



United Nations  
Educational, Scientific and  
Cultural Organization



ADVOCATING FOR  
SMALL ISLAND  
DEVELOPING STATES

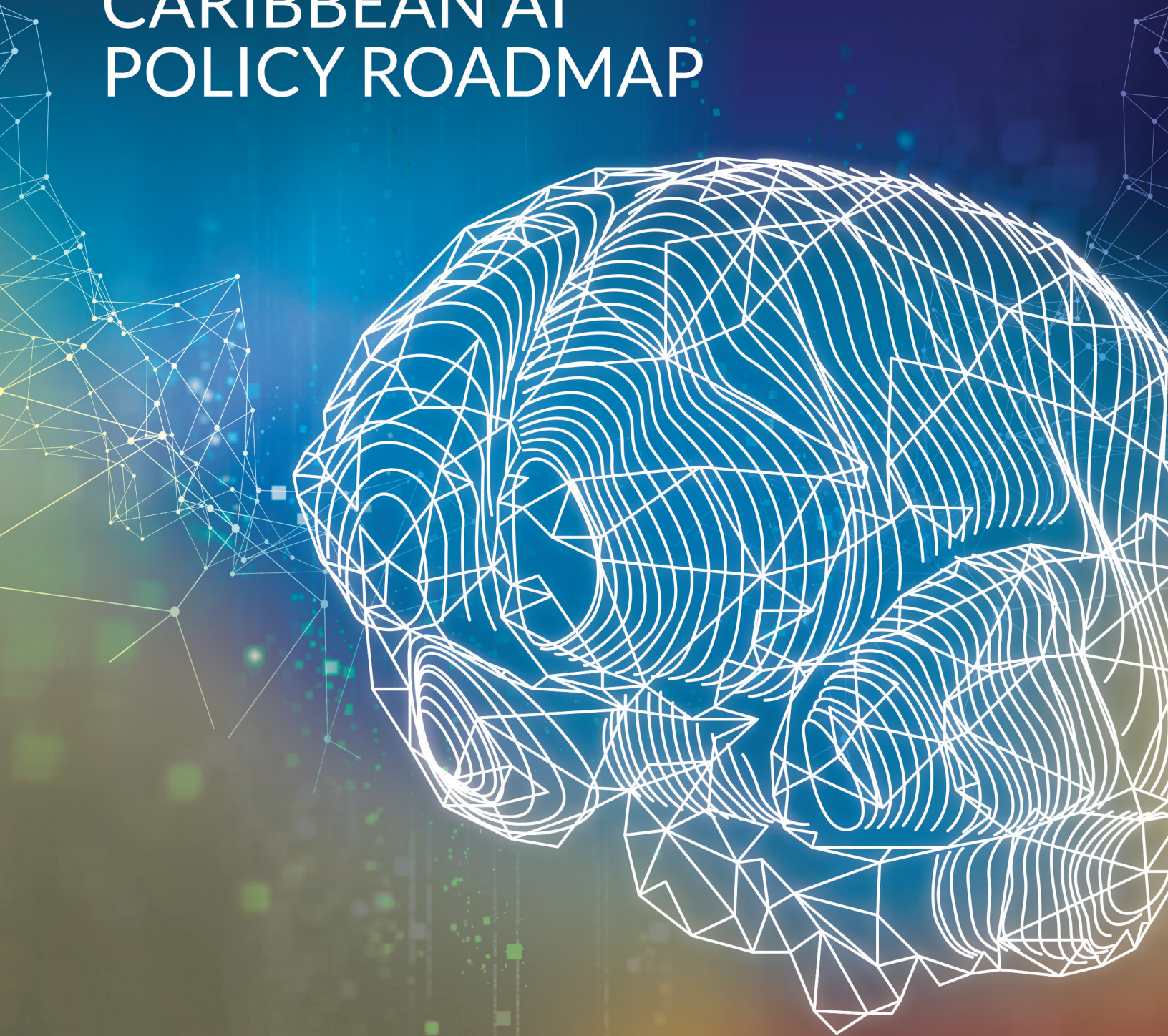


CARIBBEAN  
ARTIFICIAL INTELLIGENCE  
INITIATIVE

BROADCASTING  
COMMISSION

PEOPLE • TRANSITIONING • DIGITAL

# UNESCO CARIBBEAN AI POLICY ROADMAP



Prepared in June 2021 by the United Nations Educational, Scientific and Cultural Organization, 7, place de Fontenoy, 75352 Paris 07 SP, France

© UNESCO 2021

This report is available in Open Access under the Attribution-ShareAlike 3.0 IGO (CC-BY-SA 3.0 IGO) license (<http://creativecommons.org/licenses/by-sa/3.0/igo/>). The present license applies exclusively to the text content of this report and to images whose copyright belongs to UNESCO. By using the content of this report, the users accept to be bound by the terms of use of the UNESCO Open Access Repository (<http://www.unesco.org/open-access/terms-use-ccbysa-en>).

The designations employed and the presentation of material throughout this report do not imply the expression of any opinion whatsoever on the part of UNESCO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The ideas and opinions expressed in this report are those of the authors; they are not necessarily those of UNESCO or the “Broadcasting Commission of Jamaica and do not commit those organizations.

This report was facilitated by the UNESCO Cluster Office for the Caribbean as a part of the AI for the Caribbean Initiative

Printed by UNESCO

The printer is certified Imprim’Vert®, the French printing industry’s environmental initiative.  
CCO/2021/AI/2 REV

The statements in this publication are the views of the authors and do not necessarily reflect the policies or the views of UNESCO. The designations in this publication do not imply an opinion on legal status of any country or territory, or of its authorities, or the delimitation of frontiers.





United Nations  
Educational, Scientific and  
Cultural Organization



ADVOCATING FOR  
SMALL ISLAND  
DEVELOPING STATES



CARIBBEAN  
ARTIFICIAL INTELLIGENCE  
INITIATIVE



PEOPLE • TRANSITIONING • DIGITAL

# UNESCO CARIBBEAN AI POLICY ROADMAP

## TABLE OF CONTENTS

Acknowledgements	iii
Executive Summary	1
<b>Introduction</b>	<b>10</b>
Purpose	11
How the Policy Roadmap was Developed?	11
How to Use the Policy Guidance	12
Assumptions	12
<b>AI and the Caribbean</b>	<b>13</b>
Definitions	13
Challenges	24
Opportunities	33
Caribbean SWOT Analysis	40
<b>Caribbean AI Policy Roadmap</b>	
<b>Policy Guidelines &amp; Recommendations</b>	<b>41</b>
<i>Resilience - Environmental Care &amp; Climate Change Fight</i>	
<i>Governance - Regulation, Legislation, Accountability &amp; Management</i>	
<i>Transformation - Public &amp; Private Sector Investment</i>	
<i>Upskilling - Education &amp; Training</i>	
<i>Preservation - Big Data &amp; Creativity</i>	
<i>Sustainability - Innovation &amp; Adaptation</i>	
<b>Conclusion: Looking Forward - Where Do We Go From Here?</b>	<b>47</b>
<b>APPENDIX</b>	
#1 Summary of Stakeholder Consultations - Caribbean AI Initiative - Forum 1 Summary	50
#2 Summary of Stakeholder Consultations - Caribbean AI Initiative - Forum 2 Summary	52
#3 Stakeholders Poll Results	57
#4 Summary of Poll Results Youth Stakeholder Consultations	64
#5 Caribbean AI Roadmap Summary	69
#6 Figures	74
#7 Glossary	75
<b>BIBLIOGRAPHY</b>	<b>78</b>

# ACKNOWLEDGEMENTS

The policy roadmap was an output of the Caribbean AI Initiative which was conducted by the UNESCO Cluster Office for the Caribbean and the Broadcasting Commission of Jamaica (BCJ), with the support of UNESCO IFAP.

With special thanks to:

NAME	UNESCO
Isabel Viera Bermúdez	Advisor for Communication and Information, UNESCO Cluster Office for the Caribbean
Paula Istúriz Caveró	Programme Specialist, Social and Human Sciences, UNESCO Cluster Office for the Caribbean
Giuliana Neumann	Consultant UNESCO Cluster Office for the Caribbean
Catherina Schönhammer	Public Information Officer, UNESCO Cluster Office for the Caribbean

NAME	Broadcasting Commission of Jamaica	CARIBBEAN AI INITIATIVE ROLE
Cordel Green	Executive Director	Project Oversight
Nicole Walford	Deputy Executive Director	Project Management
Latoya Duffus	Senior Director Communications and Public Education (Acting)	Project Promotions
Sasha Harrison	Economist	Project Research Management
Ajani Domville	Communications Intern	Project Promotions Intern
Ashleigh Stampp	Research Intern	Project Support & Data Collection Intern
Abigail Francis	Public Relations Intern	Project Promotions Intern

## Research and Drafting Team

Erica Simmons, Executive Director – Centre for Digital Innovation and Advanced Manufacturing, Caribbean Maritime University

Andrea Davis, IP and Creative Industries Consultant

## Design and layout

Ikechukwu Ojuro

The policy recommendations were informed by a series of UNESCO-sponsored multi-stakeholder events, discussions, online surveys as well as contextualized research and analysis related to Artificial Intelligence in the Caribbean carried out in 2020 and early 2021.





# **EXECUTIVE SUMMARY**

*“The difficulties facing the region are no longer simply about competing effectively in a globalising economy. Rather, they are ‘existential threats’ which bring into question the fundamental viability of Caribbean society itself. Climate change, transnational crime, the decline of regional industries, food security, governance challenges, international diplomacy ... are becoming increasingly acute in the immediate present; failure to act immediately, decisively and coherently at the regional level could quite conceivably herald the effective decline of Caribbean society as a ‘perfect storm’ of problems gathers on the horizon.”<sup>1</sup>*

*- Sir Shridath Ramphal, former Guyana Government Minister, UWI Chancellor and three-term Secretary General of the Commonwealth at Inaugural G. Arthur Brown Lecture hosted by the Bank of Jamaica 2011*

The Caribbean is a glorious pepperpot soup bursting with the diverse flavours of humanity and reflecting the innovative spirit and resiliency of its ancestors. Often referred to as a ‘zone of peace’ and a ‘melting pot’ because of the rich cultural, linguistic, ethnic and environmental diversity among its nation states, the Caribbean’s uniquely vibrant and multifaceted culture has been global exports for centuries. Reflecting the inclusive nature of the Caribbean’s diversity in terms of race, ethnicity, language and culture, forty-four million persons call the cluster of islands home.

*The Greater Caribbean region boasts linguistic plurality as a result of its colonial history: English, French and Spanish are the three main languages spoken in the Region, which are among the most spoken languages in the world and could offer the region a competitive advantage in relation to trade, investment and tourism.<sup>2</sup> Representing approximately 0.56% of the total world population, the islands in the Caribbean region are considered Small Island Developing States (SIDS).<sup>3</sup> SIDS are extremely important for global biodiversity as islands harbour 20% of all plant, bird and reptile species in only about 3% of the Earth’s land surface. New data on the benefits that coral reefs provide to the travel industry and the region’s economy reveal that the value of reef-associated tourism is estimated at more than US\$7.9 billion annually from over 11 million visitors. This accounts for 23% of all tourism spending and is equivalent to more than 10% of the region’s GDP (gross domestic product).<sup>4</sup>*

<sup>1</sup> Lowrie-Chin, J., 2011 The Only Things That Separates Us. Retrieved from <https://jamaicans.com/weseparatesus/>

<sup>2</sup> Artificial Intelligence and the Caribbean, Lodewijk Smets - Zubin Deyal, Caribbean Dev Trends.com, November 20, 2018, <https://blogs.iadb.org/caribbean-dev-trends/en/9397/>

<sup>3</sup> <https://www.worldometers.info/world-population/caribbean-population/>

<sup>4</sup> EcoEarnings: A Shore Thing – The Ocean Foundation - EcoEarnings: A Shore Thing (jetblue.com)

SIDS were recognized as a special case, both for their environment and development, at the United Nations Earth Summit held in Rio de Janeiro, Brazil (3–14 June 1992). The islands are a part of a distinct group of developing countries facing specific social, economic and environmental vulnerabilities. The *SIDS Accelerated Modalities of Action (S.A.M.O.A) Pathway* an outcome of the ‘Third International Conference on Small Island Developing States (SIDS Conference)’ in 2014, acknowledged that the identification of SIDS priorities was needed in the formulation of the 2030 Agenda.<sup>5</sup>

Despite the challenges and marginalization that slavery, stagnant growth and climatic threats have posed to the region and while the Caribbean exited colonialism largely without a development pact, it has produced excellence across fields. Its people have continued to emerge as some of the most warm, resilient, innovative and globally competitive human resources and cultural creators of *non-perishable consumables* - Nobel laureates, exceptional sportsmen and sportswoman, globally influential artistes, thinkers and leaders. If data and information that is produced within the region by these leaders on art, music, film, fashion or sports is characterized as ‘thought data’, ‘physical data’ and ‘cultural data’, one can begin to contextualize the national, global, economic and social importance of Caribbean creativity.

Artificial Intelligence (AI) is a dynamic technology of the 4th Industrial Revolution. Its effects are forecasted to impact every aspect of society. As the discussions about AI heightens, many SIDS including those in the Caribbean, have yet to develop strategies and national policies to manage the impacts of AI on their society even as the citizens interact with AI in daily life. As an underrepresented stakeholder in the AI ethics debate, Caribbean SIDS must begin to articulate the indigenous knowledge, cultural and ethnic pluralism, and diverse value systems that define the region.

These characteristics should underpin the humanistic development and ethical deployment of AI technologies in the region and guide it towards service to the people. This context must be reflected in the region’s policy discussions.

<sup>5</sup> The SAMOA Pathway, <http://www.2030caribbean.org/content/unct/caribbean/en/home/sustainable-development-goals/samoa-pathway.html#:~:text=The%20SAMOA%20Pathway&text=The%20SIDS%20Accelerated%20Modalities%20of,September%202014%20in%20Apia%2C%20Samoa.>



Critical questions such as how AI should be deployed in the Caribbean, so it does not cannibalize this region's human creativity but serve to enhance or even amplify it. How can AI be combined with the diversity of the region to produce products that fight AI bias, discrimination and threats to security? How can AI help the Caribbean overcome historical developmental challenges such as poverty, crime, stagnant growth and the impacts of climate change? Answers to these questions may provide a starting point for how to contextualize the needs of the people and how AI can support the Caribbean's social, cultural and environmental wellbeing.

While AI has generally contributed to improved performance and productivity where deployed, its employment has commonly seen a variety of 'blind spots' or risks related to the infringement and exploitation of citizen data privacy.

AI systems raise new types of ethical issues that include, but are not limited to, their impact on decision-making in employment and labour, social interaction, health care, education, media, freedom of expression, access to information, privacy, democracy, discrimination, and weaponization. Furthermore, new ethical challenges are created by the potential of AI algorithms to reproduce biases, for instance regarding gender, ethnicity, and age, and thus to exacerbate already existing forms of discrimination, identity prejudice and stereotyping. As Caribbean nations expand their adoption of AI tools and other exponential technologies, stakeholders (policymakers, citizens, private

sector, academia, and NGOs) must proactively collaborate to create strategies for the humanistic development of guidelines, regulations and laws. Boundaries should be defined to regulate the AI decision-making, AI rights, inclusion of manual overrides and AI accountability protocols.

The future of Artificial Intelligence predicts that all industries will eventually be affected by AI technologies. The international audit and consultancy firm PWC, has estimated that the *global market for AI, the general-purpose technology, in 2020 was US\$2.43 trillion, and by 2030 is expected to grow to US\$15.7 trillion up to 14% higher in 2030 because of the accelerating development and take-up of AI.*<sup>6</sup> As a General-Purpose Technology, AI is both a horizontal and vertical industry with diverse applications and the ability to learn almost any task. It is forecasted that AI will move to revolutionize every field it touches.

The big industries in the Caribbean poised for regional development as defined by the CARICOM Council for Trade and Economic Development (COTED) includes: Healthcare, Financial Services, Education, Security, Environment, Culture, Manufacturing, Agriculture and Tourism. All these industries of UNESCO: education, sciences, culture, and communication. UNESCO aims to be a catalyst in bringing together multidisciplinary, universal and holistic approach to the development of AI in the service of humanity, sustainable development, and peace. The human-centered

<sup>6</sup> Sizing the Prize: What's the real value of AI for business and how can you capitalize? PWC. <https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf>



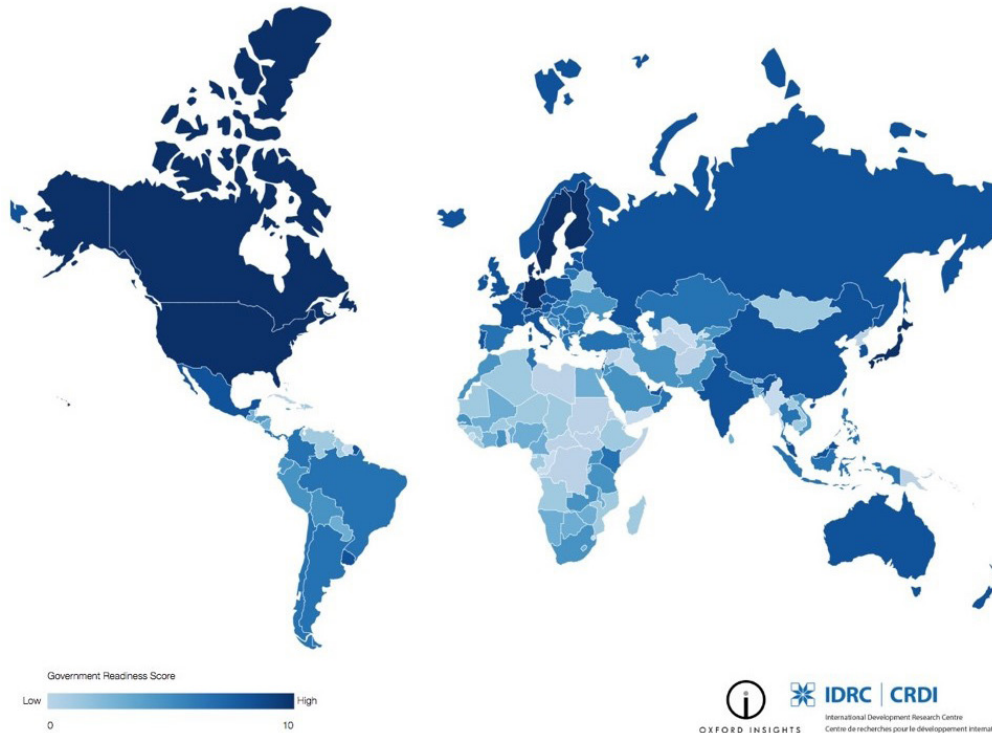


Figure 1. IDRC | CRDI Government Readiness Score

design includes the participation of stakeholders in the design and implementation of the AI system. It is believed that this strategy can help provide essential perspectives in the design or redesign of governance systems in the Caribbean context.<sup>7</sup>

*“While the rest of the world is investing in AI, the Caribbean is still talking about it.”<sup>8</sup>*

*- Leslie Lee Fook, Director, A.I., Analytics and Automation, Incus Services*

The integration of AI and automation in the Caribbean must not compromise the region’s most valuable renewable resource - human creativity. Data is such an important topic for today and into our future as it has been noted that ‘we are our data’, and ‘data rights will be the civil rights of our time’<sup>9</sup>.

It is therefore critical that a multi-disciplinary, multi-stakeholder Caribbean Small Island Developing States (SIDS) strategy and action plan

be developed to further govern the deployment of AI technologies in the region. AI is an industry that must have regulations to manage the span of its integration in the lives of people. Without it, there is a risk of tipping the balance of power in favour of corporate affective computing over human rights and well-being.

According to the World Bank, “Data collection and processing requires an adequate framework, extensive digital infrastructure, stringent regulations for privacy protection, and tools to mitigate risks of harm to data subjects.”<sup>10</sup> Developing nations often lack the data necessary to fine-tune development interventions as data collection has long been a regional weakness. The need for big data will require a big push representing significant new job opportunities for women, youth and disabled people. AI’s ability to tackle unstructured data such as text, images, and audio will be useful for extracting existing knowledge from legacy systems. The information is needed to improve strategic planning and better ensure sustainable development.

<sup>7</sup> UNESCO 2020. First Draft of the Recommendation of the Ethics of Artificial Intelligence, 40 C/37, Pub UNESCO.

<sup>8</sup> Leslie Lee Fook, Director, A.I., Analytics and Automation, Incus Services. Lee Fook, L. (2021, Feb 19). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum], [https://www.youtube.com/watch?v=\\_y1q0KmHG2Q&t=327s](https://www.youtube.com/watch?v=_y1q0KmHG2Q&t=327s)

<sup>9</sup> Renee Cummings, Criminologist, Criminal Psychologist, AI Ethicist, Data Activist Cummings, R. (2021, Feb 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum], <https://www.youtube.com/watch?v=FSY4rAgpIFc>

<sup>10</sup> Peersman, G. (2014). Overview: Data Collection and Analysis Methods in Impact Evaluation, Methodological Briefs: Impact Evaluation 10, UNICEF Office of Research, Florence.





Figure 2. Machine Learning

Policymakers should equip themselves with the requisite knowledge and skills to inform legislation and regulations to effectively govern the further deployment Artificial Intelligence technology in the Caribbean region.

*“We stand to leave so many of our practitioners and stakeholders behind if we do not consider the role of AI in actually streamlining the ecosystem.”<sup>11</sup>*

- Dr. Marielle Barrow, Program Coordinator,  
Caribbean Development Bank

The upskilling and reskilling of the regional workforce must be facilitated to support education targeted at AI literacy and development of requisite skills. Derived from input of diverse stakeholders across the Caribbean islands, this framework for AI technologies and its social implications, take into consideration their well-being, social values and ethical principles.



<sup>11</sup>Dr. Marielle Barrow, Program Coordinator at the Caribbean Development Bank

## ASSUMPTIONS

For the purposes of developing this policy roadmap, the following assumptions were made regarding the Caribbean and Artificial Intelligence:

- Human creativity is inextricably linked to Caribbean identity, economic viability and sustainable development
- AI is a product of human creativity
- AI in service of humanity
- AI is transformative
- AI Industry is vertical and horizontal
- AI must be inclusive, fair, transparent, accountable
- AI is an existential threat to humanity
- AI must be regulated
- Human rights supersede AI rights
- AI not eligible for human rights
- AI is global
- AI is the most important general-purpose technology of the century
- AI and 5G are inevitable
- Bias is everywhere in AI
- We Are Our Data
- Data rights will be the civil rights movement of the 21st century
- Broadband access will be a human right in the 21st century
- New skills education and training are essential

Considering the challenges and opportunities linked to AI technologies, the principles and objectives which follow are recommended to

support AI integration in the Caribbean.

The Caribbean stakeholder consensus was clear that human creativity can never be sacrificed and that AI must work in service to the people to enable greater productivity especially among women, youth and disabled persons. In addition, AI should be employed in service of the preservation and protection of each Caribbean nation's creative advantages, socio-cultural heritage and natural environment. The Caribbean rejects technological determinism and embraces human centered AI design for the good as the way forward.

The proposed framework for the Caribbean AI Policy Roadmap is built on six (6) principles. These principles include national and regional strategies and deliverables recommended to enable the Caribbean's effective adaptation of AI technologies and digital transformation of its economies.

1. **Resiliency** to enable environmental management and fight climate change.
2. **Governance** to enable regulation, legislation to enhance safety, security, and accountability of AI – Do No Harm.
3. **Transformation** through investment in smart island digital infrastructure & public sector digital transformation.
4. **Upskilling** of human capital with digital skills to contribute to regional industry productivity.
5. **Preservation** of Caribbean cultural data using capture, storage and digitalisation technologies.
6. **Sustainability** strategies to support Caribbean attainment of the UN SDGs including gender equality, poverty eradication, climate justice and environmental protection.

The recommended strategies from the consultations and stakeholder presentations in 2020 and early 2021, are reflected in the principles, objectives, guidelines, actions and deliverables outlined in the roadmap below.



## Caribbean AI Policy Roadmap

Figure 3. Caribbean AI Policy Roadmap

RESILIENCY			
GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
<b>Disaster Mitigation</b>	Environmental Management Save Lives Climate Change Fight Decarbonization Improve Food Security Reduce Climate Risks	<b>Early Warning Systems</b> Earthquakes   Hurricanes   Rising Seas <b>Environmental Monitoring</b> Report Trouble Spots Using Satellite Imagery <b>Disaster Management   Public Education</b>	Save Lives Minimize Risk & Economic Loss Predictive Analysis
<b>Resource Management</b>		<b>Monitor</b> Oceans   Rivers   Ports   Volcanoes   Carbon Emissions	Decarbonization Improve Food Security
<b>Predictive Analysis</b>		<b>Monitor</b> Weather   Rainfall   Temperature Reefs   Pollution   Climate	Improve Responsiveness
GOVERNANCE			
GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
<b>Ethics</b>	Do No Harm Fairness Data Protection Accountability Explainability Autonomy Stewardship Reduce Bias Responsible AI Interoperability Standards Values IOT Innovation Improved Citizen Services	Establish Regional <b>Common Values And Principles</b> Establish <b>National And Regional Ai Offices And Data Trusts</b> Develop <b>Technical Code Of Conduct</b> (Developers) Develop <b>Procurement Guidelines</b> (Buyers) Encourage Companies To Develop AI Design   Use Principles <b>Reference IEEE P7000™ Series Of Standards</b> For Ethically Aligned Design	Fairness   Stewardship Reduced biases Raise Awareness of responsible AI Responsible AI Strategies Interoperability of Systems Standards   Values
<b>Legislation</b>		<b>AI Policy   Regulations   Penalties</b> Review Policy & Legislation On Ict And Cybercrimes To Align With Responsible Ai Governance Establish Longterm Policy, Soft Laws And Legislative Framework To Address Ai Harms, Responsibility And Liability <b>Adaptation Of New Financial Instruments</b> Including Digital Currencies <b>Lobby For Fiscal And Policy Space To Align Frameworks</b> (National   Regional   International)	Enforcement   Deterrent Integration   Adaptation Investment   Trade Public Health
<b>Transparency, Explainability &amp; Accountability</b>		<b>Create Caribbean AI Standards Authority to aggregate the specialized competencies that would be required to evaluate &amp; approve deployment of proposed AI solutions</b> Require <b>AI data sheets</b> with training process explained	Explainability Accountability
<b>Safety &amp; Wellbeing</b>		<b>Develop AI to test AI for biases</b> <b>Identify</b> AI applications to assist with safety & wellbeing and AI applications in most need of governance <b>Design Manual Override Options</b> (Kill Switch) <b>Establish AI Innovations and frameworks for Justice Reform &amp; Law Enforcement</b> <b>Online Dispute Resolution System</b> <b>Defend Human Rights</b> <b>(create   own   marry   reproduce etc)</b>	Risk Impact Do No Harm Technology Protect and Save Lives Retain Human Control
<b>Equity</b>		Provide <b>equitable high speed internet access</b> and broadband Create flexible strategies to ensure <b>technology access</b> Recruit women and youth to inform and develop software Utilize <b>equitable machine learning algorithms</b>	Access   Inclusion   Increased participation - women-youth-disabled Increase sharing
<b>Advocacy</b>		<b>Participate in Global AI Discourses</b> <b>Promote AI regional/global networks</b> <b>Launch software conference targeting software developers</b> <b>Lobby big tech</b> companies to collaborate with the Caribbean Issue <b>Papers on AI</b>   Responsible AI Training   AI Policies <b>Participate</b> in global AI forums   Data Protection <b>Public Education</b>	Data Privacy Informed Consent Autonomy Increase Sphere of Influence
SUSTAINABILITY			
GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
<b>Service to Humans</b>	Sustainable Development Improve Citizen Wellbeing Decision-Making Gender Equity Structural Improvements	<b>Use as tool</b> in creation   production   protection   preservation Establish <b>Caribbean AI Governance Network</b> comprised of a network of experts to recommend new AI developments Establish Data Bank in National Archives Structural Improvements   Digitize Operations	Cultural Preservation Predictive Analysis Increased Efficiency
<b>Global Goals</b>		Implement programmes leveraging AI in Poverty Reduction Clean Energy   Economic Development (Women and Youth) Reduce Digital Gender Gap   Upgrade Systems	Sustainable Development

TRANSFORMATION			
GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Public Sector	Investment Infrastructure Modernize Digital Economy Improved Efficiency Monitize Data New Industries	Introduce <b>Efficiency Programmes</b> (crime education health energy) maintenance) with public/private partnerships Public sector efficiency programmes ex. patent and trademark examination, management and forecast of traffic, the development of predictive capabilities for emergency responses AI Assistants to Improve citizen engagement and services such as online experiences for website visitors and reducing the number of people entering brick and mortar service centres Paperless <b>Data Integration</b> Support Caribbean <b>IOT Innovation</b>	Digital Transformation Improved Efficiency Digital Economy
Smart Island Infrastructure		<b>Establish National and Regional Data Banks (governance)</b> <b>Establish secure, energy efficient renewable energy based Data Centres (storage)  Data Hubs (R&amp;D   products)</b> Establish <b>Internet Infrastructure</b> - Broadband   WiFi   5G <b>Establish secure regional computing cloud</b>	AI Infrastructure (Physical   Digital) Digital Autonomy
UPSKILLING			
GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Innovation	Innovation   Monitization Digital Skills   Digital Literacy   AI Adoption Responsible AI Culture   R&D   Innovation Increase Data Management Capacity   Improved AI Curriculum   Increased Awareness   Increase Work Pool	<b>New Programmes for women, youth, disabled Public Education on Media and Information Literacy</b> <b>MOOC Courses for public sector</b> <b>Establish Regional AI Incentives for</b> Academia   Private Sector Create a <b>AI R&amp;D Tech Fund   Regional AI R&amp;D Cloud</b> <b>Initiate and Strengthen Strategic Alliances</b> <b>Establish new AI assisted industries</b> Medical Cannabis  E-Health  E-Sports   E-Education Mariculture   Wellbeing Management Software Development <b>Increase Productivity Across Industries</b> Manufacturing-Regenerative Agriculture-Tourism-Transportation-Criminal Justice-Financial Services-Creative Industries	Expand Digital Skill Pool New Products Wealth Generation Transform Industries Increase Efficiency & Productivity Enhance Customer Service Diversify Consumer Experience
Monitization		<b>Develop AI Bias Test Software Algorithms for efficient AI training</b> Optimize algorithms for efficient testing (energy optimization) <b>Leverage Linguistic Plurality develop AI tools to support inclusion online such e-translation systems</b> <b>Structuring Data to extract value</b> <b>Digitize Creative and Environmental Content</b> <b>Develop Digital Content   Promote Data Services</b> <b>E-Tourism and Creative Industries</b> <b>Augmented Reality Experiences</b> <b>Mentoring, Training and Accelerator Programmes for women, youth and disabled</b>	Revenue Generation Diversify AI Economy Increase Trade E-Translation Services Increase Knowledge Services
PRESERVATION			
GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Data Capture	Culture   Environment   Society Data Archives Data Security Data Utility Structured Data Virtual Tourism Experiences Cultural Heritage Preservation	Launch <b>National and Regional Preservation Programmes</b> <b>Establish National and Regional Data Banks</b> Recruit and train youth and creatives to work as preservationists	Accurate Digital Data
Data Storage		Ensure there are Secure <b>National and Regional Storage Platforms</b> Recruit and train women, youth, disabled and creatives to handle <b>data</b>	Data Security
Data Preservation		<b>Clean public data   prepare machine readable format</b> classify, label, archive and manage content <b>Recruit and train women, youth, disabled and creatives in archival and data cleaning services</b>	Data Utility
Data Management		<b>Capture   Classify   Clean   Format   Store   Analyze   Archive</b>	Structured Data Socio-Cultural Environmental Heritage Preservation
Data Monitization		<b>3D Mapping of Caribbean SIDS Capitals (28)</b> Cultural   Historical   Social   Environmental <b>Augmented Reality Experiences   Increase Financial Literacy</b>	Virtual Tourism Experiences Cultural Heritage Preservation

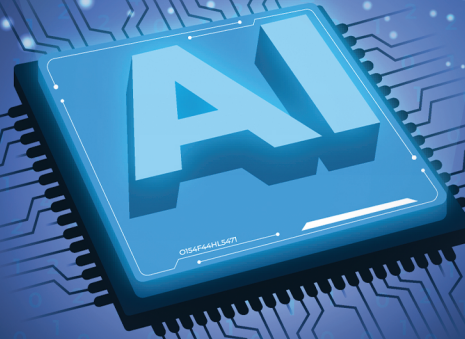












*“UNESCO’s ‘Algorithms for All’ agenda seeks to encourage the creation of diverse, equitable, communicative AI using multidisciplinary, holistic and ethical approaches to protect humanity and the environment; enable sustainable development and promote human rights.”<sup>12</sup>*

*- Sadia Sanchez-Vegas, Director,  
UNESCO Cluster office for the Caribbean*

In UNESCO’s Developing Competencies for the AI Era Forum held December 7-8, 2020, UNESCO called on Member States to recognize the increasing importance of developing AI literacy and AI competencies for all citizens.

*The debates over the two days recognized that the pervasive use of Artificial Intelligence will be the distinct feature of the future. Living and working with AI will not be optional, and therefore, preparing to live and work safely and effectively with AI has become a shared challenge at global level. The speakers noted that countries face diverse development challenges and possible futures, which implies that development of AI competencies and the use of AI will need to account for the diversity of local contexts. It is recognized that the potentials of AI - including automation of low-skill tasks, augmentation of human capacities, and amplification of business models - should be used for the benefit of society and for the common good. Aligned with the humanistic approach UNESCO takes towards the use of AI, humans should be protected*

*from becoming victims of AI tools. AI should be designed and deployed as a tool at the service of humans towards a sustainable development that is economically and socially just and inclusive. Keeping AI under control should be from, and by, design. AI developers need to be regulated, and the design of AI should be based on accountability, transparency and ‘explainability’. AI by nature has the power to transcend borders. It is therefore imperative that cross-border regulations be developed and executed to ensure that AI is designed for and serves the common good. The work of UNESCO in developing the Recommendation on the Ethics of Artificial Intelligence was presented and was recognized as one of the most important international response to the need.<sup>13</sup>*

While most believe in the uniqueness of human intelligence, creativity and ethical reasoning, people need to understand the theory and practice of artificial intelligence. The UNESCO debates suggested that:

- AI Literacy should include understanding how AI collects and can manipulate data
- Data Literacy and the skills to ensure safety and protection of our personal data
- Algorithm Literacy that comprises knowledge of how algorithms process data and control behaviour through personalized human-machine communication

<sup>12</sup>Sanchez-Vegas, S. (2020, Dec 10). Artificial Intelligence In the Caribbean Context: What Are We Talking About? [Online forum]. [https://www.youtube.com/watch?v=\\_ylq0KmHG2Q&t=327s](https://www.youtube.com/watch?v=_ylq0KmHG2Q&t=327s)

<sup>13</sup>International education community gathers to deliberate on the development of AI competencies for all, UNESCO <https://en.unesco.org/news/international-education-community-gathers-deliberate-development-ai-competencies-all>

## PURPOSE

The guidelines reflected in this document are intended to provide a roadmap for developing AI policy within the Caribbean context and reflects UNESCO's human-centered, multi-stakeholder vision for developing standards for AI use including cooperation, human rights and sustainable development.

## HOW THE POLICY ROADMAP WAS DEVELOPED

The findings and analyses of this paper are limited primarily to Caribbean Small Island Developing States (SIDS). These guidelines were informed by a broad consultative process through UNESCO sponsored stakeholder forums produced by the Broadcasting Commission of Jamaica that provided a platform to share perspectives from a variety of experts to better reflect the regional landscape. Stakeholders including private sector, government and relevant NGOs, as well as academics were engaged. Also included were perspectives from women, youth and disabled persons, representing traditionally underserved communities. Their collective contributions are woven into the policy roadmap and reflected in key quotes throughout the document highlighting perspectives of AI in the Caribbean.

This policy roadmap also builds on and refers to guidance provided in key related resource documents including -

- UNESCO Ad Hoc Expert Group (AHEG)'s First Draft of the Recommendation on the Ethics of Artificial Intelligence
- *Universal Declaration of Human Rights (1948)*, including Article 27 emphasizing the right to share in scientific advancement and its benefits
- Small Island Development States Accelerated Modalities of Action (S.A.M.O.A) Pathway (2014)
- UN Guiding Principles on Business and Human Rights (2011)
- UN Policy Brief: Impact of COVID-19 on Women (2020)
- UNICEF Policy Guidance on AI for Children (2020)
- UNICEF | CAPRI The Effect of COVID-19 Pandemic on Jamaican Children – Preliminary Results (2021)
- IEEE Ethically Aligned Design: A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems (2020)
- National Institute of Standards and Technology: Four Principles of Explainable Artificial Intelligence (2020)
- European Commission White Paper on Artificial Intelligence – A European Approach to Excellence and Trust (2020)
- The European Commission's High-Level Expert Group on Artificial Intelligence Ethics Guidelines for Trustworthy AI (2020)

This paper was compiled using multiple sources of information including a combination of desk research and literature review of information from the United Nations, World Bank, The World Economic Forum and the Organization for Economic Co-operations and Development and other statistical data sources. Reports from local news outlets were also used to gather relevant information on activities of individual Caribbean SIDS nations to provide a wide range of views and opinions. All sources are referenced in a brief footnote. Full details of all sources cited and consulted are found alphabetically in the bibliography. Information deficits were observed including numerous data constraints posed by limited, fragmented or non-existent data on the topic of AI by nation and as a region.

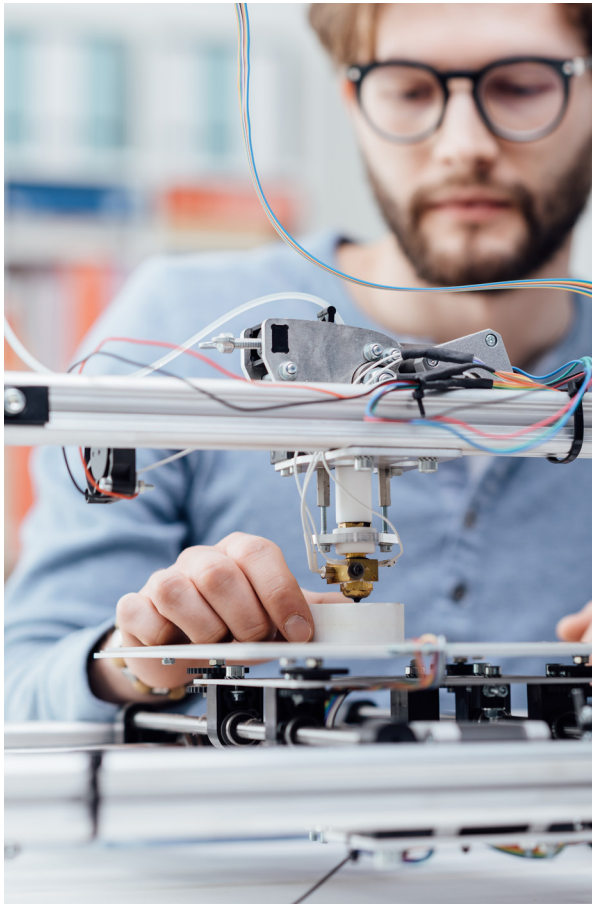




## HOW TO USE THE POLICY GUIDANCE

The guidance herein can be used in a variety of contexts:

- When educating stakeholders about the opportunities and risks of AI – important when developing the life cycle of policy and technology development, within Caribbean governments and companies
- When creating, reviewing and/or updating AI policies, strategies or codes of conduct
- When developing and implementing AI systems that interact with or impact women, youth, disabled and other at-risk communities



## ASSUMPTIONS

For the purposes of developing this policy roadmap, the following assumptions were made regarding the Caribbean and Artificial Intelligence:

- Human creativity is inextricably linked to Caribbean identity, economic viability and sustainable development
- AI is a product of human creativity
- AI in service of humanity
- AI is transformative
- AI Industry is vertical and horizontal
- AI must be inclusive, fair, transparent, accountable
- AI is an existential threat to humanity
- AI must be regulated
- Human rights supersede AI rights
- AI not eligible for human rights
- AI is global
- AI is the most important general-purpose technology of the century
- AI and 5G are inevitable
- Bias is everywhere in AI
- We Are Our Data
- Data rights will be the civil rights movement of the 21<sup>st</sup> century
- Broadband access will be a human right in the 21<sup>st</sup> century
- New skills education and training are essential

## AI & THE CARIBBEAN

### AI Definition

In 1956, an American computer and cognitive scientist John McCarthy coined the term artificial intelligence (AI)<sup>14</sup> as the science and engineering of making intelligent machines. UNESCO's first draft on the recommendation on the ethics of Artificial Intelligence approaches AI systems as technological systems which have the capacity to process information in a way that resembles intelligent behaviour and, typically includes aspects of reasoning, learning, perception, prediction, planning or control.<sup>15</sup>

The European Commission's High-Level Expert Group on Artificial Intelligence Ethics Guidelines for Trustworthy AI said

*"Artificial Intelligence (AI) systems are software (and possibly hardware) systems designed by humans, that given a complex goal, act in the physical and digital dimension by perceiving their environment through data acquisition, interpreting the collected structure of 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 action."<sup>16</sup>*

The growing capabilities of these systems and their horizontal impact help to categorize AI as a General-Purpose Technology (GPT). General-Purpose Technologies are technologies or clusters of related technologies defined by the potential for pervasive use in a wide range of industry sectors and by their technological dynamism.<sup>17</sup> Characterized as engines of growth, some examples include the steam engine, the electric motor and the microprocessor.

AI systems train using large data sets to identify patterns, make predictions, recommend actions, and figure out what to do in unfamiliar situations, learning from new data and thus improving over time. This new learning is called Machine Learning

or Deep Learning also encompassed under AI make these systems descriptive, prescriptive and predictive in nature. Their use will continue to be introduced to the daily lives of Caribbean people much more than they are today.

### CHARACTERISTICS OF AI

- 4th Revolution (3,000x impact of 1st Revolution)
- Product of the Human Mind
- Horizontal and Vertical Industry
- General-Purpose Technology
- Cyber-Physical Systems
- Transformative
- Amoral
- Cognitive
- Disruptive
- Descriptive
- Predictive
- Prescriptive

Figure 4. Characteristics of artificial intelligence

Forms of AI in use today include digital assistants, chatbots and machine learning amongst others.

- Automated Intelligence: Automation of manual/cognitive and routine/nonroutine tasks.
- Assisted Intelligence: Helping people to perform tasks faster and better.
- Augmented Intelligence: Helping people to make better decisions.
- Autonomous Intelligence: Automating decision-making processes without human intervention.

<sup>14</sup> Professor John McCarthy - Artificial Intelligence (stanford.edu)

<sup>15</sup> UNESCO, 2020. First Draft of the Recommendation of the Ethics of Artificial Intelligence, 40 C/37. Paris: UNESCO.

<sup>16</sup> European Commission's High-Level Expert Group on Artificial Intelligence, 'Ethics Guidelines for Trustworthy AI' (2019) p. 36

<sup>17</sup> Timothy F Bresnahan and Manuel Trajtenberg. General purpose technologies 'engines of growth?' Journal of econometrics, 65(1):83-108, 1995.

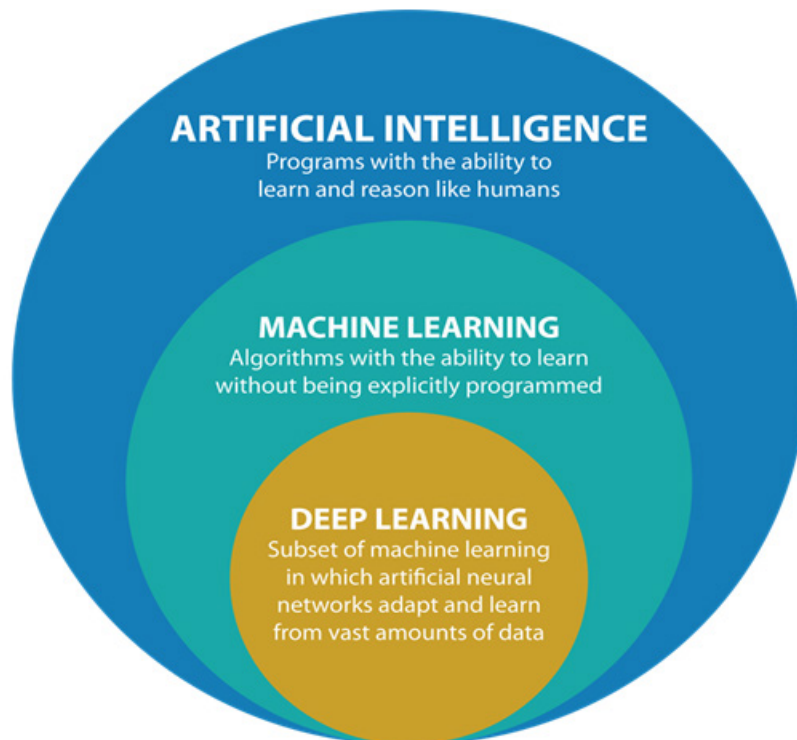


Figure 5. Visual Diagram of Elements of Artificial Intelligence

Machine learning and deep learning, a subset of artificial intelligence, is based on the idea that systems can learn from data, identify patterns and make decisions with minimal human intervention. It is a 4th industrial revolution innovation that is everywhere and is used in multiple fields helping to enhance industrial and professional processes and is also delivering benefits to everyday living. For example, machine learning is used for medical diagnosis, image processing, prediction, classification, learning association and regression use machine learning. A few examples of machine learning applications are:

1. **Virtual Personal Assistants** - Siri, Alexa, Google
2. **Self-driving Cars** – Google Car, Telsa
3. **Product Recommendations** - Online recommendation offers such as those from Amazon and Netflix
4. **Social Media Services:** Knowing what people are saying on Twitter, or suggestions for people you know on Facebook
5. **Traffic predictions** – Traffic hotspots or rerouting

An AI system needs to learn from data in order to be able to fulfill its function and so AI systems need big data to work. AI's ability to work so well with data analytics is the primary reason why AI and Big Data are now seemingly inseparable. Data and AI are merging into a synergistic relationship, where AI cannot function without data and data insights are insurmountable without AI. AI machine learning and deep learning must learn from every data input. These systems use those inputs to generate new rules for future business analytics. Problems arise, however, when the data being used is not good data. For AI machine learning systems to work efficiently, there must be an agreed-upon methodology to data collection (mining) and data structure before running the data through a machine learning or deep learning algorithm.

Natural language processing, for example, will not be possible without millions of samplings of human speech, recorded and broken down into a format that AI engines can more easily process. Big Data is going to continue to grow larger as AI becomes a viable option for automating more tasks, and AI will become a bigger field as more data is available for learning and analysis.





Human + AI	AI
<p><b>Assisted Intelligence</b></p> <p>Assisted in making decisions and taking actions</p>	<p><b>Automation</b></p> <p>Automation of routine tasks</p>
<p><b>Augmented Intelligence</b></p> <p>Human decision making automation</p>	<p><b>Augmented Intelligence</b></p> <p>Adaptation to different situations, acting without human assistance</p>

Figure 6. PWC AI Report

As of 2021, there are nine companies that steer the future of Artificial Intelligence. Six of these nine companies are in the United States including: IBM, Facebook, Apple, Google and Amazon, and the remaining three are in China (Tencent, Alibaba and Baidu).<sup>18</sup> Caribbean SIDS rely heavily on trade and other technologies from the economic giants and technology creators in the US and China. However, Artificial Intelligence technologies are being developed by groups of persons that may not be cognizant of diverse socio-cultural and historical context that exist in the Caribbean and as such may cause adverse effects on countries if these

18 Davos 2019 - Setting Rules for the AI Race: <https://www.youtube.com/watch?v=Lzqw5c0MyqW>

algorithms are deployed out of the box.<sup>19</sup> Across the world, COVID 19 has accelerated the creation and deployment of digital offerings by seven (7) years.<sup>20</sup>

Since Artificial Intelligence (AI) and Machine Learning are fundamental technologies of the future, it will therefore be important that the Caribbean puts greater focus and accelerate the understanding of it. The international audit and consultancy firm PWC, has estimated that the global market for AI, the general-purpose technology, in 2020 was US\$2.43 trillion, and by 2030 is expected to grow to US\$15.7 trillion up to 14% higher in 2030 because of the accelerating development and take-up of AI.<sup>21</sup>

### Machine Learning Tips

- Rule #1: Always start with data
- Rule #2: Focus on the main ideas
- Rule #3: Have empathy for the audience.

-Joshua Starmer, StatQuest

Figure 7. Machine Learning Tips

19 Noble, Safiya. Algorithms of Oppression How Search Engines Reinforce Racism. New York: NYU Press, 2019  
 20 How Covid 19 Has Pushed Companies Over the Technology Tipping Point - and Transformed Business Forever, Oct 5, 2020, McKenzie and Company.  
 21 Sizing the Prize: What's the real value of AI for business and how can you capitalize? PWC, <https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf>

## AI CHALLENGES

Norwegian diplomat Christian Louis Lange made the statement that *“Technology is a useful servant but a dangerous master”* in his Nobel Peace Prize acceptance speech in 1921 about the advancements of technology in the 20th century.<sup>22</sup> This statement predicted the advancement of technology as a useful tool to aid humans in their work, but also warned of the possibility that it could evolve and become an uncontrollable entity. Lange’s prediction came true, as ninety five years later, technology has captured the people’s attention, making them the servants. This damaged the relationship between people and nature to the point where people are more concerned with the health of their technology rather than the health of their environment.

<sup>22</sup>Posner, T., 10.29.2018, Artificial Intelligence for All: A Call for Equity in the Fourth Industrial Revolution, Our World, Retrieved from <https://ourworld.unu.edu/en/artificial-intelligence-for-all-a-call-for-equity-in-the-fourth-industrial-revolution>

As AI technology increasingly impacts society, key affiliated challenges include:

1. Existential Threat
2. Ethics-Bias-Harm
3. Big Data Rights
4. Job Loss
5. Equity
6. Cyber-Security

The dangers of advanced AI have been popularized in the late 2010s by Stephen Hawking, Bill Gates & Elon Musk. For Tesla CEO and tech maverick Elon Musk, *“AI is a rare case when we need to be proactive instead of reactive with regulations”*.<sup>23</sup> He thinks the advent of digital superintelligence is by far a more dangerous threat to humanity than nuclear weapons and that the field of AI research must have government regulation.

<sup>23</sup>Elon Musk: Superintelligent AI is an Existential Risk to Humanity, Science Time, December 12, 2020, [https://www.youtube.com/watch?v=iHh16HLgp0&ab\\_channel=ScienceTime](https://www.youtube.com/watch?v=iHh16HLgp0&ab_channel=ScienceTime)

## TOP 9 ETHICAL ISSUES IN ARTIFICIAL INTELLIGENCE

According to the World Economic Forum (2016), the top nine ethical issues associated with AI include

1. **Unemployment** - Increasing fears of job loss due to increased automation and the use of robots
2. **Inequality** - The potential for AI technologies to create an increasing wealth divide
3. **Humanity** - Particularly the implication of machines on human behaviour and interaction
4. **Artificial Stupidity** - The possibility of intelligent technology making mistakes
5. **Racist Robots** - The generation of biased outcomes with discriminatory effects
6. **Security** - The importance of cybersecurity and data protection
7. **Evil Genies** - The possibility of unintended consequences which may be as extreme as rogue AI
8. **Singularity** - The ability to retain human control over such complex systems; Robot rights - the ‘humane’ treatment of AI robots

Figure 8. Top 9 Ethical Issues in Artificial Intelligence

In the long term, AI systems could challenge human's special sense of experience and agency, raising additional concerns about human self-understanding, social, cultural and environmental interaction, autonomy, agency, worth and dignity.

*"So far AI is exacerbating structural inequalities and creating new inequities and millions are falling the below the digital literacy poverty line."*

- Wendell Wallach, Co-Convenor,  
International Congress for the Governance of AI (ICGAI)

Implementation of AI's automated decision making technologies are impacting decision-making on employment and labour, social interaction, health care, education, media, freedom of expression, access to information, privacy, democracy, discrimination, and weaponization. Furthermore, the potential of AI algorithms to reproduce biases that perpetuate already existing forms of discrimination, identity prejudice and stereotyping including gender, ethnicity, and age are a *"threat to cultural, social and ecological diversity"*.<sup>24</sup> These concerns surround the biases that the developers of these systems can embed that can potentially exacerbate or perpetuate inequality, exclusion, and a threat to cultural, social and ecological diversity and social or economic divides.<sup>25</sup>

What has become clear over the last decade is that AI systems raises fundamental ethical concerns. AI systems require explanations, justification and contextual information about how algorithms are designed. Algorithms must always be transparent, accountable, explainable, accurate, auditable and responsible. Efforts must be made to ensure that AI is designed ethically by using interdisciplinary and multidisciplinary approaches. A new kind of respect for data will need to be developed to help detect, monitor and mitigate against AI bias and risks.

Interestingly, software development, unlike other professions that require high ethical discipline, is for the most part, a profession that has no consolidated professional code of conduct or licensing requirements to operate. This is a real dilemma when you consider the impacts that

these systems have. These powerful tools are now available and in the hands of professionals and novices alike. This is perhaps a broader discussion on how to regulate and license professionals and companies operating in the industry.

*"One thing the technologies can't do is answer the moral issues they raise. Who is going to be held accountable when they go wrong? What responsibility do we as creators or users have?"*

- Wendell Wallach, Co-Convenor,  
International Congress for the Governance of AI (ICGAI)

**UN Special Representative John Ruggie proposed a framework on business and human rights to the UN Human Rights Council in June 2008, resting on three pillars to guide businesses:**

1. State duty to protect against human rights abuses by third parties, including business
2. Corporate responsibility to respect human rights
3. Greater access by victims to effective remedy, both judicial and non-judicial

2011, the United Nations endorsed the *Guiding Principles for Business and Human Rights*<sup>26</sup>, which defines the responsibilities that businesses and states have to protect the rights and liberties afforded to all individuals. Protection of human rights should be the first foundational principle that technology is built upon; however, it is not sufficient on its own. The paper however noted that additional guidelines and principles are needed to protect society from harms still worth addressing that are not necessarily a violation of human rights and offers the *United Nations "Protect, Respect and Remedy" Framework* as a roadmap. The Caribbean should ensure that there is representation on these standards bodies to provide diversity and influence on the technical standards by which these products will be created. It is an important pathway and point of influence for the Caribbean to be involved with the development of the standards that govern these systems.

<sup>24</sup> UNESCO, 2020. First Draft of the Recommendation of the Ethics of Artificial Intelligence, 40 C/37. Paris: UNESCO.  
<sup>25</sup> IBID.

<sup>26</sup> United Nations Guiding Principles for Business and Human Rights [https://www.ohchr.org/documents/publications/GuidingprinciplesBusinesshr\\_eN.pdf](https://www.ohchr.org/documents/publications/GuidingprinciplesBusinesshr_eN.pdf)





*“We need Caribbean research expertise on the big questions facing AI use.”*

*- Dhanaraj Thakur,  
Research Director Center for Democracy & Technology*

According to the World Bank, *“Data collection and processing requires an adequate framework, extensive digital infrastructure, stringent regulations for privacy protection, and tools to mitigate risks of harm to data subjects.”*<sup>27</sup> The data that is used by machine learning can analyse patterns found in your online behaviour and disclose your political beliefs, religious affiliation, race, ethnicity, health conditions, gender and sexual orientation, even if you have never revealed this information to anyone online hence privacy concerns with AI remain a critical challenge.

According to Criminologist Renee Cummings, *“we have experienced the hidden effects of algorithms, algorithmic discrimination, algorithmic profiling, algorithms marginalizing and victimizing, algorithms replicating and reinforcing racial disparities, economic disparities, creating a digital form of system racism and discrimination. We have seen the dangers of arraignment by AI, algorithms changing the way justice is administered, outsourcing of criminal justice decision making to algorithms and risk scores which have been disproportionately unfair and racially biased against black and brown defendants. Machine bias, algorithms codifying unconscious bias and systemic racism and criminal justice. Proxies for race such as criminal history, financial history, education, employment, neighborhood or zip code slip into data classification. AI is presenting new challenges and new risks for vulnerable populations.”*<sup>28</sup>

*“In developing AI policy, it is important to remember that it is not only about privacy and data protection, but in terms of innovation and development, we need to think of more comprehensive models of how to address data models for reuse, local entrepreneurs, open data policy”* according to Carolina Aguerre, Director at the Center for Technology and Society at the University of San Andres.<sup>29</sup>

<sup>27</sup> Peersman, G. (2014). Overview: Data Collection and Analysis Methods in Impact Evaluation, Methodological Briefs: Impact Evaluation 10, UNICEF Office of Research, Florence.

<sup>28</sup> Cummings, R. (2021, Feb 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. <https://www.youtube.com/watch?v=FSY4rAgplFc>

<sup>29</sup> Carolina Aguerre, Director, Center for Technology and Society, University of San Andres Aguerre, C. (2021, Feb 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. <https://www.youtube.com/watch?v=FSY4rAgplFc>

By 2025, it is estimated that annual savings from replacement of employees by AI will reach U\$9 trillion with an additional cost reduction of U\$8 trillion from efficiencies gained in manufacturing healthcare and further U\$2 trillion in efficiency gains from deployment of self-driving cars and drones. (Bank of America | Merrill Lynch).<sup>30</sup> The emergence of these systems will drive efficiency and see automated systems managing a growing number of tasks including reasoning, planning, learning, and problem solving in ways far beyond the capacity of humans to undertake.

*When it comes to AI and creativity, what is not clear is the degree to which human-level ability to experience art is required to create art. Can AI create art on par with human composers or painters despite lacking the ability to experience art, and reality, like humans do? Growing empirical evidence, especially in painting and music, suggest that artistic creativity may not require the capacity for subjective experience but instead be learnable by AI from human-created art and feedback. We believe that as AI becomes better at patterns and associations learning, and as it receives more feedback from people, it will create art capable of eliciting increasingly rich multi-sensory and emotional human experiences with increasingly complex associations: namely, increasingly better art, possibly moving beyond art created by humans.*<sup>31</sup>

*"Intelligence used to be the province of only humans but it no longer is. We don't programme the machines, they learn by themselves." "Affective computing – AI that interprets and simulates human emotions. Machines will interact with humans just as we interact with one another – through perception and through conversation so we want to build emotion AI that enables machines to have empathy"*<sup>32</sup>

*How Far is Too Far? | The Age of A.I., The Age of A.I.*

Broadening access and inclusion for AI not only mitigates the risks of inequality and disenfranchisement, but it also ensures that AI reaches its fullest potential. The fourth industrial revolution can bring prosperity, health, and stability to the globe. But it can also accelerate our worst natures, driving marginalisation, inequality

and destructive growth. By granting access to the revolutionary potential of AI to all of us, we can harness the best of humanity for all of humanity.<sup>33</sup>

A critical factor underpinning the institutional environment for disruptive technologies is trust. Consumers and stakeholders must trust that privacy of children and other stakeholders will be respected, that data are used responsibly, that technologies are adopted in a way that is environmentally and socially sustainable, and that in particular, these technologies are adopted in a way that support inclusion and equity.

AI integration will also lead to increased Cyber Attacks which are particularly problematic and dynamically changing areas of protection and Cybersecurity. The right mechanisms to protect data and systems against cyberattack are not in place in the Caribbean and there are limited penalties legislated for Cybercrimes vis a vis physical crimes. Aggressive and agile cyber criminals have the advantage over ill-equipped agencies using obsolete laws and regulations.

*"There should be a certain degree of concern, even now, given the interplay between technology and society and our common commodity - DATA."*

Eldon Marks CEO, V75

*If it were measured as a country, then cybercrime – which is predicted to inflict damages totaling \$6 trillion USD globally in 2021 – would be the world's third-largest economy after the U.S. and China. Cybersecurity Ventures expects global cybercrime costs to grow by 15% per year over the next five years, reaching \$10.5 trillion USD annually by 2025, up from \$3 trillion USD in 2015. This represents the greatest transfer of economic wealth in history, risks the incentives for innovation and investment, is exponentially larger than the damage inflicted from natural disasters in a year, and will be more profitable than the global trade of all major illegal drugs combined. The damage cost estimation is based on historical cybercrime figures including recent year-over-year growth, a dramatic increase in hostile nation-state sponsored and organized crime gang hacking activities, and a cyberattack surface which will be an order of magnitude greater in 2025 than it is today.*

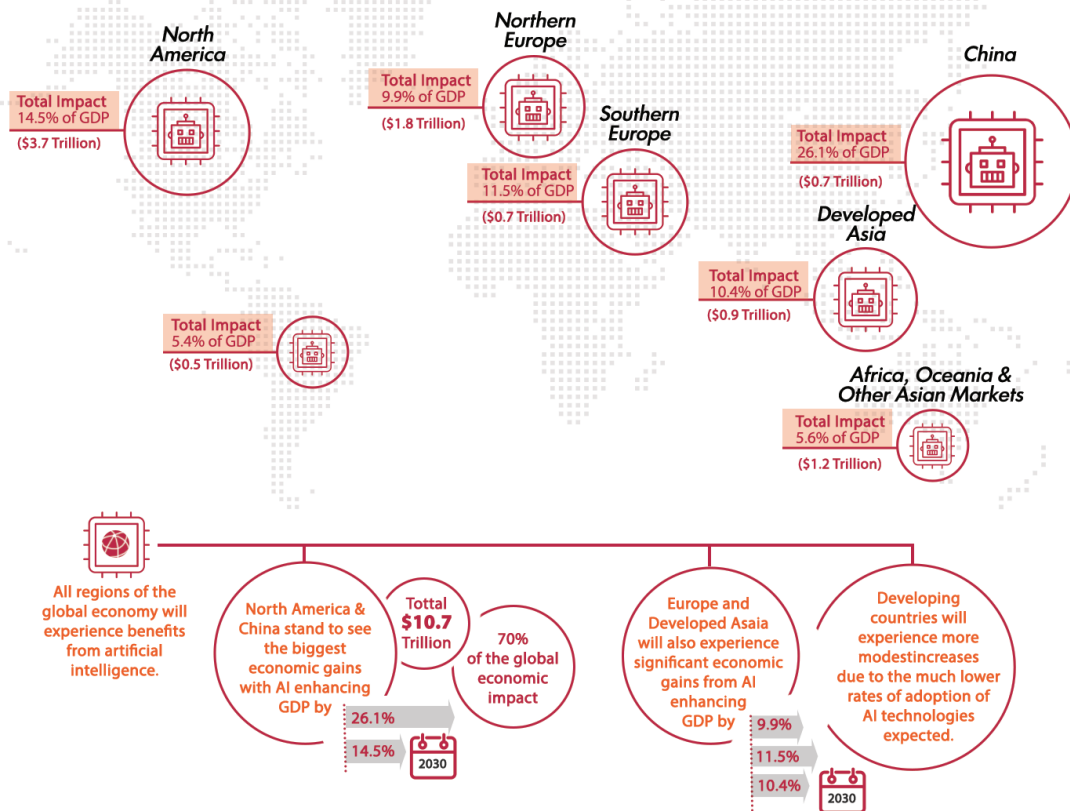
<sup>30</sup>Bank of America | Merrill Lynch

<sup>31</sup>Supercreativity, AI may soon surpass human artistic creativity, Serafim Batzoglou and Theodoros Evgeniou, August 21, 2019, <https://towardsdatascience.com/supercreativity-b4114ebd0357>

<sup>32</sup>How Far is Too Far? | The Age of A.I., The Age of A.I. S1 • E1, December 18, 2019, [https://www.youtube.com/watch?v=UwsrzCVZAb8&ab\\_channel=YouTubeOriginals](https://www.youtube.com/watch?v=UwsrzCVZAb8&ab_channel=YouTubeOriginals)

<sup>33</sup>Posner, T., 10.29.2018, Artificial Intelligence for All: A Call for Equity in the Fourth Industrial Revolution, Our World, Retrieved from <https://ourworld.unu.edu/en/artificial-intelligence-for-all-a-call-for-equity-in-the-fourth-industrial-revolution>





All GDP figures are reported in market exchange rate terms  
 All GDP figures are reported in real 2016 prices, GDP baseline based on Market Exchange Rate Basis

Figure 9. Predicted regional gains from AI

Cybercrime costs include damage and destruction of data, stolen money, lost productivity, theft of intellectual property, theft of personal and financial data, embezzlement, fraud, post-attack disruption to the normal course of business, forensic investigation, restoration and deletion of hacked data and systems, and reputational harm.<sup>34</sup>

The potential for the digital transformation is threatened by the migration of terrorism and organized crime to the unregulated cyberspace including social media. These threats include:

- \* Use of social media for undermining democracy and inciting violence
- \* Use of the Internet and social media by rogue governments and fringe organizations for censorship, abuse of rights and

oppressive purposes as well as membership recruitment

\* New ways to commit financial crimes i.e. tax evasion, money laundering, fraud and theft (scamming, phishing, bank hacks, stolen credit cards and identify theft).

\* Distribution of narcotics, weapons and stolen artifacts

Other threats include the militarization of AI weapons technology with lethal capability and liability issues with automation of decision making in law enforcement.

## AI OPPORTUNITIES

The current utilization of AI across Caribbean industry is poised to expand and if done properly, the industry sector should see more efficiencies and new industry opportunities unfold by 2030 due

<sup>34</sup> Morgan, S. Nov 20, 2020, Cybercrime To Cost The World \$10.5 Trillion Annually By 2025: Special Report: Cyberwarfare In The C-Suite, Cyber Crime Magazine <https://cybersecurityventures.com/hackerpocalypse-cybercrime-report-2016/>



to data efficiency and management. Automation and AI-assisted decision-making will enable businesses in the region to be more efficient and do more with less.

*Artificial intelligence (AI) will have an economic impact comparable to the steam engine and could boost global gross domestic product by 1.2% per year by 2030, delivering an additional US\$13 trillion in economic value. AI is rapidly becoming more adept at performing complex tasks thanks to dramatic increases in data processing speed, storage capability and transfer rates. IBM CEO Ginny Rometty has recently said that AI will impact “100% of jobs, professions and industries.” But beyond these impending economic shifts, the real promise of AI lies in its potential to tackle global challenges like hunger, poverty, and climate change.<sup>35</sup>*

According to global advisory firm PwC, the global GDP will be up to 14% higher in 2030 because of the accelerating development and take-up of AI – the equivalent of an additional \$15.7 trillion.<sup>36</sup> The economic impact of AI will be driven by:

1. Productivity gains from businesses automating processes (including use of robots and autonomous vehicles).
2. Productivity gains from businesses augmenting their existing labour force with AI technologies (assisted and augmented intelligence).

3. Increased consumer demand resulting from the availability of personalized and/or higher-quality AI-enhanced products and services.

The region can reallocate savings earned from these increased efficiencies, to invest in infrastructure development, poverty eradication, improving healthcare and education systems, protecting the environment, emergency management capacity and other areas critical to the sustainable development of the region.

In considering the future of Caribbean workers who will be affected by AI, Professor Anthony Clayton, Director of the Institute of Sustainable Development, UWI, Mona and Chairman of Broadcasting Commission of Jamaica, posed critical questions at the UNESCO | Broadcasting Commission regional stakeholder forum including:

*What will happen to the unskilled and to those whose skills are no longer necessary? If no solution, this could lead to poverty and civil unrest. We need to have a fundamental rethink of the nature of work and education and what is going to be the relationship between qualifications and the means by which we earn a living in the future.<sup>37</sup>*

In 2020, the *Institute of Electrical and Electronics Engineers (IEEE)* issued its seminal piece *Ethically Aligned Design: Prioritizing Human Wellbeing with Autonomous and Intelligent Systems*. The guidelines stated that ‘to be human-centered, businesses must first establish a culture of trust, transparency, and accountability internally’ in order to effectively

<sup>35</sup> Posner, T., 10.29.2018, Artificial Intelligence for All: A Call for Equity in the Fourth Industrial Revolution, Our World, Retrieved from <https://ourworld.unu.edu/en/artificial-intelligence-for-all-a-call-for-equity-in-the-fourth-industrial-revolution>

<sup>36</sup> Sizing the Prize: What's the real value of AI for business and how can you capitalize? PwC, <https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf>

<sup>37</sup> Anthony Clayton(2021, Feb 18), Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum], <https://www.youtube.com/watch?v=FSY4rAgplFc>





code these values into products.

The IEEE technical community has created guidelines for developing these systems and the IEEE P7000™ series of standards<sup>38</sup> are recommended to be considered for adoption by the Caribbean:

- **P7001™** Transparency of Autonomous Systems
- **P7002™** Data Privacy Process
- **P7003™** Algorithmic Bias Considerations
- **P7004™** Standard on Child and Student Data Governance
- **P7005™** Standard on Employer Data Governance
- **P7006™** Standard on Personal Data AI Agent Working Group
- **P7007™** Ontological Standard for Ethically driven Robotics and Automation Systems
- **P7008™** Standard for Ethically Driven Nudging for Robotic, Intelligent and Autonomous Systems
- **P7009™** Standard for Fail-Safe Design of Autonomous and Semi-Autonomous Systems
- **P7010™** Recommended Practice for Assessing the Impact of Autonomous and Intelligent Systems on human well-being

<sup>38</sup>IEEE Ethics in Action: Ethically Aligned Design <https://ethicsinaction.ieee.org/#series>





## SMALL ISLAND DEVELOPING STATES (SIDS)

The Caribbean’s dynamic culture and environmental diversity have made it one of the number one destinations on the planet for centuries.

*“Because of its diversity, the Caribbean has the capacity to build bridges not only among classes and races of people from countries across the region but also between continents of the world which are represented in the Caribbean through centuries of voluntary and involuntary migration which is now continued via tourism, commercial transaction, and professional contacts.”<sup>39</sup>*

*Professor Rex Nettleford,  
Expressions of the Mind: Philosophy and the  
Making of the Caribbean Nation Symposium, 2008*

The Caribbean region is referred to as a melting pot because of the high cultural, linguistic and ethnic diversity among each of its 28 nations. Forty-four million persons call the Caribbean cluster of islands home, representing about 0.56% of the

39 La Rose, M., 2008 September 5, Caribbean culture too diverse to be labelled – Prof Nettleford, Guyana News, retrieved from <https://www.stabroeknews.com/2008/09/05/news/guyana/caribbean-culture-too-diverse-to-be-labelled-%E2%80%93-prof-nettleford/>

total world population and each with a unique economic, cultural and historical flavour. The Caribbean region are considered Small Island Developing States (SIDS) and each country has a unique economic, cultural and historical flavour. The islands are characterised as developing nations because they facing specific social, economic and environmental vulnerabilities.

SIDS were recognized as a special case both for their environment and development at the United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit, held in Rio de Janeiro, Brazil (3–14 June 1992). *The SIDS Accelerated Modalities of Action (S.A.M.O.A) Pathway* an outcome of the ‘Third International Conference on Small Island Developing States (SIDS Conference)’ acknowledged that the identification of SIDS priorities was needed in the formulation of the 2030 Agenda (UN Sustainable Development Goals).<sup>40</sup>

40 The SAMOA Pathway, <http://www.2030caribbean.org/content/unct/caribbean/en/home/sustainable-development-goals/samoa-pathway.html#:~:text=The%20SAMOA%20Pathway&text=The%20SIDS%20Accelerated%20Modalities%20of,September%202014%20in%20Apia%2C%20Samoa>



Figure 11. Caribbean SIDS

## CARIBBEAN TRADITION

- **Advocacy**  
Uniquely positioned to advocate based on the Caribbean DNA and resistance history
- **Challenge Injustice**  
Marcus Garvey-Pan Africanism | Reggae Music-Apartheid
- **Context**  
Cultural | Sociological | Anthropological | Historical
- **Creativity**  
Globally competitive creators of non-perishable consumables
- **Identity**  
Who we are | Global village reflection | Diverse | Multi-ethnic
- **Revolution**  
Enslaved African people – Maroons (Jamaica) | Toussaint (Haiti) | Bussa (Barbados)
- **Resistance**  
Bob Marley (*global symbol of freedom*)
- **Movements**  
Rastafari (*revolutionary | way of life | global*)

Figure 10. Caribbean Tradition

## CARIBBEAN CHALLENGES

The poverty and inequality in the region may, to an extent, be associated with structural heterogeneity and low-productivity sectors, which account for more than half of all jobs in some Caribbean countries. Income is an important driver for addressing inequality, and across the Caribbean there are significant disparities in this area (ECLAC, 2018). Concerns loom that AI may widen gaps between countries, reinforcing or even exacerbating current socio-economic divides.

*“Our region, as resilient as we are, continues to face existential threats such as, the effects of climate change and vulnerability to natural disasters, the rise in crime and violence associated with organized criminal enterprises in narco-trafficking, small arms trafficking, contraband trafficking, human trafficking and money-laundering, energy and commodity price instability and high indebtedness. This is further exacerbated by our generally small size and economic openness. While we focus individually on our respective national challenges, it is imperative that we engage and develop regional and international strategies in our efforts to achieve economies of scale and collectively address those issues that affect us in common”.*

*- Prime Minister Andrew Holness, Jamaica  
The Opening Ceremony of the Thirty-Seventh Regular Meeting of the  
Conference of Heads of Government of the Caribbean Community  
(CARICOM) Georgetown, Guyana, 4– 6 July 2016*

Caribbean SIDS have been disadvantaged in their development process. The common challenges faced by these countries are:

- Narrow resource base depriving them of the benefits of economies of scale
- Small domestic markets and heavy dependence on a few external and remote markets
- High costs for energy, infrastructure, transportation, communication and servicing
- Long distances from export markets and import resources
- Low and irregular international traffic

volumes

- Little resilience to natural disasters
- Growing populations
- High volatility of economic growth
- Limited opportunities for the private sector and a proportionately large reliance of their economies on their public sector
- Fragile natural environments.

Despite the challenges and marginalization that slavery, stagnant growth, climatic threats and exiting colonialism without a development pact, the Caribbean has produced excellence across fields. Its people have continued to emerge as some of the most warm, resilient, innovative and globally competitive human resources and cultural creators of non-perishable consumables. The national, global, economic and social importance of Caribbean creativity - ‘thought data’, ‘physical data’ and ‘cultural data’ developed in the region by globally influential artistes, thinkers, leaders, Nobel laureates, and exceptional sportsmen and sportswoman, is an invaluable asset and must be protected at all costs.

The island nations continue to have mounting resource constraints and sustained developmental challenges. They include environmental vulnerability due to climate change, natural disasters and pollution; social challenges due to lack of resources focused on key developmental challenges such as poverty, crime and education; and economic constraints due to persistent negative trade, high public debt and fiscal imbalances. Compounding challenges threaten to widen the digital divides in the Caribbean and among individual nations.

## ENVIRONMENT & CLIMATE CHANGE

*The Caribbean is the second most environmental hazard-prone region in the world. Between 2000 and 2019 over 152 million people have been affected by over 1,205 natural disasters. These natural disasters include over 500 floods, 330 storms, 75 earthquakes, 74 droughts, 66 landslides, 50 extreme temperature periods, 38 volcanic events and 24 wildfires. While natural disasters are a main environmental challenge, concerns about climate change, loss of biodiversity,*



anthropogenic stressors on freshwater ocean systems including land-based sources of pollution. The Caribbean is more dependent on tourism than any other region in the world and is an essential pillar of all Caribbean economies accounting for 15% of GDP and 13% of jobs.<sup>41</sup>

This dependency and leverage by the tourism industry has also put pressure on the regions natural ecosystems. *“The Covid-19 pandemic has impacted our global village in quite significant ways. One of the impacts will be on the youngest generation’s attitude to travel and exploration of different places. We have had over a million persons pass away due to COVID 19 over the past year and a half, and this will impact the persons’ desire to travel as they did pre-Covid 19. In addition, changed economic circumstances, family units and the mental health development of children are also factors that will become more and more relevant as time goes by. Therefore, SIDS should shift their tourism oriented focus to rely more on e-Tourism ventures, I am suggesting that the region should focus its energies (and money) on developing a niche in the area of well-being management that enables augmented reality to be a significant part of the package. In other words, place Well-being management under the umbrella of E-Tourism and develop it as such. So the virtual Carnival concerts, virtual Panoramas, virtual fetes and accompanying exercise programmes geared towards the existing tourists niche, can also be used as part of a Well-Being Management Programme.”*

Keri A. Kitson

Civil Attorney at Law, Author and Former Credit Union Director

New data on the *benefits that coral reefs provide to the travel industry and the region’s economy reveal that the value of reef-associated tourism is estimated at more than US\$7.9 billion annually from over 11 million visitors. This accounts for 23% of all tourism spending and is equivalent to more than 10% of the region’s GDP (gross domestic product).*<sup>42</sup> Studies have shown that there is evidence of over 60% decline of living corals in the Caribbean in just the last three decades alone since the region first raised the global alarm about climate change, and now SIDs must bear the weight of the world’s destructive behaviour.

<sup>41</sup> UN Office for the Coordination of Humanitarian Affairs: Natural Disasters in Latin America and the Caribbean (2000 – 2019) <https://reliefweb.int/report/world/natural-disasters-latin-america-and-caribbean-2000-2019>

<sup>42</sup> EcoEarnings: A Shore Thing – The Ocean Foundation





The Nature Conservancy is currently deploying innovative solutions to protect and restore coral reefs throughout the region. “Millions of people in the Caribbean depend on coral reefs as a source of livelihood and the region is known as paradise to many travellers from around the globe. It is ours our responsibility to protect the natural wonders, like coral reefs, that sustain both the Caribbean economy and tourism alike. We must however move faster to outpace the current rate of degradation and increasing threats to coral reefs” noted Dr. Luis Solórzano, Executive Director of The Nature Conservancy in the Caribbean during the recent regional stakeholders consultation.<sup>43</sup>

These catastrophic environmental threats like the coral reef deterioration is causing lingering damages such as eroding coastlines from rising seas, vanishing ground water, increasing frequency of extreme weather events, temperature

fluctuations and drought. These events are compounded by man-made damage caused by pollution, coastal development and overfishing and is threatening the precious ecosystem. The continued depletion of the Caribbean’s natural resources could lead to severe economic and social fallout for the region by threatening important bio-diversity and geo-heritage sites. Moreover, the people of the Caribbean will require international assistance and cooperation to deal with climate change and challenges to food security.

It has been noted that “Caribbean countries import more than US \$4 billion in food; this represents more than 60% of the total food that they consume (FAO, 2015). This is expected to increase to US \$8-10 Billion by 2020 as Caribbean populations increase and climate change reduces the region’s food production.”<sup>44</sup>

<sup>43</sup>Regional economies face peril with declining coral reefs report, Jamaica Observer, [https://www.jamaicaobserver.com/news/Regional-economies-face-peril-with-declining-coral-reefs-report\\_18827999](https://www.jamaicaobserver.com/news/Regional-economies-face-peril-with-declining-coral-reefs-report_18827999)

<sup>44</sup>Artificial Intelligence and the Caribbean, Lodewijk Smets - Zubin Deyal, Caribbean Dev Trends.com, November 20, 2018, <https://blogs.iadb.org/caribbean-dev-trends/en/9397/>





## WOMEN, YOUTH AND COVID-19

*"The voice of AI is Female"... Did you notice?"*

*- Hon Olivia Grange, CP, MP,  
Minister of Culture, Gender, Entertainment and Sports;  
Chair, Jamaica National Commission For UNESCO*

Caribbean women have played an essential part in the region's history, development and culture. They have been strong, resilient and responsible partners in nation building, in all walks of society from the arts to science, law and politics. Today Caribbean women outpace men in the years of secondary school education and tertiary institution enrolment but due to ongoing gender inequities, make only 60-70% percent of every dollar made by their male counterparts with comparable skills in the same position.<sup>45</sup> The protections against

gender inequity and pay discrimination vary widely across the region. Guyana is the only Caribbean nation that has established a legal framework for equal pay and job access for women while across the Caribbean, women have other professional challenges including family leave.

Globally, the COVID 19 pandemic has had an exponentially negative impact on at high-risk groups including people of colour, women, youth and the elderly. The pre-existing systematic inequities common within these groups including poor living standard, inadequate healthcare, low wages and poor housing have been further exacerbated by the repeated lockdowns and job losses suffered since March 2020. Women are more vulnerable, not only COVID-19-related economic effects, but also to threats based on increased automation as many work in jobs slated to be made redundant.

A study by Harvard Business Review found that depending on the pace of automation around the world, between 40-160 million women (as many as

45 Bando, R. Evidence-based gender equality policy and pay in Latin America and the Caribbean: Progress and Challenges. *Lat Am Econ Rev* 28, 10 (2019). <https://doi.org/10.1186/s40503-019-0075-3>

one in four women employed today),<sup>46</sup> may need to transition into new occupations and often into higher-skilled roles, in order to remain employed and seize new job opportunities.

*It is estimated that 90% of the 400 million jobs that will be replaced by AI are in low-income countries and that by 2050, there will be about 6 billion people in the world's workforce with about 5 billion of them, doing jobs that don't exist today (The Millennium 2020 Project).<sup>47</sup>*

Children in particular need to be protected from any harmful and discriminatory impacts of AI systems and be provided leeway to interact with them in a safe way. AI systems should also be leveraged to actively protect children from harm and exploitation to support the rights foreseen under the CRC (Child Rights Convention) until they reach the age of 18 even if they reach the age of digital consent, which begins at 13 years old in many countries. AI systems must be developed and deployed in a way that simultaneously upholds children's collective rights to protection, provision and participation.

**The following highlights UNICEF policy guidance for AI and Children, drafted in September 2020 :**

1. Children need to be protected from any harmful and discriminatory impacts of AI systems and interact with them in a safe way.
2. AI systems should also be leveraged to actively protect children from harm and exploitation.

3. Children are entitled to the rights foreseen under the CRC (Convention on the Rights of the Child) until they reach the age of 18.
4. Reaching the age of digital consent, which begins at 13 years old in many countries, does not mean they should then be treated as adults.
5. AI systems must be developed and deployed in a way that simultaneously upholds children's collective rights to protection, provision and participation.
6. The opportunities that AI systems bring to children of all ages and backgrounds – such as to support their education, health care and right to play – need to be fully leveraged when, and this is critical, it is appropriate to use AI systems.

AI inclusion by design approach ensures that all children can use AI products or services, regardless of their age, gender identities, geographic and cultural diversity. This can ensure relevance for and use by children that may otherwise be excluded through bias, discrimination or profiling. Include a broad range of stakeholders in design teams, such as parents, teachers, child psychologists, child rights experts, and, where appropriate, children themselves. If all these challenges are taken in context, AI could be a useful tool in provide solutions to these challenges. AI could be focused on helping to improve learning equity and reduce losses.

COVID-19's adverse impact on at-risk segments of women, youth and disabled, has been evident and therefore it is imperative that these vulnerable

<sup>46</sup>As Jobs Are Automated, Will Men and Women Be Affected Equally? (hbr.org)  
<sup>47</sup>The Millenium Project, <http://www.millennium-project.org/2020/01/>





groups be targeted for re-education and new skills training to enable them to find employment and opportunity in the post COVID digital economy.

According to a recent UNESCO report on Caribbean school closures, *7 million learners and over 90 000 teachers across 23 countries and territories are grappling with the new reality of distance-learning.*<sup>48</sup> With the declaration of the pandemic in March 2020, the effects on Caribbean youth has been profound. UNESCO's Education Response to Covid 19 in the Caribbean Report recognized that almost all education institutions are now providing their services online due to the pandemic with loss measured in terms of learning, colleagues and equity:<sup>49</sup>

<sup>48</sup> Education Response to COVID-19 in the Caribbean  
<sup>49</sup> IBID

1. **Learning Loss** – It is estimated that if they could reopen now the learning loss because of COVID-19 is at 15/30% of what the students would have retained. This is a Massive loss.
2. **Loss of Colleagues** – We may see a big dropout rate as female students may not return when school reopens.
3. **Loss of Equity** – Only about 1 in 2 homes have appropriate equipment and the right bandwidth to take classes online. Most households lack access to quality internet access and bandwidth.





# The future of work after COVID-19

Trends accelerated by COVID-19

## Remote work

20–25% of workers in advanced economies could work remotely 3+ days a week on a long-term basis

## Digitization

2–5x growth in e-commerce, as a surge in digital platforms is underway

## Automation

Uptick in use of robotics, robotic process automation, and AI

Work arenas with high physical proximity were most disrupted short term during COVID-19, and some will see enduring effects.



Occupation transitions may increase by as much as 25 percent by 2030

Increase in occupation transitions between pre- and post-COVID-19 scenarios by 2030, %

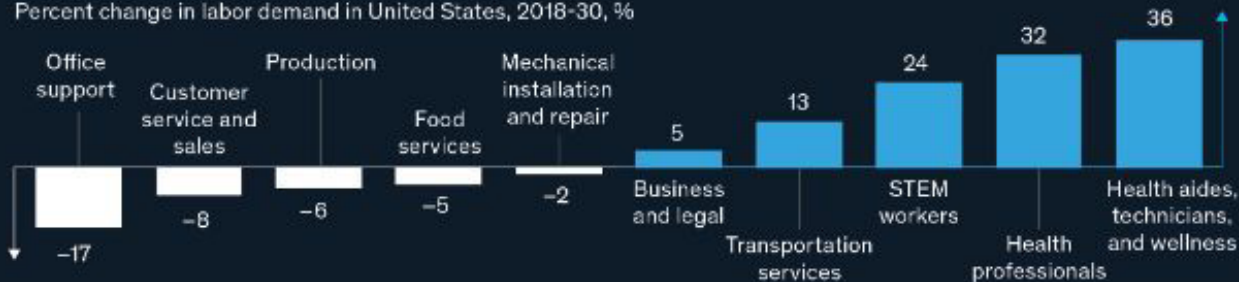


Total workers needing to make occupation transitions in post-COVID-19 scenario, millions



## Labor demand will shift across occupations

Percent change in labor demand in United States, 2018-30, %



Business leaders and policy makers can build out digital infrastructure, enable faster reskilling, and innovate new worker benefits and support mechanisms.



## DIGITAL INFRASTRUCTURE

Information and Communication Technologies (ICTs) including the deployment of high-performance computing such as GPU computing is needed. Lack of access to broadband and big data pose big challenges to the region and can potentially impact or even arrest the rate of digital transformation. Research done by the International Telecommunications Union show that there is a strong correlation between a region's income levels and the number of fixed-telephone and fixed-broadband connections per 100 inhabitants, reflecting the price and availability of fixed connections.<sup>50</sup>

*Indeed access to bandwidth and internet is being considered a 21st century human right.*

*- Dr. Francesc Pedró, Director, UNESCO International Institute for Higher Education in Latin America and the Caribbean*

**AI adoption attitudes in the region are in need of improvement according to the INCUS AI in Caribbean Industries Survey which indicates that<sup>51</sup>**

- 91% agreed or were neutral that AI is critical to their survival
- 12% of businesses in the Caribbean are using AI - Adoption is low even among the large digital leaders in the region
- 91% spend nothing or very little on AI

Jason Mars, Assistant Professor of Computer Science at University of Michigan & Co-founder of Clinc Inc noted during the stakeholders consultation that *"We can build the Caribbean in AI with Community, Culture, Communication, Mentorship and a little investment capital. We need to collect the data – this is the most expensive process if there is not a strong technical infrastructure."*<sup>52</sup>

Essentially if we are the data that is being created, the question to be asked, according to Executive Director, Caribbean Competition Authority Nievia Ramsundar is, *"how can the consumer remain in personal ownership of their unique identity and not have it traded by external parties like common stock."*<sup>53</sup>

<sup>50</sup>International Telecommunications Union Measuring digital development – Facts and Figures (2019)

<sup>51</sup>Incus Services State of AI in the Caribbean Survey - <http://incusservices.com/ai/>

<sup>52</sup>Jason Mars, Caribbean Stakeholders Consultation

<sup>53</sup>Ramsundar, N. (2021, Feb 19). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. [https://www.youtube.com/watch?v=\\_ylq0KmHG2Q-](https://www.youtube.com/watch?v=_ylq0KmHG2Q-)

## SECURITY AND JUSTICE

The stability of the Caribbean depends on the development and implementation of strategies relating to crime and security. Crime, violence and corruption have continued to plague the region having a massive impact on development affecting some countries more severely than others. There is a need now more than ever to address the challenges that impact security and crime as the integrity of the SIDS are under increasing threats from entities using conventional and unconventional forces capable of destabilizing the Caribbean's institutional and social structures. However, due to limited resources the Caribbean will need to establish a method to collectively prioritize threats based on probability and impact. Regional threats to security and justice include:

- Threats include trafficking of people, weapons and narcotics
- Corruption, money laundering and tax evasion
- Compromising of democracy and political process by sewing division and inciting violence (increasing with social media)
- Organized crime penetrating democratic institutions

The high cost of crimes such as homicide and assault are a clear and present danger to the region. The estimated costs include public expenditure on public safety (police, criminal justice, and prison administration), private expenditure on security by firms and households, and the social costs of crime (poorer quality of life due to victimization). The majority of public and private funds are used for security primarily in policing and surveillance. Criminality and inefficient processes has the judicial system stressed with excessive processing delays and long backlogs. The reasons for the backlogs are multifaceted and include primarily the slow pace of investigations by police, delays in production of depositions, and lack of human and technological resources. According to the Caribbean Court of Justice, the main consequence of the backlogs is a failure to "provid(e) accessible, fair and efficient justice for the people and states of the Caribbean Community."

Incarceration rates are soaring and in most Caribbean countries prison capacity is exceeded by more than 70% with 40% of prisoners on pretrial detention awaiting trial. The justice system's failure to provide timely, responsive, consistent and transparent services is impacting the regions development.

The rise of nationalism across the world is challenging basic assumptions of global interconnectedness and threatens to fragment nations and regions. In so far as the Caribbean is known to be mostly peaceful with stable democracies, the region cannot ignore the threat that AI is having on human rights, security, media & democracy. Civil society's basic role to enable trust, safety and support to citizens is under threat from Mis, Dis and Mal Information produced and perpetuated by AI technology.

The January 2021 attack on the United States Capital Building is a case study on democracy's fragility vs the power of misinformation. If it can happen to one of the world's oldest and most developed democracies, with its established infrastructure and ecosystem, what would happen to any of the Caribbean's relatively younger, less economically developed democracies? It is doubtful that the Caribbean nations' smaller size, younger institutions and struggling GDPs would have the same chance at resiliency as the US.

Social media has become the largest news source in the world but has little editorial control, regulation, or legal recourse against lies and slander. Governments have become deeply concerned about the ways that social media can now be used to undermine the truth, create division, spread hatred, and manipulate democracy, and a number of governments are, therefore, now preparing to take steps to change the law and regulate social media.

The UK's OfCom report identified the most pressing priorities in the development of online standards. These were:

- The protection of children across all sources and types of content with special attention on ensuring that child pornography and the arrangements for trafficking children are driven off the Internet.
- Protection from illegal or harmful content

in viewing or online interactions, including exposure to hate speech, the promotion of terrorism, encouragement of suicide, self-harm or violence, bullying, harassment or trolling, disinformation, and fake news.

- Mandatory provision of information to users to allow them to make a more informed assessment of material they view online with regard to whether it is factual or fictitious. This could include greater transparency requirements for the algorithms used to rank search results.
- Collaborative approach to regional governance of the Internet and online applications include:
  - A collaborative regional approach to regulating technology companies.
  - Consider taxation of technology based companies and use the part of the proceeds to fund digital literacy and build regulatory capacity.
  - Develop algorithms to monitor content online and assess the efficacy of the tools used by online operators to protect against various harms such as fact-checking and detecting disinformation and political manipulation.
  - Provide protection from illegal or harmful content in viewing or online interactions, including exposure to hate speech, the promotion of terrorism, encouragement of suicide, self-harm or violence, bullying, harassment or trolling, disinformation, and fake news
- Upholding freedom of expression. In practice, this means that regulators will pay more attention to the technical processes that platforms employ to identify, assess, and address harmful content, as well how they handle appeals, to ensure that legitimate comment gets through while malicious attacks can be prevented or retracted.
- That the regulatory approach must be flexible and adapt to changing consumer behaviour and expectations and to allow for technological innovation in developing better ways to protect users.



## CARIBBEAN OPPORTUNITIES

AI can support the challenges of Caribbean SIDS sensitive to its cultural, social and anthropological histories. A region-wide strategy can be created and expanded to:

- Align AI strategy with regional developmental plans for education, food security, climate change, digital transformation
- Expand regional digital skills and AI capability integrating more women, youth and disabled
- Build strong digital infrastructure (5G, High performance computing, GPUs, Cyber Security) to support AI deployment, content development and guaranteed access to the Internet
- Establish AI-appropriate governance for security, risk mitigation regional strategy implementation
- Invest in education and R&D in science, technology and engineering led by public sector digital transformation and provision of incentives for business transformation

Unite to rebuild the region stronger post COVID-19 using digital and smart island transformation as a lever

AI governance is needed in the region to enable regulation, legislation and to enhance safety, security and accountability. Caribbean SIDS should establish regional common values and principles to promote the development of human-centered AI. The region should review existing policy and legislation on ICTs to align with responsible AI governance. Long term policy considerations should include soft laws and legislative frameworks to address potential harm, responsibility and liability related to AI. The region should create a standards authority with responsibility for transparency, safety and wellbeing. The Caribbean SIDS should increase participation in international AI forums and discussions as well as continue the region's tradition of advocacy against harm and biases which may marginalize, discriminate or codify prejudice and stereotyping of people in the digital age.





Figure 12. UNESCO ROAM Principles for Internet Universality

Information and Communication Technologies (ICTs) are key building blocks of the digital economy, to facilitate trade and drive e-commerce.<sup>54</sup> The *UNESCO Internet Universality Principles of Rights*, Openness, Access to All and Multi-Stakeholder Participation should be applied to cross the cutting issues of Internet access in the Caribbean. Priority should be placed on collaboratively prioritizing and mobilizing the requisite investment in digital infrastructure to ensure all citizens have access to the internet, regional computing resources and data centres.

*“Indeed access to bandwidth and internet is being considered a 21st century human right.”*

*- Dr. Francesc Pedró, Director, UNESCO International Institute for Higher Education in Latin America and the Caribbean*

Public sector digital transformation projects should be encouraged to increase public sector efficiency, new jobs, new skills development. Caribbean nations can improve their security and criminal justice systems with AI systems. Professor Richard Susskind, global leader in technology and the judiciary research, says the legal system will change more in the next 10 years than it has in the last 200. In neighbouring territories like Brasil, *“the discussions now is about the criminal justice system and is NOT IF AI WILL REPLACE, BUT HOW AND WHERE it can replace in a safe way”* according to Brazilian Federal Judge Isabela Ferrari.<sup>55</sup>

<sup>54</sup> Aid For Trade At A Glance 2017: Promoting Trade, Inclusiveness And Connectivity For Sustainable Development Oecd, Wto 2017

<sup>55</sup> Judge Isabela Ferrari, Federal Judge, Brazil (2021, Feb 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. <https://www.youtube.com/watch?v=FSY4rAgplFc>

AI can assist in increasing the efficiency of Caribbean justice in a number of ways such as case research, scheduling, drafting decisions and precedents, resulting in a more effective, efficient and just criminal justice system for citizens. Caribbean SIDs should transform into smart islands. Smart islands use big data and other information technology resources to manage everything from public transport to garbage collection to the use of water and other resources. This strategy includes using the Internet of Things (IOT), sensors, software and 5G technologies connect devices and systems to the Internet. In 2022, Internet data traffic is projected to be three times that of 2017, and the share of licensed IoT devices is predicted to rise from 13% in 2018 to 28% in 2025.<sup>56</sup>

AI systems can be deployed for climate change mitigation and environmental preservation including early warning systems, remote monitoring, disaster management, structural improvements and public education. AI could reduce imports of foreign food by helping local farmers create better conditions for crop growth, especially in response to different weather patterns using predictive analysis, early warning systems and the like. There is an opportunity for the Caribbean to contribute to the development of AI tools that are focused on fighting bias, discrimination and promote transparency and fairness.

The region has a very vibrant cultural and creative industry that can be paired with technology and engineering to produce tools and solutions that aid in transparency and understandability

<sup>56</sup> Gartner, Inc Report - CIO Agenda 2019: Digital Maturity Reaches a Tipping Point



of the workings of algorithms and the data with which they have been trained with. These tools could focus on predicting or scoring the potential impact on human dignity, human rights, gender equality, privacy, freedom of expression, access to information, social, economic, political and cultural processes, scientific and engineering practices, animal welfare, and the environment and ecosystems.

*“With automation impacting employment, public policies strategies and programs are most needed to ensure that Artificial Intelligence empowers people not replace people.”*

- Paula Istúriz Caveró, Programme Specialist,  
Social and Human Sciences, UNESCO Cluster Office  
for the Caribbean

Data has renewable exponential value. The Caribbean need and capacity for big data will increase too because AI needs data to learn these trends will supercharge the development of more powerful AI technologies. A lot of data in the Caribbean is available but not yet ready for general consumption of AI systems. Given the value of the region’s cultural and environment heritage, the power of AI technologies can be applied to data capture, storage and management of existing works. This is an area which will require new skills training and offer business opportunities to focus

on digitalisation services for these unstructured data. Therefore the youth should be targeted for inclusion and trained in data capture, storage, cleaning and management services. Data collection and cultural heritage preservation can become an active engine for digital skilled jobs, upward mobility and economic growth while sensitizing youth to value their country and its social, cultural and environmental assets. This would transfer the responsibility for preservation to the next generation aided by AI, mobile phones, and the Internet for which this generation is wired.

Associate Professor, Penn-State University and Founder of PlantVillage David Hughes has proposed youth engagement as an effective strategy to data collection and reporting. *“They can make observations using smart phones and apps. We can democratize the access to AI and put problem-solving AI to work for everyone, in service of humanity”*.<sup>57</sup>

The Caribbean cultural and creative industries could also be engaged to provide training in digitalising, categorizing and data analysis services. The preservation programme would create digital jobs, build archives, preserve cultural heritage and enable monetization of data.

57 David Hughes, Associate Professor, Penn-State University and Founder of PlantVillage Hughes, D. (2021, Feb 19). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. [https://www.youtube.com/watch?v=\\_ylq0KmHG2Q&t=327s](https://www.youtube.com/watch?v=_ylq0KmHG2Q&t=327s)

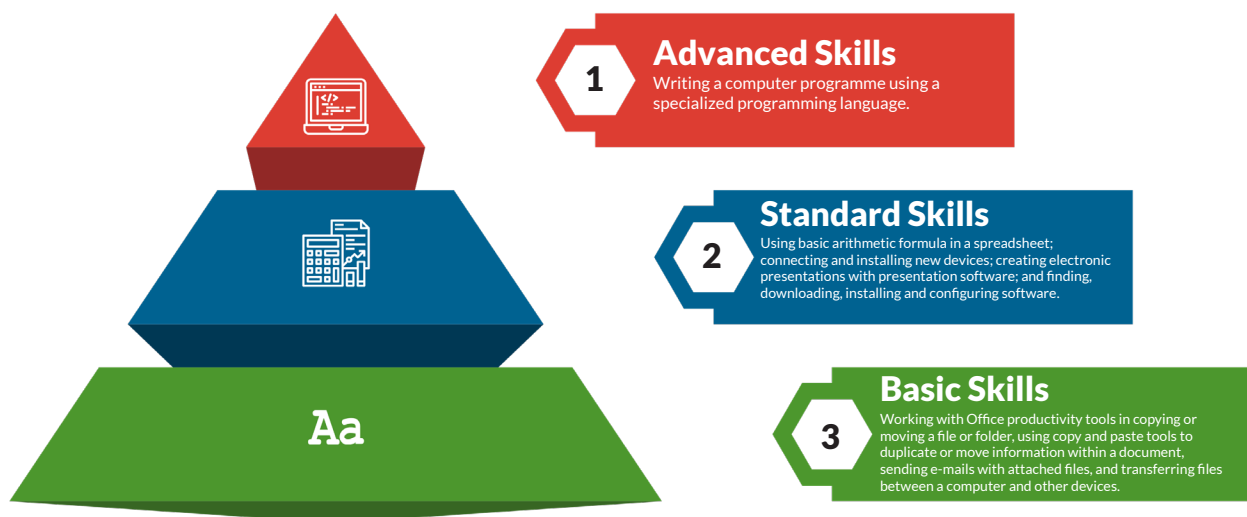


Figure 13. The Basic, Standard and Advanced 'Computer Skills of the Future' Pyramid  
Source: Author and ITU skill frameworks

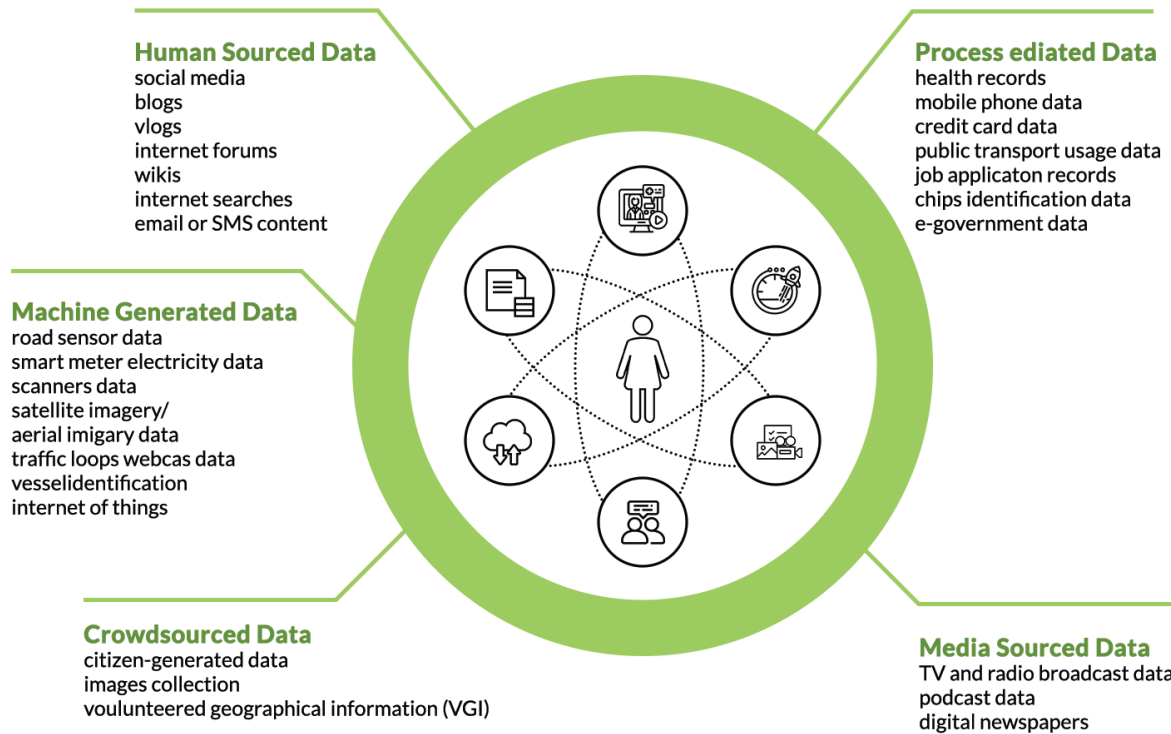


Figure 14. Current Data Sources for Big Data

The big industries in the Caribbean are poised for regional development as defined by the *CARICOM Council for Trade and Economic Development (COTED)* includes: Healthcare, Financial Services, Education, Security, Environment, Culture, Manufacturing, Agriculture and Tourism. All these industries stand to gain greatly by the application of Artificial intelligence technologies adding up to 5.4% to the regions GDP.<sup>58</sup> In support of the region’s digital transformation, Caribbean SIDS should develop a plan to enable collective action in areas such as joint procurement of ICT equipment; regional VAT holidays; data capture, storage and management; and to deliver full access to the Internet and bandwidth to all citizens.

New business models and new revenue streams can be created with investment. Technology funding is critical according to Grammy award winning producer Walshy Fire who noted *“We need to inspire our people to engage tech, create tech and to fund tech”*<sup>59</sup> SoftBank’s investment vehicle, the U\$100 billion Vision Fund, invests in emerging technologies like artificial intelligence, robotics. The value of the fund is U\$10 billion

more than the entire of GDP of every CARICOM member combined according to Leslie Lee Fook, Director, A.I. Analytics and Automation at Incus Services. Digital transformation in the region will rely on investment in infrastructure, education and training required to integrate AI in the region.

*“Robust AI curricula must ensure balance between human-orientated and technology-mediated approaches. AI literacy should also be integrated into lifelong learning programmes, so that all citizens can understand how to interact with AI systems and make informed decisions. It is also key to support youth to achieve higher levels of AI competence, and engage youth in the design and implementation of IT systems. (UNESCO.org)”*

Healthcare is an industry that can greatly benefit from the adoption of AI technologies as evidenced by the success of regional healthcare advances aided by AI include the *“first prostate cancer cell line from the Caribbean, only one of three in the world for men of African descent, which was developed with AI accessing the resources and characterizing the cell line based on other big data.”*<sup>60</sup>

58 Sizing the Prize: What’s the real value of AI for business and how can you capitalize? PWC, <https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf>  
59 Walsh, L. (2021, Feb 19). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. [https://www.youtube.com/watch?v=\\_ylq0KmHG2Q&t=327s](https://www.youtube.com/watch?v=_ylq0KmHG2Q&t=327s)

60 Henkel Valentine, PhD Candidate & Researcher in Prostate Cancer, The University of the West Indies, Mona, Jamaica  
Valentine, H., UNESCO | Broadcast Commission Panel (2021, Feb 19). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. [https://www.youtube.com/watch?v=\\_ylq0KmHG2Q&t=327s](https://www.youtube.com/watch?v=_ylq0KmHG2Q&t=327s)



The Cultural and Creative Industries (CCI) is currently estimated at US\$3 trillion and the AI industry is an estimated to reach US\$4 trillion in value by 2022,<sup>61</sup> making their pace of growth and value close. Integration of AI technologies to create an enabling environment for the cultural and creative industries in the Caribbean would enhance the packaging of destination spaces and e-Tourism user experiences. Intellectual Property assets can be developed to provide tools that will increase creativity, productivity, marketing and distribution of creative and cultural products and services. Legislative framework for policy, regulations and ethical guidelines would be required for effective governance.

**Potential AI applications in the creative and cultural industries can be categorized as follows:**

1. Content Creation
2. Data Analysis
3. Content Enhancement
4. Information Extraction And Enhancement
5. Data Compression

Given the Caribbean's athletic talent, legacy and brand reputation, opportunities will exist to expand the revenue generation through adaptation of AI technologies. Delivery of virtual variations for coaching, events and master classes would be part of a growing e-learning and virtual event market. There is a lane for Caribbean masters in the eSports race using AI technologies such as avatars to enable the development of digital players, leagues and events that can access the e-sports market which estimated to reach U\$1.8 trillion by 2026.<sup>62</sup>

<sup>61</sup> Chung, A. (2021, Feb 19). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online forum]. [https://www.youtube.com/watch?v=\\_ylq0KmhG2Q&t=327s](https://www.youtube.com/watch?v=_ylq0KmhG2Q&t=327s)

<sup>62</sup> Esports Market Size is Projected to Reach USD 1860.2 Million by 2026 at CAGR 15.1% | Valuates Reports <https://www.prnewswire.com/in/news-releases/esports-market-size-is-projected-to-reach-usd-1860-2-million-by-2026-at-cagr-15-1-valuates-reports-822454230.html#:~:text=The%20global%20Esports%20market%20size,the%20forecast%20period%202021-2026.>





Figure 15. Smart City Benefits

Smart cities are metropolitan areas that have implemented effective and ergonomic ways of distributing resources. It also refers to the movement that is creating citizen centered ecosystems to improve quality of life and stimulate economic activity via data-driven technologies.

## CHARACTERISTICS OF SMART ISLANDS

The transformation of the Caribbean into Smart Islands will enable companies and users to create an unprecedented amount of data, drive the upskilling of people and contribute to the productivity across all sectors of Government. The following characteristics are indicative of smart island economies :

- Using Information and Communications Technologies (ICT)
- Building automation and control – efficient energy generation and savings
- Efficient urban planning – smart electrification such as IOT and LED street

lights

- Urban mobility and sustainable public transport – smart traffic solutions, e-Mobility, parking space management
- Smart solid waste management – IoT garbage collection and recycling
- Concern for social environment – technology to support crime
- Technology applied to education – learning analytics, personalized education
- Technology applied to health
- E-commerce and digital money systems
- Public transparency of data and information
- Shared and open data

(Source: IESE Cities in Motion (2017))



HEALTH AND WELLNESS	FINANCIAL SERVICES	EDUCATIONAL SERVICES
<p>AI promises to use biological, medical and pharmaceutical data along with advance analytics to provide ground-breaking solutions for the diagnosis and care of disease. In the Caribbean, opportunities exist to use scientific and medical expertise to achieve better care outcomes and improve the productivity and efficiency of care delivery. It can also improve the day-to-day life of healthcare practitioners, letting them spend more time looking after patients and in so doing, raising staff morale, and improving retention. Better customer service thru smarter scheduling (e.g., appointments and operations) and insurance claim management is expected. In addition, the Caribbean can tap into data-driven diagnostics and virtual drug development to produce results such as the one of three prostate cancer cell line for African males developed using Caribbean medical research and AI.</p>	<p>The financial services industry has been integrating AI in the form of ATMs and other back-office technology such as solution to identify common customer transaction patterns and better understand the key triggers driving variances. However, there is now opportunity to integrate in technologies dealing with automated insurance underwriting and robotic process automation in areas such as finance and compliance. AI developments such as robo-advice have made it possible to develop customized investment solutions for mass market consumers in ways that would, until recently, only have been available to high-net-worth clients. The regions banking sector must take seriously the transition to digital money and digital banking and the use of the blockchain.</p>	<p>AI has already been applied to education primarily in some tools that help develop skills and testing systems. The opportunity for AI With learning loss in the region of 15% - 30% due to COVID-19, AI must be put in service to students and teachers. The market is there to support the investment in this area to drive efficiency, personalization and streamline admin tasks to allow teachers the time and freedom to provide understanding and adaptability. A humanization and transformation of the pedagogy can happen. In 2019, the global AI in education market reached \$1.1 billion and is predicted to generate \$25.7 billion in 2030, advancing at a 32.9% CAGR during the forecast period (2020-2030). There stands to be an explosion of student and learning data with the deployment of Online Learning Management Systems.</p>
INFORMATION & COMMUNICATION TECHNOLOGIES	ENVIRONMENT	CULTURE AND CREATIVE INDUSTRIES
<p>The ICT industry sector in the Caribbean perhaps has the most important opportunities including build out of the Internet infrastructure and creation of AI based products for the region. Multiple benefits across both hardware and software is expected as the forecast for new applications to support citizen services such as justice, cybersecurity, labor and market collaboration, media and communications will be needed. The development of a strong and regional technology ecosystem is needed. The opportunities to connect the Caribbean with the global ecosystem of AI development are vast. Access to the internet for all regional citizens should be accelerated.</p>	<p>Environmental resiliency is imperative for SIDs. Technologies that support environmental protection, preservation and study can be leveraged to attain the climate goals. AI can support Geo-heritage and Geohazard Resilience by supporting the data collection/Data acquisition/Data Mining of environmental data. AI can be used to support campaigns that promote the reduction of plastics pollution and the preservation of environmental resources such as water and Caribbean forestry. AI can be used to study the ocean ecosystem to learn more about how new industries in the blue economy can benefit Caribbean SIDs.</p>	<p>The culture, the region's most visible export is well suited to advances due to AI. These include making the industry supply chain more efficient, opening new markets, and allowing for the digitalization of cultural heritage including media creation, classification, archiving. Additionally, opportunities for cultural and creative industry to be more integrated into ICT should be considered. The sector can add to the humanistic development into the IT sector. Other forms of access to the Digital Economy can be attained for the creative industries. Caribbean cuisine which is a fusion of global traditions, is internationally recognized as one of the premium culinary experiences in the world. Application of AI technologies to Caribbean cuisine can enhance R&amp;D, production efficiencies, export potential and marketing impact.</p>
MANUFACTURING	AGRICULTURE	TOURISM
<p>Three areas with the biggest AI potential in manufacturing include giving even greater ability to monitor and auto-correct the manufacturing process and support On-demand production. Predictive analytics will allow for supply chain and production optimization. Self-learning monitoring will make the manufacturing process more predictable and controllable, reducing costly delays, defects, or deviation from product specifications. There is huge amount of data available right through the manufacturing process, which allows for intelligent monitoring.</p>	<p>Food security and crop optimization could be achieved by the implementing robotics and artificial intelligence systems. Hyperlocal weather forecasts that can be aggregated by AI systems can help to support crop risk management. Additional solution includes automated farming activities such as identification of pests and disease, managing crop quality with agricultural drones &amp; robots, Crop health monitoring systems, Precision farming and Automated Irrigation Systems could support the transformation of the agricultural sector.</p>	<p>The tourism industry is set to benefit from AI post COVID. For example, artificial intelligence can be used to improve personalization, tailor recommendations, and guarantee fast response times, even in the absence of staff. Other operational efficiencies such as energy savings, logistics and supply chain gains and asset management should be achieved with the implementation of AI based Internet of Things products. Blockchain technologies leveraging AI can also provide benefits to tourism.</p>

Figure 16. Opportunities for AI in Caribbean Industries

## SWOT ANALYSIS

### STRENGTHS

- Creative Culture (music | art | drama | fashion etc)
- Entrepreneur Culture (SMEs | innovation)
- Diversity (racial | ethnicity | cultural | language)
- Location (proximity | climate | global transportation zone)
- Environment (fauna | flora | marine | fisheries | birds | agriculture etc)
- Hospitality (personnel | training | personality)
- Cuisine (flavours | techniques | presentation)
- Sports (talent | legacy)
- Hospitality Infrastructure (resorts | community tourism | air b&bs | attractions | transportation | ICTs)
- Independent Democracies (votes | human rights | civil society | freedoms)
- Stable Governance (peaceful transfer of power)
- Tech Saavy Consumers (mobile | AI | social media etc)
- Regional Finance (Jamaica Stock Exchange | Eastern Caribbean Stock Market | East Caribbean Dollar (ECCU) | OECS)
- Regional Educational Institution UWI (regional tertiary institution | research)
- Resiliency (disasters | healthcare | economic)
- History (Africa | Colonial Lessons | Independence Experience)

### WEAKNESSES

- Sustainable Governance (long term planning)
- Regional Integration (economy | security | justice | politics)
- Regional (Caricom | copyright | courts)
- Digital Infrastructure (wifi | bandwidth | regulatory)
- Fluctuating Exchange Rates (weak dollars)
- Trade Imbalance (high power costs = weak manufacturing)
- AI Literacy
- AI Education & Training across society
- Development Finance
- Capital Access
- Lack Of Regional Data
- Colonial Legacy (mindset)
- At Risk Communities

### OPPORTUNITIES

- Technology & Innovation (renewables | software)
- Creative Industries (music | film | art | design etc)
- Health & Wellness Products | Services (e-health | ganja | herbs | nutraceuticals etc)
- Digital Services (data collection | cleaning | storage | management) Preservation (jobs | archives | youth engagement)
- Digital Economy (digital currencies | new business stocks)
- New Digital Jobs
- New AI Assisted Industries (mariculture | e-manufacturing | e-education | e-tourism)
- Increased productivity in traditional industry sectors

### THREATS

- Climate Change (rising seas | sargasso seas | extreme weather)
- Food Security (coral reefs | overfishing)
- Pandemics (covid | chick V | etc.)
- Crime & Violence
- AI & Automation
- Brain Drain
- Capital Flight
- Lack of action on upskilling
- Lack of quality broadband access
- Lack of collective governance plan
- Lack of regional digital currencies
- Slow government digital transformation
- Slow private sector investment in digital transformation
- Learning loss

Figure 17. Caribbean Swot Analysis



## CARIBBEAN AI POLICY ROADMAP RECOMMENDATIONS

There are several existing frameworks that could be used as a starting point for developing a roadmap. These include *Asimov's Three Laws of Robotics*, *IEEE The General Principles of Ethically Aligned Design*,<sup>63</sup> *UK House of Lords Select Committee: Five Core Principles to Keep AI Ethical*,<sup>64</sup> and the *European Commission's High Level Expert Group on AI Ethics Guidelines for Trustworthy AI* to name a few.

UNESCO is the United Nations' lead agency concerned with the humane dimensions of the Information society and the ethical implications of AI. *UNESCO's Ad Hoc Expert Group (AHEG)'s Outcome document: First Draft of the Recommendation on the Ethics of Artificial Intelligence*<sup>65</sup> document is UNESCO's first normative instrument on a process for the elaboration of a Recommendation on the Ethics of AI was selected as the right place to start looking for guidance.

UNESCO aims to be a catalyst in bringing together multidisciplinary, universal and holistic approach to the development of AI in the service of humanity, sustainable development, and peace. The human-centered design includes the participation of stakeholders in the design and implementation of the AI system.

These policy guidelines were created to aid in the development and deployment of AI in the Caribbean. The policy focuses on the amplification of the governance, skills and infrastructure needed to preserve human creativity and protect the environment. These strategies and objectives support safe, responsible, and accountable AI –

The proposed framework for the Caribbean AI Policy Roadmap is built on six (6) principles. These principles include national and regional strategies and deliverables recommended to enable the Caribbean's effective adaptation of AI technologies and digital transformation of its economies.

1. **RESILIENCY - Enable Environmental Management and Climate Change Fight** by protecting the environment, leveraging the power AI to produce strategies and solutions for climate change mitigation and environmental preservation including early warning systems, remote monitoring, disaster management, structural improvements and public education. AI technologies must be used to mitigate climate change effects and protection in SIDS reducing carbon-emissions to improve food security and citizen well-being.
2. **GOVERNANCE - Develop Responsible AI Governance, Oversight, Principles & Policies to Do No Harm and to enhance safety, security and accountability of AI.** Promote AI as a tool for service to humanity. Establish common values and principles to ensure fairness, transparency and accountability in digital transformation and increased integration of AI algorithms. Develop policy and legislation to enable the establishment of national and regional AI Governance Committees / Oversight Boards as well as national and regional licensing regime to manage and monitor the development of standards that govern the industry including technical code of conduct for developers, procurement guidelines for buyers, design and use principles and ethically aligned design standards that include manual override option and open data protocol. Leverage existing ICT and/or science policies. Regulate AI industry to provide redress and punishment for individuals & companies that violate citizen rights and wellbeing including banning cyberbullying, hate crimes, discriminatory algorithms, disinformation and graphically violent images inclusive of penalties and fines. Develop an AI Appeal Court and Online Dispute Resolution System. Increase advocacy for AI ethics by targeting software developers at global forums and hosting a global software conference to network, lobby, share research and initiate collaborations with big tech. Develop AI software to test AI for biases and identify AI applications in most need of governance. Protect citizen privacy and instill trust.

<sup>63</sup>IEEE The General Principles of Ethically Aligned Design, <https://ethicsinaction.ieee.org/>

<sup>64</sup>UK House of Lords Select Committee: Five Core Principles to Keep AI Ethical, <https://publications.parliament.uk/pa/ld201719/ldselect/ldai/100/100.pdf>

<sup>65</sup>UNESCO. 2020. First Draft of the Recommendation of the Ethics of Artificial Intelligence, 40 C/37. Paris: UNESCO.

Introduce new financial instruments including digital currencies and align legislative frameworks nationally, regionally and internationally. Create regional data trust to establish data licensing best practices aligned with AI offices.

3. **TRANSFORMATION** – Transform through investment in infrastructure and smart island digital transformation of citizen services via increased operational efficiency and income generation for AI and R&D in AI for Good. Launch Caribbean R&D Tech Fund and regional AI incentives to establish new AI assisted industries including medical cannabis, e-health, e-education, mariculture, wellbeing management, software development, e-sports, e-translation services and data management services leveraging linguistic plurality and cultural diversity. Existing industries should be modernized including manufacturing, agriculture, transportation, tourism, financial services and the creative industries. Acquire high speed broadband and independent secure storage space. Create AI data hubs aligned with tertiary institutions for R&D and give access to AI technologies for innovation generation.
4. **UPSKILLING** – Upskill the human capital by increasing education and training to develop digital skills and media and information literacy at all levels of society on AI and digital transformation including the development of regional research, innovation and entrepreneurship hubs to specifically include diverse populations including women, youth and differently abled people. Provide equitable access to quality high-speed internet as a basic human right and utilize equitable machine learning algorithms to develop online platforms facilitating e-learning and public education. Launch the Caribbean AI Institute to offer diploma and certificate programmes, integrate AI into primary and secondary school courses to facilitate technical AI training and advance regional AI research and development with collaborative research resources such as computing. Develop localized media campaigns and MOOC courses for digital literacy public education and MOOC Courses for public

officials in AI | AI Ethics | AI in Public Sector Transformation as well as Sensitivity Training. Engage creative professionals and youth to develop AI collaterals, courses and messaging for digital literacy programmes.

5. **PRESERVATION** - Preserve and manage unique cultural, historical & sociological data. AI should be used to support Caribbean creativity, preserving the regions historical and sociological context, such as language and diversity. Building archives thru data banks and empowering youth thru education and training. The Caribbean region should develop tools and programmes to support AI literacy which reflects the region's linguistic plurality and diversity making it a globally applicable dataset with aggregated regional data banks to handle big data. Seek to establish new modes of digitalization and monetization of Caribbean culture. Digitize creative, cultural and environmental content while building data management capacity and services among youth, women and disabled people. Develop e-tourism and e-culture augmented reality experiences for the region's globally competitive hospitality and creative industries. Initiate 3D Mapping of Caribbean SIDs Capitals and their cultural, historical, social and environmental assets. Establish a big data preservation programme anchored by national and regional tri-level data management infrastructure to capture, classify, clean, format, store, analyze and archive data banks.
6. **SUSTAINABILITY** - Sustainability strategies to support Caribbean attainment of the UN SDGs including gender equality, poverty eradication, climate justice and environmental protection and to transform the economy, enable creativity and improve citizen wellbeing. Promote innovation and investment in the application of AI to attain the UN SDG.



### Incentives support AI development and implementation across industries in Caribbean SIDS

1. Attract engineering and R&D entities to establish operations in Caribbean SIDS
2. Establish and offer advanced testing, prototyping and other innovation services
3. Encourage development of AI solutions in the region aligned to global industry standards for human-centered design
4. Promote the creation, proper attribution and retention of intellectual property
5. Create additional jobs for the digital future such as digital archiving or data classification
6. Create collaborative partnerships between academia, government and industry and create opportunities for women, youth and disabled people to work
7. Create incentives for industry citizens to be involved in starting new digital businesses
8. Deploy innovation and commercialization labs across the region to support technological innovation
9. Create a digital services industry based on exportable digital services
10. Promote the development of future skills courses at all levels of society to promote the expansion of the digital economy in the region
11. Promote industry internships that allow women, youth and differently abled people to be involved in innovation and transformation

Figure 18. Incentives support AI development and implementation across industries In Caribbean SIDS



## UNESCO Caribbean AI Policy Roadmap Recommendations

Figure 3.

The recommended strategies from the consultations and stakeholder presentations in 2020 and early 2021, are reflected in the principles, objectives, guidelines, actions and deliverables outlined in the roadmap below.

RESILIENCY			
GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Disaster Mitigation	Environmental Management Save Lives Climate Change Fight Decarbonization Improve Food Security Reduce Climate Risks	<b>Early Warning Systems</b> Earthquakes   Hurricanes   Rising Seas <b>Environmental Monitoring</b> Report Trouble Spots Using Satellite Imagery <b>Disaster Management   Public Education</b>	Save Lives Minimize Risk & Economic Loss Predictive Analysis
Resource Management		<b>Monitor</b> Oceans   Rivers   Ports   Volcanoes   Carbon Emissions	Decarbonization Improve Food Security
Predictive Analysis		<b>Monitor</b> Weather   Rainfall   Temperature Reefs   Pollution   Climate	Improve Responsiveness

GOVERNANCE			
GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Ethics	Do No Harm Fairness Data Protection Accountability Explainability Autonomy Stewardship Reduce Bias Responsible AI Interoperability Standards Values IOT Innovation Improved Citizen Services	Establish Regional <b>Common Values And Principles</b> Establish <b>National And Regional Ai Offices And Data Trusts</b> Develop <b>Technical Code Of Conduct</b> (Developers) Develop <b>Procurement Guidelines</b> (Buyers) Encourage Companies To Develop Ai Design   Use Principles <b>Reference IEEE P7000™ Series Of Standards For Ethically Aligned Design</b>	Fairness   Stewardship Reduced biases Raise Awareness of responsible AI Responsible AI Strategies Interoperability of Systems Standards   Values
Legislation		<b>Ai Policy   Regulations   Penalties</b> Review Policy & Legislation On Ict And Cybercrimes To Align With Responsible Ai Governance Establish Longterm Policy, Soft Laws And Legislative Framework To Address Ai Harms, Responsibility And Liability Adaptation Of <b>New Financial Instruments</b> Including Digital Currencies <b>Lobby For Fiscal And Policy Space To Align Frameworks</b> (National   Regional   International)	Enforcement   Deterrent Integration   Adaptation Investment   Trade Public Health
Transparency, Explainability & Accountability		<b>Create Caribbean AI Standards Authority to aggregate the specialized competencies that would be required to evaluate &amp; approve deployment of proposed AI solutions</b> Require <b>AI data sheets</b> with training process explained	Explainability Accountability
Safety & Wellbeing		Develop <b>AI to test AI for biases</b> <b>Identify</b> AI applications to assist with safety & wellbeing and AI applications in most need of governance <b>Design Manual Override Options</b> (Kill Switch) <b>Establish AI Innovations and frameworks for Justice Reform &amp; Law Enforcement</b> <b>Online Dispute Resolution System</b> <b>Defend Human Rights</b> <b>(create   own   marry   reproduce etc)</b>	Risk Impact Do No Harm Technology Protect and Save Lives Retain Human Control
Equity		Provide <b>equitable high speed internet access</b> and broadband Create flexible strategies to ensure <b>technology access</b> Recruit women and youth to inform and develop software Utilize <b>equitable machine learning algorithms</b>	Access   Inclusion   Increased participation - women-youth-disabled Increase sharing
Advocacy		<b>Participate in Global AI Discourses</b> <b>Promote AI regional/global networks</b> <b>Launch software conference targeting software developers</b> <b>Lobby big tech</b> companies to collaborate with the Caribbean Issue <b>Papers on AI</b>   Responsible AI Training   AI Policies <b>Participate</b> in global AI forums   Data Protection <b>Public Education</b>	Data Privacy Informed Consent Autonomy Increase Sphere of Influence



## TRANSFORMATION

GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
<b>Public Sector</b>	Investment Infrastructure Modernize Digital Economy Improved Efficiency Monitize Data New Industries	Introduce <b>Efficiency Programmes</b> (crime education health energy maintenance) with public/private partnerships Public sector efficiency programmes ex. patent and trademark examination, management and forecast of traffic, the development of predictive capabilities for emergency responses AI Assistants to Improve citizen engagement and services such as online experiences for website visitors and reducing the number of people entering brick and mortar service centres Paperless <b>Data Integration</b> Support Caribbean <b>IOT Innovation</b>	Digital Transformation Improved Efficiency Digital Economy
<b>Smart Island Infrastructure</b>		<b>Establish National and Regional Data Banks (governance)</b> <b>Establish secure, energy efficient renewable energy based Data Centres (storage)  Data Hubs (R&amp;D   products)</b> Establish <b>Internet Infrastructure</b> - Broadband   WiFi   5G <b>Establish secure regional computing cloud</b>	AI Infrastructure (Physical   Digital) Digital Autonomy

## UPSKILLING

GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
<b>Innovation</b>	Innovation   Monitization Digital Skills   Digital Literacy   AI Adoption Responsible AI Culture   R&D   Innovation Increase Data Man- agement Capacity   Improved AI Curriculum   Increased Awareness   Increase Work Pool	<b>New Programmes for women, youth, disabled</b> <b>Public Education on Media and Information Literacy</b> <b>MOOC Courses for public sector</b> <b>Establish Regional AI Incentives for</b> Academia   Private Sector Create a <b>AI R&amp;D Tech Fund   Regional AI R&amp;D Cloud</b> <b>Initiate and Strengthen Strategic Alliances</b> <b>Establish new AI assisted Industries</b> Medical Cannabis  E-Health  E-Sports   E-Education Mariculture   Wellbeing Management Software Development <b>Increase Productivity Across Industries</b> Manufacturing-Regenerative Agriculture-Tourism- Transportation-Criminal Justice-Financial Services-Creative Industries	Expand Digital Skill Pool New Products Wealth Generation Transform Industries Increase Efficiency & Productivity Enhance Customer Service Diversify Consumer Experience
<b>Monitization</b>		<b>Develop AI Bias Test Software Algorithms for efficient AI training</b> Optimize algorithms for efficient testing (energy optimization) <b>Leverage Linguistic Plurality develop AI tools to support inclusion online such e-translation systems</b> <b>Structuring Data to extract value</b> <b>Digitize Creative and Environmental Content</b> <b>Develop Digital Content   Promote Data Services</b> <b>E-Tourism and Creative Industries</b> <b>Augmented Reality Experiences</b> <b>Mentoring, Training and Accelerator Programmes for women, youth and disabled</b>	Revenue Generation Diversify AI Economy Increase Trade E-Translation Services Increase Knowledge Services

## PRESERVATION

GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Data Capture	Culture   Environment   Society Data Archives Data Security Data Utility Structured Data Virtual Tourism Experiences Cultural Heritage Preservation	Launch <b>National and Regional Preservation Programmes</b> <b>Establish National and Regional Data Banks</b> Recruit and train youth and creatives to work as preservationists	Accurate Digital Data
Data Storage		Ensure there are Secure <b>National and Regional Storage Platforms</b> Recruit and train women, youth, disabled and creatives to handle <b>data</b>	Data Security
Data Preservation		<b>Clean public data   prepare machine readable format</b> classify, label, archive and manage content <b>Recruit and train women, youth, disabled and creatives in archival and data cleaning services</b>	Data Utility
Data Management		<b>Capture   Classify   Clean   Format   Store   Analyze   Archive</b>	Structured Data Socio-Cultural Environmental Heritage Preservation
Data Monetization		<b>3D Mapping of Caribbean SIDS Capitals (28)</b> Cultural   Historical   Social   Environmental <b>Augmented Reality Experiences   Increase Financial Literacy</b>	Virtual Tourism Experiences Cultural Heritage Preservation

## SUSTAINABILITY

GUIDELINES	OBJECTIVES	ACTION	DELIVERABLES
Service to Humans	Sustainable Development Improve Citizen Wellbeing Decision-Making Gender Equity Structural Improvements	<b>Use as tool</b> in creation   production   protection   preservation Establish <b>Caribbean AI Governance Network</b> comprised of a network of experts to recommend new AI developments Establish Data Bank in National Archives Structural Improvements   Digitize Operations	Cultural Preservation Predictive Analysis Increased Efficiency
Global Goals		Implement programmes leveraging AI in Poverty Reduction Clean Energy   Economic Development (Women and Youth) Reduce Digital Gender Gap   Upgrade Systems	Sustainable Development







**CONCLUSION**  
**WHERE DO WE GO FROM HERE ;**  
**LOOKING FORWARD**

*"We may not be where we want to be today, but we have a lot of opportunities for making things better right now and building a better future."*

*- Dorothy Gordon, Chair,  
UNESCO Information For All Programme (IFAP)*

All around the world, Artificial Intelligence (AI) is being employed to respond to challenges by providing innovative technological solutions to a host of social, economic, environmental, political, and security concerns. The response to the COVID-19 global pandemic, has benefitted from the use of AI for example in the fast track development of vaccines and remote healthcare tools. The opportunities for AI's to address the multiple

development challenges that the Caribbean faces is an undeniable motivator and attractive value proposition. Since its declaration in March 2020,<sup>66</sup> the global pandemic continues to negatively impact the region. ECLAC's Preliminary Overview of the Economies of the region forecasted an average contraction of -7.7% for 2020 , the largest in 120 years.<sup>67</sup>

Strategies to help the region rebuild after the pandemic should be immediately deployed. First, there should be focus on the strengthening the regional digital infrastructure for internet access and build local data centres and GPU capacity. Equitable access to the Internet in the region must be expanded and costs kept low so that every

66 Preliminary Overview of the Economies of Latin America and the Caribbean 2020 – Economic Commission for Latin America and the Caribbean  
67 Ibid



citizen has opportunity to participate in the digital economy. There are existing ICT frameworks and science policies that can be amended to address the growing opportunities of AI. This means a collective investment to build critical infrastructure in a way that scales the services across all 28 Caribbean SIDS.

It will be critically important to begin the upskilling of the work force where AI education and development can begin with media and information literacy campaigns. AI education and development should be encouraged, and rewards put in place to build AI tools in service to humanity such as tools to reduce bias by testing algorithms before acquisition. The Caribbean is the perfect melting pot to ensure that this AI development can happen in this human centric way. More awareness is needed and digital literacy and awareness campaigns should continue and a new intensity started. A key driver to the upskilling will be the collaboration between the public and private sector. Governments should take a collaborative approach to deployment of technologies to support the modernization of citizen services and promote the transformation into smart island economies. However before this can be done, the humanistic deployment of ethical best practices, frameworks, policies and laws to ensure, safety, trust and protection of human creativity and human rights, should be encouraged.

The chasm to development for Caribbean SIDS is quite large and has surely been exacerbated by the COVID-19 pandemic, however, they can act quickly to embrace the opportunity to pivot and reorient the region to the digital future using AI. This general purpose technology is here with its advantages and disadvantages but the opportunities for development too large to ignore. In the Caribbean stakeholder consultations, the participants agreed that with all that is at stake, the region's humanity must be preserved and that AI in the Caribbean must serve the people. Caribbean SIDS must act now to develop a multi-dimensional strategy that pushes AI governance, education and digital infrastructure across the region while

preserving human creativity, increasing trust and protecting the environment. The magnitude of AI must be taken seriously as it could pose an existential threat to Caribbean society. The task ahead may be daunting and will require long term vision, strong leadership, investment and cohesive action to enable the transformation and survival of the Caribbean SIDS in the digital age.

The Caribbean is a glorious and harmonious microcosm of humanity, reflecting the collective potential of its people to create and innovate as they transform to meet the challenges and opportunities of the times. AI is a hallmark of the fourth industrial revolution. The benefits that AI can deliver towards the regions sustainability is a big driver for action. The plan for the future requires leadership to chart a strategic course for the future which will support the region's competitive advantages and address its developmental challenges.

*“Caribbean states have done well to manage and contain the spread of the pandemic within our jurisdictions, but our tourism-dependent, open economies have had little defence against the global economic contagion that has followed.” She further stated that the “way forward for our countries lie in developing emerging technologies and innovations that solve issues affecting small island developing states. Technologies that allow us to overcome the vulnerabilities of our small populations, our small economies, and our vulnerabilities to natural disasters. Technologies that allow us to leverage our assets of climate, geographic location, and of course, our collective creativity. The time is now to unleash the power of our creative imagination to move our islands beyond cautious incrementalism, and to enter a period of rapid, large-scale transformation and global distinction. We have been that region that has led the world in humanization and has continued to focus on the centrality of that individual person and we have sought more for social justice and continue to point the way forward”*

*Prime Minister Mia Mottley, Barbados, Pivot Conference 2020*





# APPENDIX





## APPENDIX #1

### Summary of Stakeholder Consultations: Forum 1

Caribbean AI Initiative  
FORUM 1 Summary  
December 10, 2020

#### FORUM SPEAKERS

##### Sadia Sanchez-Vegas

Director of UNESCO Cluster Office for the Caribbean

*"AI and AI Applications are developing at tremendous speeds raising several ethical, legal and humanistic concerns."*

##### Dorothy Gordon

Chair, UNESCO Information for All Programme (IFAP)

*"We may not be where we want to be today, but we have a lot of opportunities for making things better right now and building a better future."*

##### Erica Simmons

Exec Director, Caribbean Maritime University

*"The most important General-Purpose Technology of our Era is here, we cannot let this opportunity pass us by."*

##### Prof Paul Golding

School of Business & Management, University of Technology, Jamaica

*"Each country should not go it alone."*

##### Eldon Marks

CEO, V75

*"There should be a certain degree of concern, even now, given the interplay between technology and society and our common commodity – Data"*

#### Policy & Strategy Recommendations

1. Any policies, laws or regulations must be grounded in Human Rights FIRST
2. Science and Technology policies should be developed at National and Regional Level.
3. Pay attention to Data and Digital Infrastructure
4. There are tools and other strategies for the Caribbean nations including UNESCO's leading with an International Standard Setting Instrument to help with AI Policy.
5. Caribbean SIDS must come together to develop AI competencies with the goal to be producers of AI technologies appropriate for the region. Data Literacy is an important area of AI competency.
6. Caribbean SIDS need AI Infrastructure including GPU and 5G.
7. Caribbean SIDS should consider developing in depth guidelines for AI that will guarantee a certain level of transparency and trust. Including a procurement guide for government officials.
8. Caribbean SIDS should create policies that encourage the creation of unique datasets for the Caribbean focusing on structured and unstructured information as a service.
9. Caribbean SIDS can develop a specialization in



the humanistic methodologies or approaches that can assist companies to balance commercial opportunity against the human ethical side of AI solution development.

10. USE global policy guidelines from IEEE, UNESCO, UNICEF and others to leverage the learnings from these international organizations in policy and regulation development.
11. A regional AI ecosystem should be created and collaboration on the development of AI across the region such as each country having specific specialization with regards to the regional AI ecosystem approach.
12. As positioning as an AI service region would fit well with our already service focused so these services are possible areas that we can excel in.
13. Policy development can come under existing frameworks. CARICOM has a policy regionally for the harmonization of ICT and this is probably a natural place for policies about AI to come under
14. Promote the use of anonymized data in AI Innovations where applicable.
15. Support the use of AI models which require less training data.
16. Devise and enforce appropriate data protection policies.
17. Encourage the development of AI technologies that combat the destructive uses of AI Technology. This includes the creation of NGOs and other organizations that promote AI for Social Good.
18. Policies should be put in place that foster innovation of AI-based specializations at the industry level within the region.
19. Make a meaningful bridge between academia and industry to enable true utilitarianism at the tertiary institutions and enable the research in motion within industry.
20. Meaningful investments to develop the skills and capabilities of AI development in the region starting from primary school.

## APPENDIX #2

### Summary of Stakeholder Consultations: Forum 2

Caribbean AI Initiative  
FORUM 2 Summary  
February 18 – 19, 2021

### ARTIFICIAL INTELLIGENCE: OPPORTUNITIES TO ACCELERATE HUMAN PROGRESS FOR SUSTAINABLE DEVELOPMENT

#### EXECUTIVE SUMMARY

Initiative to raise awareness on the scope of opportunities for AI and encourage Caribbean SIDS and inform the preparation of a policy brief for the region.

**Sadia Sanchez-Vegas**  
Director of UNESCO Cluster office for the Caribbean

**Dorothy Gordon**  
Chair, Information for All Programme (IFAP)

**Hon Olivia Grange**  
CP, MP Minister of Culture, Gender, Entertainment and Sports; Chair, Jamaica National Commission For UNESCO

**Carolina Aguerre**  
Director, Center for Technology and Society  
University of San Andres

**Dhanaraj Thakur**  
Research Director  
Center for Democracy & Technology

**Patrick Lafayette**  
Veteran Jamaican Broadcaster

**Deidre Williams**  
Teacher, Librarian and Administrator  
St Lucia

**Wendell Wallach**  
Co-Convener, International Congress for the Governance of AI (ICGAI)

**Renee Cummings**  
Criminologist, Criminal Psychologist, AI Ethicist, Data Activist

**Chief Justice Ivor Archie**  
Trinidad and Tobago

**Judge Isabela Ferrari**  
Federal Judge, Brazil

**Dr. Francisc Pedró,**  
Director  
UNESCO International Institute for Higher Education in Latin America and the Caribbean

**Dr. Gunjan Mansingh**  
Head of Department of Computing  
University of the West Indies, Mona

**Professor Anthony Clayton**  
Director, Institute of Sustainable Development, UWI, Mona  
Chairman of Broadcasting Commission of Jamaica

**Dr. Royston Emmanuel**  
E-Learning Specialist & Head of E-Learning Academy  
The Sir Arthur Lewis Community College (SALCC), Saint Lucia

**Jane Zavalishina**  
President and Co-Founder of Mechanica AI

**Nievia Ramsundar**  
Executive Director, Caribbean Competition Authority

**Leslie Lee Fook**  
Director, A.I., Analytics and Automation, Incus Services

**Jason Mars**  
Assistant Professor of Computer Science at University of Michigan & Co-founder of Clinc Inc

**Nicholas Kee**  
Executive Director, Next Gen Creators



**David Hughes**

Associate Professor, Penn-State University and Founder of PlantVillage

**Rakesh Bhukal**

PhD Candidate, Founder, Managing Director & Specialist in Aquaculture, Aquaponics & Hydroponics, Aquatic solutions, Trinidad and Tobago

**Professor Lloyd Waller**

Executive Director, The Global Tourism Resilience and Crisis Management Centre (GTRCM)

**Jhannel Tomlinson**

PhD Candidate, Climate and Agriculture, The University of the West Indies, Mona, Jamaica

**Henkel Valentine**

PhD Candidate & Researcher in Prostate Cancer, The University of the West Indies, Mona, Jamaica

**Dr. Sherene James-Williamson**

Associate Dean, Undergraduate Matters, Senior Lecturer & Museum Curator, The University of the West Indies, Mona

**Leighton Paul Walsh (Walshy Fire)**

DJ, MC, Grammy Award Winning Record Producer, Member of “Major Lazer”

**Andrea Dempster Chung**

Executive Director, Kingston Creative

**Dr. Marielle Barrow**

Program Coordinator, Caribbean Development Bank

**Octavio Kulesz**

Digital Publisher, Entrepreneur, & Director of Teseo

**Cordel Green**

Cordel Green, Executive Director, Broadcasting Commission of Jamaica and UNESCO Representative

**Isabel Viera Bermúdez**

Advisor for Communication and Information, UNESCO Cluster Office for the Caribbean

**Paula Istúriz Cavero**

Programme Specialist, Social and Human Sciences, UNESCO Cluster Office for the Caribbean

**Erica Simmons**

Executive Director, Centre for Digital Innovation, Caribbean Maritime University

**Professor Paul Golding**

Associate Professor, College of Business and Management, University of Technology

**M Georgia Gibson Henlin**

QC Managing Partner  
Henlin Gibson Henlin, Attorneys-at-Law

**Eldon Marks**

Founder & CEO of V75 Inc.

**Sasha Harrison**

The University of the West Indies STAT  
Vice-Chancellor’s Ambassador & Economist,  
Broadcasting Commission of Jamaica

**Indi McLymont-Lafayette**

Development  
Communications Specialist, Change  
Communications Limited

**Dr. Sonjah N. Stanley Niaah**

Director and Senior Lecturer, Institute of Caribbean Studies & Reggae Studies Unit, University of the West Indies, Mona, Jamaica

Policy & Strategy Recommendations

1. Given automation’s impact on employment, public policies strategies and programmes are needed to ensure that Artificial Intelligence empowers people not replace people
2. Set goals to ensure that the voice of Caribbean AI is gender neutral
3. Establish a Caribbean AI Governance Network
4. Operationalize AI principles to avoid ‘ethics washing’
5. Launch digital literacy, digital skills and digital hygiene awareness public education campaigns
6. Governments in the Caribbean have a crucial role in the policy process and identifying the themes that are most vital for AI policy, systems and potential applications in each country and the region.
7. Establish comprehensive data policy to address the industry beyond privacy and data protection

- concerns to include how to we create data, clean data and develop data models such as Open Data for reuse.
8. Establish AI policy areas around ethical impact assessment, ethical governance and management, data policy, development and international cooperation, environment and ecosystem, gender, culture, education and research, economy and labor, health and social welfare to protect Caribbean people
  9. Address this inflection point in human history where technology radically restructuring and destabilizing human affairs
  10. AI for Good and principles are mostly weak instruments in comparison to the power of the digital economy to exacerbate structural inequalities. Design regulations and laws to protect the people.
  11. AI in the Caribbean should be directed to developing technological innovations that solve the region's most pressing development problems including poverty, climate change, crime and violence, public safety, healthcare and gender inequalities.
  12. Create ender responsive AI Policy and make sure women are at the table when talking about gender -equitable decision making.
  13. Encourage industry to hire women and promote women leadership in AI.
  14. Collect trusted data on the landscape such as gender metrics for the AI industry and related sectors.
  15. Create algorithmic impact assessments and explainability guidelines to help industry mitigate potential gender discrimination in their products and services (apply these to government use and procurement of AI tools).
  16. Provide incentives to traditional capital sources and venture capital that promote gender equality in AI.
  17. Provide finance and training to support gender equitable AI entrepreneurship.
  18. Address the Social Science Gap in AI development teams so that more ethical development can happen.
  19. Establish R&D centers focused on the big questions facing AI tools.
  20. Improve transparency in training data sets by requiring explainability and impact assessments to be done.
  21. Address affordability of the tools to assist the visually impaired individuals in the Caribbean.
  22. Severely punish bias discrimination by fines or punished thru the courts.
  23. Implement AI policy protects disabled people like a Watchdog for the disabled.
  24. Make a concentrated effort to educate the young people to create AI technology reflective of our regional experience.
  25. Create an Initiative for the collection and protection of our inclusive and accurate data in all industry sectors.
  26. Require explanations, justifications, contextual information about the application of algorithms.
  27. Find reasonable ways to regulate the use of algorithms and balance innovation and ethics.
  28. We must design ethical AI by using interdisciplinary and multidisciplinary approaches and interventions to detect, mitigate and monitor AI risks.
  29. Demand that rigorous stewardship and robust ethical guardrails are established for AU to ensure we DO NO HARM with AI.
  30. Algorithms must be interrogated. Mandate audits and impact assessments that continually check for bias in algorithms.
  31. We must advocate always for justice-oriented design principals and data rights.
  32. The research, design, development, and deployment of AI must consider the wellbeing of humanity, the environment and sustainable development and AI systems must ensure diversity, inclusion, and gender equality.
  33. Get Civil Society to raise their voice to point out issues linked to bias and discrimination, this also makes AI developers and AI developing Companies accountable.
  34. Recommend that we consider AI to help in the criminal justice system. To improve citizen services by helping the judicial with decision making processes. Go back to the definition of What is a court?



35. Start conversations about how AI can be used in a safe way in the judiciary. AI gives the opportunity to expand access to justice.
36. Ban facial recognition systems in the judiciary because of its ethical problems.
37. Employ AI in service to student's education. Determine if AI can be used to make up for the COVID-19 learning loss. We have losses of 15%-30%.
38. Provide universal access to quality internet for all citizens of the Caribbean. Access to Internet is a fundamental right.
39. Use AI to improve pedagogical outcomes for students. AI can help teachers make better more personalized decisions about teaching and learning of each student. Individualizing education. Consider learning analytics to make the teaching, learning and administration of education more efficient and personalized thereby humanizing the pedagogy.
40. Reskill large parts of the workforce especially those in repetitive jobs that are often low hanging fruit for automation – customer support, telesales, security guard, hematologists, truck driver, research analyst, radiologist.
41. Improve the technology education in schools starting at the primary level thru to secondary.
42. Fundamentally rethink the nature of work and education including the relationship between qualifications and future of work
43. Empower teachers so that they have the technical skills to use the technology.
44. Encourage curiosity in the people, get them to play with technology by providing relevant content.
45. Consider focusing on knowledge transfer industry as a regional industry strategy. Software is a weightless export product. That gives good competitive advantage and AI is a software product.
46. Review how AI works with competition. Propose regulatory intervention. Review tacit collusion because AI can create unfair competition.
47. Consider creating industry specific toolkits to help regulators respond to consumer or market harm caused by fast moving technology.
48. Invest in developing new jobs to replace the ones that will be obsoleted.
49. AI should be integrated into agriculture so that we can increase the efficiency of that sector including precision farming, disease and weather predictions, crop monitoring systems.
50. AI should help to facilitate the collection and analysis of data in the agricultural sector use R&D and University projects to support the deployment of these technology into small farmers.
51. AI can be used to support better service delivery to the Tourism sector such as keyless entry.
52. AI can be used to tackle some of the most pressing problems like finding a vaccine for COVID-19.
53. AI can be used to tread with community spread and to find out other data about how disease is spread among the populous
54. We can continue to use AI in medical research just like we did to discover one of three prostate cancer cell lines for men of African descent in the world.
55. AI can be used to make our healthcare sector more efficient; this is an area that we can focus on that will benefit the people however we must ensure transparency of AI systems in medical research.
56. AI should be used to help with research on Geoheritage and Geohazard Resiliency R&D by giving researchers more access to data to do analysis. This is a form of cultural preservation.
57. Use art to engage people with Technology applications.
58. Create multilateral relationships to help with the expansion to technology and arts.
59. Technology should help with customer service representative to deliver a better product in tourism.
60. AI is being used in arts and fashion in all kinds of creative ways and should be expanded further.
61. We must put mechanisms in place to ensure that the stakeholders of the creative industry in the region do not get left behind due to lack of digital literacy skills.

62. We need to better understand the implications of the data and backend systems that collect our data.
63. Create a cultural data bank for all citizens to deposit their data and become shareholders in the bank.
64. Determine how we can help drive AI across the Caribbean creative ecosystem to get more efficiency, more creativity, more scale across creation, production, distribution channels.
65. Ensure that our cultural expressions are free of Bias.
66. Work concurrently in the Field of Culture and AI. Bring AI into the field of Culture and bring Culture into the field of AI.
67. We cannot have ethical AI without diversity.
68. AI must be put to the service of the creative industry in the Caribbean. Making creatives more efficient.
69. We must be sensitive to intellectual property rights and sacred spaces and places and treat them with respect.
70. We should use AI to amplify what is working for us in the Caribbean such as the expertise in Carnival productions.
71. Remove the barriers for sharing data among and between Caribbean countries.
72. Create opportunities for youth to engage with technology thru cultural digitalization/ preservation - Digitalize the culture - turn physical assets into digital assets - film, tv, music, artwork, oral traditions.
73. Provide a collective backend for creatives to leverage that would help them to streamline their business.
74. Provide global leadership in AI ethics transparency.
75. Create regional infrastructure including data centres, GPUs, and access to the internet as a digital strategy



## APPENDIX #3

Stakeholders' Poll Results  
February 18, 2021 – Polls & Results



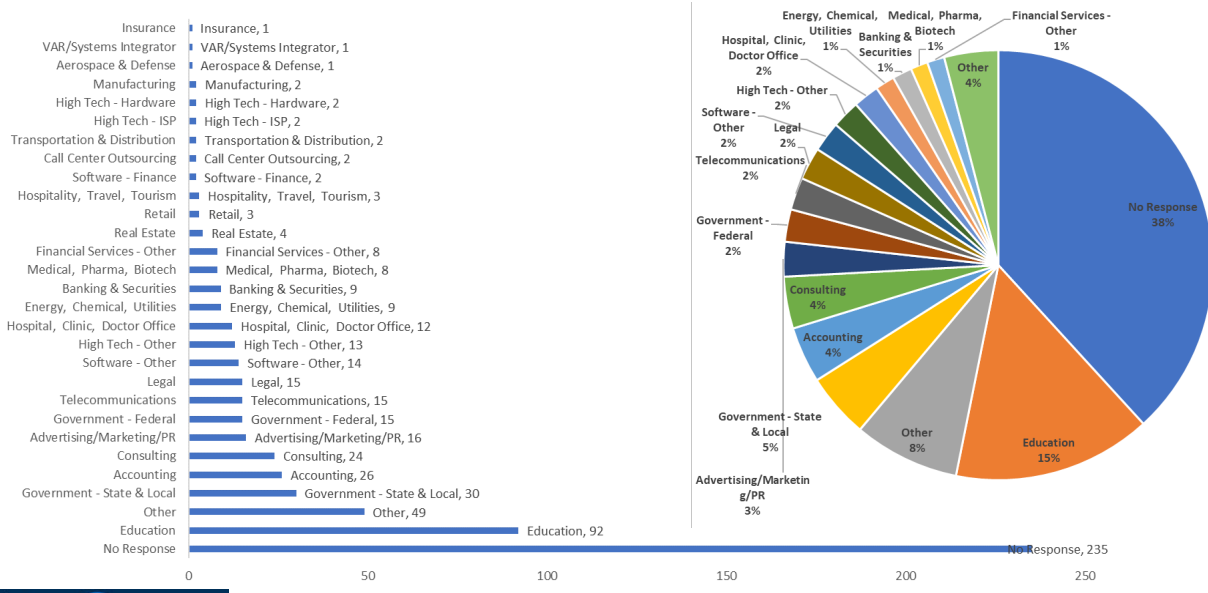
### FORUM 2

ARTIFICIAL INTELLIGENCE: OPPORTUNITIES TO ACCELERATE HUMAN PROGRESS FOR SUSTAINABLE DEVELOPMENT

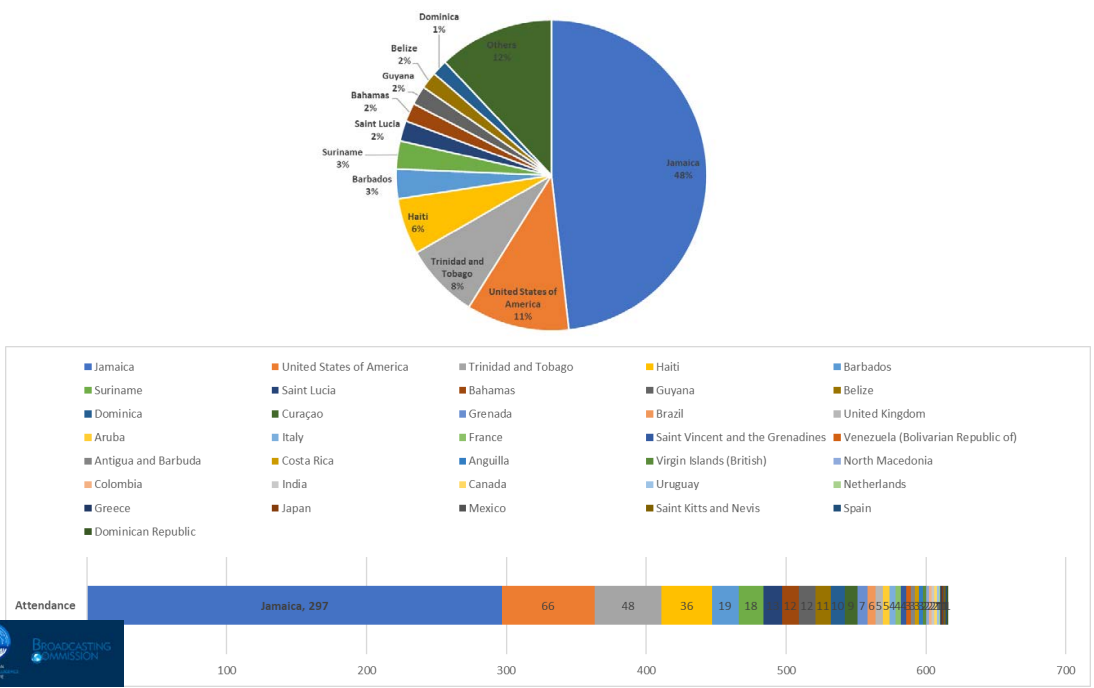
18 – 19 February 2021

# Forum 2 Polling Results

# PARTICIPANTS BY INDUSTRY FEB 18

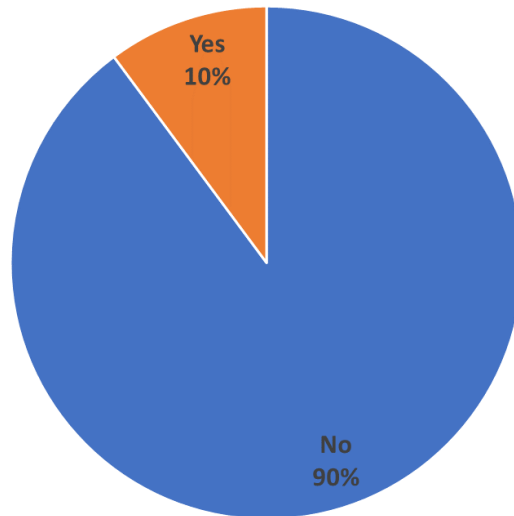


# PARTICIPANTS BY COUNTRY FEB 18



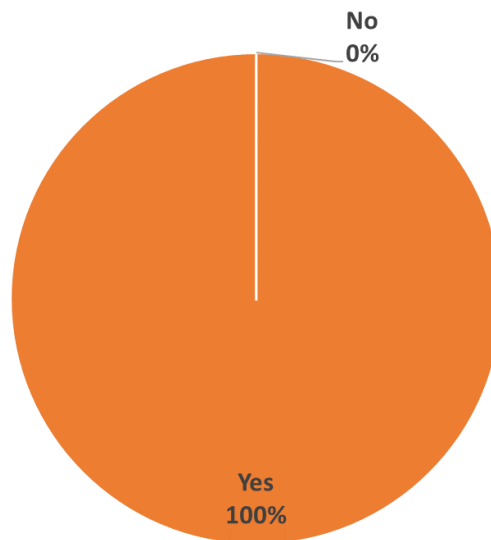
### Poll Feb 18:

Have you read the UNESCO Draft Recommendation on the Ethics of Artificial Intelligence or other similar reports/recommendations on AI Ethics?



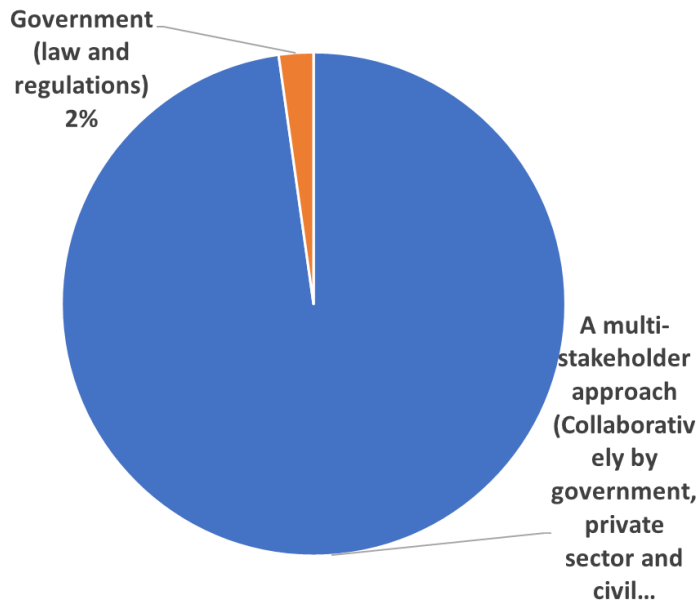
### Poll Feb 18:

Given the importance of data to AI, do you believe people should own their personal data and have the right to determine how it is accessed and used?

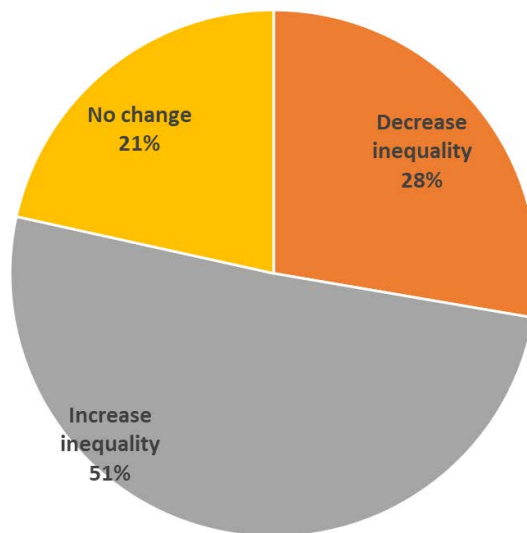




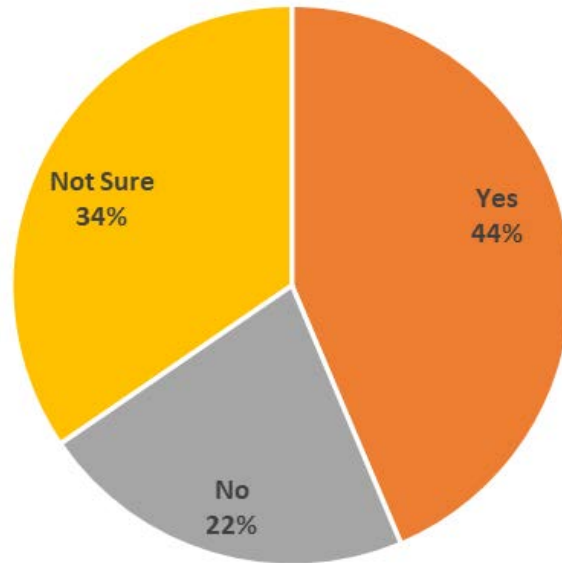
# Poll Feb 18: Who should primary responsibility for AI regulation be left to?



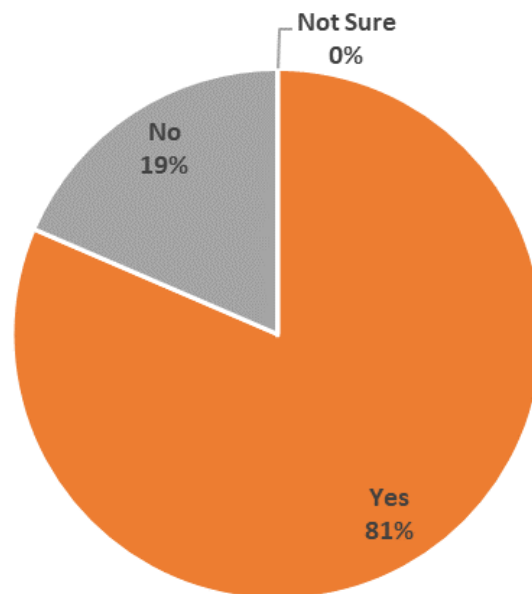
# Poll Feb 18: Do you think AI will increase or decrease gender-inequality in the Caribbean?



### Poll Feb 18: Are you receptive to the use of AI in the Justice System in the Caribbean?



### Poll Feb 18: Do you believe AI will advance inclusive and sustainable economic growth, full and productive employment and decent work for all?

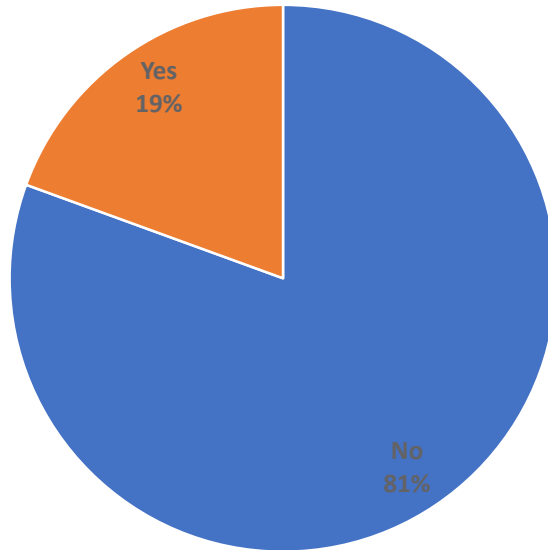






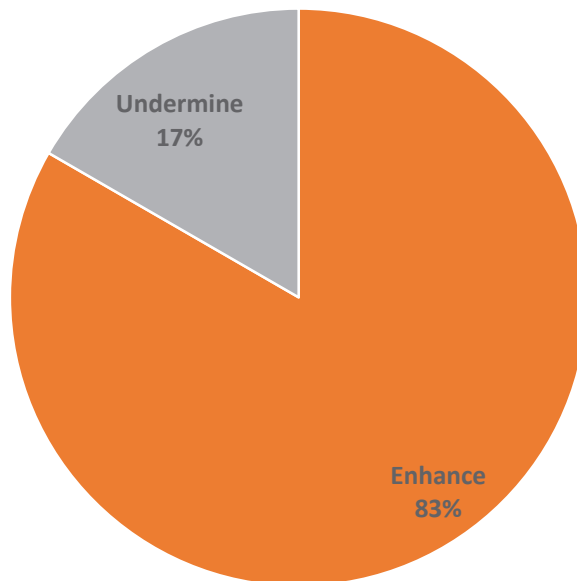
### Poll Feb 19:

Do you think the risks associated with AI outweigh the potential benefits for Caribbean Sustainable Development?



### Poll Feb 19:

Do you believe that AI will undermine OR enhance human creativity?



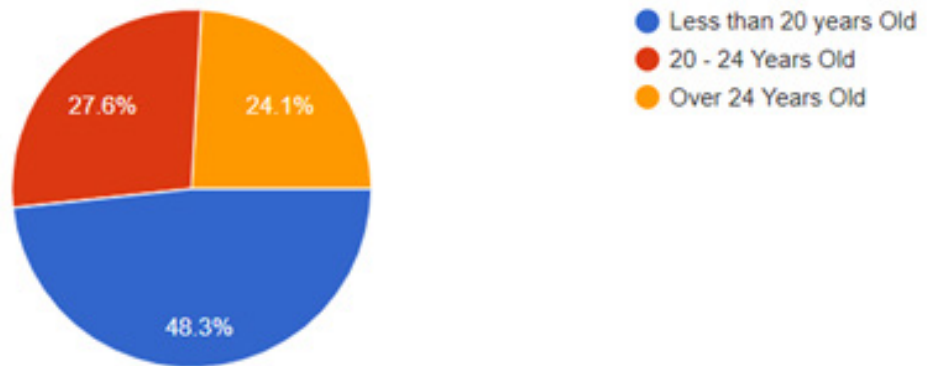
## APPENDIX #4

### Stakeholders' Poll Results – Reimagine the future with Artificial Intelligence: A Virtual link up for Caribbean Youth

April 28, 2021 - Polls & Results

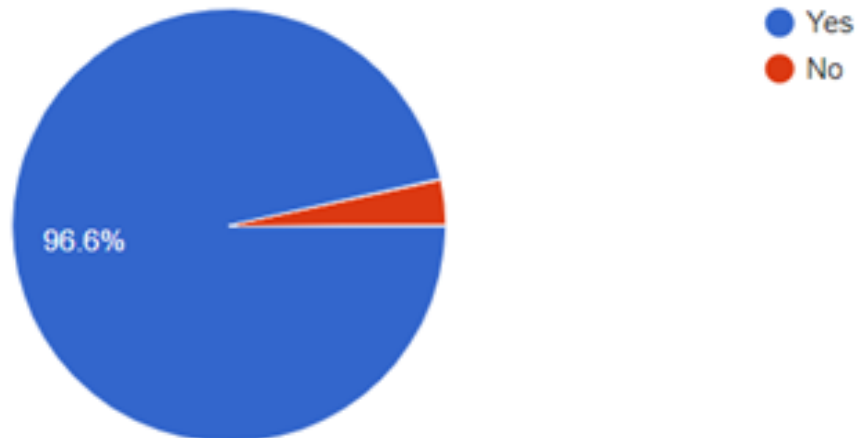
Age:

29 responses



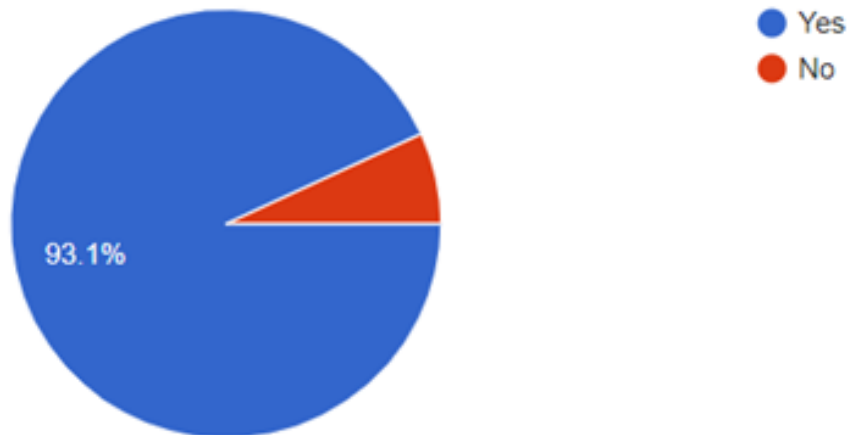
Have you heard of the term Artificial Intelligence before today?

29 responses



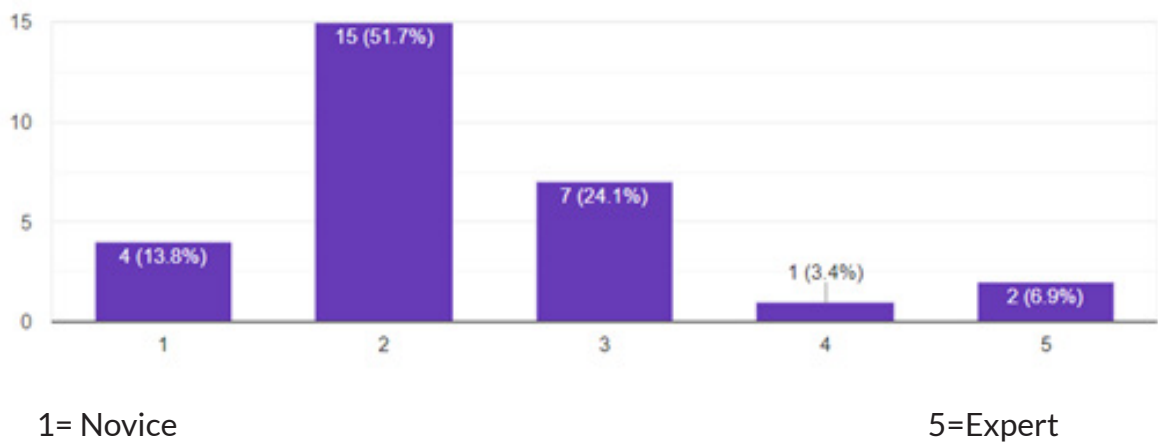
### Have you ever interacted with any form of Artificial Intelligence?

29 responses



### How much do you know about Artificial Intelligence?

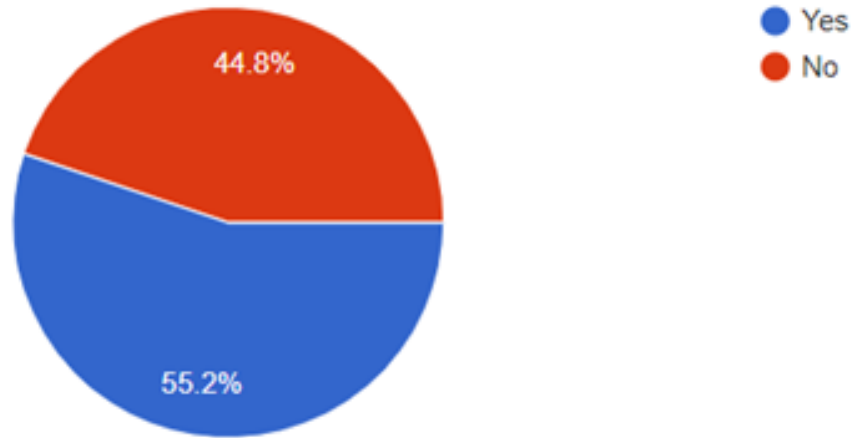
29 responses





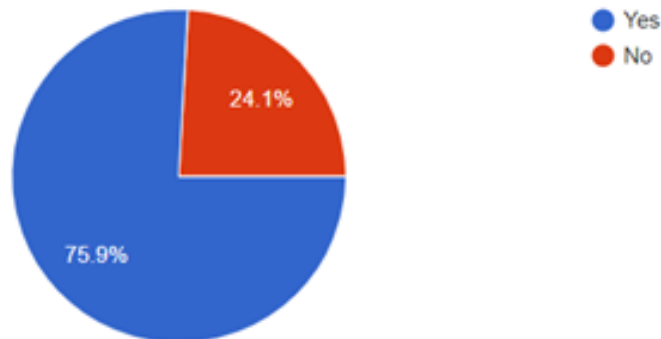
### Have you ever heard the term algorithmic bias?

29 responses



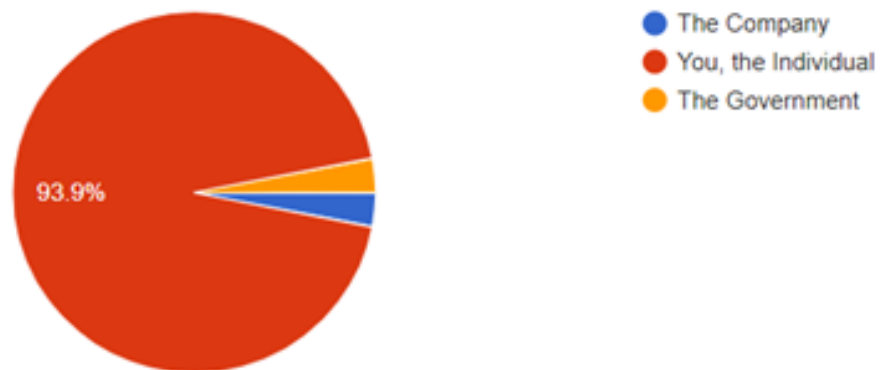
### Do you think Artificial Intelligence can be biased? ex. Could the AI prefer men over women, or dogs over cats, or even rich or poor?

29 responses



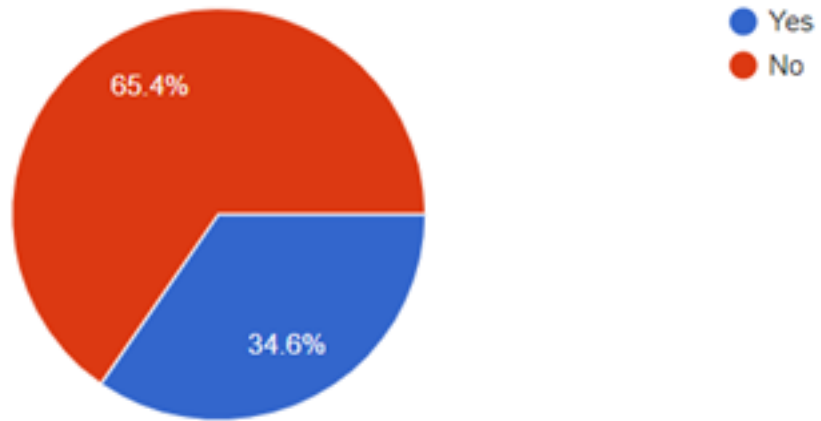
### Who should own the data between you and your Personal Robot?

33 responses



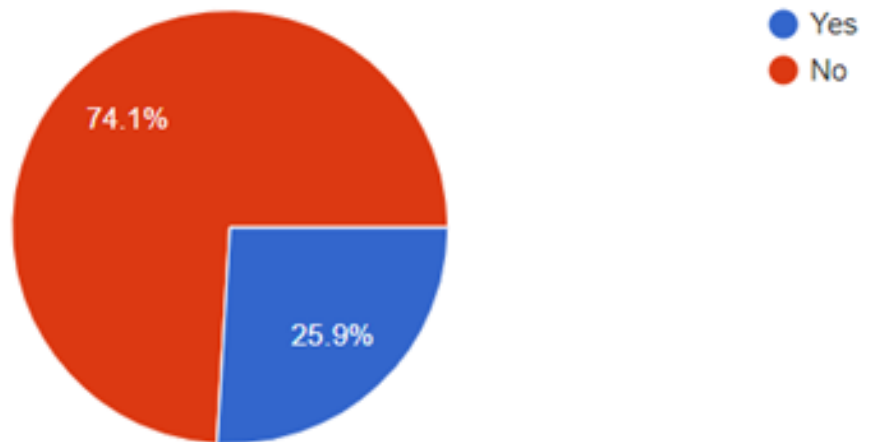
### Should we be using AI for Sentencing?

26 responses



### Are you being introduced to AI in school now?

27 responses



## Do you have any Recommendations on the UPSKILLING Principle?

2 responses

I would recommend that the workforces/organisations should encourage their current staff to be trained technically on IT software or basic IT skills and campaign to youths to encourage the importance of IT, Digitalization and AI initiatives.

Firstly, it's important to educate the public on the importance and efficiency of AI, for example; what does it entail and how do we integrate it into our everyday lives. Additionally, it's necessary to look at the different methods of integration and implementation measures needed to ensure a smooth transition from our current labour force to AI without completely disrupting the workforce. Importantly, while AI will make most positions in the workplace obsolete, other job titles may continue the use of people, a clear cut transition is needed. But AI is definitely essential. How do we do this, by engaging AI professionals to provide training sessions from as early as primary level, even if its as an introduction.



# APPENDIX #5

## Caribbean AI Roadmap Summary



### 1. RESILIENCY

#### DISASTER MITIGATION

- Early Warning Systems
- Trouble Spot Monitoring
- Disaster Management
- Public Education
- Resiliency Framework
- Post Event Protocols (communication | security)
- Post Event Media Recovery

#### RESOURCE MANAGEMENT

- Monitor Oceans | Rivers
- Monitor Ports
- Monitor Carbon Emissions
- Survey Terrain for Roads
- Underground Infrastructure Resiliency
- Mobile Renewable Energy Stations
- Potable Water Machinery
- Healthcare Facilities
- Rationalization | Mobilization | Allocation

#### DATA MANAGEMENT

- Capture
- Classify
- Clean
- Format
- Store
- Analyze
- Archive
- Protection

#### PREDICTIVE ANALYSIS

- Monitor Weather | Rainfall
- Monitor Reefs | Pollution
- Monitor Climate Changes
- Monitor Natural Events ie Volcano

#### DELIVERABLES

- Save Lives
- Minimize Risk & Economic Loss
- Improve Responsiveness
- Increase Efficiency
- Decarbonization
- Improve Food Security
- Structured Data
- Preservation
- Predictive Analysis

## 2. GOVERNANCE

### ETHICS

- Common Values & Principles
- National-Regional AI Offices | Data Trusts

### STANDARDS

- Develop Technical Code of Conduct (developers)
- Develop Procurement Guidelines (buyers)
- Develop AI Design | Use Principles
- Reference IEEE P7000 Series of Standards

### DELIVERABLES

- Fairness
- Stewardship
- Reduced Bias
- Increase Awareness
- Responsible AI Strategies
- Interoperability of Systems
- Standards | Values
- Enforcement | Deterrent
- Integration | Adaptation
- Investment | Trade
- Public Health
- Explainability
- Accountability
- Responsive Legislation Framework
- Enhance Trust

### SAFETY & WELLBEING

- Develop AI to test AI for biases
- Identify AI applications in need of governance
- Defend Human Rights
- Establish AI innovations and framework for Justice reform | law enforcement | online dispute resolution system
- Design manual override options

### EQUITY

- Provide equitable high speed internet|broadband access
- Access to technology
- Targeted recruitment – women | youth
- Equitable machine learning algorithms

### LEGISLATION

- AI framework – long term policy | regulations | penalties
- Introduce laws (soft|hard) to address AI harms, responsibility, liability
- Review policy and legislation on ICT and cyber crimes
- New financial instruments
- Fiscal and policy space to align frameworks (national | regional | global)
- Enshrine AI for Good as a Human Right

### TRANSPERANCY | EXPLAINABILITY ACCOUNTABILITY

- Create Caribbean AI Standards Authority to aggregate, evaluate and approve deployment of proposed AI solutions
- Corporate Responsibility Education Programme
- Enable AI assisted Cyber Security to increase data security
- Build Trust in AI among Caribbean citizens

### LEGISLATION

- Participate in global AI discourse
- Promote AI regional/global networks
- Launch international developers software conference
- Lobby big tech for collaborations
- Issue academic papers on AI
- Participate in global forums
- Responsible AI Training and Policies

### DELIVERABLES

- Risk Impact
- Do No Harm Technology
- Protect and Save Lives
- Retain Human Control
- Access | Inclusion
- Increased participation
- Increased sharing
- Data Privacy
- Informed Consent
- Autonomy
- Increase Sphere of Influence

## 3. TRANSFORMATION

### PUBLIC SECTOR

- Introduce efficiency programmes (crime | education | health | energy)
- Paperless data integration
- Support Caribbean IOT Innovation
- Develop 'Smart Island' infrastructure
- Initiate and strengthen strategic alliances
- maintenance) with public/private partnerships to enable collective development of internet and data management infrastructure
- Public sector efficiency programmes re patent and trademark examination, management and forecast of traffic, the development of predictive capabilities for emergency responses
- AI Assistants to Improve citizen engagement and services such as online experiences for website visitors and reducing the number of people entering brick and mortar service centres
- Retain talent in the region

### SMART ISLAND INFRASTRUCTURE

#### DATA TRUSTS Aligned with NATIONAL-REGIONAL AI OFFICES

Govern data standards and data licensing

#### DATA BANKS Aligned with National Archives | REGIONAL DATA BANK

Drive youth centered data preservation programmes to build archives and data management capacity

#### DATA HUBS Aligned with Tertiary Institutions

Facilitate R&D and promote AI innovation as a wealth generator

#### DATA CENTRES

National-Regional Secure Storage Platforms

#### INFRASTRUCTURE

Establish internet infrastructure (Broadband | WiFi | 5G)

#### CLOUD

Establish secure regional computing cloud

### DELIVERABLES

- Digital Transformation
- Improved Efficiency
- Digital Economy
- AI Infrastructure (Physical | Digital)
- Digital Autonomy



## 4. UPSKILLING

### INNOVATION

- Establish Regional AI Incentives for Academia | Private Sector
- Target women, youth, differently abled
- Public Education on Media and Information Literacy
- Create AI R&D Tech Fund
- Initiate and strengthen strategic alliances
- Establish new AI assisted industries (medical cannabis | e-health | e-education| e-sports | mariculture | wellbeing management | software
- Increase productivity in across industries - manufacturing | criminal justice | regenerative agriculture | tourism | transportation | financial services | creative industries

### MONITIZATION

- Develop AI bias test software algorithms for efficient AI training (energy optimization)
- Leverage linguistic plurality develop AI tools to support inclusion online ie e-translation
- Structure data to extract value
- Digitize creative and environmental content
- Develop digital content
- Promote data services
- Augmented Reality Experiences - E-Tourism and Creative Industries
- Mentoring, Training and Accelerator Programmes for W, Y, DA

### DELIVERABLES

- New Products
- Wealth Generation
- Transform Industries
- Increase Efficiency & Productivity
- Enhance Customer Service
- Diversify Consumer Experience
- Revenue Generation
- Diversity AI Economy
- Increase Trade
- E-Translation & Knowledge Services

## 5. PRESERVATION

### DATA CAPTURE

- Launch national | regional preservation programmes
- Establish national | regional data banks
- Recruit and train youth and creatives to handle data

### DATA STORAGE

- Ensure secure national | regional storage platforms
- Recruit and train youth and creatives to handle data

### DATA PRESERVATION

- Clean public data
- Prepare machine readable format (classify, label, archive and manage content)
- Recruit and train youth and creatives in archival and data cleaning services

### DATA MONITIZATION

- Augmented reality experiences
- Increase financial literacy
- 3D Mapping of Caribbean SIDS Capitals (28)  
(cultural | historical | social | environmental)

### DELIVERABLES

- Accurate Digital Data
- Data Security
- Data Utility
- Virtual Tourism Experiences
- Cultural Heritage Preservation

## 6. SUSTAINABILITY

### SERVICE TO HUMANITY

- AI as a tool
- Establish Caribbean AI Governance Network
- Establish Data banks in National Archives
- Structural Improvements
- Digitize Operations

### CARIBBEAN AI GOVERNANCE NETWORK

### CARIBBEAN AI STANDARDS AUTHORITY

### AI R&D TECH FUND

### DATA PRESERVATION

- Implement programmes leveraging AI in Poverty Reduction
- Clean Energy | Economic Development (Women and Youth)
- Reduce Digital Gender Gap | Upgrade Systems  
Digitize operations
- Automate decision-making
- Reduce digital gender gap
- Upgrade systems

### DELIVERABLES

- Cultural Preservation
- Predictive Analysis
- Increased Efficiency
- Sustainable Development

## APPENDIX #6

FIGURES	PAGE
Figure 1 IDRC   CRDI Government Readiness Score	3
Figure 2 Machine Learning	4
Figure 3 Caribbean AI Policy Roadmap	6
Figure 4 Characteristics of AI	13
Figure 5 Visual Diagram of Elements of Artificial Intelligence	14
Figure 6 PWC AI Report	15
Figure 7 Machine Learning Tips	15
Figure 8 Top 9 Ethical Issues in Artificial Intelligence	16
Figure 9 Predicted regional gains from AI	20
Figure 10 Caribbean Tradition	21
Figure 11 Caribbean 28 SIDS	23
Figure 12 UNESCO ROAM Principles for Internet Universality	35
Figure 13 The Basic, Standard and Advanced 'Computer Skills of the Future' Pyramid	36
Figure 14 Current Data Sources for Big Data	37
Figure 15 Smart City Benefits	39
Figure 16 Opportunities for AI in Caribbean Industries	40
Figure 17 Caribbean SWOT Analysis	41
Figure 18 Incentives support AI development and implementation across industries In Caribbean SIDS	44



## APPENDIX #7

### Glossary

**Artificial Intelligence or AI systems** - Artificial intelligence (AI) systems are software (and possibly also hardware) systems designed by humans 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). Humans design AI systems directly, but they may also use AI techniques to optimise their design.

A separate document prepared by the AI HLEG and elaborating on the definition of AI used for the purpose of this document is published in parallel, titled “A definition of AI: Main capabilities and scientific disciplines”.

**AI Practitioners** - Individuals or organisations that develop (including research, design or provide data for) deploy (including implement) or use AI systems, excluding those that use AI systems in the capacity of enduser or consumer.

**AI system’s life cycle** - An AI system’s life cycle encompasses its development (including research, design, data provision, and limited trials), deployment (including implementation) and use phase.

**Auditability** - Auditability refers to the ability of an AI system to undergo the assessment of the system’s algorithms, data and design processes. This does not necessarily imply that information about business models and Intellectual Property related

to the AI system must always be openly available. Ensuring traceability and logging mechanisms from the early design phase of the AI system can help enabling the system’s auditability.

**Bias** - Bias is an inclination of prejudice towards or against a person, object, or position. Bias can arise in many ways in AI systems. For example, in data-drive AI systems, such as those produced through machine learning, bias in data collection and training can result in an AI system demonstrating bias. In logic-based AI, such as rule-based systems, bias can arise due to how a knowledge engineer might view the rules that apply in a particular setting. Bias can also arise due to online learning and adaptation through interaction. It can also arise through personalisation whereby users are presented with recommendations or information feeds that are tailored to the user’s tastes. It does not necessarily relate to human bias or human-driven data collection. It can arise, for example, through the limited contexts in which a system is used, in which case there is no opportunity to generalise it to other contexts. Bias can be good or bad, intentional or unintentional. In certain cases, bias can result in discriminatory and/or unfair outcomes, indicated in this document as unfair bias.

**Broadband** - In telecommunications, broadband is wide bandwidth data transmission which transports multiple signals and traffic types. The medium can be coaxial cable, optical fiber, radio or twisted pair. In the context of Internet access, broadband is used to mean any high-speed Internet access that is always on and faster than dial-up access over traditional analog or ISDN PSTN services.

**Computer vision techniques** - Techniques that provide computers with understanding of digital images or videos, such as for facial recognition.

**Data** - Facts, figures or information that are used to train AI about humans and the world.

**Data Center** - A data center or data centre is a building, dedicated space within a building, or a group of buildings used to house computer systems and associated components, such as telecommunications and storage systems.

**Digital Economy** - Digital economy refers to an economy that is based on digital computing technologies, although we increasingly perceive this as conducting business through markets based

on the internet and the World Wide Web. The digital economy is also referred to as the Internet Economy,

**Digital Transformation** - Digital transformation is the integration of digital technology into all areas of a business, fundamentally changing how you operate and deliver value to customers.

**Ethics** - Ethics is an academic discipline which is a subfield of philosophy. In general terms, it deals with questions like “What is a good action?”, “What is the value of a human life?”, “What is justice?”, or “What is the good life?”. In academic ethics, there are four major fields of research: (i) Meta-ethics, mostly concerning the meaning and reference of normative sentence, and the question how their truth values can be determined (if they have any); (ii) normative ethics, the practical means of determining a moral course of action by examining the standards for right and wrong action and assigning a value to specific actions; (iii) descriptive ethics, which aims at an empirical investigation of people’s moral behaviour and beliefs; and (iv) applied ethics, concerning what we are obligated (or permitted) to do in a specific (often historically new) situation or a particular domain of (often historically unprecedented) possibilities for action. Applied ethics deals with real-life situations, where decisions have to be made under time pressure, and often limited rationality.

AI Ethics is generally viewed as an example of applied ethics and focuses on the normative issues raised by the design, development, implementation and use of AI. Within ethical discussions, the terms “moral” and “ethical” are often used. The term “moral” refers to the concrete, factual patterns of behaviour, the customs, and conventions that can be found in specific cultures, groups, or individuals at a certain time. The term “ethical” refers to an evaluative assessment of such concrete actions and behaviours from a systematic, academic perspective.

**Ethical AI** - Ethical AI is used to indicate the development, deployment and use of AI that ensures compliance with ethical norms, including fundamental rights as special moral entitlements, ethical principles and related core values. It is the second of the three core elements necessary for achieving Trustworthy AI.

**Human-Centric AI** - The human-centric approach to AI strives to ensure that human values are central to the way in which AI systems are developed, deployed, used and monitored, by ensuring respect for fundamental rights, including those set out in the Treaties of the European Union and Charter of Fundamental Rights of the European Union, all of which are united by reference to a common foundation rooted in respect for human dignity, in which the human being enjoy a unique and inalienable moral status. This also entails consideration of the natural environment and of other living beings that are part of the human ecosystem, as well as a sustainable approach enabling the flourishing of future generations to come.

**Identity** – coined by entertainer/tech investor Will I Am as “ the marriage of my data and my identity - I’m what I like and what I don’t like. I’m where I go. I’m who I know. I’m what I search. I am my thumbprint. I am my data. That’s who I am.”

**Machine learning** - A programming technique in which a software system is provided thousands of examples of a concept and searches for patterns by itself.

**Natural language processing (NLP)** - Systems used, for example, by chatbots and voice assistants, are designed to understand and generate human language, either written or spoken.

**(Deep) neural networks** - A number of information processing units that send information between each other, similarly to the way neurons work in the brain. Combined with ever-powerful computers and large amounts of data, this technique enables more efficient machine learning.

**Predictive analytics** - Statistical techniques that analyse data to make predictions about unknown events or outcomes.

**Pattern recognition** - The automated identification of regularities in data used, for example, for image processing or computer vision.

**Red Teaming** - Red teaming is the practice whereby a “red team” or independent group challenges an organisation to improve its effectiveness by assuming an adversarial role or point of view. It is particularly used to help identifying and addressing potential security vulnerabilities.

**Reproducibility** - Reproducibility describes whether an AI experiment exhibits the same behaviour when repeated under the same conditions.

**Robust AI** - Robustness of an AI system encompasses both its technical robustness (appropriate in a given context, such as the application domain or life cycle phase) and as well as its robustness from a social perspective (ensuring that the AI system duly takes into account the context and environment in which the system operates). This is crucial to ensure that, even with good intentions, no unintentional harm can occur. Robustness is the third of the three components necessary for achieving Trustworthy AI.

**Stakeholders** - By stakeholders we denote all those that research develop, design, deploy or use AI, as well as those that are (directly or indirectly) affected by AI – including but not limited to companies, organisations, researchers, public services, institutions, civil society organisations, governments, regulators, social partners, individuals, citizens, workers and consumers.

**Traceability** - Traceability of an AI system refers to the capability to keep track of the system's data, development and deployment processes, typically by means of documented recorded identification.

**Trust** - "Trust is viewed as: (1) a set of specific beliefs dealing with benevolence, competence, integrity, and predictability (trusting beliefs); (2) the willingness of one party to depend on another in a risky situation (trusting intention); or (3) the combination of these elements." While "Trust" is usually not a property ascribed to machines, it is important to stress the importance of being able to trust not only in the fact that AI systems are legally compliant, ethically adherent, and robust, but also that such trust can be ascribed to all people and processes involved in the AI system's life cycle.

**Trustworthy AI** - Trustworthy AI has three components: (1) it should be lawful, ensuring compliance with all applicable laws and regulations (2) it should be ethical, demonstrating respect for, and ensure adherence to, ethical principles and values and (3) it should be robust, both from a technical and social perspective, since, even with good intentions, AI systems can cause unintentional harm. Trustworthy AI concerns not only the trustworthiness of the AI system itself but also comprises the trustworthiness of all processes and

actors that are part of the system's life cycle.

**Vulnerable Persons and Groups** - No commonly accepted or widely agreed legal definition of vulnerable persons exists, due to their heterogeneity. What constitutes a vulnerable person or group is often context-specific. Temporary life events (such as childhood or illness), market factors (such as information asymmetry or market power), economic factors (such as poverty), factors linked to one's identity (such as gender, religion, or culture) or other factors can play a role. The Charter of Fundamental Rights of the EU encompasses under Article 21 on non-discrimination the following grounds, which can be a reference point amongst others: namely sex, race, colour, ethnic or social origin, genetic features, language, religion, or belief, political or any other opinion, membership of a national minority, property, birth, disability, age and sexual orientation. Other articles of law address the rights of specific groups, in addition to those listed above. Any such list is not exhaustive and may change over time. A vulnerable group is a group of persons who share one or several characteristics of vulnerability.



## BIBLIOGRAPHY

- Aguerre, C. (2021, February 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. <https://www.youtube.com/watch?v=FSY4rAgplFc>
- Barrow, M. (2021, February 19). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. [https://www.youtube.com/watch?v=\\_ylq0KmHG2Q&t=327s](https://www.youtube.com/watch?v=_ylq0KmHG2Q&t=327s)
- Batzoglou, S., & Evgeniou, T. (2019, August 21). Supercreativity AI may soon surpass human artistic creativity. <https://Towardsdatascience.com/>. <https://towardsdatascience.com/supercreativity-b4114ebd0357>
- Bresnahan, T. F., & Trajtenberg, M. (1995). 'General purpose technologies' Engines of growth? *Journal of Econometrics*, 65(1), 83–108. [https://doi.org/10.1016/0304-4076\(94\)01598-T](https://doi.org/10.1016/0304-4076(94)01598-T)
- Broadcasting Commission-Jamaica. (2020, December 11). UNESCO Caribbean AI Initiative Forum 1 | AI in the Caribbean Context: What are we talking about? [Video]. YouTube. [https://www.youtube.com/watch?v=\\_ylq0KmHG2Q&t=327s](https://www.youtube.com/watch?v=_ylq0KmHG2Q&t=327s)
- Broadcasting Commission-Jamaica. (2021a, February 23). UNESCO AI in the Caribbean Context Forum 2: Day 1 | Opportunities to Accelerate Human Progress for Sustainable Development [Video]. YouTube. [https://www.youtube.com/watch?v=R5mX-MgZIBtA&list=PL9k97wyKmKYyU8YtBqIDzx-Om\\_0qYqgS1F&index=2](https://www.youtube.com/watch?v=R5mX-MgZIBtA&list=PL9k97wyKmKYyU8YtBqIDzx-Om_0qYqgS1F&index=2)
- Broadcasting Commission-Jamaica. (2021b, February 24). UNESCO AI in the Caribbean Context Forum 2: Day 2 | Opportunities to Accelerate Human Progress for Sustainable Development [Video]. YouTube. [https://www.youtube.com/watch?v=dRLUr\\_yX\\_Xg&list=PL9k97wyKmKYyU8YtBqIDzx-Om\\_0qYqgS1F&index=3](https://www.youtube.com/watch?v=dRLUr_yX_Xg&list=PL9k97wyKmKYyU8YtBqIDzx-Om_0qYqgS1F&index=3)
- Broadcasting Commission-Jamaica. (2021c, April 27). AI Consultations: Public Sector [Video]. YouTube. [https://www.youtube.com/watch?v=Ne8\\_ID-wCes&list=PL9k97wyKmKYyU8YtBqIDzx-Om\\_0qYqgS1F&index=6](https://www.youtube.com/watch?v=Ne8_ID-wCes&list=PL9k97wyKmKYyU8YtBqIDzx-Om_0qYqgS1F&index=6)
- Broadcasting Commission-Jamaica. (2021d, April 27). UNESCO Caribbean AI Initiative Consultation: Academia, Civil Society and Youth [Video]. YouTube. [https://www.youtube.com/watch?v=dJpstTRRb-cE&list=PL9k97wyKmKYyU8YtBqIDzxOm\\_0qYqgS1F&index=4](https://www.youtube.com/watch?v=dJpstTRRb-cE&list=PL9k97wyKmKYyU8YtBqIDzxOm_0qYqgS1F&index=4)
- Broadcasting Commission-Jamaica. (2021e, April 27). UNESCO Caribbean AI Policy Roadmap Stakeholder Consultation: Private Sector [Video]. YouTube. [https://www.youtube.com/watch?v=-JCxyecFSr1w&list=PL9k97wyKmKYyU8YtBqIDzx-Om\\_0qYqgS1F&index=5](https://www.youtube.com/watch?v=-JCxyecFSr1w&list=PL9k97wyKmKYyU8YtBqIDzx-Om_0qYqgS1F&index=5)
- Broadcasting Commission-Jamaica. (2021f, April 28). UNESCO Reimagine the World with Artificial Intelligence: A Virtual Link Up for Caribbean Youth [Video]. YouTube. <https://www.youtube.com/watch?v=KnrEpXelcF4>
- CARICOM. (2016, June 5). Remarks by the Most Honourable Andrew Holness, O.N., M.P., Prime Minister of Jamaica to the Opening Ceremony of the Thirty-Seventh Regular Meeting of the Conference of Heads of Government of the Caribbean Community (CARICOM) Georgetown, Guyana, 4– 6 July 2016 [Press release]. <https://caricom.org/remarks-by-the-most-honourable-andrew-holness-o-n-m-p-prime-minister-of-jamaica-to-the-opening-ceremony-of-the-thirty-seventh-regular-meeting-of-the-conference-of-heads-of-government-of-the-cari/>
- Clayton, A. (2021, February 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. <https://www.youtube.com/watch?v=FSY4rAgplFc>
- The Costs of Crime and Violence: New Evidence and Insights in Latin America and the Caribbean. (2017, February). Inter-American Development Bank. <https://doi.org/10.18235/0000615>
- Cummings, R. (2021, February 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. <https://www.youtube.com/watch?v=FSY4rAgplFc>
- Dempster-Chung, A. (2021, February 19). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. [https://www.youtube.com/watch?v=\\_ylq0KmHG2Q&t=327s](https://www.youtube.com/watch?v=_ylq0KmHG2Q&t=327s)
- Economic Commission for Latin America and the Caribbean (ECLAC). (2021). Preliminary Overview of the Economies of Latin America and the Caribbean (LC/PUB.2020/17-P/Rev.1). ELAC Documents

and Publications Division. [https://www.cepal.org/sites/default/files/publication/files/46504/S2000989\\_en.pdf](https://www.cepal.org/sites/default/files/publication/files/46504/S2000989_en.pdf)

European Commission. (2020). WHITE PAPER On Artificial Intelligence - A European approach to excellence and trust. [https://ec.europa.eu/info/sites/default/files/commission-white-paper-artificial-intelligence-feb2020\\_en.pdf](https://ec.europa.eu/info/sites/default/files/commission-white-paper-artificial-intelligence-feb2020_en.pdf)

European Commission INDEPENDENT HIGH-LEVEL EXPERT GROUP ON ARTIFICIAL INTELLIGENCE. (2019, August 4). The Ethics Guidelines for Trustworthy Artificial Intelligence (AI). <https://ec.europa.eu/futurium/en/ai-alliance-consultation>. [https://ec.europa.eu/newsroom/dae/document.cfm?doc\\_id=60419](https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=60419)

Ferrari, I. (2021, February 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. <https://www.youtube.com/watch?v=FSY4rAgpIFc>

Gartner. (2019). CIO Agenda 2019: Digital Maturity Reaches a Tipping Point. <https://www.gartner.com/smarterwithgartner/cio-agenda-2019-digital-maturity-reaches-a-tipping-point/#:~:text=Digital%20business%20has%20moved%20from,focus%20on%20scaling%20digital%20initiatives>.

Global TechnoPolitics Forum, Treverton, G. F., & Esfandiari, P. (2020, December). Data: Governance and Geopolitics. Global TechnoPolitics Forum. <https://technopolitics.org/wp-content/uploads/2021/Data-Governance.pdf>

Golding, P. (2020, December 10). Artificial Intelligence In the Caribbean Context: What Are We Talking About? [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. [https://www.youtube.com/watch?v=\\_ylq0KmHG2Q-&t=327s](https://www.youtube.com/watch?v=_ylq0KmHG2Q-&t=327s)

Gordon, D. (2020, December 10). Artificial Intelligence In the Caribbean Context: What Are We Talking About? [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. [https://www.youtube.com/watch?v=\\_ylq0KmHG2Q-&t=327s](https://www.youtube.com/watch?v=_ylq0KmHG2Q-&t=327s)

Grange, O. (2021, February 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. <https://www.youtube.com/watch?v=FSY4rAgpIFc>

Green, C. (2021, February 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. <https://www.youtube.com/watch?v=FSY4rAgpIFc>

Government of Jamaica, & Clayton, A. (2014, March). A NEW APPROACH: NATIONAL SECURITY POLICY FOR JAMAICA Towards a Secure & Prosperous Nation. National Security Policy Coordination Unit (Cabinet Office) and the Ministry of National Security. <https://cabinet.gov.jm/wp-content/uploads/2017/05/NATSEC-March-25-2014-1-1.pdf>

Hagendorff, T. (2020). The Ethics of AI Ethics: An Evaluation of Guidelines. Springer: Minds and Machines. Published. <https://doi.org/10.1007/s11023-020-09517-8>

Hughes, D. (2021, February 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. [https://www.youtube.com/watch?v=\\_ylq0KmHG2Q&t=327s](https://www.youtube.com/watch?v=_ylq0KmHG2Q&t=327s)

IDB Office of Strategic Planning and Development Effectiveness, & Bando, R. (2018, December). Evidence-Based Gender Equality Policy and Pay in Latin America and the Caribbean: Progress and Challenges. Inter-American Development Bank. <https://doi.org/10.18235/0001614>

IEEE. (2020). IEEE Ethically Aligned Design. <https://ethicsinaction.ieee.org/#series>

Incus Services. (2021). ARTIFICIAL INTELLIGENCE - THE TIME IS NOW! <http://Incusservices.com/>. <http://incusservices.com/ai/>

International Forum on Artificial Intelligence and the Futures of Education 2020. (2020). International Forum on AI and the Futures of Education (AIED).

International Monetary Fund, Alleyne, T., Otker, I., Ramakrishnan, U., & Srinivasan, K. (2017). Unleashing growth and strengthening resilience in the Caribbean. International Monetary Fund, Publication Services. <https://www.imf.org/en/Publications/Books/Issues/2018/02/26/Unleashing-Growth-and-Strengthening-Resilience-in-the-Caribbean-44910>

International Telecommunication Union. (2020). Measuring digital development: Facts and figures 2020. <https://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx>

- Kitson, K. (2021, April 27). UNESCO Caribbean AI Initiative Consultation: Private Sector [Online Forum]. UNESCO Caribbean AI Initiative Consultations, Kingston, Jamaica. [https://www.youtube.com/watch?v=JCxyecFSr1w&list=PL9k97wyKm-KYyU8YtBqIDzxOm\\_0qYqgS1F&index=5](https://www.youtube.com/watch?v=JCxyecFSr1w&list=PL9k97wyKm-KYyU8YtBqIDzxOm_0qYqgS1F&index=5)
- KPMG, Justice, K., & Lohr, T. (2018). An Ethical Compass in the Age of Automation. KPMG. <https://home.kpmg/xx/en/home/insights/2018/08/an-ethical-compass-in-the-automation-age-guiding-digital-labor.html>
- LaRose, M. (2008, September 5). Caribbean culture too diverse to be labelled – Prof Nettleford. <https://www.stabroeknews.com/>. <https://www.stabroeknews.com/2008/09/05/news/guyana/caribbean-culture-too-diverse-to-be-labelled-%E2%80%93-prof-nettleford/>
- Lee Fook, L. (2021, February 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. <https://www.youtube.com/watch?v=FSY4rAgpIFc>
- Lowrie-Chin, J. (2010). The Only Thing That Separates Us Is Us. [jamaicans.com/weseparatesus/](https://jamaicans.com/weseparatesus/)
- Marks, E. (2020, December 10). Artificial Intelligence In the Caribbean Context: What Are We Talking About? [Forum Presentation]. UNESCO Caribbean AI Initiative - Forum 1, Kingston, Jamaica.
- Mars, J. (2021, February 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. <https://www.youtube.com/watch?v=FSY4rAgpIFc>
- Martinho-Truswell, E. (2019, November 1). As Jobs Are Automated, Will Men and Women Be Affected Equally? *Harvard Business Review*. <https://hbr.org/2019/11/as-jobs-are-automated-will-men-and-women-be-affected-equally>
- McKinsey & Company. (2020, October 5). How Covid 19 Has Pushed Companies Over the Technology Tipping Point – and Transformed Business Forever. <https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/how-covid-19-has-pushed-companies-over-the-technology-tipping-point-and-transformed-business-forever>
- nance/our-insights/how-covid-19-has-pushed-companies-over-the-technology-tipping-point-and-transformed-business-forever
- Morgan, S. (2020, November 13). Cybercrime To Cost The World \$10.5 Trillion Annually By 2025: Special Report: Cyberwarfare In The C-Suite. *Cyber Crime Magaine*. <https://cybersecurityventures.com/hackerpocalypse-cybercrime-report-2016/>
- Mottley, M. (2021, May 21). Mia Mottley, Prime Minister of Barbados, address during the high level welcome to WHA73 [High Level Welcome Address]. The 73rd World Health Assembly, Bridgetown, Barbados. <https://www.youtube.com/watch?v=tc-j41ZV6zw0>
- NIST Interagency/Internal Report (NISTIR). (2020, August). Four Principles of Explainable Artificial Intelligence (Draft). National Institute of Standards and Technology - U. S. Department of Commerce. <https://doi.org/10.6028/NIST.IR.8312-draft>
- Noble, S. U. (2018). *Algorithms of Oppression: How Search Engines Reinforce Racism* (Illustrated ed.). NYU Press.
- OECD/WTO. (2019). *Aid for Trade at a Glance 2019: Economic Diversification and Empowerment*. OECD Publishing. <https://doi.org/10.1787/18ea27d8-en>.
- Pedro, F. (2021, February 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. <https://www.youtube.com/watch?v=FSY4rAgpIFc>
- Peersman, G. (2014, September). Overview: Data Collection and Analysis Methods in Impact Evaluation. UNICEF Office of Research Methodological Briefs. [https://www.unicef-irc.org/publications/pdf/brief\\_10\\_data\\_collection\\_analysis\\_eng.pdf](https://www.unicef-irc.org/publications/pdf/brief_10_data_collection_analysis_eng.pdf)
- Population of Caribbean (2021) - Worldometer. (2021). *Worldometer*. <https://www.worldometers.info/world-population/caribbean-population/>
- PwC. (2017). *Sizing the Prize: What's the real value of AI for your business and how can you capitalize?* (No. 170905-115740-GK-OS). <https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf>
- Ramsundar, N. (2021, February 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica.



- Regional-economies-face-peril-with-declining-coral-reefs-report. (2015, April 27). Jamaica Observer. [https://www.jamaicaobserver.com/news/Regional-economies-face-peril-with-declining-coral-reefs-report\\_18827999](https://www.jamaicaobserver.com/news/Regional-economies-face-peril-with-declining-coral-reefs-report_18827999)
- Rêgo de Almeida, P. G., Denner dos Santos, C., & Silva Farias, J. (2020, January 7–10). Artificial Intelligence Regulation: A Meta-Framework for Formulation and Governance [Paper Presentation]. 53rd Hawaii International Conference on System Sciences, Maui, Hawaii. <https://aisel.aisnet.org/hicss-53/>
- Sanchez-Vegas, S. (2020, December 10). Artificial Intelligence In the Caribbean Context: What Are We Talking About? [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. [https://www.youtube.com/watch?v=\\_ylq0KmHG2Q-&t=327s](https://www.youtube.com/watch?v=_ylq0KmHG2Q-&t=327s)
- Science Time. (2020, December 12). Elon Musk: Superintelligent AI is an Existential Risk to Humanity [Video]. YouTube. <https://www.youtube.com/watch?v=iHh16HLgp0>
- Smets, L., & Deyal, Z. (2018, November 20). Artificial Intelligence and the Caribbean. IDB Blogs. <https://blogs.iadb.org/caribbean-dev-trends/en/9397/>
- Srinivasan, K., Ötker, I., Ramakrishnan, U., & Alleyne, T. S. C. (2017). Excerpt: Unleashing Growth and Strengthening Resilience in the Caribbean. INTERNATIONAL MONETARY FUND.
- Stanford University. (2012). Professor John McCarthy. <http://jmc.stanford.edu/>
- Starmer, J. (2021, February 19). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. [https://www.youtube.com/watch?v=\\_ylq0KmHG2Q&t=327s](https://www.youtube.com/watch?v=_ylq0KmHG2Q&t=327s)
- Thakur, D. (201–02-19). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Online Forum]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. <https://www.youtube.com/watch?v=FSY4rAgpIFc>
- The Institutions for Development Sector, & Jaitman, L. (2017). The costs of crime and violence: new evidence and insights in Latin America and the Caribbean (IDB-MG-510). Inter-American Development Bank.
- The Millennium Project. (2021, January 28). WORK/TECHNOLOGY 2050: SCENARIOS AND ACTIONS. <http://Www.Millennium-Project.Org/>. <http://www.millennium-project.org/work-technology-2050-scenarios-and-actions-preface-introduction-executive-summary/>
- The Ocean Foundation. (2014, December). EcoEarnings: A Shore Thing. JetBlue. [https://www.jetblue.com/magnoliapublic/dam/ui-assets/p/ecoearnings\\_report.pdf](https://www.jetblue.com/magnoliapublic/dam/ui-assets/p/ecoearnings_report.pdf)
- UK House of Lords. (2018, April 16). AI in the UK: ready, willing and able? UK Parliament. <https://publications.parliament.uk/pa/ld201719/ldselect/ldai/100/100.pdf>
- UN Office for the Coordination of Humanitarian Affairs. (2020, January). Natural Disasters in Latin America and the Caribbean, 2000–2019. OCHA. <https://reliefweb.int/report/world/natural-disasters-latin-america-and-caribbean-2000-2019>
- UN Women. (2020). UN Secretary-General's policy brief: The impact of COVID-19 on women. <https://www.unwomen.org/en/digital-library/publications/2020/04/policy-brief-the-impact-of-covid-19-on-women>
- UNESCO. (2019). UNESCO ROAM-X Indicators. <https://en.unesco.org/internet-universality-indicators/roamx-indicators>
- UNESCO. (2020, December 17). International education community gathers to deliberate on the development of AI competencies for all. <https://en.unesco.org/news/international-education-community-gathers-deliberate-development-ai-competencies-all>
- UNESCO Cluster Office for the Caribbean. (2021, January). Responding to the COVID-19 Emergency in Education. <https://en.unesco.org/caribbean-education-response>
- UNESCO, & Cuny, L. (2020). Freedom & Creativity: Defending art, defending diversity. UNESCO Diversity of Cultural Expressions. <https://en.unesco.org/creativity/publications/freedom-creativity-defending-art-defending>
- UNESCO Information for All Programme (IFAP). (2020, December). AI4IA Conference Final Report. IFAP Working Group for Information Accessibility. <https://www.i-c-i-e.org/post/ai4ia-final-conference-report>

- UNICEF Office of Global Insight & Policy, & Vosloo, S. (2020, August). Policy Guidance on AI for Children - Recommendations for building AI policies and systems that uphold child rights. UNICEF. <https://www.unicef.org/globalinsight/reports/policy-guidance-ai-children>
- UNICEF/CAPRI. (2020, September). The effect of the COVID-19 pandemic on Jamaican children preliminary results. <https://www.unicef.org/>. <https://www.unicef.org/jamaica/reports/effect-covid-19-pandemic-jamaican-children-preliminary-results>
- United Nations. (1948, October). Universal Declaration of Human Rights. <https://www.un.org/en/about-us/universal-declaration-of-human-rights>
- United Nations. (2011). Guiding Principles on Business and Human Rights: Implementing the United Nations “Protect, Respect and Remedy” Framework (HR/PUB/11/04). [https://www.ohchr.org/documents/publications/GuidingprinciplesBusinesshr\\_eN.pdf](https://www.ohchr.org/documents/publications/GuidingprinciplesBusinesshr_eN.pdf)
- United Nations Educational Scientific and Cultural Organization. (2020). Elaboration of a Recommendation on the ethics of artificial intelligence. <https://unesdoc.unesco.org/ark:/48223/Pf0000373434>. <https://unesdoc.unesco.org/ark:/48223/pf0000373434>
- United Nations Development Programme for Latin America and the Caribbean. (2020). Caribbean Justice: A Needs Assessment of the Judicial System in Nine Countries. UNDP. [https://www.latinamerica.undp.org/content/dam/rblac/docs/Research%20and%20Publications/Democratic%20Governance/UNDP-RBLAC-Caribbean%20Justice\\_final.pdf](https://www.latinamerica.undp.org/content/dam/rblac/docs/Research%20and%20Publications/Democratic%20Governance/UNDP-RBLAC-Caribbean%20Justice_final.pdf)
- United Nations Food and Agriculture Organization (FAO). (2021). The Impact of Disasters and Crisis on Agriculture and Food Security (ISBN: 978-92-5-130359-7). FAO Publications. <https://doi.org/10.4060/cb3673en>
- United Nations Office of the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States. (2014, September). SIDS ACCELERATED MODALITIES OF ACTION (S.A.M.O.A.) PATHWAY. United Nations. <https://unohrlls.org/custom-content/uploads/2015/01/SA-MOA-Pathway.pdf>
- United Nations University. (2019, October 29). Artificial Intelligence for All: A Call for Equity in the Fourth Industrial Revolution. <https://Ourworld.Unu.Edu/En/Artificial-Intelligence-for-All-a-Call-for-Equity-in-the-Fourth-Industrial-Revolution>. <https://ourworld.unu.edu/en/artificial-intelligence-for-all-a-call-for-equity-in-the-fourth-industrial-revolution>
- Valentine, H. (2021, February 19). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. [https://www.youtube.com/watch?v=\\_yIqOKmHG2Q&t=327s](https://www.youtube.com/watch?v=_yIqOKmHG2Q&t=327s)
- Valuates Reports. (2021, February 24). Esports Market Size is Projected to Reach USD 1860.2 Million by 2026 at CAGR 15.1% [Press release]. <https://www.prnewswire.com/in/news-releases/esports-market-size-is-projected-to-reach-usd-1860-2-million-by-2026-at-cagr-15-1-valuates-reports-822454230.html#:~:text=The%20global%20Esports%20market%20size,the%20forecast%20period%202021%2D2026>
- Wallach, W. (2021, February 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica. <https://www.youtube.com/watch?v=FSY4rAgpIFc>
- Walsh, L. (2021, February 18). Artificial Intelligence: Opportunities to Accelerate Human Progress For Sustainable Development [Forum Presentation]. UNESCO Caribbean AI Initiative, Kingston, Jamaica.
- World Economic Forum. (2019, February 9). Davos 2019 - Setting Rules for the AI Race [Video]. YouTube. <https://www.youtube.com/watch?v=Lzqw5c-0Myqw>
- YouTube Originals. (2019, December 18). How Far is Too Far? | The Age of A.I. [Video]. YouTube. [https://www.youtube.com/watch?v=UwsrzCVZAb8&ab\\_channel=YouTubeOriginals](https://www.youtube.com/watch?v=UwsrzCVZAb8&ab_channel=YouTubeOriginals)