Liability, and Establish Checklists

We must maintain an emphasis on taking social objectives into research priorities. Determining the pros and cons when evaluating A.I. technology considers who it helps, who it harms, its intended benefits and consequences, as well as its potential for misuse. The ethical debate around A.I. revolves around ethical agents and liability issues. In the instance of malicious A.I., does the designer accept all human responsibility? Presently, no mechanism exists around designer ethics other than abstract theories such as the Asilomar principles. We require a critical assessment of the checks and balances in technicians' processes of complex computation models in machine learning. Additionally, it is crucial to prepare unbiased fact sheets as data setup impacts the outcomes of machine learning, as well as establish checklists to identify and acknowledge bias in algorithms. The algorithms should be developed with the goal of reducing structural bias and disparity between gender, ethnicity and age to improve on equity².

3) Applying Algorithms to Auditing

While the review framework guides interdisciplinary teams of experts in their operations, the issue of biased data producing discriminatory data labels can potentially be resolved with the solution of Algorithmic Fairness proposed by Cynthia Dwork³. Differential Privacy is a security guarantee; a set of techniques that retain the privacy of individuals within a large database without fear of identification⁴. Additionally, Google's Equality of Opportunity in Supervised Learning⁵ can serve as guidelines for reducing biases in data models. Multidisciplinary collaboration is essential to reduce discrimination in machine learning.

Application to Hong Kong

The significance and urgency for a human-centered framework is ever more relevant in light of China's continued development of the Greater Bay Area (Fig. 1) into a leading center of technological development. Launched in May 2018, Hong Kong's very first A.I. Lab has tens of millions of Hong Kong dollars of investment, supercomputers and technology from Alibaba and SenseTime⁶, in collaboration with Hong Kong Science and Technology Parks Corporation (HKSTP). With government funding of HK\$40 billion allocated to HKSTP, and another HK\$10 billion allocated to healthcare and A.I. research clusters, Hong Kong now has access to national level funds that

² Please see the Fig. 2: Human-Centered AI development goal of Equity & Inclusion

³ James Zou and Londa Schiebinger, "AI Can Be Sexist and Racist — It's Time to Make It Fair," *Nature* 559, no. 7714 (July 19, 2018): , doi:10.1038/d41586-018-05707-8.

⁴ Kevin Hartnett and Quanta Magazine, "Making Algorithms Fair: An Interview With Cynthia Dwork." *Quanta Magazine*, www.quantamagazine.org/making-algorithms-fair-an-interview-with-cynthia-dwork-20161123/.

⁵ Google, "Attack Discrimination with Smarter Machine Learning." Google, research.google.com/bigpicture/attacking-discrimination-in-ml/.

⁶ Zen Soo and Philia Siu, "SenseTime Joins Alibaba Group to Nurture AI Start-Ups in Hong Kong." *South China Morning Post*, *South China Morning Post*, 21 May 2018, www.scmp.com/tech/chinatech/article/2147055/sensetime-joins-forces-alibaba-group-nurture-ai-start-ups-hong-kong.

⁷ Leading Facial Recognition company. For more information, please see: Russell, Jon. "China's SenseTime, the World's Highest Valued AI Startup, Raises \$600M." *TechCrunch*, *TechCrunch*, 8 Apr. 2018, techcrunch.com/2018/04/08/sensetime-raises-600-million/.

were once exclusive to mainland Chinese researchers⁷. With strong policy support and funding from Beijing, Hong Kong's academic freedom should not be compromised. Considering that the approval of innovation projects on the national level is carried out by independent experts, Hong Kong remains in a state where national policy does not encompass all aspects of cross-border policy.

Aside from funding, Hong Kong has a need for a coherent and clear policy for research and development in collaboration with mainland China. Thus, to maintain Hong Kong's free speech and democracy, and to continue to engage with those with differing political views who coexist on the same platforms, we must maximize transparency of policy and adhere A.I. technology to a human-centered framework.

Ultimately, Hong Kong's funds should be directed to ensure artificial general intelligence (AGI) incorporates human values, reinforces human dignity, and benefits humans⁸. As humans now commonly assist A.I.s in applications like hate speech filtering on social media⁹, no longer is the human-A.I. interaction solely one-sided, with A.I. assisting humans. Instead, we now sustain a reciprocal mutualistic relationship¹⁰.



Figure 1. Google Maps. China's Bay Area. Map data ©2018 Google.

Retrieved July 30, 2018, from <https://www.google.com/maps/@22.3990326,113.2568244,190274m/data=!3m1!1e3>. Screenshot by author.

China's Bay Area: 6890km² of land. Projected by 2030, to produce the highest GDP among global bay areas including Tokyo, New York, San Francisco.

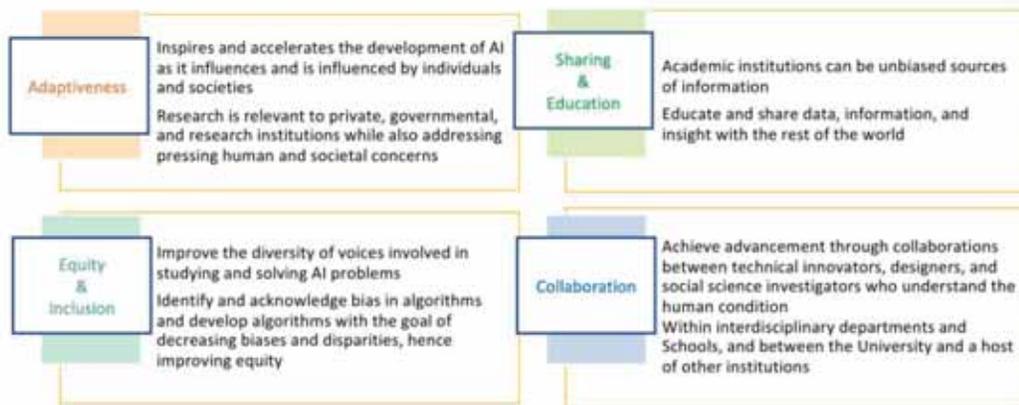
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Figure 2:

Stanford's Human-Centered A.I. research values:

**Figure 3:**

Core Issues in the A.I. Ecosystem:

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How Asean Can Feed A.I. the Right Data

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Executive Summary

Artificial intelligence (A.I.) development is on the rise, and regulators are scrambling to ensure that the algorithms are fair and responsible. Although the United States and China are two large economies that are making strides in this field, Asean still has some lead time to draft and implement the appropriate regulations and policies before its smartest A.I. developers begin to gain traction.

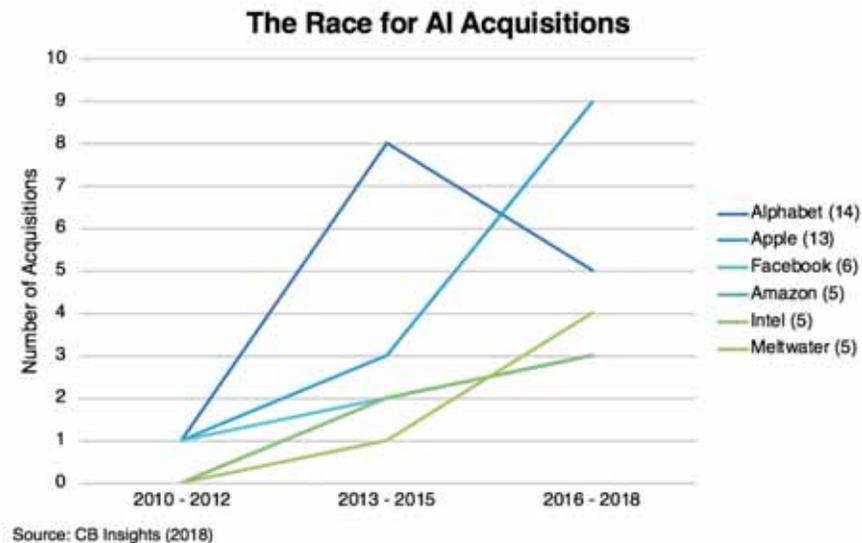
Currently, there one crucial problem with A.I.: they are only as smart as the data they feed on. The data sets that are presently used by most—if not all—A.I. developers are still biased and do not represent the population fairly. Biased data lead to biased algorithms, eventually yielding biased outputs. In order to prevent Asean from going down this problematic spiral, this problem needs to be addressed at its roots: the data itself. This policy brief recommends a three-prong approach for Asean to feed A.I. more representative data.



A map depicting Asean's member states. Source: United Nations (2012)

The Situation

A.I. is far too prevalent for regions such as Asean to undermine its existence. PwC estimates that A.I. would make up \$15.7 trillion of the global economy by 2030¹. Technology giants have been on an acquisition spree: Alphabet acquired 14 companies since 2010, followed by Apple with 13 and Facebook with 6².



Although the development of the A.I. field in the industry is arguably beneficial for world economies, A.I. is only as good as the data it parses. The problem of biased data is crucial as the world is relying more and more on data-based decision making. This fundamental flaw could have serious repercussions for people affected by the outcome of the aforementioned algorithms. UC Berkeley's Deirdre Mulligan encapsulates it simply: "The data isn't fair."³

The implications of algorithmic bias can be life-changing for certain marginalised demographics that are not represented fairly in the data used to train A.I. systems. From calculations of credit ratings to the severity of prison sentences to the pricing insurance packages, the numerical outcomes from these algorithms could yield prejudiced results depending on how the algorithm identifies you, the data input. Microsoft's Kate Crawford said that biased data may, in the future, be "influencing our core social institutions."⁴

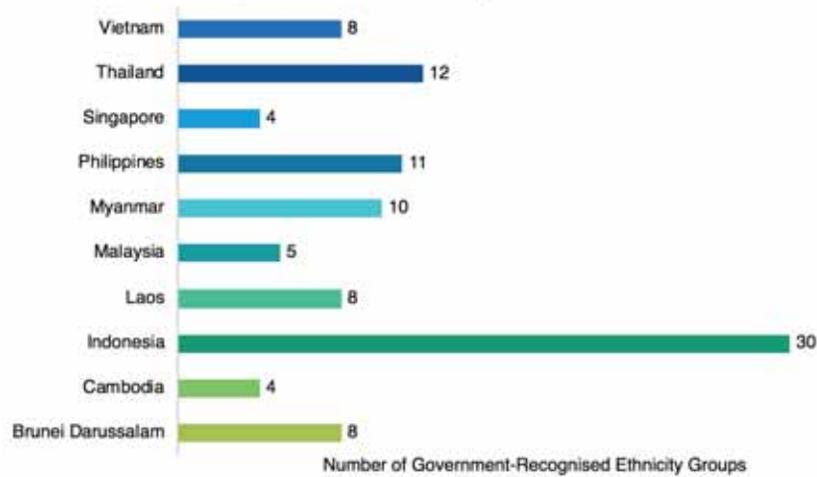
¹ PwC (2017). PwC's Global Artificial Intelligence Study: Sizing the Prize. [online] PwC. Available at: <https://www.pwc.com/gx/en/issues/data-and-analytics/publications/artificial-intelligence-study.html>.

² CB Insights (2018). The Race For AI: Google, Intel, Apple In A Rush To Grab Artificial Intelligence Startups. [online] CB Insights Research. Available at: <https://www.cbinsights.com/research/top-acquirers-ai-startups-ma-timeline/>.

³ Vanian, J. (2018). Unmasking A.I.'s Bias Problem. [online] Fortune. Available at: <http://fortune.com/longform/ai-bias-problem/>.

⁴ Ibid.

Diversity of Ethnic Groups in Southeast Asia



Source: United Nations (2001), United Nation Population Fund (2013), Badan Pusat Statistik (2010), Lao Front for National Construction (2006), Department of Information, Ministry of Communications and Multimedia, Malaysia (2015), Population Council (2013), Philippine Statistics Authority (2000), SingStat (2017), Office of the National Culture Commission (2004), Trang Web Thủ tướng (2014)

Recommendations

This policy brief recommends the Asean committee to set up a task force dedicated to mitigating risks stemming from biased data within the region. The task force is delegated a three-prong approach to address the issue in the Asean region.

- 1 Create Representative Datasets:** the task force's main responsibility is to create a fully-inclusive data set for algorithms to learn from. This comes from a background of rich racial and ethnic diversity present in the region as well as mobility that allows citizens to travel freely between countries⁵. The datasets curated would be available to the public to encourage input and assure fairness, but more importantly, these datasets could be used by A.I. developers around the region to train their algorithms better. Public participation in curating representative data is also encouraged by inviting participants to submit selfies or take photos at government-run events such as the Asian Games or the biennial Southeast Asian Games.
- 2) Auditing Biased Datasets:** the next responsibility of the task force is to offer auditing services to demographic datasets. A common method to overcome biased data is oversampling, which is adding weight to underrepresented elements in a dataset⁶. The task force is also encouraged to be open to auditing suggestions from the public, especially in addressing issues from demographics that are normally underrepresented.

⁵ ASEAN (2006). ASEAN Framework Agreement on Visa Exemption. [online] ASEAN. Available at: <http://agreement.asean.org/media/download/20160831072909.pdf>.

⁶ Pew Research Center (2018). Oversamples. [online] Pew Research Center for the People and the Press. Available at: <http://www.people-press.org/methodology/sampling/oversamples/9/> [Accessed 17 Jul. 2018].

- 3) Encourage Participation from More Diverse Talent:** one of the most effective methods to discourage biased codes and algorithms is to have a diverse team build them. The third responsibility of the task force is to promote diversity in A.I., technology start-ups, or organizations that work with A.I.. This can be achieved through creating programs or spearheading initiatives that target demographic groups who are not yet as heavily involved in A.I. development.

Conclusion

Feeding A.I. representative data would yield less biased codes and algorithms that would ultimately benefit the Asean community. The Asean region is recommended to set up a task force to take a three-prong approach in mitigating issues related to biased data before they hit the region. The most important responsibility of the task force is to create fully-inclusive datasets that will be available to the public for A.I. development in the region. The task force will also audit data sets to counter the biases present in readily-available datasets. Lastly, the task force should make a push towards diversity in A.I. development teams all across the region. By fully utilizing the lead time the region has, Asean has the chance to ensure a more responsible and fair A.I. industry that would benefit the region as a whole.

Artificial Intelligence in Australia: Accelerating Beyond Our Means

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1 Executive Summary

Artificial intelligence (A.I.) is the ability for computers to display intelligence.¹ A.I. impacts international competitiveness, health and standards of living.² Amid Australia's aging population³ A.I. is crucial. Automation is projected to increase Australia's national income by \$2.2 trillion⁴. 2018 estimates indicated 14% of jobs in O.E.C.D. countries have high probability of automation.⁵ 2015 projections indicated a higher 40% at risk in Australia over 7-12 years.⁶ The problem for humanity to proactively harness A.I. benefits is facilitating measured automation in affected industries, acknowledging industry differences (see Figure 1), whilst maintaining overarching equality, transparent A.I.-deployment processes and counterbalancing technologically-displaced labour.

2. Background

A.I. projects suffer sustainability issues. In labor, A.I. disproportionately excludes lower-skilled workers predisposed with lower inclinations for formal education.⁷ Rural regions suffer double discrimination – agricultural tasks tend towards manual repetitiveness,⁸ and young people move to urban areas,⁹ leaving behind relatively older labor communities less likely to re-skill. Proactive post-automation re-training policies including job-transition programs are essential.¹⁰ In technology, ethical concerns surround A.I. auditability for legal compliance¹¹ and biased-data discrimination.¹² A.I. augments traditional agricultural tasks like selective pesticide application. Although technological capital exists through telecommunications infrastructure like the National Broadband Network and pending \$160.9 million improvements to satellite technology accuracy and coverage, narrowing the urban-rural divide,¹³ social threats to rural economies demand proactive mitigation.

3. Recommendations (see Figure 3)

The Rulebook

A.I. will generate another technological revolution, altering interaction norms. A non-binding Code of Ethics serves educative functions, driving transparent transitions.¹⁴ These best-practice guidelines comprise model redundancy policies and employment clauses for automation-vulnerable professions,¹⁵ liability guides, data security principles, in addition to privacy policies for mandatory disclosure of A.I. technology and consent schemes for A.I.-sourced data. This promotes consumer business and industry confidence, trust and predictability in A.I. decision making logic. As the precursor to binding legislation, this Code can be periodically

amended to assuage public concern and refresh stakeholder appetite for A.I., creating an ideal public test space for regulatory test cases parallel to the Australian Government's recently announced \$30 million investment injection.¹⁶ These provisions will uphold a self-assessed pursuit of beneficial outcomes measured by improvements to living standards, human lives and sustainability proposed by Chief Scientist Dr Alan Finkel over mere scientific intrigue.¹⁷ However, as A.I. contributes to significant decision making, affecting individual livelihoods and societal norms, enforceable provisions should be created to moderate the finality of A.I.-decisions, guaranteeing reversibility by human A.I. supervisors and user review.¹⁸ A Code ensures consistency with global data security regulation, aligning Australian A.I. deployment with extraterritorial regulatory instruments like the European Union's General Data Protection Regulation, fostering certainty for further A.I. investment.

The Custodian

Oversight of the Code falls to a new Strategic Council on A.I. Implementation (the Council) consisting of: ministerial officials from the Department of Innovation and Jobs, academics and technocratic staff, unions and industry partners including companies pioneering A.I. development and automation-vulnerable sectors like agriculture. The Council unifies stakeholder interests under the mission of equitable A.I. development for posterity and protection of individual rights. The Council will also pursue targeted-policy development by administering consultative committees, competitive grant schemes, public-private partnerships, A.I. test projects and open-source knowledge, while managing technology-transfer schemes with overseas A.I. organizations like the European Coordinating Committee for Artificial Intelligence. A possible model for the Council is the Australian Council of Learned Academies (ACOLA). ACOLA's cross-disciplinary focus and high-level roadmap navigation provides accountable outreach and inclusive dialogue to areas automation-vulnerable areas, alleviating technological divides fostered by A.I. development. The Council will chiefly provide recommendations to the Prime Minister based on collaborative research.¹⁹

The Teacher

Australian A.I. policies have been development oriented, leaving a deficit in sustainable job creation and A.I. human capital harmonisation benchmarks, requiring adaptation to frequent change.²⁰ In Agriculture, this comprises backend pivots towards 'decision agriculture' tasks involving data-driven decision-making.²¹ Post-automation education schemes should facilitate tailored technology proficiencies, including the development of relevant 'human touch' and STEM skills where relevant. These suggested schemes would allow flexibility and be modeled after subsidised, 'drop-in' short course, vocational schools in informal settings. They would include in-work training, webinars and consultation programs to maximize accessibility in regional areas²² and curriculum adaptability.²³ Coordinating with the Council, Local Governments will help with the front-end communications to workers of automation's impacts, emphasizing the development of technology-complementary skills in the same industry.²⁴ Consistent curricula updates for students in primary, secondary and tertiary education alongside technological development will create a culture of receptiveness to further technological cooperation and utilization, while also preparing younger generations for the rapidly evolving labour market.²⁵

4. Conclusion

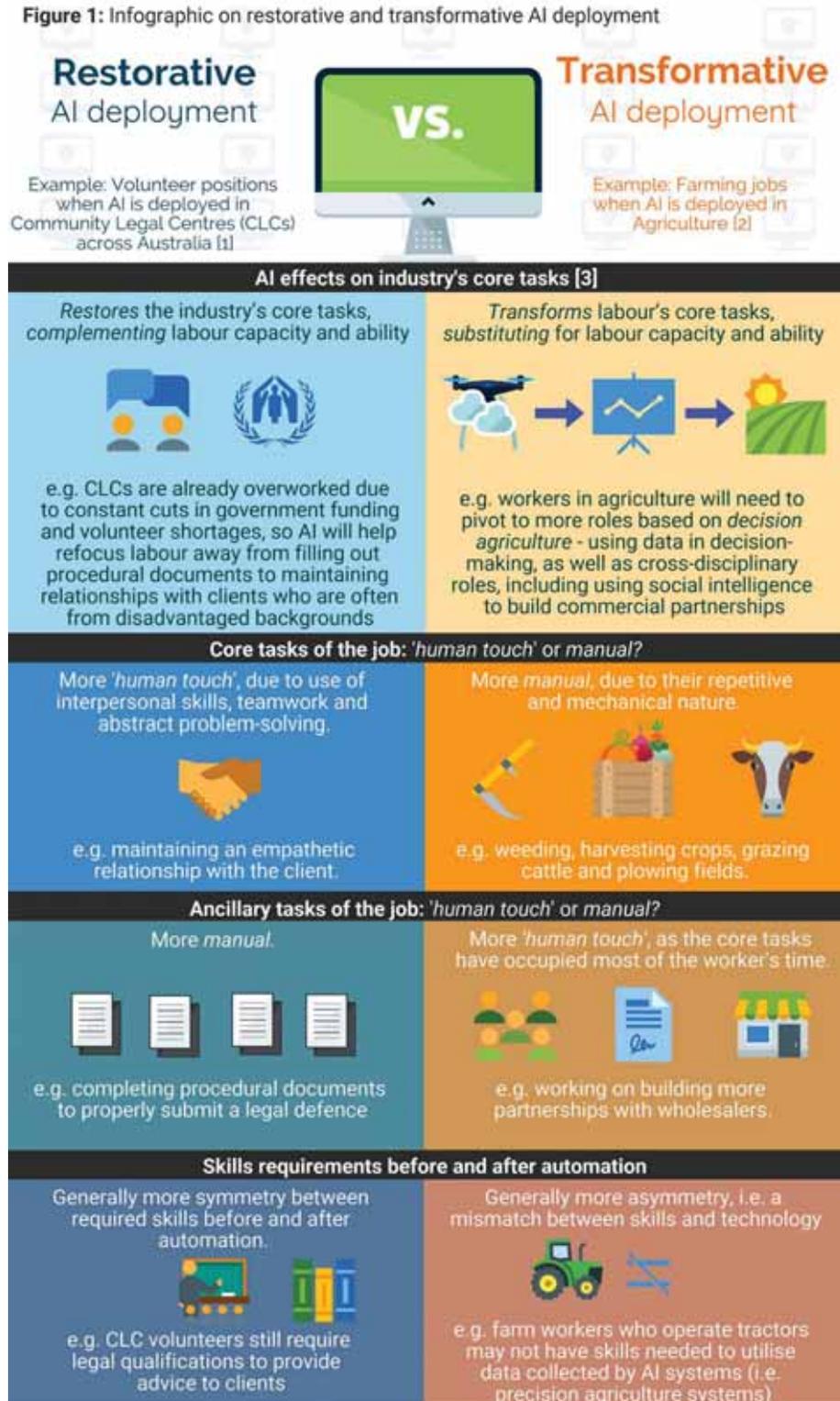
These recommendations reinforce the pressing need to temper accelerated A.I. development through sustained skills development to retain workforce agility. Drawing regulatory boundaries early enables an inclusive and social impact-oriented framework whilst retaining the aspiration at A.I.'s core. A.I. belongs to the future and therefore, it must belong to all of us.

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Figure 1: Infographic on restorative and transformative AI deployment



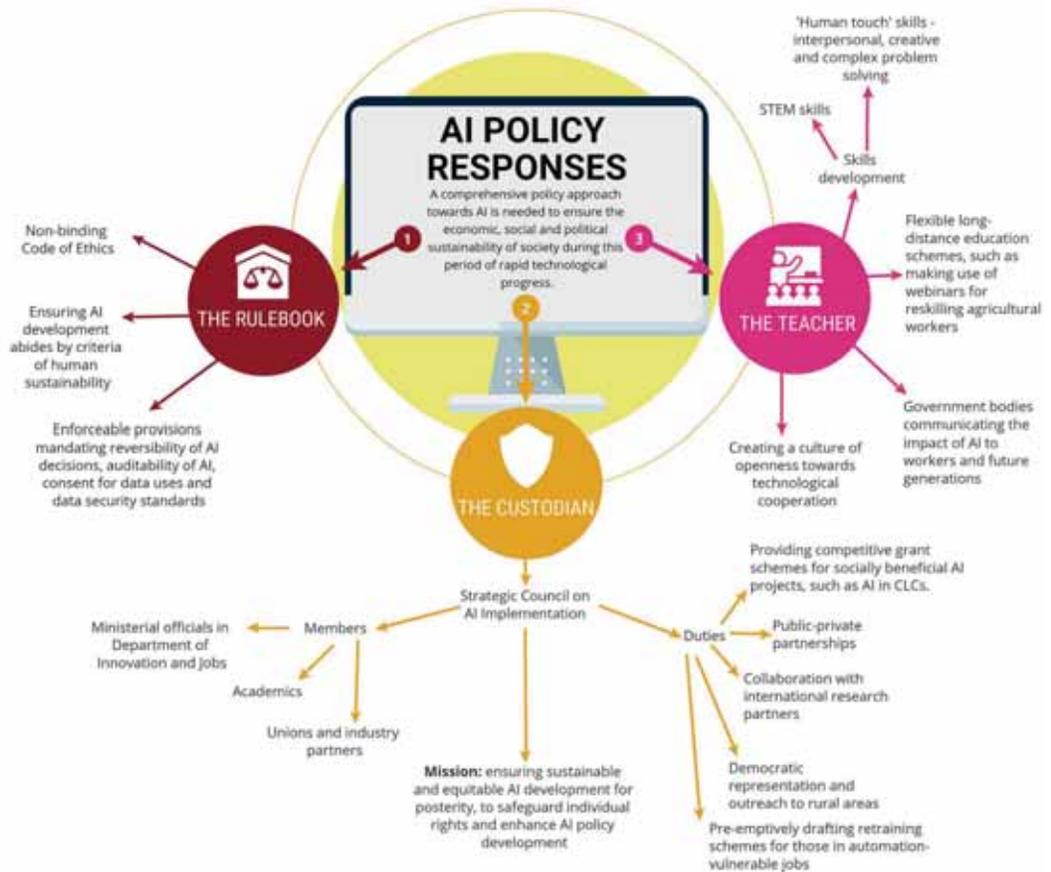
Overall stakeholder attitude towards AI	
<p>More likely to have support.</p>  <p>e.g. as mentioned above, CLCs already have extensive backlogs, so AI has been welcomed by many to help manage casework.</p>	<p>More likely to have both support and formidable opposition.</p>  <p>e.g. farming will become more cost-competitive with AI, but at the cost of affecting rural job markets, in turn accelerating the decline of communities</p>
Gravity of economic, political and social consequences	
<p>Relatively lower.</p>  <p>e.g. AI in CLCs are unlikely to generate structural unemployment due to dependence on volunteer workers, and would help lower inequality by improving access to legal aid</p>	<p>Relatively greater.</p>  <p>e.g. AI in agriculture will may cause structural unemployment in rural areas and increase inequality by benefitting land owners. If the structurally unemployed are not re-employed, this will counteract the gains in productivity from AI</p>
Risks in AI implementation	
<p>Issues internal to the AI platform, such as technology R&D, privacy and data bias</p>  <p>e.g. in CLCs, ensuring lawyer-client confidentiality is maintained with respect to data security.</p>	<p>Issues both internal and external to the AI platform, such as how AI may be practically applied in addition to R&D, privacy and data issues</p>  <p>e.g. in applying AI, whether farmers and consumers want certain tasks automated due to social norms, such as milking cows</p>
<p>Sources:</p> <p>[1] J. Zelenznikow, 'Don't fear robo-justice: Algorithms could help more people access legal advice', <i>The Conversation</i>, 2017, https://theconversation.com/dont-fear-robo-justice-algorithms-could-help-more-people-access-legal-advice-85395, (Accessed 27 July 2018). J. Bennett et al., 'Current state of automated legal advice tools', <i>Networked Society Institute, Discussion Paper 1</i>, University of Melbourne, 2018.</p> <p>[2] Standing Committee on Agriculture and Industry, 'Smart farming: Inquiry into Agricultural Innovation', <i>The Parliament of the Commonwealth of Australia, Canberra, ACT</i>, May 2016, https://www.aph.gov.au/Parliamentary_Business/Committees/House/Agriculture_and_Industry/Agricultural_innovation/Report, (accessed 21 July 2018).</p> <p>[3] D. Acemoglu and P. Restrepo, 'The race between man and machine: Implications of technology for growth, factor shares, and employment', <i>American Economic Review</i>, 108(6), pp. 1488-1542, doi:10.1257/aer.20160696, D. H. Autor, 'Why are there still so many jobs? The history and future of workplace automation', <i>The Journal of Economic Perspectives</i>, 29(3), pp. 3-30, doi:10.1257/jep.29.3.3</p>	



Figure 2: Original aerial photographs of the rural north-eastern region of Victoria state (Left) and the metropolitan Western Sydney region (Right) by Jonathan Gu. According to modelling conducted by the Committee for Economic Development of Australia (CEDA) in 2015, rural economies have a disproportionately higher number of automation-vulnerable jobs compared to urban areas. Thus, the introduction of AI in rural areas will possibly accelerate the decline in rural communities, as the structurally unemployed older workers may relocate to urban areas in search of employment opportunities.

See Committee for Economic Development of Australia, *How unequal? Insights on inequality*, Melbourne, CEDA, 2018, http://ceda.com.au/CEDA/media/General-Publication/PJF%20CEDA-How-unequal-Insights-on-inequality-April-2018-FINAL_WEB.pdf, (accessed 28 July 2018).

Figure 3: Mindmap of Recommendations



Ensuring the Development of A.I. is Not Void of Human Involvement

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Research indicates that by 2030, A.I. will contribute \$16 trillion to the global economy and impact approximately 40% of the global workforce¹.

What was once an arcane idea, antagonized in popular culture (think the Terminator), has become essential to society. Nonetheless, the ability of A.I. to completely change society has begun to unsettle many. For instance, UBS' research on self-driving taxi services² revealed that benefits such as lower cost and convenience, was weighed significantly against the displacement in employment.

This example demonstrates the need for policy measures recommended which allows us to utilize the benefits of A.I. whilst ensuring social and economic stability. To achieve this goal, we provide three policy recommendations: (1) early stage monitoring of A.I. development prior to grants, (2) regulation to hold parties accountable for autonomous operation of A.I. and (3) innovative redundancy training for unprecedented displacement caused by A.I.

1) A standardized approach to regulating young A.I. companies: Across APAC and globally, regulatory progress amongst countries has been fragmented, with greater emphasis being placed on fostering and funding A.I. rather than managing it. For instance, the Australian government through the NISA³ and the CRC⁴ program has committed A\$1.1 billion and A\$29.9 million respectively over four years to provide grants and incubator services for early stage ventures, notably those engaging in A.I.

One of the areas of concern lies in the lack of transparency towards the algorithms and decision making. Accordingly, we suggest that regulatory bodies adopt criteria that ventures must meet to qualify for grants to encourage clarity and accountability.

a) The requirement for A.I. source code to be periodically audited and compared against predetermined industry benchmarks to minimize inconsistencies;

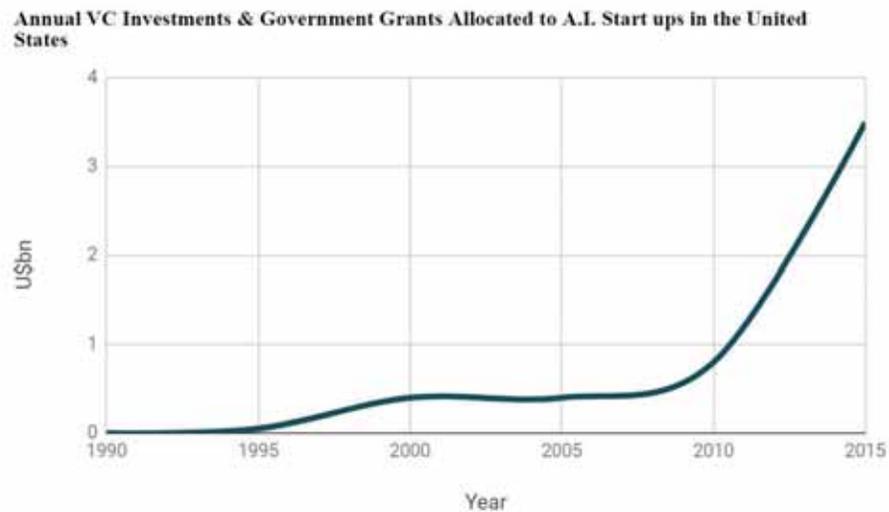
¹ <https://euagenda.eu/upload/publications/untitled-128126-ea.pdf>
<https://www.theguardian.com/technology/2018/mar/19/uber-self-driving-car-kills-woman-arizona-tempe>

² <https://www.cnbc.com/2017/09/29/self-driving-taxis-like-uber-will-disrupt-public-transport-study.html>

³ <http://www.arc.gov.au/nisa>

⁴ <https://www.business.gov.au/assistance/cooperative-research-centres-programme>

- b) Compulsory ethics training for developers and entrepreneurs to manage the risk of unscrupulous conduct; and
- c) Performance of a litmus test to ensure that the public benefit derived from the disruption caused to a particular industry or sector by A.I. outweighs detriments.



- 2) Regulation when A.I. operates autonomously:** As we make further developments in A.I. there is a shift to relying on A.I. to independently make decisions. Despite the benefits that A.I. can offer, the nature of code is such that unexpected or harmful behaviors are unavoidable. One notorious example can be seen with Knight Capital⁵ where an error in a trading algorithm caused \$440 million to be lost in 45 minutes. Another example is the death of an Arizona woman by a self-driving Uber earlier this year.⁶ Given the lack of a regulatory framework in APAC⁷, it is important to develop regulations to hold people accountable and to mitigate potential errors that A.I. can make. We recommend implementing extensive logging requirements wherever A.I. is able to make autonomous decisions so that when things do go wrong there is a clearer idea behind what happened. Furthermore, there needs to be a clear hierarchy of liability so that the actions of the A.I. can be held accountable. This also incentivizes those that are liable to ensure that there are sufficient safeguards to mitigate risks. An example of such a hierarchy is shown below.

⁵ <https://dealbook.nytimes.com/2012/08/02/knight-capitalsays-trading-mishap-cost-it-440-million/>

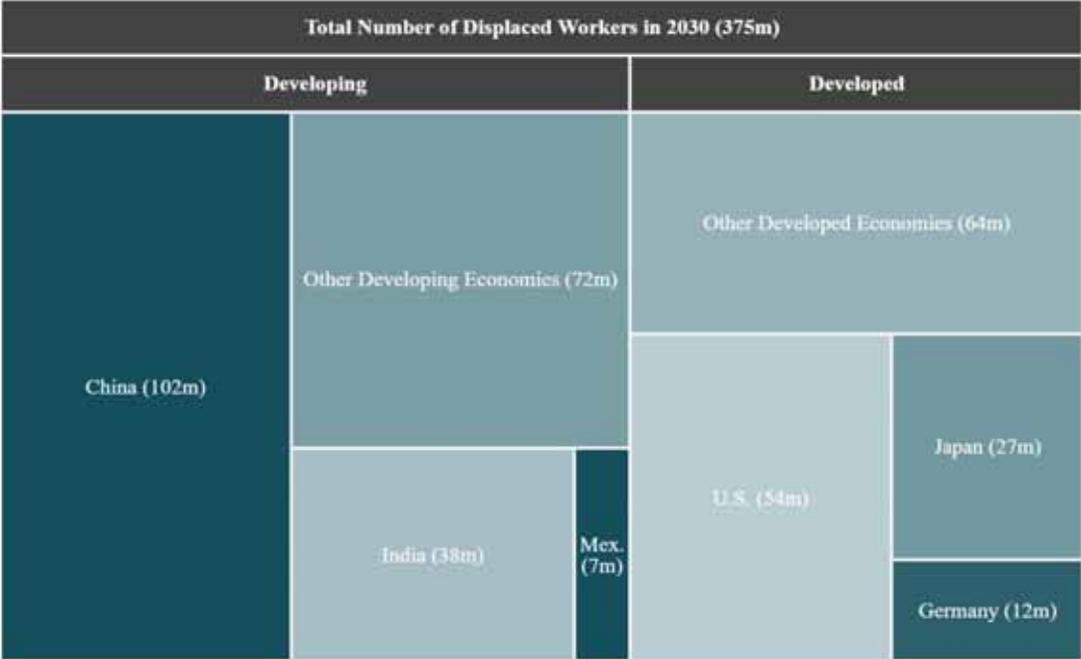
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⁷ <https://euagenda.eu/upload/publications/untitled-128126-ea.pdf>



- 3) Radical transformation of the workplace requires a different redundancy scheme:** We should be less concerned with whether A.I. will lead to more or less jobs and more concerned with the impacts of the inevitable mass restructuring of the labor market. We recommend for governments to ensure that the redundancy process provided by employers should include re-skilling and re-hiring in addition to redundancy pay to prevent the creation of a 'redundant generation'. This proposed regulatory framework should operate in conjunction with existing redundancy regulations. However, the new framework should target workers employed for a significant period, who have been made redundant due to A.I. and incorporate two key factors:
- a) The government should encourage the formalization of 'new collar' skills just as it has done for other technical skills e.g. automotive technicians and welders. Formalizing national credentials will help employers recognize that candidates are sufficiently qualified, benefiting workers and employers alike.
 - b) Development of a government-funded online national vocational and training provider. With mass restructuring caused by A.I. expected to be a global phenomenon and impact 375 million in 2030, traditional tertiary education would be too expensive and rigid.⁸ However, teaching could become far more accessible and applicable if educational programs are made available online. Looking at the advent of universities like Stanford making entire courses freely available online and success of TAFE NSW, a government-funded vocational and training provider, it is only logical to imagine a marriage of the two.

⁸ <https://www.mckinsey.com/global-themes/future-of-organizations-and-work/what-the-future-of-work-will-mean-for-jobs-skills-and-wages>



4) Conclusion

In summation, we maintain the belief that the suggestions presented appropriately assist in regulating the ever-challenging developments in A.I. that seek to ensure the benefits are reaped in a safe and predictable manner.

Artificial Intelligence in Singapore

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Introduction

ARM's 2017 Global Artificial Intelligence Survey reported that 61% of people globally believe in the potential of Artificial Intelligence (A.I.) to better society (Arm Ltd., 2017). This is endorsed by David Schatsky, managing director at Deloitte, who postulates 2018 to be the year A.I. talk turns into action (Zetlin, 2018). Despite the optimism, A.I. risks being overestimated (Waters, 2018). Presently, A.I. still lacks human understanding. If A.I. research and development persist without sufficient human intervention, society may lose sight of social goals and marginalize those who cannot access its benefits. To avoid this, we should invest in human computation, and incorporate diversity in A.I. research and development, while reinforcing algorithmic accountability.

Current Landscape

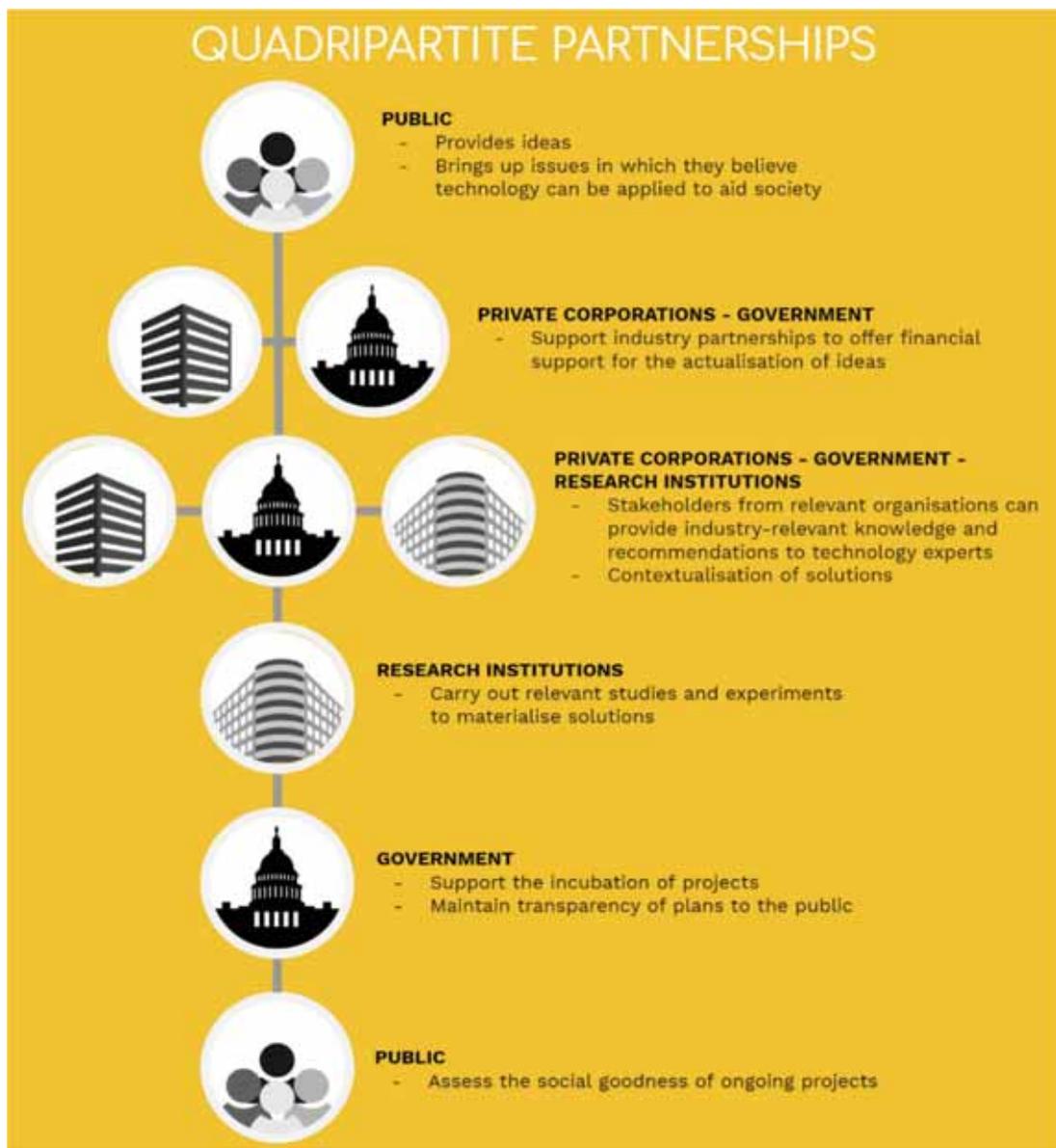
In response to the heightening interest in A.I., AI Singapore was established to deepen Singapore's A.I. capacity and capabilities and equip the workforce with field-relevant knowledge. The program involves partnerships with research institutions and private corporations and runs apprenticeship programs to groom talent (Bhunia, 2018). As it purported to circumvent negative trade-offs of A.I. such as manpower displacement, the initiative is largely reactive and constrained in combating the underlying issues of A.I. advancement. This warrants certain recommendations that target the intrinsic limitations of A.I.

Human Computation

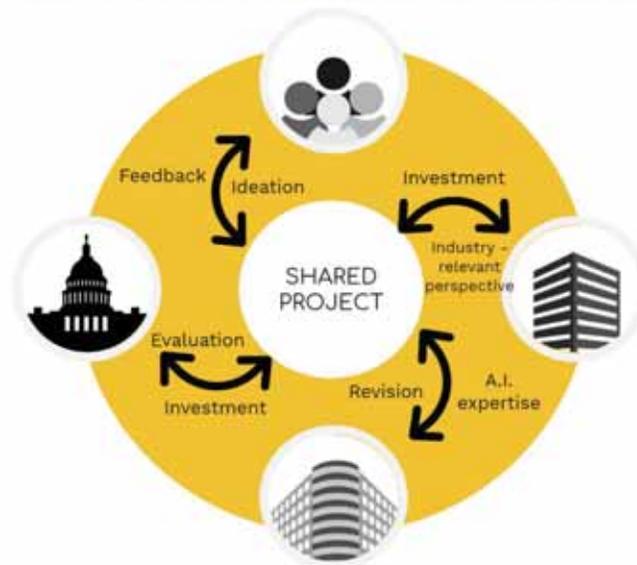
Human computation involves engineering hybrid distributed intelligent systems that capitalize on the complementary assets of humans and computers to perform tasks that exceed the capabilities of either alone ("How to manage AI's risks and rewards", 2018) (Michelucci & Dickinson, 2016). Applying human computation ensures technology progresses with society at heart, provided the human stakeholders inserted into the A.I. processes are accountable for the human-centeredness of the A.I. Human computation thus becomes an agent of change in society.

We should model A.I. powerhouses like the United States, who have recognized the potential of human computation in making positive societal impacts. Their 2014 Human Computation Roadmap Summit concluded with a proposal to launch a national center for human computation (Michelucci, Shanley, Dickinson & Hirsh, 2015). Singapore, in its pursuit of being a Smart Nation,

should strive to do the same. In three days, the summit produced multiple actionable plans that target socially-relevant issues by integrating humans and computers. If this can be expanded to a nationwide effort, the local A.I. environment would be more conducive for enacting social change. This warrants quadripartite partnerships beyond that accomplished by AI Singapore, involving the government, research institutions, private corporations, and the public, to create an ecosystem with social checks and balances, while maintaining high levels of expertise to actualize plans, supported by capital endowment.



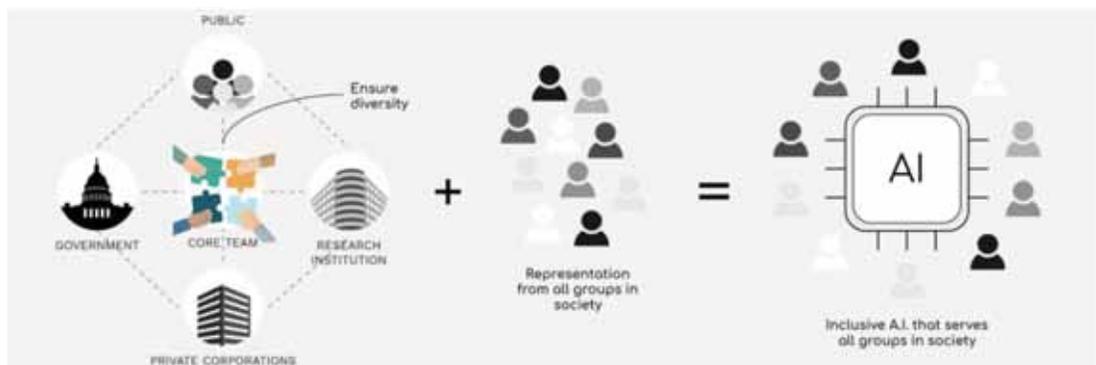
ARTIFICIAL INTELLIGENCE ECOSYSTEM



Diversity

Where human computation ensures social goals are incorporated, the problem of algorithmic bias remains. A.I. are the brainchildren and creations of humans, and the product of this circumstance is algorithmic bias - the phenomenon where A.I. takes on the biases in human decision-making (Knight, 2017). If allowed to persist, the result is bias amplification, resulting in a lack of equitable distribution of benefits which will stymie the progress of society as a whole. Brandie Nonnecke from the University of California spells out the implications succinctly: "For those who are over-, under- or misrepresented in the data and calculations, decisions made on their behalf can perpetuate inequality." (Nonnecke, 2017).

Diversity must be integrated into human computation to nip the issue at the bud. It is therefore necessary to control the environment in which the research is conducted. While sustaining quadripartite partnership, the core research and development team must be inclusive. This entails incorporating human diversity into the team itself, and minimizing bias in the data sample. The latter involves avoiding reliance on historical data and managing data generation to consult and reflect all groups in society, producing A.I. with inclusive design and application (Baer & Kamalnath, 2017).



Algorithmic Audits

With the system heavily dependent on human participation, the threat of exploitation by nefarious human agents cannot be overlooked. In 2017, New York City took the first step to create accountability for A.I. systems by creating a task force to analyze the fairness and validity of government algorithms. This transparency bill is significant for all nations moving toward an automated future. Apart from rigorous manpower screenings, we should enforce algorithmic audits to evaluate the impacts of A.I. on society, modeling the above measure taken. Any disproportionate impacts on different communities must be flagged out and adjusted for any inequality. This process would deter and alleviate the risk of unjust manipulation.

Conclusion

The objective of employing A.I. has always been to improve the quality of life of all citizens. A.I. has indeed facilitated the development of Singapore as a Smart Nation, extending through many facets of our lives (Varakantham, An, Low, & Zhang, (n.d.)). Nevertheless, we cannot trust mathematical models with complete certainty. While they have been able to replicate and replace human processes, A.I. is not faultless. The automated future is characterized by uncertainty and wonder, and we must tread carefully to ensure we head towards it in a manner that benefits our community equitably and sustainably for the long run.

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Institutionalized Inequality: Combating Ethical Dilemmas Arising From the Proliferation of Artificial Intelligence

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Introduction

Artificial Intelligence (A.I.) is a double-edged sword; while it purports to improve the lives of people, it risks discriminating against the very group of people it aims to protect. Furthermore, A.I. may render the jobs of lower-skilled workers redundant. This threatens to widen the inequality gap as this group of people are often the most disadvantaged in society. We thus propose the following measures to combat the potential institutionalization of inequality which may result from the use of A.I. systems. First, companies which utilise A.I. should be held to higher standards of transparency and accountability. Second, grants which encourage companies to adopt A.I. should include the retraining of existing workers as a requirement in the application.

Greater Transparency

The output of machine-learning software hinges on the data being fed into it and the algorithm. A.I. thus embodies the ethical principles of those involved in programming it. More companies are adopting A.I. to ease the workload of hiring, and police departments adopt A.I. to predict the risk of felons. These systems are far from unbiased. In fact, African-Americans were twice as likely to be classified as a high-risk reoffender as compared to a Caucasian in the risk assessment used by US police departments. However, information on the calculation of the scores remains unknown to the public since it is proprietary information. Acknowledging the risks involved in A.I., the government has set up a council to look into ethical use of A.I. and data. We propose working closely with the Council to enforce greater transparency through the following measures:

- (1) Enforce disclosure of all data and algorithms used in hiring processes to the Council. This allows the Council to analyze the weights given to the various factors and be alerted of potential discriminatory practices.
- (2) Formulate a set of compliance measures which are harsh enough to prevent companies from side-stepping the rules. This includes fines for companies with unethical algorithms.
- (3) Educate HR managers on what transparency entails and ensure they understand the consequences of non-compliance.
- (4) Should the police and/or judiciary system utilize A.I. in their risk assessments, disclose the factors which contribute to the test score to the public.

As demonstrated by the following SWOT analysis, these measures prevent the missteps which may lead to injustice, especially for those already marginalized by society. We also derived that, if action is not taken in time, threats may arise.

Chart 1: Analysis of feasibility of proposed Greater Transparency

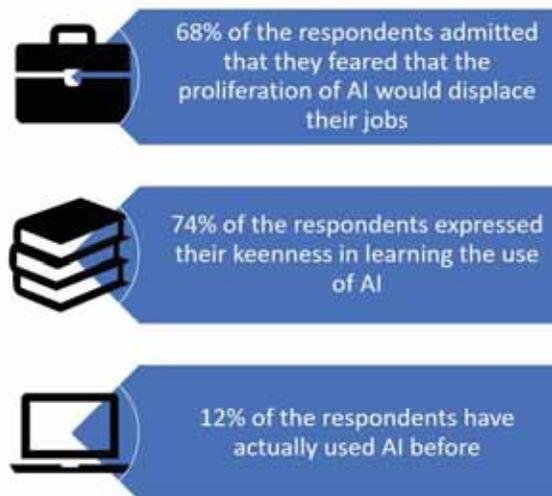


It is thus critical that we enforce greater transparency so we can avoid the compromising of A.I. systems by human misjudgment. This will hold companies and state departments accountable for their actions and ensure those perpetuating inequity do not get off scot-free.

Retraining of Existing Workers

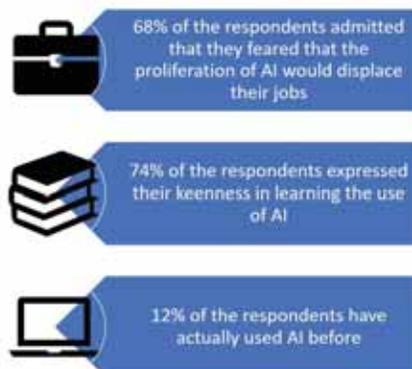
To prevent A.I. from rendering the jobs of individuals obsolete, firms ought to take active steps to retrain their existing workers. Given that A.I. is a relatively uncharted territory - one that requires huge support and funding - firms are likely to seek financial support from the government. Examples of existing support include the 100 Experiments program, where A.I. Singapore provides up to S\$250,000 worth of funds in support of the use of A.I.. To qualify for grants and governmental support, we propose the following criteria:

- (1) Firms are required to retrain their existing workers. Upon completion of training, workers are expected to understand and incorporate the use of A.I. into their work to promote greater efficiency.
- (2) Firms must retain at least 90 percent of their existing workers upon introducing the use of A.I.. This ensures that firms are truly committed to upgrading the skills of existing workers, allowing them to remain relevant within the industry.

Chart 2: Survey of public opinions regarding A.I.

Ultimately, A.I. ought to complement, rather than replace, the jobs of current workers. It would be grossly counterintuitive to the very fundamental purpose of the SMART Nation Initiative - to improve the lives of individuals and create economic opportunities for them - should the proliferation of A.I. leave many relatively lower-skilled workers out of a job. More importantly, despite the abundant benefits that A.I. has to offer, there have been warnings about the potential destructive capabilities of A.I. given the sheer power it possesses. By encouraging the A.I. systems to still be regulated by humans, the risk in power concentration - should A.I. systems be completely automated - will be brought to a minimum.

The proposed measure is highly feasible since the grant is already in place and funds have been approved and set aside. Nonetheless, we anticipate some issues and propose the following measures to prevent or manage them should they arise.

Chart 3: Solving issues which may arise from the policy

Ultimately, A.I. reflects the moral compass of its designers. For A.I. to truly enhance the lives of individuals, it is vital that that everyone involved in the process of programming such systems be held to the utmost moral standards. Steps need to be taken before systems which are susceptible to human error entrench a cycle of discrimination against the most needy in our society.

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<https://www.independent.co.uk/life-style/gadgets-and-tech/news/elon-musk-artificial-intelligenceopenai-neuralink-ai-warning-a8074821.html>

As a network of leading universities linking the Americas, Asia and Australasia, the Association of Pacific Rim Universities (APRU) is the Voice of Knowledge and Innovation for the Asia-Pacific region. We bring together thought leaders, researchers, and policy-makers to exchange ideas and collaborate on effective solutions to the challenges of the 21st century.



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Thank You

We would like to give a special thank you to all the university staff and faculty, students and judges who took part in this year's competition. Without your support, the competition would not have been such a success.

The judges:

Jiro Kokyuro

Vice President for International Collaboration, Keio University

Sabrina Lin

Vice President for Institutional Advancement

Kar Yan Tam

Dean of HKUST Business School

Jim Hollander

Staff Editor of The New York Times

Philip Traynor

Staff Editor of The New York Times

Case Competition Task

Artificial Intelligence

How A.I. Is Edging Its Way Into Our Lives

“Academia and the government must help ensure that A.I. evolved into something that enhanced our humanity, created as many jobs as it replaced and operated in safe and predictable ways”

Fei-Fei Li, Chief Scientist of A.I./ML, Google Cloud, and Associate Professor, Computer Science, Stanford University.

With this quote and this article in mind, write an 800-word policy brief to a political leader or public official in your country on the best ways to ensure that social goals are built into A.I. research and development, and that the benefits of A.I. are shared equitably for sustainable development demonstrating how risks might be mitigated. Each policy brief must include at least three original photographs, charts, figures, or infographics to illustrate issues and solutions proposed.

Judging Criteria

Accuracy (20%)

- 1 Demonstration of knowledge of the subject matter in discussion, and coherence of the argument.
- 2 The use of accurate information or data to support arguments, with proper citation and definition of major terms.

Relevance (30%)

- 1 Appropriate use of theories, concepts, or external data to justify the arguments.
- 2 The proposal of practical and feasible solution or action with proper justification on the costs or tradeoffs involved.
- 3 Evidence on relevance or applicability of external data, field data, foreign research or method to the local environment.

Clarity (20%)

- 1 Well-defined problem followed by a structured and organized presentation of data, ideas, and solutions.
- 2 Writing with clarity, style and professionalism, free of grammatical and spelling mistakes.

Originality (30%)

- 1 The proposal of original and innovative solution adequately addressing the case prompt.
- 2 Demonstration of independent thoughts and critical reflection on the specific circumstances of the situation involved.
- 3 Directness and magnitude of the impact created by the solution. (Who will benefit and how many of them? What could be the costs and benefits?)

Note: All submissions have been reviewed for grammatical and typographical inconsistencies but otherwise appear in their original form.

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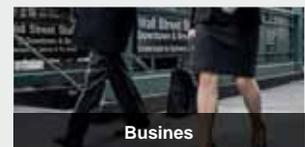
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