CHAPTER 7:
AI Policy and National Strategies

Artificial Intelligence
Index Report 2021

CHAPTER 7:
Chapter Preview

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Overview

AI is set to shape global competitiveness over the coming decades, promising to grant early adopters a significant economic and strategic advantage. To date, national governments and regional and intergovernmental organizations have raced to put in place AI-targeted policies to maximize the promise of the technology while also addressing its social and ethical implications.

This chapter navigates the landscape of AI policymaking and tracks efforts taking place on the local, national, and international levels to help promote and govern AI technologies. It begins with an overview of national and regional AI strategies and then reviews activities on the intergovernmental level. The chapter then takes a closer look at public investment in AI in the United States as well as how legislative bodies, central banks, and nongovernmental organizations are responding to the growing need to institute a policy framework for AI technologies.

CHAPTER HIGHLIGHTS

- Since Canada published the world's first national AI strategy in 2017, more than 30 other countries and regions have published similar documents as of December 2020.

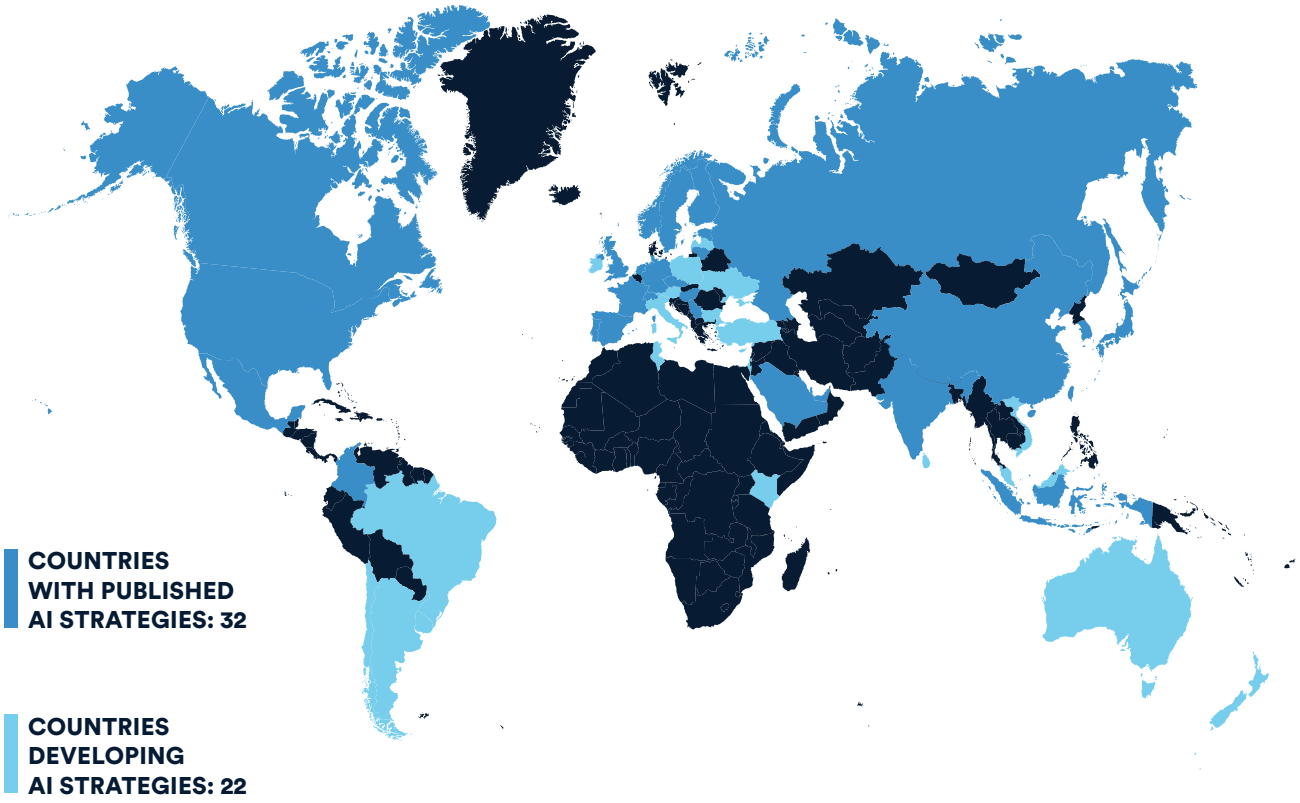
- The launch of the Global Partnership on AI (GPAI) and Organisation for Economic Co-operation and Development (OECD) AI Policy Observatory and Network of Experts on AI in 2020 promoted intergovernmental efforts to work together to support the development of AI for all.

- In the United States, the 116th Congress was the most AI-focused congressional session in history. The number of mentions of AI by this Congress in legislation, committee reports, and Congressional Research Service (CRS) reports is more than triple that of the 115th Congress.

This section presents an overview of select national and regional AI strategies from around the world, including details on the strategies for G20 countries, Estonia, and Singapore as well as links to strategy documents for many others. Sources include websites of national or regional governments, the OECD AI Policy Observatory (OECD.AI), and news coverage. "AI strategy" is defined as a policy document that communicates the objective of supporting the development of AI while also maximizing the benefits of AI for society. Excluded are broader innovation or digital strategy documents which do not focus predominantly on AI, such as Brazil's E-Digital Strategy and Japan's Integrated Innovation Strategy.

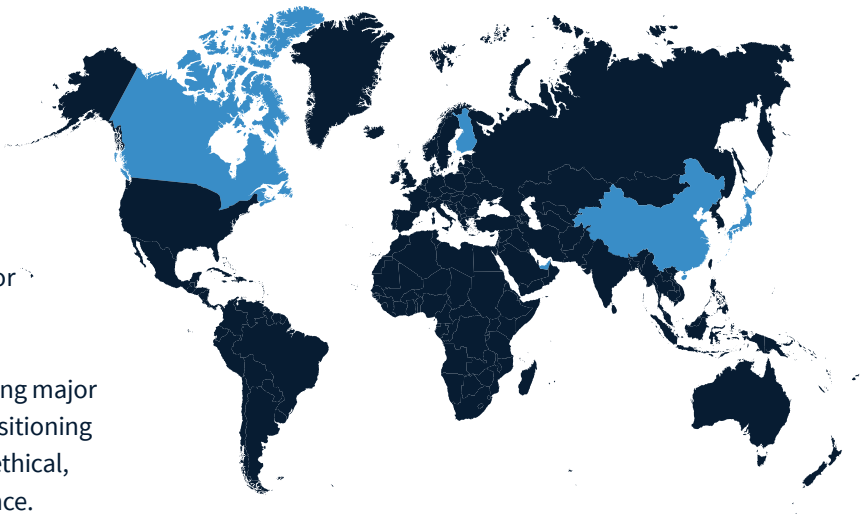
7.1 NATIONAL AND REGIONAL AI STRATEGIES

To guide and foster the development of AI, countries and regions around the world are establishing strategies and initiatives to coordinate governmental and intergovernmental efforts. Since Canada published the world's first national AI strategy in 2017, more than 30 other countries and regions have published similar documents as of December 2020.



Published Strategies

2017



Canada

- **AI Strategy:** Pan Canadian AI Strategy
- **Responsible Organization:** Canadian Institute for Advanced Research (CIFAR)
- **Highlights:** The Canadian strategy emphasizes developing Canada's future AI workforce, supporting major AI innovation hubs and scientific research, and positioning the country as a thought leader in the economic, ethical, policy, and legal implications of artificial intelligence.
- **Funding (December 2020 conversion rate):** CAD 125 million (USD 97 million)
- In November 2020, CIFAR published its most recent annual report, titled "AICAN," which tracks progress on implementing its national strategy, which highlighted substantial growth in Canada's AI ecosystem, as well as research and activities related to healthcare and AI's impact on society, among other outcomes of the strategy.

China

- **AI Strategy:** A Next Generation Artificial Intelligence Development Plan
- **Responsible Organization**: State Council for the People's Republic of China
- **Highlights:** China's AI strategy is one of the most comprehensive in the world. It encompasses areas including R&D and talent development through education and skills acquisition, as well as ethical norms and implications for national security. It sets specific targets, including bringing the AI industry in line with competitors by 2020; becoming the global leader in fields such as unmanned aerial vehicles (UAVs), voice and image recognition, and others by 2025; and emerging as the primary center for AI innovation by 2030.
- **Funding:** N/A
- **Recent Updates:** China established a New Generation AI Innovation and Development Zone in February 2019 and released the "Beijing AI Principles" in May 2019 with a multi-stakeholder coalition consisting of academic institutions and private-sector players such as Tencent and Baidu.

Japan

- **AI Strategy:** Artificial Intelligence Technology Strategy
- **Responsible Organization:** Strategic Council for AI Technology
- **Highlights:** The strategy lays out three discrete phases of AI development. The first phase focuses on the utilization of data and AI in related service industries, the second on the public use of AI and the expansion of service industries, and the third on creating an overarching ecosystem where the various domains are merged.
- **Funding:** N/A
- **Recent Updates:** In 2019, the Integrated Innovation Strategy Promotion Council launched another AI strategy, aimed at taking the next step forward in overcoming issues faced by Japan and making use of the country's strengths to open up future opportunities.

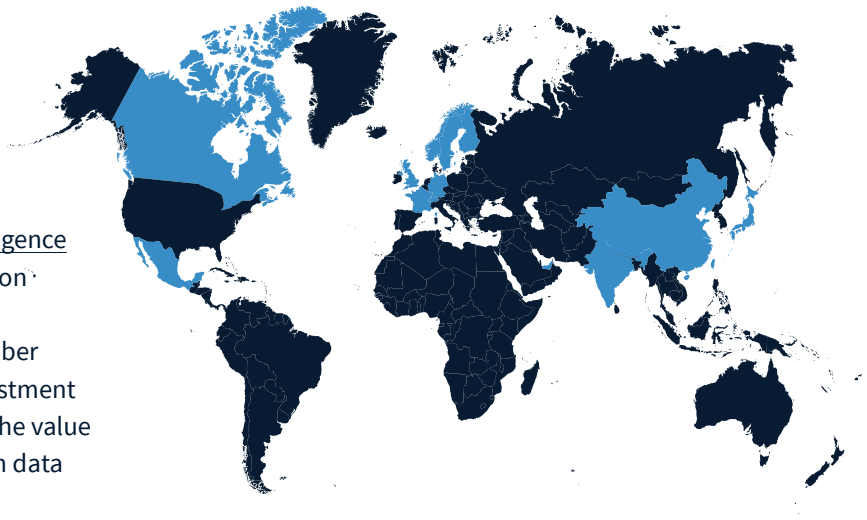
Others

Finland: Finland's Age of Artificial Intelligence

United Arab Emirates: UAE Strategy for Artificial Intelligence

Published Strategies

2018



European Union

- **AI Strategy:** Coordinated Plan on Artificial Intelligence
- **Responsible Organization:** European Commission
- **Highlights:** This strategy document outlines the commitments and actions agreed on by EU member states, Norway, and Switzerland to increase investment and build their AI talent pipeline. It emphasizes the value of public-private partnerships, creating European data spaces, and developing ethics principles.
- **Funding (December 2020 conversation rate)**: At least EUR 1 billion (USD 1.1 billion) per year for AI research and at least EUR 4.9 billion (USD 5.4 billion) for other aspects of the strategy
- **Recent updates:** A first draft of the ethics guidelines was released in June 2018, followed by an updated version in April 2019.

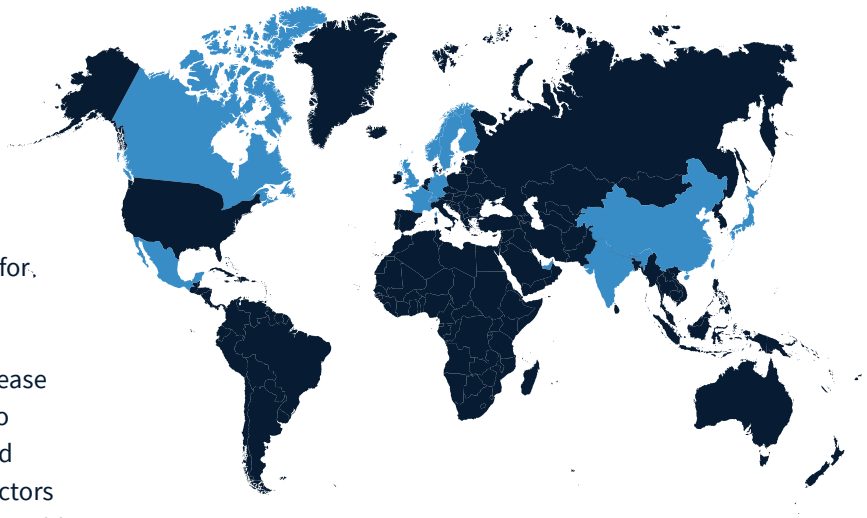
France

- **AI Strategy:** AI for Humanity: French Strategy for Artificial Intelligence
- **Responsible Organizations:** Ministry for Higher Education, Research and Innovation; Ministry of Economy and Finance; Directorate General for Enterprises; Public Health Ministry; Ministry of the Armed Forces; National Research Institute for Digital Sciences; Interministerial Director of the Digital Technology and the Information and Communication System
- **Highlights:** The main themes include developing an aggressive data policy for big data; targeting four strategic sectors, namely health care, environment, transport, and defense; boosting French efforts in research and development; planning for the impact of AI on the workforce; and ensuring inclusivity and diversity within the field.
- **Funding (December 2020 conversion rate):** EUR 1.5 billion (USD 1.8 billion) up to 2022
- **Recent Updates:** The French National Research Institute for Digital Sciences (Inria) has committed to playing a central role in coordinating the national AI strategy and will report annually on its progress.

Germany

- **AI Strategy:** AI Made in Germany
- **Responsible Organizations:** Federal Ministry of Education and Research; Federal Ministry for Economic Affairs and Energy; Federal Ministry of Labour and Social Affairs
- **Highlights:** The focus of the strategy is on cementing Germany as a research powerhouse and strengthening the value of its industries. There is also an emphasis on the public interest and working to better the lives of people and the environment.
- **Funding (December 2020 conversion rate):** EUR 500 million (USD 608 million) in the 2019 budget and EUR 3 billion (USD 3.6 billion) for the implementation up to 2025
- **Recent Updates:** In November 2019, the government published an interim progress report on the Germany AI strategy.

2018 (continued)



India

- **AI Strategy:** National Strategy on Artificial Intelligence: #AIforAll
- **Responsible Organization:** National Institution for Transforming India (NITI Ayog)
- **Highlights:** The Indian strategy focuses on both economic growth and ways to leverage AI to increase social inclusion, while also promoting research to address important issues such as ethics, bias, and privacy related to AI. The strategy emphasizes sectors such as agriculture, health, and education, where public investment and government initiative are necessary.
- **Funding (December 2020 conversion rate):** INR 7000 crore (USD 949 million)
- **Recent Updates:** In 2019, the Ministry of Electronics and Information Technology released its own proposal to set up a national AI program with an allocated INR 400 crore (USD 54 million). The Indian government formed a committee in late 2019 to push for an organized AI policy and establish the precise functions of government agencies to further India's AI mission.

Mexico

- **AI Strategy:** Artificial Intelligence Agenda MX (2019 agenda-in-brief version)
- **Responsible Organization:** IA2030Mx, Economía
- **Highlights:** As Latin America's first strategy, the Mexican strategy focuses on developing a strong governance framework, mapping the needs of AI in various industries, and identifying governmental best practices with an emphasis on developing Mexico's AI leadership.
- **Funding:** N/A
- **Recent Updates:** According to the Inter-American Development Bank's recent fAIr LAC report, Mexico is in the process of establishing concrete AI policies to further implementation.

United Kingdom

- **AI Strategy:** Industrial Strategy: Artificial Intelligence Sector Deal
- **Responsible Organization:** Office for Artificial Intelligence (OAI)
- **Highlights:** The U.K. strategy emphasizes a strong partnership between business, academia, and the government and identifies five foundations for a successful industrial strategy: becoming the world's most innovative economy, creating jobs and better earnings potential, infrastructure upgrades, favorable business conditions, and building prosperous communities throughout the country.
- **Funding (December 2020 conversion rate):** GBP 950 million (USD 1.3 billion)
- **Recent Updates:** Between 2017 and 2019, the U.K.'s Select Committee on AI released an annual report on the country's progress. In November 2020, the government announced a major increase in defense spending of GBP 16.5 billion (USD 21.8 billion) over four years, with a major emphasis on AI technologies that promise to revolutionize warfare.

Others

Sweden: National Approach to Artificial Intelligence
Taiwan: Taiwan AI Action Plan

Published Strategies

2019

Estonia

- **AI Strategy:** National AI Strategy 2019–2021
- **Responsible Organization:** Ministry of Economic Affairs and Communications (MKM)
- **Highlights:** The strategy emphasizes actions necessary for both the public and private sectors to take to increase investment in AI research and development, while also improving the legal environment for AI in Estonia. In addition, it hammers out the framework for a steering committee that will oversee the implementation and monitoring of the strategy.
- **Funding (December 2020 conversion rate):** EUR 10 million (USD 12 million) up to 2021
- **Recent Updates:** The Estonian government released an update on the AI taskforce in May 2019.

Russia

- **AI Strategy:** National Strategy for the Development of Artificial Intelligence
- **Responsible Organizations:** Ministry of Digital Development, Communications and Mass Media; Government of the Russian Federation
- **Highlights:** The Russian AI strategy places a strong emphasis on its national interests and lays down guidelines for the development of an "information society" between 2017 and 2030. These include a national technology initiative, departmental projects for federal executive bodies, and programs such as the Digital Economy of the Russian Federation, designed to implement the AI framework across sectors.
- **Funding:** N/A
- **Recent Updates:** In December 2020, Russian president Vladmir Putin took part in the Artificial Intelligence Journey Conference, where he presented four ideas for AI policies: establishing experimental legal frameworks for the use of AI, developing practical measures to introduce AI algorithms, providing neural network developers with competitive access to big data, and boosting private investment in domestic AI industries.

Singapore

- **AI Strategy:** National Artificial Intelligence Strategy
- **Responsible Organization:** Smart Nation and Digital Government Office (SNDGO)
- **Highlights:** Launched by Smart Nation Singapore, a government agency that seeks to transform Singapore's economy and usher in a new digital age, the strategy identifies five national AI projects in the following fields: transport and logistics, smart cities and estates, health care, education, and safety and security.
- **Funding (December 2020 conversion rate):** While the 2019 strategy does not mention funding, in 2017 the government launched its national program, AI Singapore, with a pledge to invest SGD 150 million (USD 113 million) over five years.
- **Recent Updates:** In November 2020, SNDGO published its inaugural annual update on the Singaporean government's data protection efforts. It describes the measures taken to date to strengthen public sector data security and to safeguard citizens' private data.

2019 (continued)

United States

- **AI Strategy**: American AI Initiative
- **Responsible Organization:** The White House
- **Highlights:** The American AI Initiative prioritizes the need for the federal government to invest in AI R&D, reduce barriers to federal resources, and ensure technical standards for the safe development, testing, and deployment of AI technologies. The White House also emphasizes developing an AI-ready workforce and signals a commitment to collaborating with foreign partners while promoting U.S. leadership in AI. The initiative, however, lacks specifics on the program's timeline, whether additional research will be dedicated to AI development, and other practical considerations.
- **Funding:** N/A
- **Recent Updates:** The U.S. government released its year one annual report in February 2020, followed in November by the first guidance memorandum for federal agencies on regulating artificial intelligence applications in the private sector, including principles that encourage AI innovation and growth and increase public trust and confidence in AI technologies. The National Defense Authorization Act (NDAA) for Fiscal Year 2021 called for a National AI Initiative to coordinate AI research and policy across the federal government.

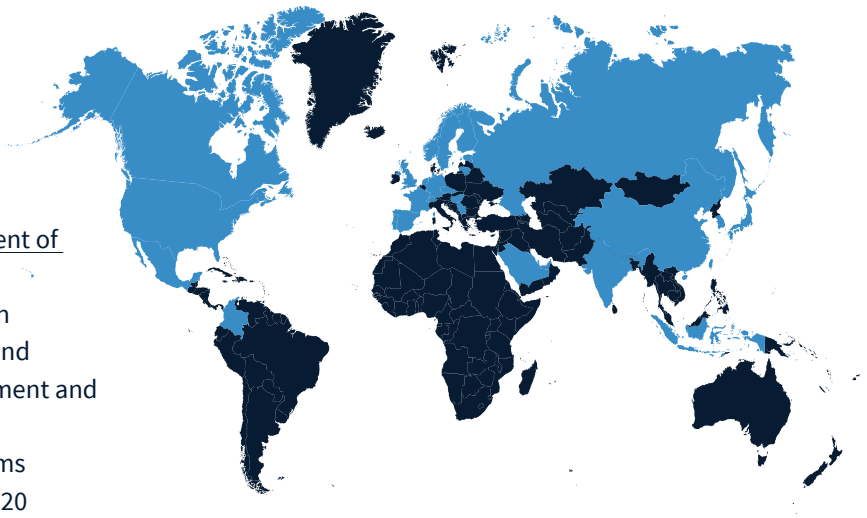
South Korea

- **AI Strategy:** National Strategy for Artificial Intelligence
- **Responsible Organization:** Ministry of Science, ICT and Future Planning (MSIP)
- **Highlights:** The Korean strategy calls for plans to facilitate the use of AI by businesses and to streamline regulations to create a more favorable environment for the development and use of AI and other new industries. The Korean government also plans to leverage its dominance in the global supply of memory chips to build the next generation of smart chips by 2030.
- **Funding (December 2020 conversion rate):** KRW 2.2 trillion (USD 2 billion)
- **Recent Updates:** N/A

Others

Colombia: National Policy for Digital Transformation and Artificial Intelligence
Czech Republic: National Artificial Intelligence Strategy of the Czech Republic
Lithuania: Lithuanian Artificial Intelligence Strategy: A Vision for the Future
Luxembourg: Artificial Intelligence: A Strategic Vision for Luxembourg
Malta: Malta: The Ultimate AI Launchpad
Netherlands: Strategic Action Plan for Artificial Intelligence
Portugal: AI Portugal 2030
Qatar: National Artificial Intelligence for Qatar

Published Strategies
2020

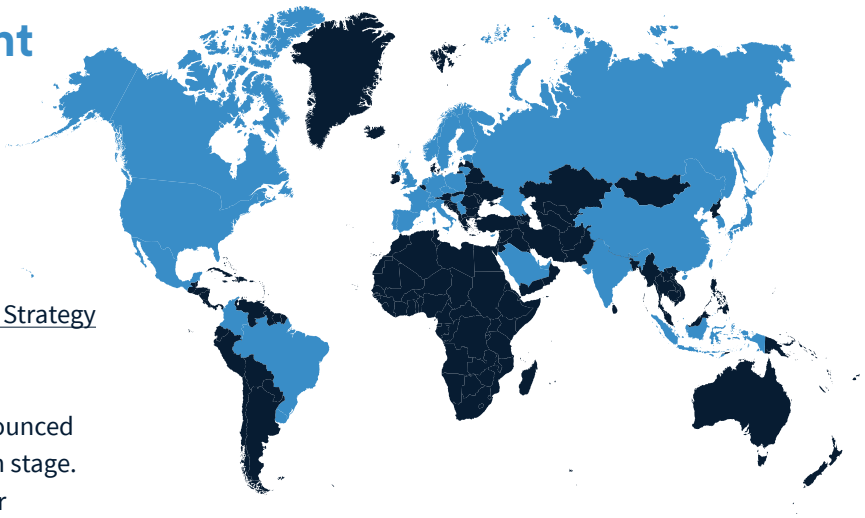


Indonesia
- **AI Strategy:** National Strategy for the Development of Artificial Intelligence (Stranas KA)
- **Responsible Organizations:** Ministry of Research and Technology (Menristek), National Research and Innovation Agency (BRIN), Agency for the Assessment and Application of Technology (BPPT)
- **Strategy Highlights:** The Indonesian strategy aims to guide the country in developing AI between 2020 and 2045. It focuses on education and research, health services, food security, mobility, smart cities, and public sector reform.
- **Funding:** N/A
- **Recent Updates:** None

Saudi Arabia
- **AI Strategy:** National Strategy on Data and AI (NSDAI)
- **Responsible Organization:** Saudi Data and Artificial Intelligence Authority (SDAIA)
- **Highlights:** As part of an effort to diversify the country's economy away from oil and boost the private sector, the NSDAI aims to accelerate AI development in five critical sectors: health care, mobility, education, government, and energy. By 2030, Saudi Arabia intends to train 20,000 data and AI specialists, attract USD 20 billion in foreign and local investment, and create an environment that will attract at least 300 AI and data startups.
- **Funding:** N/A
- **Recent Updates:** During the summit where the Saudi government released its strategy, the country's National Center for Artificial Intelligence (NCAI) signed collaboration agreements with China's Huawei and Alibaba Cloud to design AI-related Arabic-language systems.

Others
Hungary: Hungary's Artificial Intelligence Strategy
Norway: National Strategy for Artificial Intelligence
Serbia: Strategy for the Development of Artificial Intelligence in the Republic of Serbia for the Period 2020–2025
Spain: National Artificial Intelligence Strategy

Strategies in Development
(AS OF DECEMBER 2020)



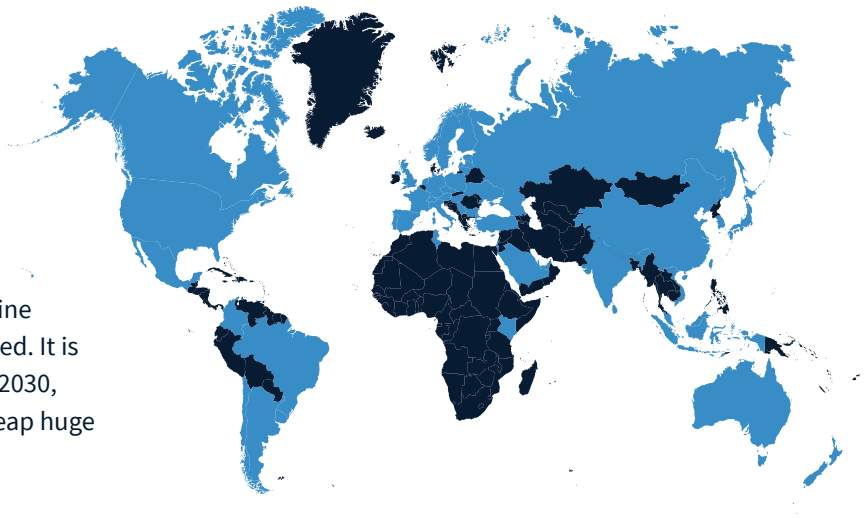
Strategies in Public Consultation

Brazil
- **AI Strategy Draft:** Brazilian Artificial Intelligence Strategy
- **Responsible Organization:** Ministry of Science, Technology and Innovation (MCTI)
- **Highlights:** Brazil's national AI strategy was announced in 2019 and is currently in the public consultation stage. According to the OECD, the strategy aims to cover relevant topics bearing on AI, including its impact on the economy, ethics, development, education, and jobs, and to coordinate specific public policies addressing such issues.
- **Funding:** N/A
- **Recent Updates:** In October 2020, the country's largest research facility dedicated to AI was launched in collaboration with IBM, the University of São Paulo, and the São Paulo Research Foundation.

Italy
- **AI Strategy Draft:** Proposal for an Italian Strategy for Artificial Intelligence
- **Responsible Organization:** Ministry of Economic Development (MISE)
- **Highlights:** This document provides the proposed strategy for the sustainable development of AI, aimed at improving Italy's competitiveness in AI. It focuses on improving AI-based skills and competencies, fostering AI research, establishing a regulatory and ethical framework to ensure a sustainable ecosystem for AI, and developing a robust data infrastructure to fuel these developments.
- **Funding (December 2020 conversion rate):** EUR 1 billion (USD 1.1 billion) through 2025 and expected matching funds from the private sector, bringing the total investment to EUR 2 billion.
- **Recent Updates:** None

Others
Cyprus: National Strategy for Artificial Intelligence
Ireland: National Irish Strategy on Artificial Intelligence
Poland: Artificial Intelligence Development Policy in Poland
Uruguay: Artificial Intelligence Strategy for Digital Government

Strategies Announced



Argentina

- **Related Document:** N/A
- **Responsible Organization:** Ministry of Science, Technology and Productive Innovation (MINCYT)
- **Status:** Argentina's AI plan is a part of the Argentine Digital Agenda 2030 but has not yet been published. It is intended to cover the decade between 2020 and 2030, and reports indicate that it has the potential to reap huge benefits for the agricultural sector.

Australia

- **Related Documents:** Artificial Intelligence Roadmap / An AI Action Plan for all Australians
- **Responsible Organizations:** Commonwealth Scientific and Industrial Research Organisation (CSIRO), Data 61, and the Australian government
- **Status:** The Australian government published a road map in 2019 (in collaboration with the national science agency, CSIRO) and a discussion paper of an AI action plan in 2020 as frameworks to develop a national AI strategy. In its 2018–19 budget, the Australian government earmarked AUD 29.9 million (USD 22.2 million [December 2020 conversation rate]) over four years to strengthen the country's capabilities in AI and machine learning (ML). In addition, CSIRO published a research paper on Australia's AI Ethics Framework in 2019 and launched a public consultation, which is expected to produce a forthcoming strategy document.

Turkey

- **Related Document:** N/A
- **Responsible Organizations:** Presidency of the Republic of Turkey Digital Transformation Office; Ministry of Industry and Technology; Scientific and Technological Research Council of Turkey; Science, Technology and Innovation Policies Council
- **Status:** The strategy has been announced but not yet published. According to media sources, it will focus on talent development, scientific research, ethics and inclusion, and digital infrastructure.

Others

Austria: Artificial Intelligence Mission Austria (official report)
Bulgaria: Concept for the Development of Artificial Intelligence in Bulgaria Until 2030 (concept document)
Chile: National AI Policy (official announcement)
Israel: National AI Plan (news article)
Kenya: Blockchain and Artificial Intelligence Taskforce (news article)
Latvia: On the Development of Artificial Intelligence Solutions (official report)
Malaysia: National Artificial Intelligence (AI) Framework (news article)
New Zealand: Artificial Intelligence: Shaping a Future New Zealand (official report)
Sri Lanka: Framework for Artificial Intelligence (news article)
Switzerland: Artificial Intelligence (official guidelines)
Tunisia: National Artificial Intelligence Strategy (task force announced)
Ukraine: Concept of Artificial Intelligence Development in Ukraine AI (concept document)
Vietnam: Artificial Intelligence Development Strategy (official announcement)

Read more on AI national strategies:

- Tim Dutton: An Overview of National AI Strategies
- Organisation for Economic Co-operation and Development: OECD AI Policy Observatory
- Canadian Institute for Advanced Research: Building an AI World, Second Edition
- Inter-American Development Bank: Artificial Intelligence for Social Good in Latin America and the Caribbean: The Regional Landscape and 12 Country Snapshots

National AI Strategies and Human Rights

In 2020, Global Partners Digital and Stanford's Global Digital Policy Incubator published a report examining governments' national AI strategies from a human rights perspective, titled "National Artificial Intelligence Strategies and Human Rights: A Review." The report assesses the extent to which governments and regional organizations have incorporated human rights considerations into their national AI strategies and made recommendations to policymakers looking to develop or review AI strategies in the future.

The report found that among the 30 states and two regional strategies (from the European Union and the Nordic-Baltic states), a number of strategies refer to the impact of AI on human rights, with the right to privacy as the most commonly mentioned, followed by equality and nondiscrimination (Table 6.1.1). However, very few strategy documents provide deep analysis or concrete assessment of the impact of AI applications on human rights. Specifics as to how and the depth to which human rights should be protected in the context of AI is largely missing, in contrast to the level of specificity on other issues such as economic competitiveness and innovation advantage.

Table 7.1.1: Mapping human rights referenced in national AI strategies

HUMAN RIGHTS MENTIONED	STATES/REGIONAL ORGANIZATIONS
The right to privacy	Australia, Belgium, China, Czech Republic, Germany, India, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Qatar, South Korea, United States
The right to equality/ nondiscrimination	Australia, Belgium, Czech Republic, Denmark, Estonia, EU, France, Germany, Italy, Malta, Netherlands, Norway
The right to an effective remedy	Australia (responsibility and ability to hold humans responsible), Denmark, Malta, Netherlands
The rights to freedom of thought, expression, and access to information	France, Netherlands, Russia
The right to work	France, Russia

7.2 INTERNATIONAL COLLABORATION ON AI

Given the scale of the opportunities and the challenges presented by AI, a number of international efforts have recently been announced that aim to develop multilateral AI strategies. This section provides an overview of those international initiatives from governments committed to working together to support the development of AI for all.

These multilateral initiatives on AI suggest that organizations are taking a variety of approaches to tackle the practical applications of AI and scale those solutions for maximum global impact. Many countries turn to international organizations for global AI norm formulation, while others engage in partnerships or bilateral agreements. Among the topics under discussion, the ethics of AI—or the ethical challenges raised by current and future applications of AI—stands out as a particular focus area for intergovernmental efforts.

Countries such as Japan, South Korea, the United Kingdom, the United States, and members of the European Union are active participants of intergovernmental efforts on AI. A major AI powerhouse, China, on the other hand, has opted to engage in a number of science and technology bilateral agreements that stress cooperation on AI as part of the Digital Silk Road under the Belt and Road (BRI) initiative framework. For example, AI is mentioned in China's economic cooperation under the BRI Initiative with the United Arab Emirates.

INTERGOVERNMENTAL INITIATIVES

Intergovernmental working groups consist of experts and policymakers from member states who study and report on the most urgent challenges related to developing and deploying AI and then make recommendations based on their findings. These groups are instrumental in identifying and developing strategies for the most pressing issues in AI technologies and their applications.

Working Groups

Global Partnership on AI (GPAI)

- **Participants:** Australia, Brazil, Canada, France, Germany, India, Italy, Japan, Mexico, the Netherlands, New Zealand, South Korea, Poland, Singapore, Slovenia, Spain, the United Kingdom, the United States, and the European Union (as of December 2020)
- **Host of Secretariat:** OECD
- **Focus Areas:** Responsible AI; data governance; the future of work; innovation and commercialization
- **Recent Activities:** Two International Centres of Expertise—the International Centre of Expertise in Montreal for the Advancement of Artificial Intelligence and the French National Institute for Research in Digital Science and Technology (INRIA) in Paris—are supporting the work in the four focus areas and held the Montreal Summit 2020 in December 2020. Moreover, the data governance working group published the beta version of the group's framework in November 2020.

OECD Network of Experts on AI (ONE AI)

- **Participants:** OECD countries
- **Host:** OECD
- **Focus Areas:** Classification of AI; implementing trustworthy AI; policies for AI; AI compute
- **Recent Activities:** ONE AI convened its first meeting in February 2020, when it also launched the OECD AI Policy Observatory. In November 2020, the working group on the classification of AI presented the first look at an AI classification framework based on OECD's definition of AI divided into four dimensions (context, data and input, AI model, task and output) that aims to guide policymakers in designing adequate policies for each type of AI system.

High-Level Expert Group on Artificial Intelligence (HLEG)

- **Participants:** EU countries
- **Host:** European Commission
- **Focus Areas:** Ethics guidelines for trustworthy AI
- **Recent Activities:** Since its launch at the recommendation

of the EU AI strategy in 2018, HLEG presented the EU Ethics Guidelines for Trustworthy Artificial Intelligence and a series of policy and investment recommendations, as well as an assessment checklist related to the guidelines.

Ad Hoc Expert Group (AHEG) for the Recommendation on the Ethics of Artificial Intelligence

- **Participants:** United Nations Educational, Scientific and Cultural Organization (UNESCO) member states
- **Host:** UNESCO
- **Focus Areas:** Ethical issues raised by the development and use of AI
- **Recent Activities:** The AHEG produced a revised first draft Recommendation on the Ethics of Artificial Intelligence, which was transmitted in September 2020 to Member States of UNESCO for their comments by December 31, 2020.

Summits and Meetings

AI for Good Global Summit

- **Participants:** Global (with the United Nations and its agencies)
- **Hosts:** International Telecommunication Union, XPRIZE Foundation
- **Focus Areas:** Trusted, safe, and inclusive development of AI technologies and equitable access to their benefits

AI Partnership for Defense

- **Participants:** Australia, Canada, Denmark, Estonia, Finland, France, Israel, Japan, Norway, South Korea, Sweden, the United Kingdom, and the United States
- **Hosts:** Joint Artificial Intelligence Center, U.S. Department of Defense
- **Focus Areas:** AI ethical principles for defense

China-Association of Southeast Asian Nations (ASEAN) AI Summit

- **Participants:** Brunei, Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam
- **Hosts:** China Association for Science and Technology, Guangxi Zhuang Autonomous Region, China
- **Focus Areas:** Infrastructure construction, digital economy, and innovation-driven development

BILATERAL AGREEMENTS

Bilateral agreements focusing on AI are another form of international collaboration that has been gaining in popularity in recent years. AI is usually included in the broader context of collaborating on the development of digital economies, though India stands apart for investing in developing multiple bilateral agreements specifically geared toward AI.

India and United Arab Emirates

Invest India and the UAE Ministry of Artificial Intelligence signed a memorandum of understanding in **July 2018** to collaborate on fostering innovative AI ecosystems and other policy concerns related to AI. Two countries will convene a working committee aimed at increasing investment in AI startups and research activities in partnership with the private sector.

India and Germany

It was reported in **October 2019** that India and Germany likely will sign an agreement including partnerships on the use of artificial intelligence (especially in farming).

United States and United Kingdom

The U.S. and the U.K. announced a declaration in **September 2020**, through the Special Relationship Economic Working Group, that the two countries will enter into a bilateral dialogue on advancing AI in line with shared democratic values and further cooperation in AI R&D efforts.

India and Japan

India and Japan were said to have finalized an agreement in **October 2020** that focuses on collaborating on digital technologies, including 5G and AI.

French and Germany

France and Germany signed a road map for a Franco-German Research and Innovation Network on artificial intelligence as part of the Declaration of Toulouse in **October 2019** to advance European efforts in the development and application of AI, taking into account ethical guidelines.

This section examines public investment in AI in the United States based on data from the U.S. Networking and Information Technology Research and Development (NITRD) program and Bloomberg Government.

7.3 U.S. PUBLIC INVESTMENT IN AI

FEDERAL BUDGET FOR NON-DEFENSE AI R&D

In September 2019, the White House National Science and Technology Council released a report attempting to total up all public-sector AI R&D funding, the first time such a figure was published. This funding is to be disbursed as grants for government laboratories or research universities or in the form of government contracts. These federal budget figures, however, do not include substantial AI R&D investments by the Department of Defense (DOD) and the intelligence sector, as they were withheld from publication for national security reasons.

As shown in Figure 7.3.1, federal civilian agencies—those agencies that are not part of the DOD or the intelligence sector—allocated USD 973.5 million to AI R&D for FY 2020, a figure that rose to USD 1.1 billion once congressional appropriations and transfers were factored in. For FY 2021, federal civilian agencies budgeted USD 1.5 billion, which is almost 55% higher than its 2020 request.

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U.S. FEDERAL BUDGET for NON-DEFENSE AI R&D, FY 2020-21
Source: U.S. NITRD Program, 2020 | Chart: 2021 AI Index Report

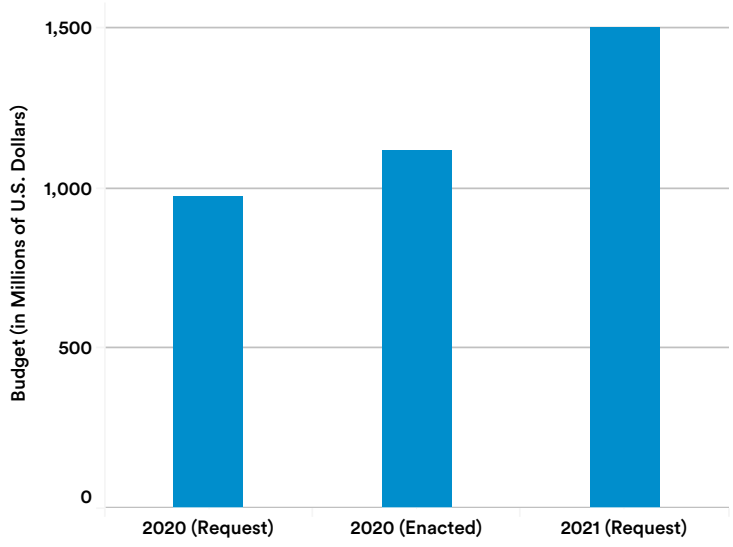

Figure 7.3.1

U.S. DEPARTMENT OF DEFENSE AI R&D BUDGET REQUEST

While the official DOD budget is not publicly available, Bloomberg Government has analyzed the department's publicly available budget request for research, development, test, and evaluation (RDT&E)— data that sheds light on its spending on AI R&D.

With 305 unclassified DOD R&D programs specifying the use of AI or ML technologies, the combined U.S. military budget for AI R&D in FY 2021 is USD 5.0 billion (Figure 7.3.2). This figure appears consistent with the USD 5.0 billion enacted the previous year. However, the FY 2021 figure reflects a budget request, rather than a final enacted budget. As noted above, once congressional appropriations are factored in, the true level of funding available to DOD AI R&D programs in FY 2021 may rise substantially.

The top five projects set to receive the highest amount of AI R&D investment in FY 2021:

- Rapid Capability Development and Maturation, by the U.S. Army (USD 284.2 million)
- Counter WMD Technologies and Capabilities Development, by the DOD Threat Reduction Agency (USD 265.2 million)
- Algorithmic Warfare Cross-Functional Team (Project Maven), by the Office of the Secretary of Defense (USD 250.1 million)
- Joint Artificial Intelligence Center (JAIC), by the Defense Information Systems Agency (USD 132.1 million)
- High Performance Computing Modernization Program, by the U.S. Army (USD 99.6 million)

In addition, the Defense Advanced Research Projects Agency (DARPA) alone is investing USD 568.4 million in AI R&D, an increase of USD 82 million from FY 2020.

U.S. DOD BUDGET for AI-SPECIFIC RESEARCH DEVELOPMENT, TEST, and EVALUATION (RDT&E), FY 2018-20
Sources: Bloomberg Government & U.S. Department of Defense, 2020 | Chart: 2021 AI Index Report

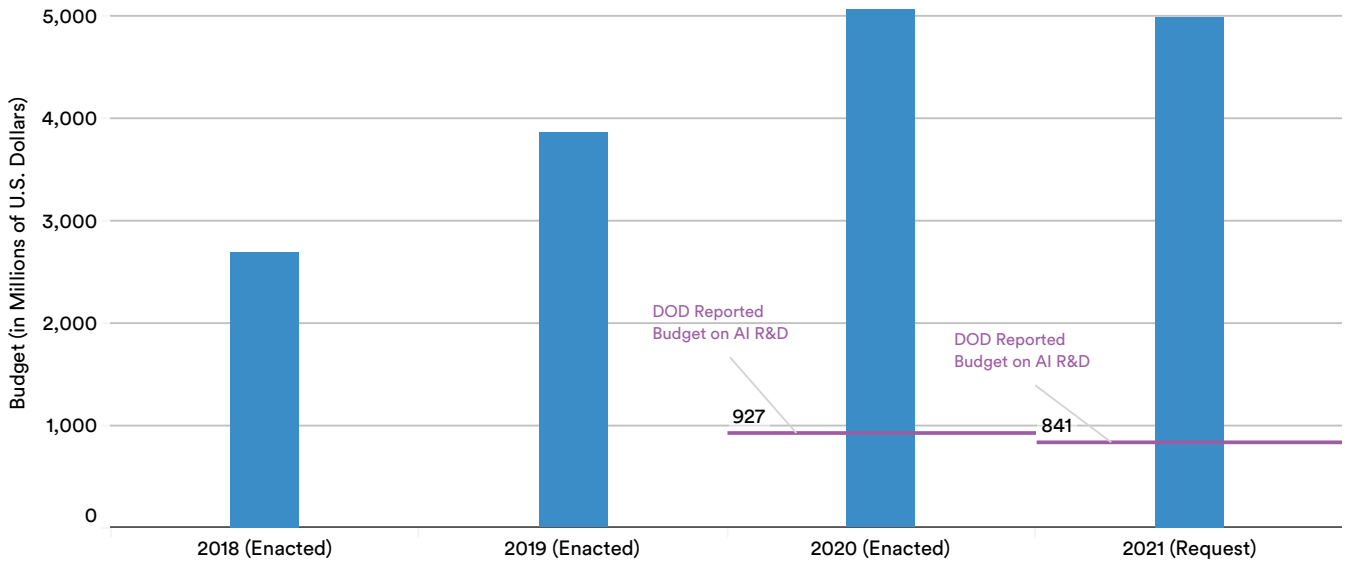

Figure 7.3.2

Important data caveat: This chart illustrates the challenge of working with contemporary government data sources to understand spending on AI. By one measure—the requests that include AI-relevant keywords—the DOD is requesting more than USD 5 billion for AI-specific research development in 2021 . However, DOD's own accounting produces a radically smaller number: USD 841 million. This relates to the issue of defining where an AI system ends and another system begins; for instance, an initiative that uses AI for drones may also count hardware-related expenditures for the drones within its "AI" budget request, though the AI software component will be much smaller.

U.S. GOVERNMENT AI-RELATED CONTRACT SPENDING

Another indicator of public investment in AI technologies is the level of spending on government contracts across the federal government. Contracting for products and services supplied by private businesses typically occupies the largest share of an agency's budget. Bloomberg Government built a model that captures contract spending on AI technologies by adding up all contracting transactions that contain a set of more than 100 AI-specific keywords in their titles or descriptions. The data reveals that the amount the federal government spends on contracts for AI products and services has reached an all-time high and shows no sign of slowing down. However, note that during the procurement process, vendors may add a bunch of keywords into their applications, so some of these things may have a relatively small AI component relative to other parts of technology.

Total Contract Spending

Federal departments and agencies spent a combined USD 1.8 billion on unclassified AI-related contracts in FY 2020. This represents a more than 25% increase from the USD 1.5 billion agencies spent in FY 2019 (Figure 7.3.3). AI spending in 2020 was more than six times higher than what it was just five years ago—about USD 300 million in FY 2015. However, to put this in perspective, the federal government spent USD 682 billion on contracts in FY 2020, so AI currently represents 0.25% of government spending.

Contract Spending by Department and Agency

Figure 7.3.4 shows that in FY 2020, the DOD spent more on AI-related contracts than any other federal department or agency (USD 1.4 billion). In second and third place are NASA (USD 139.1 million) and the Department of Homeland Security (USD 112.3 million). DOD, NASA, and the Department of Health and Human Services top the list for the most contract spending on AI over the past 10 years combined (Figure 7.3.5). In fact, DOD's total contract spending on AI from 2001 to 2020 (USD 3.9 billion) is more than what was spent by the other 44 departments and agencies combined (USD 2.9 billion) over the same period.

Looking ahead, DOD spending on AI contracts is only expected to grow as the Pentagon's Joint Artificial Intelligence Center (JAIC), established in June 2018, is

U.S. GOVERNMENT TOTAL CONTRACT SPENDING on AI, FY 2001-20
Source: Bloomberg Government, 2020 | Chart: 2021 AI Index Report

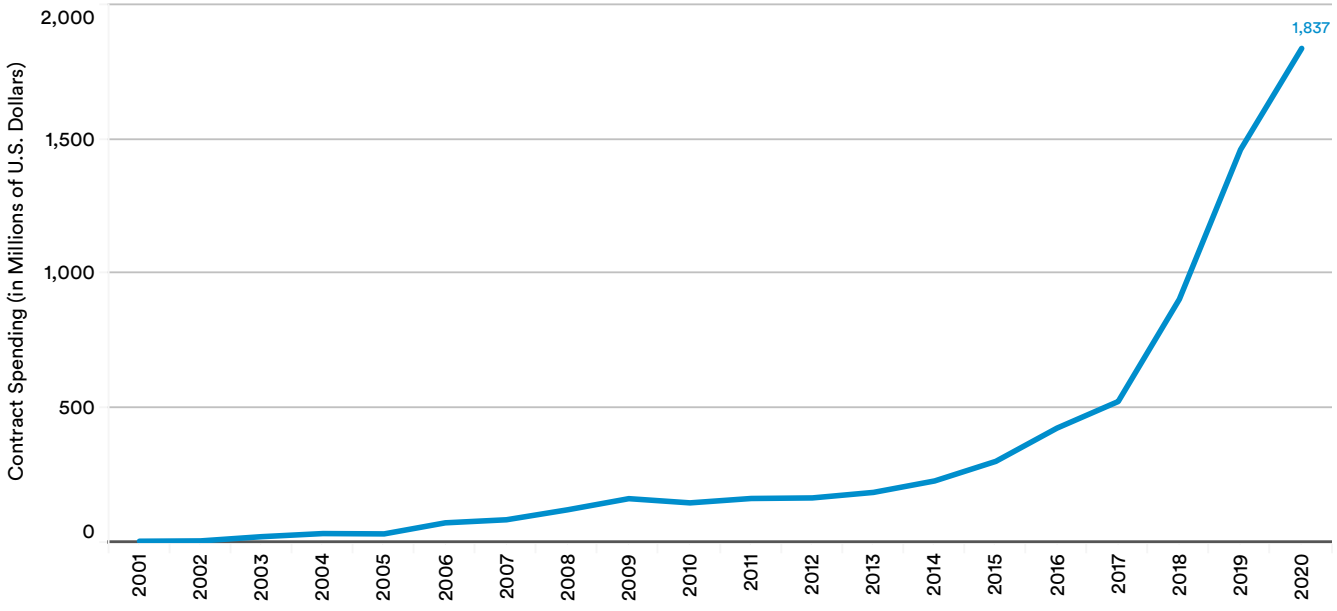

Figure 7.3.3

still in the early stages of driving DOD's AI spending. In 2020, JAIC awarded two massive contracts, one to Booz Allen Hamilton for the five-year, USD 800 million Joint Warfighter program, and another to Deloitte Consulting for a four-year, USD 106 million enterprise cloud environment for the JAIC, known as the Joint Common Foundation.

TOP 10 CONTRACT SPENDING on AI by U.S. GOVERNMENT DEPARTMENT and AGENCY, 2020
Source: Bloomberg Government, 2020 | Chart: 2021 AI Index Report

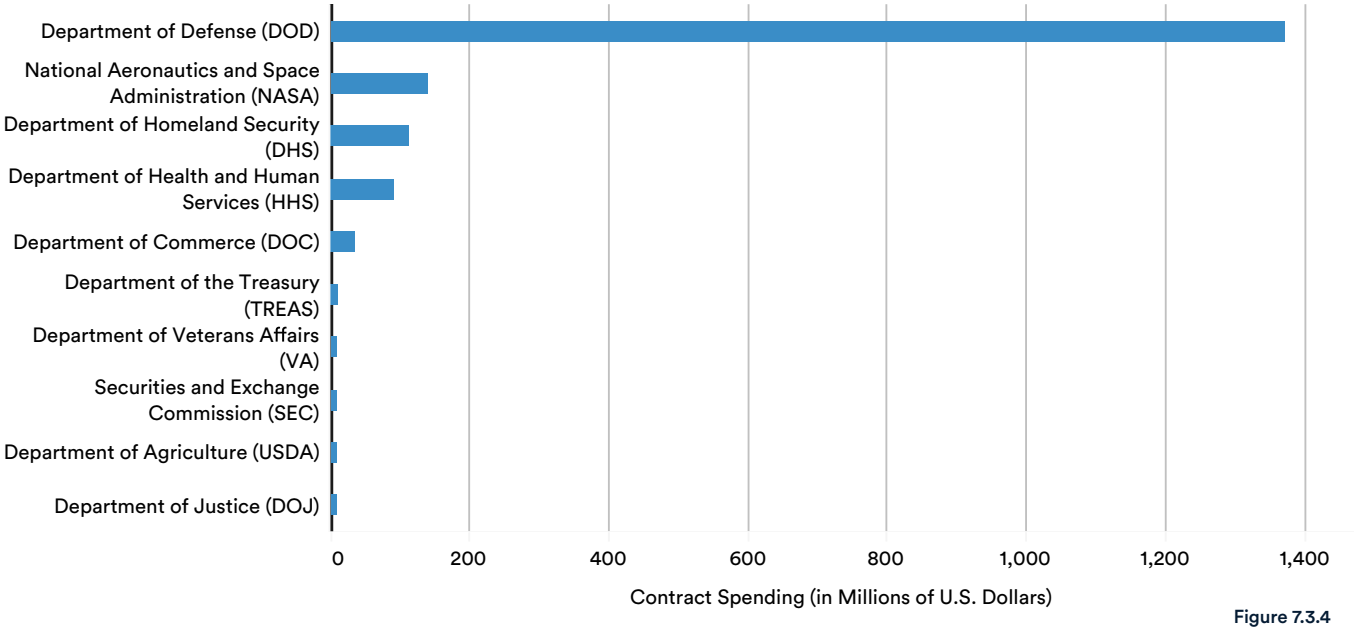

Figure 7.3.4

TOP 10 CONTRACT SPENDING on AI by U.S. GOVERNMENT DEPARTMENT and AGENCY, 2001-20 (SUM)
Source: Bloomberg Government, 2020 | Chart: 2021 AI Index Report

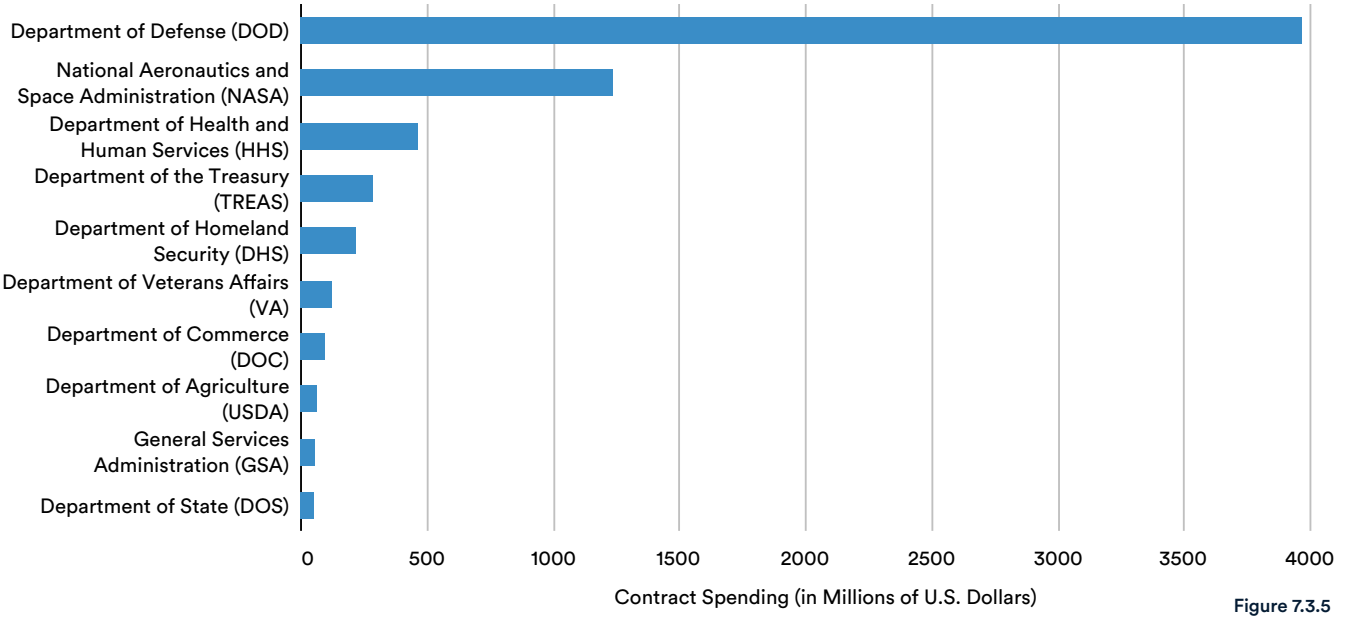

Figure 7.3.5

7.4 AI AND POLICYMAKING

As AI gains attention and importance, policies and initiatives related to the technology are becoming higher priorities for governments, private companies, technical organizations, and civil society. This section examines how three of these four are setting the agenda for AI policymaking, including the legislative and monetary authority of national governments, as well as think tanks, civil society, and the technology and consultancy industry.

LEGISLATION RECORDS ON AI

The number of congressional and parliamentary records on AI is an indicator of governmental interest in developing AI capabilities—and legislating issues pertaining to AI. In this section, we use data from Bloomberg and McKinsey & Company to ascertain the number of these records and how that number has evolved in the last 10 years.

Bloomberg Government identified all legislation (passed or introduced), reports published by congressional committees, and CRS reports that referenced one or more AI-specific keywords. McKinsey & Company searched for the terms "artificial intelligence" and "machine learning" on the websites of the U.S. Congressional Record, the U.K. Parliament, and the Parliament of Canada. For the United States, each count indicates that AI or ML was mentioned during a particular event contained in the Congressional Record, including the reading of a bill; for the U.K. and Canada, each count indicates that AI or ML was mentioned in a particular comment or remark during the proceedings.[1]

MENTIONS of AI in U.S. CONGRESSIONAL RECORD by LEGISLATIVE SESSION, 2001-20
Source: Bloomberg Government, 2020 | Chart: 2021 AI Index Report

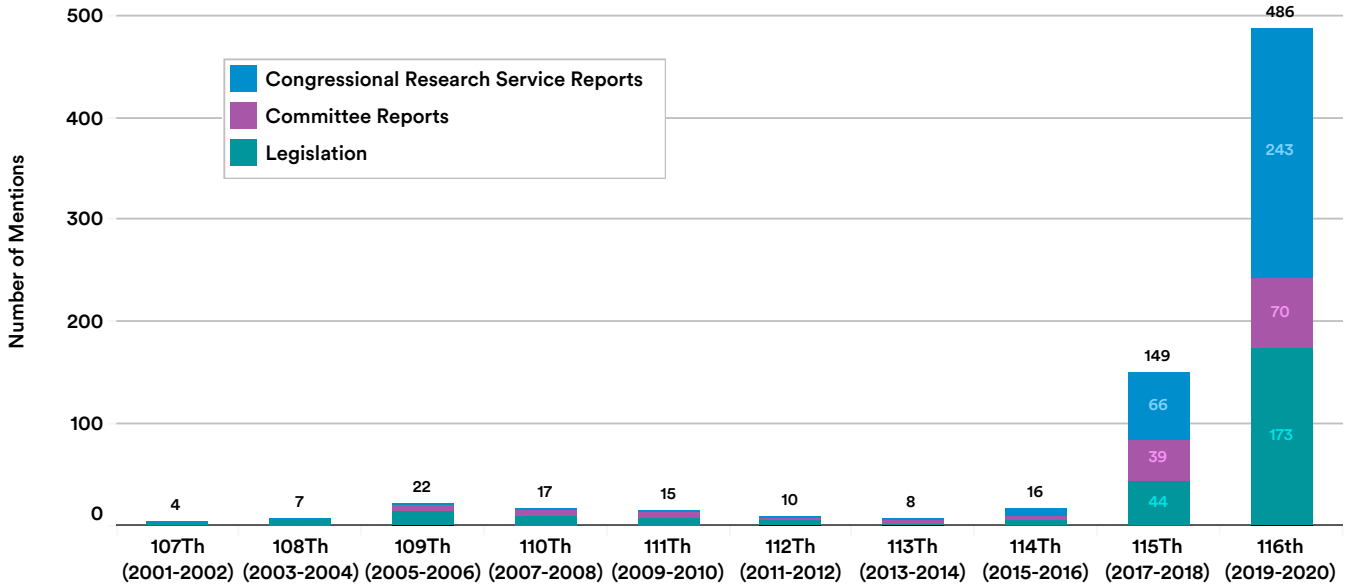

Figure 7.4.1

1 If a speaker or member mentioned artificial intelligence (AI) or machine learning (ML) multiple times within remarks, or multiple speakers mentioned AI or ML within the same event, it appears only once as a result. Counts for AI and ML are separate, as they were conducted in separate searches. Mentions of the abbreviations "AI" or "ML" are not included.

U.S. Congressional Record

The 116th Congress (January 1, 2019–January 3, 2021) is the most AI-focused congressional session in history. The number of mentions of AI by this Congress in legislation, committee reports, and CRS reports is more than triple that of the 115th Congress. Congressional interest in AI has continued to accelerate in 2020. Figure 7.4.1 shows that during this congressional session, 173 distinct pieces of legislation either focused on or contained language about AI technologies, their development, use, and rules governing them. During that two-year period, various House and Senate committees and subcommittees commissioned 70 reports on AI, while the CRS, tasked as a fact-finding body for members of Congress, published 243 about AI or referencing AI.

Mentions of AI and ML in Congressional/ Parliamentary Proceedings

As shown in Figures 7.4.2–7.4.5, the number of mentions of artificial intelligence and machine learning in the proceedings of the U.S. Congress and the U.K. parliament continued to rise in 2020, while there were fewer mentions in the parliamentary proceedings of Canada.

MENTIONS of AI and ML in the PROCEEDINGS of U.S. CONGRESS, 2011-20

Sources: U.S. Congressional Record website, the McKinsey Global Institute, 2020 | Chart: 2021 AI Index Report

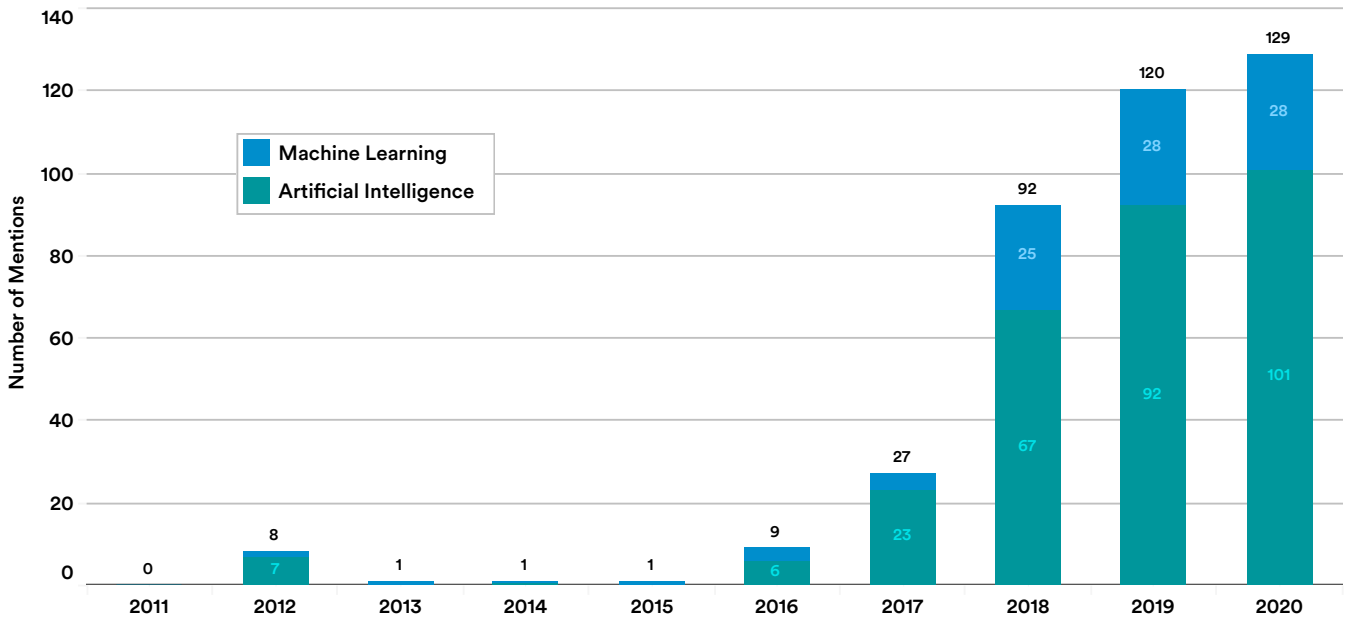

Figure 7.4.2

MENTIONS of AI and ML in the PROCEEDINGS of U.K. PARLIAMENT, 2011-20

Sources: Parliament of U.K. website, the McKinsey Global Institute, 2020 | Chart: 2021 AI Index Report

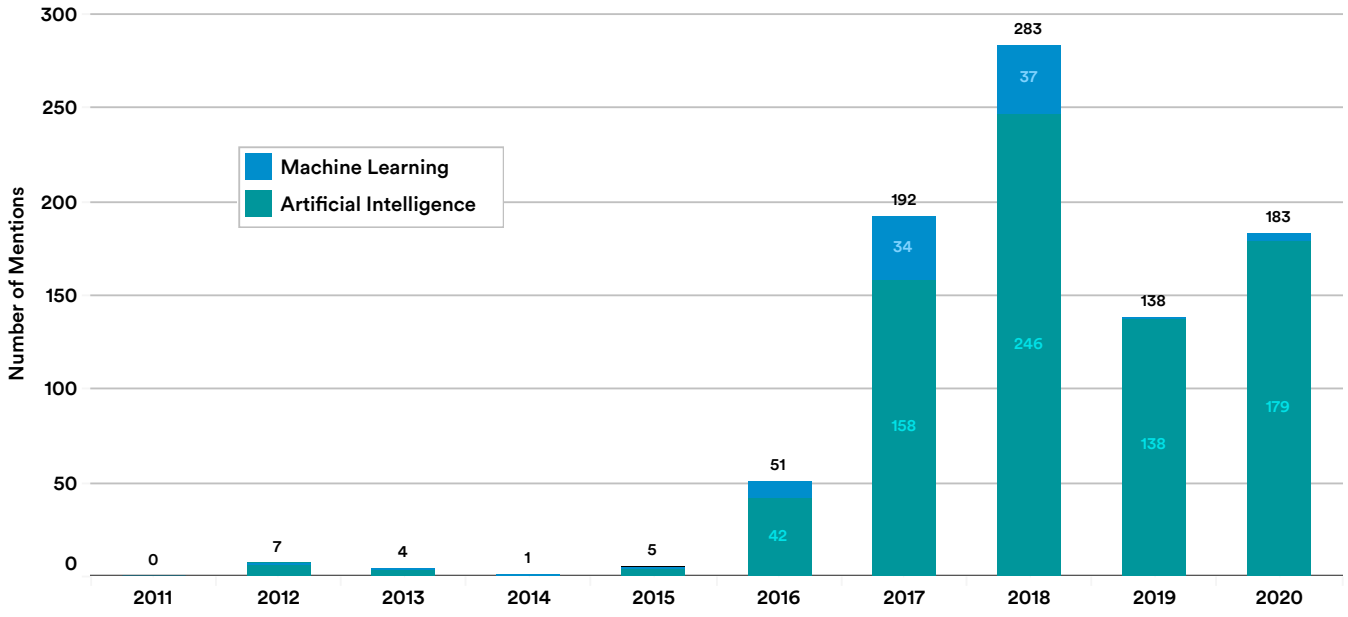

Figure 7.4.3

MENTIONS of AI and ML in the PROCEEDINGS of CANADIAN PARLIAMENT, 2011-20

Sources: Canadian Parliament website, the McKinsey Global Institute, 2020 | Chart: 2021 AI Index Report

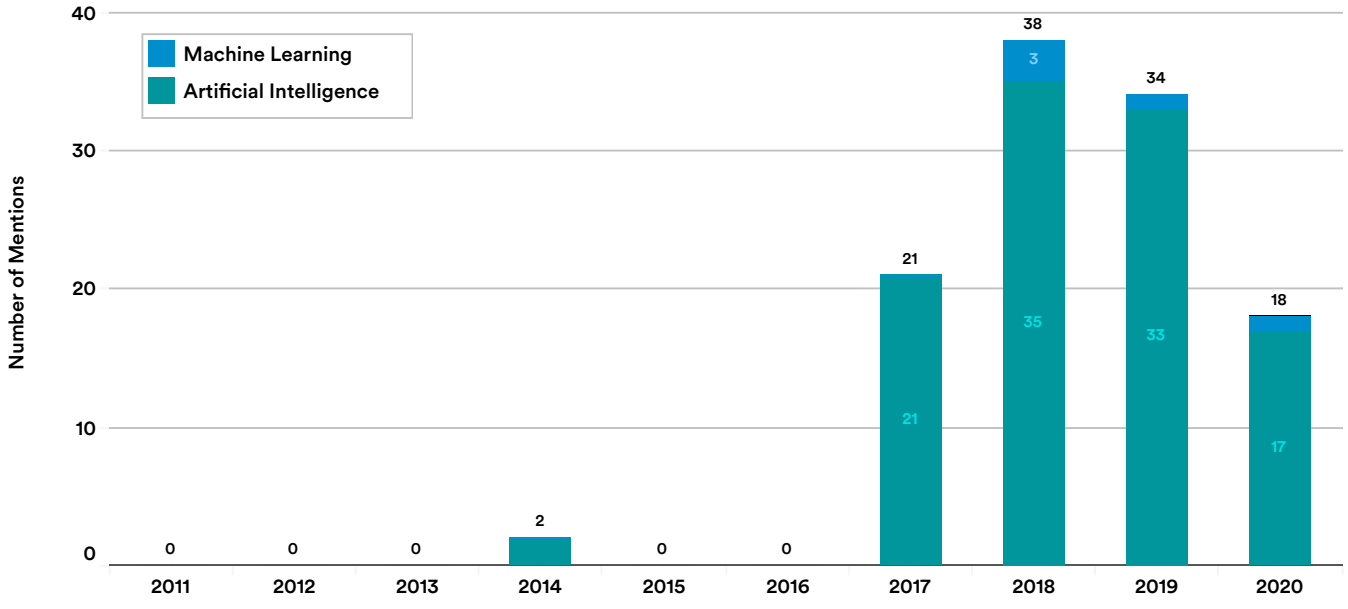

Figure 7.4.4

CENTRAL BANKS

Central banks play a key role in conducting currency and monetary policy in a country or a monetary union. As with many other institutions, central banks are tasked with integrating AI into their operations and relying on big data analytics to assist them with forecasting, risk management, and financial supervision.

Prattle, a leading provider of automated investment research solutions, monitors mentions of AI in the communications of central banks, including meeting minutes, monetary policy papers, press releases, speeches, and other official publications.

Figure 7.4.5 shows a significant increase in the mention of AI across 16 central banks over the past 10 years, with the number reaching a peak of 1,020 in 2019. The sharp decline in 2020 can be explained by the COVID-19 pandemic as most central bank communications focused on responses to the economic downturn. Moreover, the Federal Reserve in the United States, Norges Bank in Norway, and the European Central Bank top the list for the most aggregated number of AI mentions in communications in the past five years (Figure 7.4.6).

MENTIONS of AI in CENTRAL BANK COMMUNICATIONS around THE WORLD, 2011-20
Source: Prattle/LiquidNet, 2020 | Chart: 2021 AI Index Report

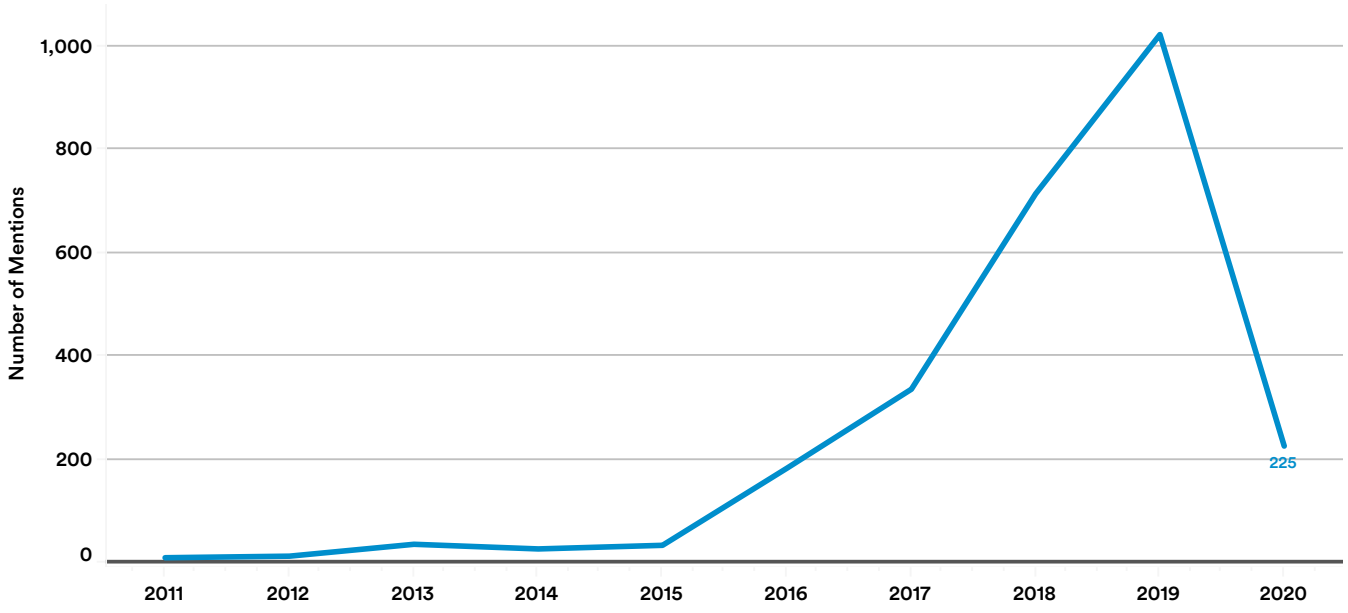

Figure 7.4.5

2 See Science & Technology Review and Scientific American for more details.

MENTIONS of AI in CENTRAL BANK COMMUNICATIONS around THE WORLD by BANK, 2016-20 (SUM)
Source: Prattle/LiquidNet, 2020 | Chart: 2021 AI Index Report

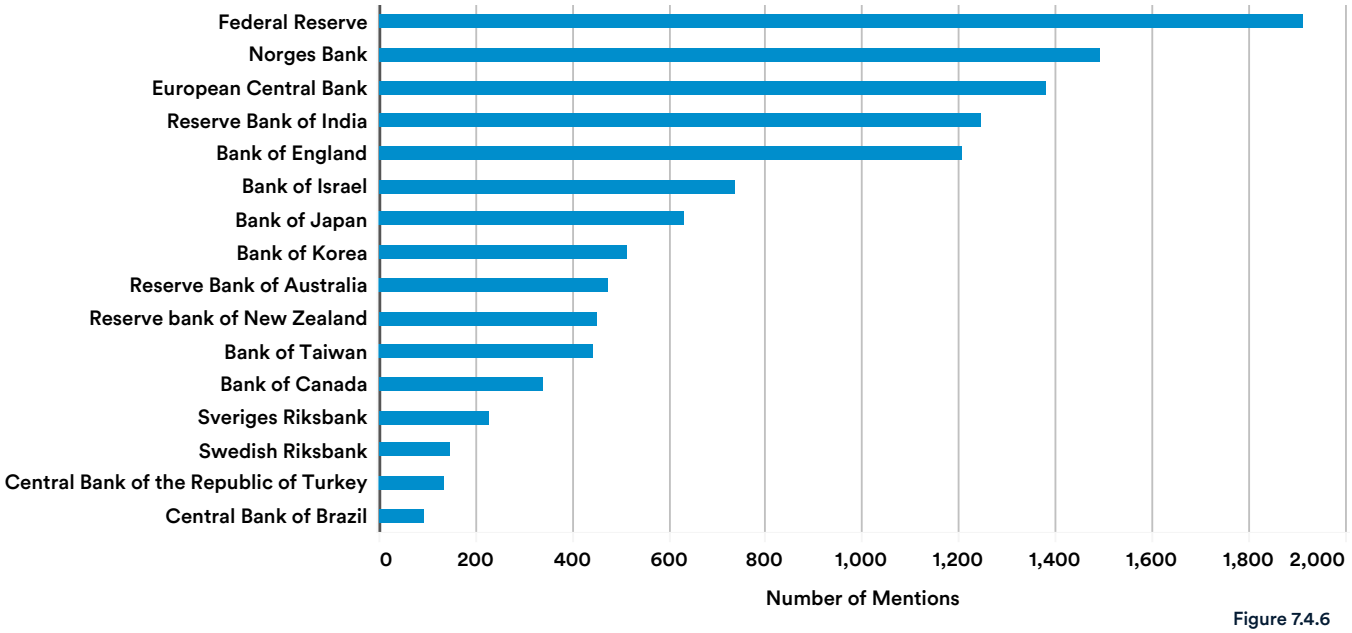

Figure 7.4.6

U.S. AI POLICY PAPERS

What are the AI policy initiatives outside national and intergovernmental governments? We monitored 42 prominent organizations that deliver policy papers on topics related to AI and assessed the primary topic as well as the secondary topic on policy papers published in 2019 and 2020. (See the Appendix for a complete list of organizations included.) Those organizations are either U.S.-based or have a sizable presence in the United States, and we grouped them into three categories: think tanks, policy institutes and academia (27); civil society organizations, associations and consortiums (9); and industry and consultancy (6).

AI policy papers are defined as research papers, research reports, blog posts, and briefs that focus on a specific policy issue related to AI and provide clear recommendations for policymakers. Primary topics mean that such a topic is the main focus of the policy paper, while secondary topics mean that the policy paper either briefly touches on the topic or the topic is a sub-focus of the paper.

Combined data for 2019 and 2020 suggests that the topics of innovation and technology, international affairs and international security, and industry and regulation are the main focuses of AI policy papers in the United States (Figure 7.4.7). Fewer documents placed a primary focus on topics related to AI ethics—such as ethics, equity and inclusion; privacy, safety and security; and justice and law enforcement—which have largely been secondary topics. Moreover, topics bearing on the physical sciences, energy and environment, humanities, and democracy have received the least attention in U.S. AI policy papers.

U.S. AI POLICY PRODUCTS by TOPIC, 2019-20 (SUM)
Source: Stanford HAI & AI Index, 2020 | Chart: 2021 AI Index Report

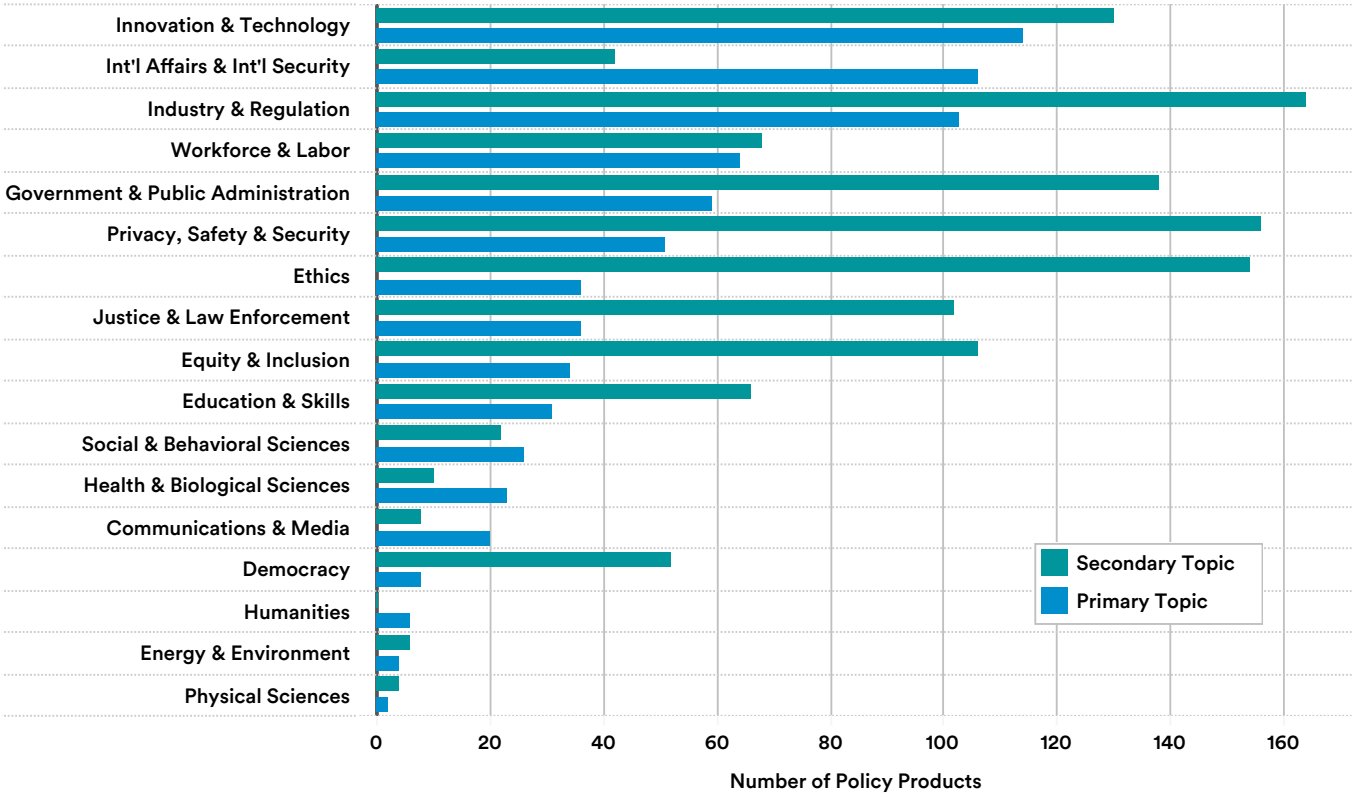

Figure 7.4.7

APPENDIX

BLOOMBERG GOVERNMENT

Bloomberg Government (BGOV) is a subscription-based market intelligence service designed to make U.S. government budget and contracting data more accessible to business development and government affairs professionals. BGOV's proprietary tools ingest and organize semi-structured government data sets and documents, enabling users to track and forecast investment in key markets.

Methodology

The BGOV data included in this section was drawn from three original sources:

Contract Spending: BGOV's Contracts Intelligence Tool ingests on a twice-daily basis all contract spending data published to the beta.SAM.gov Data Bank, and structures the data to ensure a consistent picture of government spending over time. For the section "U.S. Government Contract Spending," BGOV analysts used FPDS-NG data, organized by the Contracts Intelligence Tool, to build a model of government spending on artificial intelligence-related contracts in the fiscal years 2000 through 2021. BGOV's model used a combination of government-defined produce service codes and more than 100 AI-related keywords and acronyms to identify AI-related contract spending.

Defense RDT&E Budget: BGOV organized all 7,057 budget line items included in the RDT&E budget request based on data available on the DOD Comptroller website. For the section "U.S. Department of Defense (DOD) Budget," BGOV used a set of more than a dozen AI-specific keywords to identify 305 unique budget activities related to artificial intelligence and machine learning worth a combined USD 5.0 billion in FY 2021.

Congressional Record (available on Congressional Record website): BGOV maintains a repository of congressional documents, including bills, amendments, bill summaries, Congressional Budget Office assessments, reports published by congressional committees, Congressional Research Service (CRS), and others. For the section "U.S. Congressional Record," BGOV analysts identified all legislation (passed or introduced), congressional committee reports, and CRS reports that referenced one or more of a dozen AI-specific keywords. Results are organized by a two-year congressional session.

LIQUIDNET

Prepared by Jeffrey Banner and Steven Nichols

Source

Liquidnet provides sentiment data that predicts the market impact of central bank and corporate communications. Learn more about Liquidnet here.

Examples of Central Bank Mentions

Here are some examples of how AI is mentioned by central banks: In the first case, China uses a geopolitical environment simulation and prediction platform that works by crunching huge amounts of data and then providing foreign policy suggestions to Chinese diplomats or the Bank of Japan use of AI prediction models for foreign exchange rates. For the second case, many central banks are leading communications through either official documents—for example, on July 25, 2019, the Dutch Central Bank (DNB) published Guidelines for the use of AI in financial services and launched its six "SAFEST" principles for regulated firms to use AI responsibly—or a speech on June 4, 2019, by the Bank of England's Executive Director of U.K. Deposit Takers Supervision James Proudman, titled "Managing Machines: The Governance of Artificial Intelligence," focused on the increasingly important strategic issue of how boards of regulated financial services should use AI.

MCKINSEY GLOBAL INSTITUTE

Source

Data collection and analysis was performed by the McKinsey Global Institute (MGI).

Canada (House of Commons)

Data was collected using the Hansard search feature on Parliament of Canada website. MGI searched for the terms "*Artificial Intelligence*" and "*Machine Learning*" (quotes included) and downloaded the results as a CSV. The date range was set to "all debates." Data is as of Dec. 31, 2020. Data are available online from Aug. 31, 2002.

Each count indicates that *Artificial Intelligence* or *Machine Learning* was mentioned in a particular comment or remark during the proceedings of the House of Commons. This means that within an event or conversation, if a member mentions *AI* or *ML* multiple times within their remarks, it will appear only once. However if, during the same event, the speaker mentions *AI* or *ML* in separate comments (with other speakers in between), it will appear multiple times. Counts for *Artificial Intelligence* or *Machine Learning* are separate, as they were conducted in separate searches. Mentions of the abbreviations *AI* or *ML* are not included.

United Kingdom (House of Commons, House of Lords, Westminster Hall, and Committees)

Data was collected using the Find References feature of the Hansard website of the U.K. Parliament. MGI searched for the terms "*Artificial Intelligence*" and "*Machine Learning*" (quotes included) and catalogued the results. Data is as of Dec. 31, 2020. Data are available online from January 1, 1800 onward. Contains Parliamentary information licensed under the Open Parliament Licence v3.0.

As in Canada, each count indicates that *Artificial Intelligence* or *Machine Learning* was mentioned in a particular comment or remark during a proceeding. Therefore, if a member mentions *AI* or *ML* multiple times within their remarks, it will appear only once. However if, during the same event, the same speaker mentions *AI* or *ML* in separate comments (with other speakers in between), it will appear multiple times. Counts for *Artificial Intelligence* or *Machine Learning* are separate, as they were conducted in separate searches. Mentions of the abbreviations *AI* or *ML* are not included.

United States (Senate and House of Representatives)

Data was collected using the advanced search feature of the U.S. Congressional Record website. MGI searched the terms "*Artificial Intelligence*" and "*Machine Learning*" (quotes included) and downloaded the results as a CSV. The "word variant" option was not selected, and proceedings included Senate, House of Representatives, and Extensions of Remarks, but did not include the Daily Digest. Data is as of Dec. 31, 2020, and data is available online from the 104th Congress onward (1995).

Each count indicates that *Artificial Intelligence* or *Machine Learning* was mentioned during a particular event contained in the Congressional Record, including the reading of a bill. If a speaker mentioned *AI* or *ML* multiple times within remarks, or multiple speakers mentioned *AI* or *ML* within the same event, it would appear only once as a result. Counts for *Artificial Intelligence* or *Machine Learning* are separate, as they were conducted in separate searches. Mentions of the abbreviations *AI* or *ML* are not included.

U.S. AI POLICY PAPER

Source

Data collection and analysis was performed by Stanford Institute of Human-Centered Artificial Intelligence and AI Index.

Organizations

To develop a more nuanced understanding of the thought leadership that motivates AI policy, we tracked policy papers published by 36 organizations across three broad categories including:

Think Tanks, Policy Institutes & Academia: This includes organizations where experts (often from academia and the political sphere) provide information and advice on specific policy problems. We included the following 27 organizations: AI PULSE at UCLA Law, American Enterprise Institute, Aspen Institute, Atlantic Council, Berkeley Center for Long-Term Cybersecurity, Brookings

Institution, Carnegie Endowment for International Peace, Cato Institute, Center for a New American Security, Center for Strategic and International Studies, Council on Foreign Relations, Georgetown Center for Security and Emerging Technology (CSET), Harvard Belfer Center, Harvard Berkman Klein Center, Heritage Foundation, Hudson Institute, MacroPolo, MIT Internet Policy Research Initiative, New America Foundation, NYU AI Now Institute, Princeton School of Public and International Affairs, RAND Corporation, Rockefeller Foundation, Stanford Institute for Human-Centered Artificial Intelligence (HAI), Stimson Center, Urban Institute, Wilson Center.

Civil Society, Associations & Consortiums: Not-for profit institutions including community-based organizations and NGOs advocating for a range of societal issues. We included the following nine organizations: Algorithmic Justice League, Alliance for Artificial Intelligence in Healthcare, Amnesty International, EFF, Future of Privacy Forum, Human Rights Watch, IJIS, Institute for Electrical and Electronics Engineers, Partnership on AI

Industry & Consultancy: Professional practices providing expert advice to clients and large industry players. We included six prominent organizations in this space: Accenture, Bain & Co., BCG, Deloitte, Google AI, McKinsey & Company

Methodology

Each broad topic area is based on a collection of underlying keywords that describes the content of the specific paper. We included 17 topics that represented the majority of discourse related to AI between 2019-2020. These topic areas and the associated keywords are listed below.

- Health & Biological Sciences: medicine, healthcare systems, drug discovery, care, biomedical research, insurance, health behaviors, COVID-19, global health
- Physical Sciences: chemistry, physics, astronomy, earth science
- Energy & Environment: Energy costs, climate change, energy markets, pollution, conservation, oil & gas, alternative energy
- International Affairs & International Security: international relations, international trade, developing countries, humanitarian assistance, warfare, regional security, national security, autonomous weapons
- Justice & Law Enforcement: civil justice, criminal justice, social justice, police, public safety, courts
- Communications & Media: social media, disinformation, media markets, deepfakes
- Government & Public Administration: federal government, state government, local government, public sector efficiency, public sector effectiveness, government services, government benefits, government programs, public works, public transportation
- Democracy: elections, rights, freedoms, liberties, personal freedoms
- Industry & Regulation: economy, antitrust, M&A, competition, finance, management, supply chain, telecom, economic regulation, technical standards, autonomous vehicle industry & regulation
- Innovation & Technology: advancements and improvements in AI technology, R&D, intellectual property, patents, entrepreneurship, innovation ecosystems, startups, computer science, engineering
- Education & Skills: early childhood, K-12, higher education, STEM, schools, classrooms, reskilling
- Workforce & Labor: labor supply and demand, talent, immigration, migration, personnel economics, future of work
- Social & Behavioral Sciences: sociology, linguistics, anthropology, ethnic studies, demography, geography, psychology, cognitive science
- Humanities: arts, music, literature, language, performance, theater, classics, history, philosophy, religion, cultural studies
- Equity & Inclusion: biases, discrimination, gender, race, socioeconomic inequality, disabilities, vulnerable populations
- Privacy, Safety & Security: anonymity, GDPR, consumer protection, physical safety, human control, cybersecurity, encryption, hacking
- Ethics: transparency, accountability, human values, human rights, sustainability, explainability, interpretability, decision-making norms