Governance of Artificial Intelligence in Asia Pacific

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1. **Introduction:** Artificial intelligence (AI) is the simulation of human intelligence processes by machines, especially computer systems. These processes include learning (the acquisition of information and rules for using the information), reasoning (using the rules to reach approximate or definite conclusions), and self-correction. Particular applications of AI include expert systems, speech recognition and machine vision.[3] Artificial intelligence is intelligence demonstrated by machines, in contrast to the natural intelligence (NI) displayed by humans and other animals.[4] In computer science AI research is defined as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals.[5] From SIRI to self-driving cars, artificial intelligence (AI) is progressing rapidly. While science fiction often portrays AI as robots with human-like characteristics, AI can encompass anything from Google's search algorithms to IBM's Watson to autonomous weapons.[6] Though, data on the level of investment of AI in the region is limited, still it is huge amount. According to McKinsey, corporations invested between $20 billion and $30 billion globally in 2016.[7] This included both internal research and development (R&D) and acquisitions. Tech giants such as Alibaba, Amazon, Baidu, Facebook, and Google account for more than three quarters of total AI investment to date. From 2011 through to February 2017, these companies were behind 29 of 55 major merger and acquisition deals in the United States of America (USA) and 9 of 10 major deals in China. According to Tractica, globally, revenue generated from the direct and indirect application of AI software will grow from $1.4 billion in 2016 to nearly $60 billion by 2025 . The International Data Corporation (IDC) estimates that the adoption of cognitive systems and AI across a broad range of industries will drive worldwide revenues to more than $47 billion in 2020.

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[3] http://searchcio.techtarget.com/definition/AI

[44] https://en.wikipedia.org/wiki/Artificial_intelligence

[5] https://en.wikipedia.org/wiki/Artificial_intelligence#cite_note-Definition_of_AI-1

[6] https://futureoflife.org/background/benefits-risks-of-artificial-intelligence/

[7] http://www.unescap.org/sites/default/files/ESCAP_Artificial_Intelligence.pdf

ARTICLE 19 submitted evidence to the United Kingdom's House of Lords Select Committee on Artificial Intelligence on 6 September 2017. The submission stresses the need to critically evaluate the impact of Artificial Intelligence and automated decision making systems on human rights. It also calls for deeper understanding of various ways in which these technologies embed values and bias, thereby strengthening or sometimes hindering the exercise of these rights, particularly freedom of expression. [8] The overarching recommendation is for the development and use of AI to be subject to the minimum requirement of respecting, promoting, and protecting international human rights standards.

2. **Types of AI:** AI can be categorized in number of ways. The first classifies AI systems as either weak AI or strong AI. Weak AI, also known as narrow AI, is an AI system that is designed and trained for a particular task. Virtual personal assistants, such as Apple's Siri, are a form of weak AI. Whereas, Strong AI, also known as artificial general intelligence, is an AI system with generalized human cognitive abilities so that when presented with an unfamiliar task, it has enough intelligence to find a solution. The Turing Test, developed by mathematician Alan Turing in 1950, is a method used to determine if a computer can actually think like a human, although the method is controversial. Arend Hintze, an assistant professor of integrative biology and computer science and engineering at Michigan State University categorizes AI into four types

    i. **Reactive machines**: An example is Deep Blue, the IBM chess program that beat Garry Kasparov in the 1990s. Deep Blue can identify pieces on the chess board and make predictions, but it has no memory and cannot use past experiences to inform future ones. It analyzes possible moves -- its own and its opponent -- and chooses the most strategic move. Deep Blue and Google's AlphaGO were designed for narrow purposes and cannot easily be applied to another situation.

    ii. **Limited memory:** These AI systems can use past experiences to inform future decisions. Some of the decision-making functions in autonomous vehicles have been designed this way. Observations used to inform actions happening in the not-so-distant future, such as a car that has changed lanes. These observations are not stored permanently.

    iii. **Theory of mind:** This is a psychology term. It refers to the understanding that others have their own beliefs, desires and intentions that impact the decisions they make. This kind of AI does not yet exist.

[8] https://www.article19.org/resources/artificial-intelligence-article-19-calls-for-protection-of-freedom-of-expression-in-the-debate-2/

iv. **Self-awareness:** In this category, AI systems have a sense of self, have consciousness. Machines with self-awareness understand their current state and can use the information to infer what others are feeling. This type of AI does not yet exist.

3. **Importance of AI:** In the near term, the goal of keeping AI's impact on society beneficial motivates research in many areas, from economics and law to technical topics such as verification, validity, security and control. Whereas it may be little more than a minor nuisance if your laptop crashes or gets hacked, it becomes all the more important that an AI system does what you want it to do if it controls your car, your airplane, your pacemaker, your automated trading system or your power grid. Another short-term challenge is preventing a devastating arms race in lethal autonomous weapons. In the long term, an important question is what will happen if the quest for strong AI succeeds and an AI system becomes better than humans at all cognitive tasks. As pointed out by I.J. Good in 1965, designing smarter AI systems is itself a cognitive task. Such a system could potentially undergo recursive self-improvement, triggering an intelligence explosion leaving human intellect far behind. By inventing revolutionary new technologies, such a super intelligence might help us eradicate war, disease, and poverty, and so the creation of strong AI might be the biggest event in human history. Some experts have expressed concern, though, that it might also be the last, unless we learn to align the goals of the AI with ours before it becomes super intelligent.[9]

4. **Applications of AI:** AI could be used in various area of the human life. Some of them could be as follows:

   i. **AI in healthcare:** The biggest bets are on improving patient outcomes and reducing costs. Companies are applying machine learning to make better and faster diagnoses than humans. One of the best known healthcare technologies is IBM Watson. It understands natural language and is capable of responding to questions asked of it. The system mines patient data and other available data sources to form a hypothesis, which it then presents with a confidence scoring schema. Other AI applications include chatbots, a computer program used online to answer questions and assist customers, to help schedule follow-up appointments or aiding patients through the billing process, and virtual health assistants that provide basic medical feedback.

   ii. **AI in business**: Robotic process automation is being applied to highly repetitive tasks normally performed by humans. Machine learning algorithms are being integrated into analytics and CRM platforms to uncover information on how to better serve customers. Chatbots have been incorporated into websites to provide immediate

[9] https://futureoflife.org/background/benefits-risks-of-artificial-intelligence/

service to customers. Automation of job positions has also become a talking point among academics and IT consultancies such as Gartner and Forrester.

iii. **AI in education**: AI can automate grading, giving educators more time. AI can assess students and adapt to their needs, helping them work at their own pace. AI tutors can provide additional support to students, ensuring they stay on track. AI could change where and how students learn, perhaps even replacing some teachers.

iv. **AI in finance**: AI applied to personal finance applications, such as Mint or Turbo Tax, is upending financial institutions. Applications such as these could collect personal data and provide financial advice. Other programs, IBM Watson being one, have been applied to the process of buying a home. Today, software performs much of the trading on Wall Street.

v. **AI in law**: The discovery process, sifting through of documents, in law is often overwhelming for humans. Automating this process is a better use of time and a more efficient process. Startups are also building question-and-answer computer assistants that can sift programmed-to-answer questions by examining the taxonomy and ontology associated with a database.

vi. **AI in manufacturing**: This is an area that has been at the forefront of incorporating robots into the workflow. Industrial robots used to perform single tasks and were separated from human workers, but as the technology advanced that changed.

5. Development of Artificial Intelligence: [10]

i. **1308** Catalan poet and theologian Ramon Llull publishes *Arsgeneralisultima* (The Ultimate General Art), further perfecting his method of using paper-based mechanical means to create new knowledge from combinations of concepts.

ii. **1666** Mathematician and philosopher Gottfried Leibniz publishes *Dissertatio de arte combinatoria* (On the Combinatorial Art), following Ramon Llull in proposing an alphabet of human thought and arguing that all ideas are nothing but combinations of a relatively small number of simple concepts.

iii. **1726** Jonathan Swift publishes *Gulliver's Travels*, which includes a description of the Engine, a machine on the island of Laputa (and a parody of Llull's ideas): "a Project for improving speculative Knowledge by practical and mechanical Operations

[10] https://www.forbes.com/sites/gilpress/2016/12/30/a-very-short-history-of-artificial-intelligence-ai/#2cf509e66fba

iv. **1898** At an electrical exhibition in the recently completed Madison Square Garden, Nikola Tesla makes a demonstration of the world's first radio-controlled vessel**.** The boat was equipped with, as Tesla described, "a borrowed mind."

v. **1914** The Spanish engineer Leonardo Torres y Quevedo demonstrates the first chess-playing machine, capable of king and rook against king endgames without any human intervention.

vi. **1921** Czech writer Karel Čapek introduces the word "robot" in his play R.U.R. (Rossum's Universal Robots). The word "robot" comes from the word "robota" (work).

vii. **1925** Houdina Radio Control releases a radio-controlled driverless car, travelling the streets of New York City.

viii. **1929**Makoto Nishimura designs Gakutensoku, Japanese for "learning from the laws of nature," the first robot built in Japan. It could change its facial expression and move its head and hands via an air pressure mechanism.

ix. **1949** DonaldHebb publishes *Organization of Behavior: A Neuropsychological Theory* in which he proposes a theory about learning based on conjectures regarding neural networks and the ability of synapses to strengthen or weaken over time.

x. **1951** Marvin Minsky and Dean Edmunds build SNARC (Stochastic Neural Analog Reinforcement Calculator), the first artificial neural network, using 3000 vacuum tubes to simulate a network of 40 neurons.

xi. **1958** John McCarthy develops programming language Lisp which becomes the most popular programming language used in artificial intelligence research.

xii. **1961** The first industrial robot, Unimate, starts working on an assembly line in a General Motors plant in New Jersey.

xiii. **1964** Daniel Bobrow completes his MIT PhD dissertation titled "Natural Language Input for a Computer Problem Solving System" and develops STUDENT, a natural language understanding computer program.

xiv. **1965**Joseph WeizenbaumdevelopsELIZA, an interactive program that carries on a dialogue in English language on any topic. Weizenbaum, who wanted to demonstrate the superficiality of communication between man and machine, was surprised by the number of people who attributed human-like feelings to the computer program.

xv. **1968** Terry WinograddevelopsSHRDLU, an early natural language understanding computer program.

xvi. **1964** Daniel Bobrow completes his MIT PhD dissertation titled "Natural Language Input for a Computer Problem Solving System" and develops STUDENT, a natural language understanding computer program.

xvii. **1955** The term "artificial intelligence" is coined in a proposal for a "2 month, 10 man study of artificial intelligence" submitted by John McCarthy (Dartmouth College), Marvin Minsky (Harvard University), Nathaniel Rochester (IBM), and Claude Shannon (Bell Telephone Laboratories). The workshop, which took place a year later, in July and August 1956, is generally considered as the official birthdate of the new field.

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xx. **1972** MYCIN, an early expert system for identifying bacteria causing severe infections and recommending antibiotics, is developed at Stanford University.

xxi. **1980** Wabot-2 is built at Waseda University in Japan, a musician humanoid robot able to communicate with a person, read a musical score and play tunes of average difficulty on an electronic organ.

xxii. **1986** First driverless car, a Mercedes-Benz van equipped with cameras and sensors, built at Bundeswehr University in Munich under the direction ofErnstDickmanns, drives up to 55 mph on empty streets.

xxiii. **1998** YannLeCun, YoshuaBengio and others publish papers on the application of neural networks to handwriting recognition and on optimizingbackpropagation.

xxiv. **2000** MIT's Cynthia BreazealdevelopsKismet, a robot that could recognize and simulate emotions.

xxv. **2004** The first DARPA Grand Challenge, a prize competition for autonomous vehicles, is held in the Mojave Desert.

xxvi. **2009** Computer scientists at the Intelligent Information Laboratory at Northwestern University develop Stats Monkey, a program that writes sport news stories without human intervention.

xxvii. **2011** Watson, a natural language question answering computer, competes on *Jeopardy!*and defeats two former champions.

xxviii. **2016** Google DeepMind's AlphaGodefeats Go champion Lee Sedol.

6. AI-related Organizations

i. AI Nepal
ii. Allen Institute for Artificial Intelligence
iii. Artificial General Intelligence Research Institute
iv. Artificial Intelligence Applications Institute
v. Association for the Advancement of Artificial Intelligence
vi. Australian Research Council Centre of Excellence for Robotic Vision
European Coordinating Committee for Artificial Intelligence
vii. European Neural Network Society
viii. Future of Life Institute
ix. ILabs
x. International Joint Conferences on Artificial Intelligence
xi. Kestrel Institute
xii. Knowledge Engineering and Machine Learning Group

xiii. Lifeboat Foundation
xiv. Machine Intelligence Research Institute
xv. OpenAI
xvi. Partnership on AI
xvii. Society for the Study of Artificial Intelligence and the Simulation of Behaviour

7. **AI in Asia:** Asia is becoming a breeding ground for its immense potential for AI application. Banks such as UBS are bullish, forecasting the AI industry in Asia to grow a solid 20 percent CAGR from 2015 to 2020, reaching values worth up to US$12.5 billion. This is largely thanks to the exponential increase in the amount of data churning in the region, the development of more affordable computer processors, and the brimming young talent pool available across the continent. The younger generation across Asia also already seem to understand how AI can impact their lives. According to a Microsoft survey, 39 percent envisaged using connected or driverless cars, and another 36 percent thought future software robots would improve productivity.

   Governments, for example such as Singapore, have already jumped on the AI bandwagon, providing open access to their scores of data to the public for app development or research. Since 2011, the amount of accessible data shared by the Singapore government has leapfrogged by 60 percent.

   In China, researchers are infusing AI elements into daily applications such as Skype, breaking down linguistic barriers by translating languages in real-time. AI is also being used in India to predictively learn and suggest agricultural decisions for farmers vulnerable to weather changes.[11]

8. **Leading Countries in the Development of AI in Asia Pacific:** Estimates suggest that China's total investment in AI enterprises reached $2.6 billion in 2016.[12] China's State Council has recently issued guidelines on AI development wherein it is aiming to become a global innovation centre in the field by 2030, with an estimated total output value of the AI industry projected at $147 billion. China Artificial Intelligence Industry Innovation Alliance (CAIIIA) was set up in 2017. The newly formed alliance set a target to incubate 50 AI-enabled products and 40 firms, launch 20 pilot projects, and set up a technology platform in the next three years. Singapore recently announced plans to invest over $100 million in AI over the next five years. In the Republic of Korea, SK Telecom announced in early 2017 that it will invest $4.2 billion in AI . Measured by patents filed, from 2010-14, the USA led AI-related patent applications submitting 15,317 applications. China was

[11]https://www.techinasia.com/state-ai-asia-future-talk
[12]http://www.nasdaq.com/article/an-indepth-look-at-baidus-bidu-artificial-intelligence-aspirations-cm821145

second submitting 8,410. During this period, Japan and Republic of Korea submitted 2,071 and 1,533 respectively. India was also among the top 10 countries globally in terms of numbers of patents submitted. In addition, China and India are among the top 10 countries in terms of the number of AI companies .

8.1 AI in China : With its biggest tech companies driving momentum for R&D, China is one of the leading global hubs of AI development. Its vast population and diverse industry mix have the potential to generate huge volumes of data and provide an enormous market. Wide adoption of AI technologies could be crucial to China's future economic growth as the nation's population ages, heightening the need to accelerate productivity growth. Some of the required building blocks include a more open data environment and well-trained data science talent. But AI also poses complex social and economic questions that will require careful consideration.[13] China's State Council issued an ambitious policy blueprint calling for the nation to become ***"the world's primary AI innovation center"*** by 2030, by which time, it forecast, the country's AI industry could be worth $150 billion. "China is investing heavily in all aspects of information technology," from quantum computing to chip design, says Raj Reddy, a Turing Award–winning AI pioneer at Stanford University in Palo Alto, California, and Carnegie Mellon University in Pittsburgh, Pennsylvania. "AI stands on top of all these things."[14]

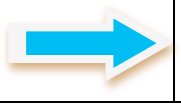
8.1.1 China's Position in AI Development: China and the United States are currently the world leaders in AI development. In 2015 alone, they accounted for nearly 10,000 papers on AI published in academic journals, while the United Kingdom, India, Germany, and Japan combined to produce only about half as many scholarly research articles.[15]

1	**Years experience of the nation's data scientists**		**Forty percent have less than 5 years.**
2	**AI patent applications, 2010–2014**		**8410 (Second)**

[13] https://www.mckinsey.com/~/media/McKinsey/Global%20Themes/China/Artificial%20intelligence%20Implications%20for%20China/MGI-Artificial-intelligence-implications-for-China.ashx

[14] http://www.sciencemag.org/news/2018/02/china-s-massive-investment-artificial-intelligence-has-insidious-downside

[15] SCImago Journal & Country Rank, 2015

3	**Number of workers in AI positions**		**50,000 (Seventh)**
4	**Percent of private AI investment (2016)**		**17% (Second)**
5	**Global ranking of data openness**		**No. 93**

8.1.2 Strategic priority on AI In China

1) Build a robust data ecosystem
2) Broaden adoption of AI within traditional industries
3) Strengthen the pipeline of specialized AI talent
4) Ensure that education and training systems are prepared to develop technology skills and retrain large segments of the workforce
5) Establishing an ethical and legal consensus among Chinese citizens and in the global community

8.2 AI in Japan: Many analysts have pointed out that the Japanese AI industry today is not very competitive on the global scale. For instance, when it comes to research papers on AI between 2008 and 2013, most of these come from Western countries and China. Only about 2 percent come from Japan.[16] Several headlines in recent articles have brought to the attention the current status of the Japanese AI industry. One headline example is "Japan must promote AI without restrictions". Other articles emphasise the need for an "AI revolution" as well as asking the question "Is revival possible with AI". In contrast to this, Professor Yutaka Matsuo, University of Tokyo, claims that AI is one of the few limited areas that could offer business opportunities for Japan's industries. But for the Japanese monozukuri (Japanese-style manufacturing processes) to get an upper hand over competition, Japanese companies have to embrace deep learning more intensively and not only focus on IoT. Several venture capital funds have recently been set up in Japan with focus on AI. Realtech Fund, targeting technology start-ups, is one example into which Japanese companies have invested money. This fund is one of the largest venture capital funds in Japan involving only private-sector companies. Investments are

[16] "Use of Everyday Artificial Intelligence Seen as Way Forward", Gadgets 360, Daisuke Ichikawa, Dec. 1, 2015, http://gadgets.ndtv.com/science/features/use-of-everyday-artificial-intelligence-seen-as-way-forward-772166

made in 10 fields including AI.[17] The plan is to invest in 40 technology start-ups by 2020. During the last 10-20 years, Japan has lost its technology leadership to companies in the west, and largely because of software shortcomings. Japan is still at the forefront in hardware such as robots. But this stronghold is in danger of being lost, because software is increasingly critical to making those products work and to compete on the international market. When it comes to deep learning, there is a clear difference between Japan and the U.S. In Silicon Valley, deep learning is mainly a way to make software better. Many Japanese companies, however, tend to look at deep learning differently, as a way to just improve the hardware.

8.2.1 R&D related to AI in Japan: [18]

a. Research at Universities

University of Tokyo. Professor Yutaka Matsuo is conducting research in artificial intelligence to realise breakthroughs in deep learning. Similarly A team from Future University, Nagoya University and the Tokyo Institute of Technology, under guidance of professor Hitoshi Matsubara (Future University) is engaged in research to make AI create a story plot and finally write an entire novel.

b. Research at Public Research Institutes

Artificial Intelligence Research Center, AIRC. This center was established in May, 2015, at National Institute of Advanced Industrial Science and Technology (AIST).[19] The aim of the research center is to develop AI technologies that will offer applications to self-driving cars, medical services and financial services including robotics. Junichi Tsujii is the director.

c. Collaboration between Companies and Universities/Research Institutes

On June 1, 2016, NEC and AIST jointly established an AI lab. The aim of the three-year collaboration is to make up for AI's shortcomings. AI is not much helpful to uncover solutions to problems with only limited data, such as predicting rare events such as major disasters.

d. Corporate Research

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[17] "JR East, Dai-ichi Life join tech venture fund", Nikkei Asian Review, April 30, 2016, http://asia.nikkei.com/Business/Companies/JR-East-Dai-ichi-Life-join-tech-venture-fund

[18] https://www.eubusinessinjapan.eu/sites/default/files/artificial_intelligence_in_japan.pdf

[19] "Artificial Intelligence Research Center", National Institute of Advanced Industrial Science and Technology, https://unit.aist.go.jp/airc/index_en.html

Interprotein, a company strong in molecular designing technologies, and A.I. Squared, an artificial intelligence-based solution provider, are jointly conducting research on AI drug discovery

8.2.2 Future of AI in Japan: A future in which human workers are replaced by machines is about to become a reality at an insurance firm in Japan, where more than 30 employees are being laid off and replaced with an artificial intelligence system that can calculate payouts to policyholders.[20] Fukoku Mutual Life Insurance believes it will increase productivity by 30% and see a return on its investment in less than two years. The firm said it would save about 140m yen (£1m) a year after the 200m yen (£1.4m) AI system is installed this month. Maintaining it will cost about 15m yen (£100k) a year. According to a 2015 report by the Nomura Research Institute, nearly half of all jobs in Japan could be performed by robots by 2035.

8.3 AI in South Korea: Se-dol Lee, one of the world top Go players, recently had a historical match with Google's Alpha Go Artificial Intelligence (AI) in Seoul. The result was 4 to 1 which technology has won over humanity. This incident has given Korea a big shock as beforehand most Koreans were confident that Lee would win. After this match, the Korean government has learned a lesson that the AI will be one of the major industries that will lead the global market. They have started to invest in AI more strategically and efficiently. While the United States, Europe and Japan are investing a lot of money in AI development, not much research has been done in Korea apart from its reputation of an IT powerhouse. Korea's market size in 2013 was approximately 2.78 billion euro which growth to 4.94 billion euro in 2017. But Nowadays South Korea is witnessing increasing research efforts for artificial intelligence, with the third most patents related to AI technologies after the US and Japan, a survey by a local research institute found Thursday. However, the country's growth pace and quality of patent applications remain inferior to those of the US and China, the survey added.[21] North Korea's AI development is expected to hit a wall, due to its strained financial resources, economic situation and international sanctions including the Wassenaar Agreement, which prohibits weapons export to countries associated with terrorism." North Korea has been developing AI technologies from the 1990s via the state-run software research institute Korea Computer Centre, the report noted. The country has three other research centres each dedicated to AI development, manufacturing automation as well as the development of digital security and biometric authentication software,

[20] https://www.theguardian.com/technology/2017/jan/05/japanese-company-replaces-office-workers-artificial-intelligence-ai-fukoku-mutual-life-insurance

[21] http://www.koreaherald.com/view.php?ud=20171221000672

it said. A hallmark of North Korea's AI development programme is Eunbyul, its self-developed AI designed for the ancient Chinese game of Go. Before the emergence of Google DeepMind's famed AlphaGo, Eunbyul, developed by the Korea Computer Centre in 1997 had been the reigning champion of international computerized Go competitions. It won the championship six times - in 1998, 2003, 2004, 2005, 2006 and 2009. The core technology underpinning Eunbyul is, in fact, no different from that of AlphaGo. Both operate on the Monte Carlo tree search method, a heuristic search algorithm which decides the most promising move based on knowledge previously learned via machine learning. Yet, the major difference is that while Eunbyul's 2010 edition was trained on just 16 CPUs, AlphaGo during its match against Go grandmaster Lee Se Dol in 2016 used 1,920 CPUs and 280 GPUs to consider 100,000 probable outcomes per second, the report noted. North Korea is also known to possess deep learning capabilities, a form of high-level machine learning which uses large artificial neural networks - layers of interconnected nodes - that rearrange themselves as new information comes in, allowing them to self-learn without the need for human programming. Recently, the country managed to vastly improve its voice recognition software Ryongnamsan using deep learning algorithms, according to a 2017 paper in Pyongyang-based Kim Il Sung University's scholarly journal, cited by KDB Research. It is the same tech powering AI voice assistants like Apple's Siri, Amazon's Alexa and Google's Assistant, the KDB report said. In addition, North Korea is reportedly developing AI systems for application to facial recognition and finger recognition software. It also is said to possess knowledge of complex computing methods such as the vector space model and support vector machine, KDB said. Despite possessing fundamental AI technologies, North Korea will increasingly find it difficult to move forward its data-driven AI development, due to strained resources stemming from its international isolation, the report concluded.[22]

9. **Leading AI Companies:** Several analysts have listed the following global companies in terms of investment in AI: Amazon, Baidu, Facebook, Google, IBM, Microsoft, Tesla Motors and Nvidia18 . Among these companies, the only company from Asia and the Pacific is Baidu. Baidu have invested $3 billion in AI R&D since 2015[23]. However, the landscape may soon change with the rapid development of AI in the region, especially in China. Apart from Baidu, two Chinese companies Alibaba and Tencent are investing heavily in AI .Alibaba plans to invest $15 billion in R&D labs and hire 100 scientists

[22] http://www.straitstimes.com/asia/east-asia/north-koreas-once-touted-ai-tech-hits-development-ceiling-report
[23]https://www.forbes.com/sites/ywang/2017/05/08/inside-baidus-billion-dollar-push-to-become-an-ai-global-leader/#19d0a503516b.

across the tech nexus of the US, China and Israel over three years starting from 2017.[24] Financial muscle apart, several factors mean these companies will play a leading role in the region in the future. First, they treat AI as long-term investment. Martin Lau, the president of Tencent, recently commented, "we will be persistent but patient with our AI investment, because we believe it is a longterm initiative and we do not necessarily require our research to generate revenue directly in the short term". Second, their strategies for investment will provide access to the latest technologies and top talent. For instance, they have all set up offices in Silicon Valley . Third, they all have access to a large amount of data. As highlighted earlier, big data is essential for AI. Statistical data are missing in determining which sectors have been most active in applying AI in theregion. Nevertheless, analysis of the types of AI companies in China, India, Japan, and Republic of Korea yields a preliminary conclusion that AI has been mainly applied in the following sectors:retail and consumer; technology, communications and entertainment; financial services; andwarehousing and logistics.

10. AI's Issues and Challenge in Asia Pacific: [25]

But even with all the underscored potential that Asia has, it doesn't come free of hurdles. For one, Asia doesn't have a terminal hub like Silicon Valley. Talent although many, is scattered across the region. Having a hub similar to Silicon Valley would allow for faster means of talent development and a more focused spread of awareness. Add to that the cultural and linguistic differences across and within countries. With data as the fuel that powers the engine of AI, scores of different cultural meanings and languages makes data challenging to analyze and interpret. Take Indonesia for example. Bahasa Indonesia has its own expression of slang and colloquial language that makes data gathering and analyzing difficult to tackle and interpret. As more chatbots are coming to prominence in the country, programs such as Wit and Kata.ai are taking on the challenge in a more local fashion. Although challenges abound, opportunities in Asia on the other hand are still undeniably plenty. AI is still in its infancy, but when done right with government and public support, it holds the promise of improving the quality of our lives.

10.1 Ethical Issues :AI can create new markets and help business and consumers alike become "smarter" and more efficient; however, ethical issues are abound. What rules should dictate the algorithms that decide how much we can borrow or what healthcare we will receive? Should driverless cars prioritise the life of the driver or pedestrian? Answers to these questions depend on, among others, the way AI algorithms are trained and the quality of data fed into the system. Biased data may yield biased AI learning outcome. In a hypothetical scenario, if all data fed into an

[24]https://www.ft.com/content/ac3fd8f8-ae5f-11e7-beba-5521c713abf4.

[25]https://www.techinasia.com/state-ai-asia-future-talk

AI system show that people from a specific region should not be granted loans, the AI system may make the same decision in the future. More recently, John Giannandrea who leads AI in Google, pointed out that bias, rather than the killer robots, would be the real AI danger. On this point, solutions should be centred on the transparency of data used to support unbiased AI systems .

i. **A New Frontier Technology Divide**: Although billions of people around the world have reaped the benefits of the internet, many billions have been left behind. As ICT infrastructure is the backbone of AI, there is a risk of a new frontier technology divide. For example, the fixed broadband subscriptions per 100 inhabitants in the AsiaPacific region is still far lower than Europe and North America, and remains below the world's average of 12.4 in 2016. 18 ESCAP member countries continue to have less than 2 broadband subscriptions for the same indicator.

ii. **Technological Unemployment – a potential concern but certainly not Preordained:** In theory, widespread adoption of automation or robots may make some jobs redundant. However, two clarifications are essential. First, automation or robots are not the same as AI, which means AI should not be held accountable for all job loss by automation orrobotics.Despite numerous forecasts on how automation or robots will replace human labour, a recent UNCTAD report shows that many existing studies mainly focus on the technical feasibility of job displacement while neglecting the factor that what is technically feasible is not always economically profitable. As a result, existing studies often overestimate the potential adverse effects of robots, especially in developing countries. Indeed, the same UNCTAD report points out that robot deployment has remained very limited.

10.2 Business Issues of AI: For all its benefits, AI projects are often costly and complex and come laden with security and privacy concerns. Don't let these issues blindside you: carefully research the business challenges around AI, and compare the costs of adopting an AI system against losing its benefits.[26]

i. **AI is expensive.** Advanced AI does not come cheap. Purchase and installation/integration prices can be high, and ongoing management, licensing, support, and maintenance will drive costs higher. Build your business case carefully; not just to sell senior management, but to understand if the high cost is worth the benefits – especially if a big business driver is cost reduction.

[26]https://www.datamation.com/big-data/artificial-intelligence-impacts-business-the-ai-business-revolution.html

ii. **AI takes time.** Give installation plenty of time in your project plan, and build your **infrastructure** before the system arrives. High-performance AI needs equally high-performance infrastructure and massive storage resources. Businesses also need to train or hire people with the knowledge skills to manage AI applications, and complex AI systems will require training time and resources. Many businesses will decide to outsource some or all their AI management; often a good business decision but an added cost.

iii. **AI needs to be integrated.** There may also be integration challenges. If your AI project will impact existing systems like ERP, manufacturing processes, or logistics systems, make sure your engineers know how to identify and mitigate interoperability or usability issues. Businesses also need to adopt big data analytics infrastructure for predictive and business intelligence AI applications.

iv. **AI has security and privacy concerns.** Cybersecurity is as important for AI applications as it is for any business computing – perhaps more so, given the massive amounts of data that many AI systems use. Privacy issues are also a concern. Some of AI's most popular use cases -- ranging from targeted social media marketing to law enforcement -- revolve around capturing user information. Businesses cannot afford to expose themselves to security or privacy investigations or lawsuits.

v. **AI may disrupt employees.** Some positions will benefit from AI, such as knowledge workers who give up repetitive manual tasks in favor of higher level strategic thinking. But other employee positions will be reduced or eliminated. Although businesses must turn a profit, employee disruption is awkward, unpopular with the public, and expensive. According to Infosys, companies with mature AI systems make it a point to retrain and redeploy employees whose positions were impacted by AI automation. Deploying AI systems is a big project, but is ultimately a business technology like any other system. Carry out due diligence. Research and build your expertise and infrastructure. Then deploy, use, refine, and profit.

10.3 Legal Issues of AI: Uncertainty associated with AI development will create new challenges to the existing legal system. AI may challenge social norms and laws. For instance, it may cause institutional conflicts within the legal framework in terms of civil subjects, obligations, intellectual property and road safety, which could have a negative impact on economic security, and social management and stability.[27] The first major problem is whether AI has the capacity of being treated

[27]http://www.straitstimes.com/asia/east-asia/the-inherent-legal-risks-in-ai-development-china-daily-columnist

as a civil subject. That is to say, should we treat AI creations such as robots as a "machine" or a "human being"? On Oct 25, Saudi Arabia granted citizenship to a humanoid robot called "Sophia", becoming the first country in the world to do so. And the European Parliament Committee on Legal Affairs has advanced a legislative motion on civil law for robots, in a bid to grant high-end AI autonomous robots the legal status of "electronic persons". However, these attempts create challenges for the traditional civil subject system. Since a robot is different from a natural person, will it have the same legal rights, obligations and liability as a human being even after being legally considered a civil subject? For instance, if some AI for specific use, such as a driverless car or drone, or a nursing robot, causes physical harm or property loss to a person while performing its duty, what punishment, if any, will it receive? Will the AI "machine" bear the full legal responsibility alone? Or will its designer, developer, owner or user be held responsible for the physical injury or property loss? Furthermore, as AI humanoid robots learning capacity improves, it might create high-quality literature or art works, or exemplary music compositions. Will such products be protected by the copyright law, and if yes, who will own the copyright? What will be the duration of such patent protection? How will the humanoid robot exercise its rights?Such legal problems have to be solved sooner rather than later, considering the rapid pace of AI development. AI development is a complicated project that is related to a country's development. Therefore, Nation should pay greater attention to the potential risks AI could cause during the development process. And based on national conditions and social reality, we should make full preparations in terms of laws and regulations to avoid the potential risks, as well as ensure the safe, reliable and controllable development of AI.

11. **AI Policy Priorities for Government:** It is well recognised that development of AI has been largely market-driven to date. However, government policy will have a crucial role to provide a direction for industry and to deliver on the ambitions of the 2030 Agenda. Governments in the Asia-Pacific region have been at the forefront of developing and implementinginnovative policies and strategies for AI development. In July 2017, China published a comprehensiveAI development policy with the overarching goal to make the country “the front-runner and globalinnovation centre in AI” by 2030. In Singapore, with an investment of over $100 million for the nextfive years, AI.SG was set up in 2017 to bring together government agencies, universities andinstitutes, investors, industry, and start-ups to advance AI research, development, and practical use in Singapore. [28] The Japanese government recently announced that it will set up an AI panel with theaim to design a road map for development and commercialisation of AI. In addition, the Ministry of Science, ICT and Future Planning (MSIP) of the Republic of Korea has laid

[28]https://www.techinasia.com/singapore-aisg-startups.

out the "ArtificialIntelligence Information Industry Development Strategy", which aims to strengthen the foundation for AI growth46. In late 2016, the government published their "Intelligence Information Society 4th Industrial Revolution Medium- to Long-term Comprehensive Response Plan.[29] How AI will unfold in the future remains unknown. There seems to be consensus that in the long term,the impacts of AI could be profound. In addition, the following challenges for assessing the social,economic and environmental impacts of AI make it difficult to develop effective AI policies.[30]

i. **Lack of data for developing countries:** A recent study by UNDESA highlighted that "very little is known about the potential impact of newtechnologies on low-income countries"[31] Existing studies are mainly focused on large economies suchas USA, European Union and China. In contrast, little attention has been given to developingcountries. Furthermore, there is little evidence to show that data and information on AI in developing ountries has been collected.

ii. **Inconsistent forecasting**: Forecasting on the impacts of AI are inconsistent and this is not only limited in the Asia-Pacific region. For instance,in 2013, researchers at Oxford University estimated that almost half of USA occupations were likely to be automated. In contrast, McKinsey in 2016, after analysing 830 occupations, concluded that just 5% of them could be completely automated[32]

iii. **Lack of public debate:** How AI will unfold in the future remains uncertain. It is essential for all stakeholders of society to havean opportunity to understand the topic and participate in the discussion. However, public debate inAsia and the Pacific is much less than similar activities in Europe andNorth America. For instance, thefirst congressional hearing on AI in the USA in 2016 and the first session of the House of Lords' selectcommittee on AI in the United Kingdom in 2017 are accessible to the public.

iv. Lack of human capacity, especially government officials and policymakers, in developing AI policy: Government officials and policymakers are often not AI technical experts, they do not have to be.However, they need adequate knowledge of AI so that effective policies can be formulated. Indeveloping countries in the region, capacities of government officials need to be enhanced.

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[29]See: http://english.msip.go.kr/english/msipContents/contentsView.do?cateId=msse44&artId=1325782

[30]http://www.unescap.org/sites/default/files/ESCAP_Artificial_Intelligence.pdf

[31]https://www.un.org/development/desa/dpad/publication/frontier-issues-artificial-intelligence-and-other-technologies-will-define-the-future-ofjobs-and-incomes/

[32]https://qz.com/904285/the-optimists-guide-to-the-robot-apocalypse/

v. **Lack of more detailed classification of AI:** In many existing studies, AI, automation and robotics have been used interchangeably. Nevertheless,a classification of AI, automation and robotics has important policy implications. For instance,automation, which is not necessarily AI-empowered, may have more direct impacts onmanufacturing industries in developing countries than AI.

12. **AI in 2018:** Ralph Haupter, President, Microsoft Asia in an interview said he sees four key AI developments happening over the next 12 months:[33]

i. **Mass adoption of AI starts from 2018**:AI adoption is set to soar in 2018 and beyond when organizations start to see clear benefits being reaped by AI innovators such as MFTBC. IDC forecast that worldwide AI revenues will surge past US$46 billion in 2020. Closer to home, AI investment in Asia Pacific is predicted to grow to US$6.9 billion by 2021, expanding rapidly by 73% (CAGR)

ii. **Ubiquitous Virtual Assistants**: We will begin to see the adoption of broad-scale AI in the form of conversational AI chatbots in both consumer and business scenarios. In fact, Gartner predicts that by 2020 more than 85% of customer interactions with the enterprise will be managed without a human interaction and AI will be the key technology deployed for customer service.

iii. **Democratizing data and decision-making**: In a world where more data exists than ever before, the ability to deliver meaningful business insights from that data to the maximum number of relevant employees becomes of paramount importance. AI will be the key technology for making that happen by bringing together data from employees, business apps, and the world.

iv. **Building trusted foundations for AI:**There will be increasingly more discussions at governmental and industrial levels to create formal governance and regulations in the usage of AI. We saw these discussions with the onset of eCommerce and the advent of cloud technologies. It is critical for transparent public-private conversations to take place as they will shape how AI can benefit economies and societies in a fair, transparent and trusted way.

13. **Conclusion:** In conclusion, AI will have far reaching consequences throughout the region and across the globe. The Asia-Pacific is leading from the front and is forecast to be the prominent market of the future. This prominent position, however, means governments need to think carefully about the role and scope of AI in pursuit of sustainable development. Specifically, governments must address the ethical dilemmas, develop a workforce fit for the future, put in place adaptive and anticipatory regulation, incentivise

[33]https://news.microsoft.com/apac/2018/01/03/welcome-2018-year-ai/

the private sector to act responsibly, and utilise AI to deliver more efficient public service delivery.This will require thoughtful research and policy formulation; cross-government cooperation; intergovernmental knowledge-sharing and consensus-building; and honest, open and regular discussion with the civil society and private sector, specifically technology developers. However, governments currently lack the necessary coordination and processes to prepare for an AI revolution.[34]Nonetheless, the revolution will come, and the United Nations could play a greater role in helping the region navigate this future.

[34]https://www.un.org/development/desa/dpad/publication/frontier-issues-artificial-intelligence-and-other-technologies-will-define-thefuture-of-jobs-and-incomes/.