

Leadership

Wise Leadership and AI | Chapter 5

China and the US —
The AI Race



By
Dr. Peter Verhezen
With
Andrew Thomson
Jimmy Chen



Amrop

Leaders For What's Next

China and the US | The AI Race

Executive Summary

The trend towards ‘techno-nationalism’, where a nation relies on its own resources to become a leader in AI machine learning and other crucial strategic tech areas, is fully underway.

The groundbreaking deep learning approach to AI has turbo-charged the cognitive capabilities of machines. This ‘narrow artificial intelligence’ (versus the as-yet-unachieved ‘general artificial intelligence’) can now do a better job than humans in a range of domains, from identifying faces and recognizing speech, to issuing loans.

Unsurprisingly, many companies, and the countries from which they originate, are eager to master them.

How these countries, especially the USA and China, the two most advanced in AI, choose to compete and cooperate, will have a dramatic effect on global economics, and geopolitics in general.

1

The stakes for global AI pre-eminence are enormous

‘Winner-take-all’ and ‘first-mover’ dynamics in internet-based industries have huge potential to fuel the economic growth of countries. AI technology has a powerful role to play in maintaining social stability, from health and transportation, to the justice system and public security. For nations that want greater independence from the US engine, a strong AI base will help them decouple.

2

China’s AI industry is under the spotlight

China aims to be one of the most advanced nations in AI by early 2021, leading in most fields by 2025, with direct AI output exceeding USD 60 billion. Some predict it will be the world’s primary innovation center by 2030. AI is a paving stone in the New Silk Road proposed by President Xi Jinping as part of the Belt and Road Initiative (BRI); trade networks connecting Asia, Africa, and Europe. The vision is of a world-class technological superpower, an international community of practice built around top Chinese AI talent, with China as a primary global AI exporter. This geopolitical re-positioning would allow China to cement partnership and export opportunities, advancing its technical and geopolitical leadership objectives.

3

China has numbers on its side

Much AI development and discovery work was driven by elite researchers clustered mainly in the USA, Canada, Israel, UK and France. Now the age of AI implementation is dawning. Computing power and good AI algorithm engineers are vital. But beyond a certain threshold, data is key for power and accuracy. Regarding 4 critical success factors for AI implementation; data, entrepreneurs, AI scientists and an AI-friendly environment, China is well placed to outpace the USA. Its AI entrepreneurs are implementing data in multiple commercially-viable AI-powered applications, drawing on a domestic population of 731 million internet and 685 million mobile users in 2019, over twice the USA equivalents. China also has about 286 million digital natives versus 75 million in the USA. Thus, the struggle for AI supremacy will become fierce.

4

Rising giants

US firms that widely use AI algorithms include Google, Amazon, Microsoft, Facebook and WhatsApp, but also Apple, IBM, Netflix, Airbnb and Uber or Lyft. Chinese-backed equivalents include Alibaba and its online shopping website Taobao, the Alipay payment platform (54% of the Chinese market), and Tencent, with its social messaging app WeChat and WeChat Pay (32%). Further examples include QQ Wallet, Baidu, or Didi Chuxing, the player that drove Uber out of China. In robotics, European firms — especially German - may still play a globally competitive role. Germany's AI strategy plays to its industrial strengths, drawing on data in cyber-physical manufacturing and the industrial IoT.

5

The Chinese government has a clear strategy

AI's impact on the Chinese economy is estimated at US\$ 7 trillion by 2030-2035 (a quarter of future GDP), contributing 1-2% to GDP growth p.a. The government has supported its "national champions" with substantial funding, encouraged domestic companies to acquire chip technology through overseas deals, and made long-term bets on supercomputing facilities. Baidu and start-ups like Cambricon are designing chips specifically for use by AI algorithms. Its strategy embraces strong state support and intervention, the transfer of technology and talent, and investment over a long-term period.

6

The battle between China and the US looks set to intensify

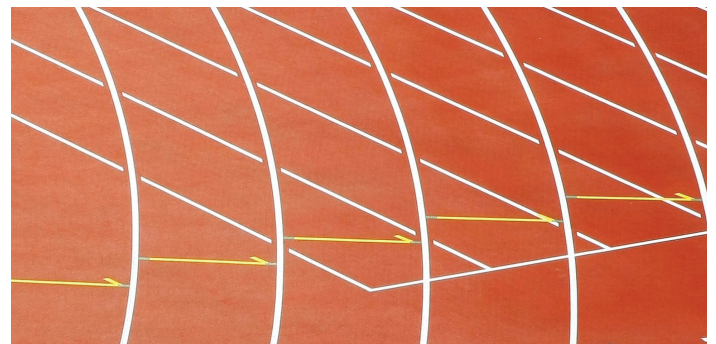
Geopolitics will be increasingly determined by the power struggles in the AI field. Yet, even if China has a numbers advantage over the USA when it comes to *data as the new oil*, the US still leads in the theoretical frameworks for deep learning innovation. And although China has the edge in face recognition algorithms, Google and other Silicon Valley players are still generally ahead of the AI game. Moreover, China still lacks the international data necessary to reduce biases for apps that could be used beyond its national borders. But there is everything to play for — and with.

7

China's AI talent is in demand

In 2018, China had 50,000 experienced AI professionals, versus 850,000 in the US. But China has a significant manpower advantage in training and labelling the data needed by AI applications. And it has been highly creative, with rapid user adoption and acceptance creating a strong feedback loop. Its fundamental AI research targets image and speech processing. In image recognition, China is now world-class, with leading companies in NLP such as Flytek, Baidu, Megvil (Face+++) and SenseTime.

Recent research highlighted a 'global brain drain, US brain gain.' Most upper-tier research happens at US institutions who rely on foreign-born talent for more than half of their output. Chinese researchers are the largest source of global AI talent. Most end up studying in the US, and working for US companies. However, there is evidence that ethnic Chinese researchers are returning from the US, and that China is turning the tables on the brain (and corporate) acquisition flow.



8

China's AI strategy has 4 factors – and it is gaining ground

1. Hardware in the form of chips for training and executing AI algorithms.
2. Data as an input for AI algorithms.
3. Research and algorithm development.
4. A commercial AI ecosystem benefiting from guidance funds set up by local governments and state-owned companies.

The Artificial Intelligence Potential Index (AIPi) estimates a country's overall AI capability. A 2018 assessment put China's AIPi score at 17/100, versus the US at 33/100. However, this is relative and individual companies may gain a specific competitive advantage, not quantified at the aggregate level. Just a year later, another report scored the US 44 out of 100 available points, China 32 and the EU 23. If the US (still) leads in theoretical potential, China is implementing at speed, hindered by fewer legacy systems.

9

Is AI poised to bring about a New World Order?

Georgetown Professor Nicholas Wright distinguishes three facets:

1. Political regimes: Liberal democracies could compete with authoritarianism.
2. Social sectors: Practical AI applications will transform multiple, fundamental fields: from transport, to healthcare or defense.
3. Singularity and the sense of self: AI 'singularity' will change our self-concept as humans.

AI applications provide a nation with a decisive strategic advantage in international security. Yet countries must prepare for answers to foreign cyber-attacks, beyond the "do-nothing or do-little-approach". Several scientists see AI as part of a surveillance system, e.g. via Silicon Valley companies predicting and influencing behavior, while the government closely monitors its citizens. AI may become the newest tool to aim for some kind of global supremacy.

10

Wise digital leadership is more important than ever

AI raises the possibility of social disorder and political collapse due to widespread unemployment and inequality between the AI 'haves' and 'have-nots'. Ethical concerns require a robust civil society and in the growing battle between economic powers, a major risk is that a given party chooses to magnify the capabilities of AI over safety. Regulations and global governance may be needed (without stifling AI research), making social and political choices that align our interests as a community. Outsmarting the 'Other' will not be enough – leaders must be wise enough to prevent destructive forces.

We should understand AI's limits and darker side and the scale, scope and speed of potential disruption. Only wise, measured and mindful leadership will be able to conceive of some form of global good for these innovative but ethically-neutral techniques, realistically implementing them in our specific world context.

Jimmy Chen, Managing Partner of Amrop China, suggests that "The New Intelligent Economy requires multi-faceted leadership talent; professionals with sound knowledge of technology, people and operations management. These people are in scarce supply. Even the most senior digital leaders are often only in their 30s. If senior IT talent is plentiful, then digital experts are a new breed, emerging only 5-6 years ago in China."

China and the US | The AI Race

The stakes for global economic pre-eminence in AI are enormous. 'Winner-take-all' and 'first-mover' dynamics in internet-based industries will enable successful countries to sustain economic growth, meet GDP targets, and become more independent of the US economy — assuming that such a decoupling would be possible or desirable.

Many countries have a national interest in employing AI technology to maintain social stability (including judicial reviews, medical care, defence and public security). AI is seen by many thinkers as a revolutionary technology that could significantly impact the balance of power.

China's AI industry, in particular, is under the spotlight. This vast country is fully embarked on a journey to be in line with the most advanced countries in the domain by early 2021. By 2025, China aims to lead the world in some AI fields (with AI industry output exceeding USD 60 billion and AI-related output grossing USD 750 billion). By 2030, according to some observers, China may become the world's primary AI innovation center (worth USD 150 billion and in AI-related industries, USD 1,5 trillion).

The New Intelligent Economy requires multi-faceted management talent; professionals with a sound knowledge of technology, people and operations. These people are in scarce supply.

AI on turbo-charge

If data are the new oil for economies, then who controls these data and how they are regulated will be crucial. It is generally understood that AI (automation) is set to have a quite dramatic impact on jobs in the short and medium-term, especially as not only blue-collar but also white-collar jobs are replaced by faster machine learning devices or robotics.

In ancient China, 'Go' represented one of the four art forms any Chinese scholar was expected to master, leading to Zen-like intellectual refinement and wisdom. In May 2017, the DeepMind learning machine AlphaGo (backed by Google, arguably the world's top technology company) beat the best Go player, Ke Jie. This was China's "Sputnik" moment. The government mobilized for national AI innovation.

The groundbreaking deep learning approach to AI has turbo-charged the cognitive capabilities of machines. These programs are known as 'narrow artificial intelligence' (versus the as-yet-unachieved 'general artificial intelligence'). They can now do a better job than humans in a range of domains, from identifying faces and recognizing speech, to issuing loans. Unsurprisingly, many companies, and the countries from which they originate, are eager to master them.

How these countries, especially the USA and China, the two most advanced in AI, choose to compete and cooperate, will have a dramatic effect on global economics, and geopolitics in general.



Follow the Digital Silk Road

From a geopolitical perspective, mastery of AI can be seen as part of the New Silk Road that President Xi Jinping has put forward as the next big step for the superpower

The New Silk Road is part of the broader Belt and Road Initiative (BRI), a project to link economies via a series of trade networks connecting Asia, Africa, and Europe. China is preparing to play a dominant role in financing trading routes through land, sea and digital reality.

President Xi Jinping's vision is to develop a world-class technological superpower, an international community of practice built around top Chinese AI talent, with China becoming a primary exporter of AI technologies around the globe. The BRI economic model seeks to transform China's reputation: from a manufacturing-based society that exports cheap goods abroad, to one of cutting-edge technological leadership based on AI and other high-tech innovation. This geopolitical re-positioning is aimed at allowing China to cement partnership and export opportunities, advancing its technical and geopolitical leadership objectives.

Lucky numbers

Until now, a lot of the difficult work in AI development and discovery has been driven by a handful of elite researchers, virtually all clustered in the USA, Canada, Israel, the UK and France. Now, we are entering the age of AI implementation, where we see real-world applications.

In this age of big data, successful AI algorithms need feeding. Certainly, computing power and good AI algorithm engineers are key to making a difference. However, once computing power and engineering talent reach a certain threshold, it is data that becomes decisive in determining the overall power and accuracy of an algorithm.

What are China's prospects, going forward? By looking at the four critical success factors for successful AI implementation – abundant data, hungry entrepreneurs, AI scientists and an AI-friendly environment — we can assume that China has a good chance to emerge as a leading power in the domain, inching ahead of the USA in the near future.

Researcher and venture capitalist entrepreneur Kai-Fu Lee argues that moving from discovery to implementation reduces the traditional disadvantages of one of China's weak points ('outside-the-box' thinking about research questions) and leverages its most significant strength, "scrappy entrepreneurs with sharp instincts for building robust businesses" — something that requires speed and adaptability. China's alternate digital universe now creates and captures vast reservoirs of new, real-world data, and this will prove invaluable in an era of AI implementation. Jack Ma's description of Alibaba's goal indicates a clear ambition to play a global role in business (and even beyond): *"to globalize e-commerce so that small businesses and young people all over the world can buy and sell globally."*

AI is a primary driver of China's rapid development towards the Intelligent Economy. Set to have a massive impact on billions of lives worldwide, the intelligent economy is having a transformative effect on China. It sits together with other enabling technologies: 5G, Cloud, Big Data, Internet of Things, Mixed Reality (MR), Blockchain, and Edge Computing. In China, as elsewhere, it will catalyze demand creation, transforming business models and manufacturing processes. It will change our lifestyles, ('smart living') the cities we live in ('smart cities') and how we travel within and through them, how we learn and are kept healthy. It will also have a profound effect on government administration processes and security.



Chinese AI entrepreneurs have everything to play for, and with. They are already finding ways to implement data in commercially viable AI-powered applications, drawing on China's huge population of 1,3 billion people, of whom 731 million are internet users and 685 million mobile users, versus 287 million internet users and 262 million mobile users in the USA in 2019. Additionally, China has roughly 286 million digital natives versus 75 million in the USA. Direct and indirect competition between US and Chinese firms will very likely 'ramp-up' into a fierce struggle for AI supremacy.

Also, the fact that China's government applies a utilitarian view (in contrast to Europe's market-determined approach) means that a 'policy-push' will encourage faster adoption of those technologies. Moreover, the Chinese government has a strategy to support its lead: a strong degree of state support and intervention, the transfer of both technology and talent, and investment over a long-term period.

Rising giants

US firms that widely use AI algorithms for their applications include Google, Amazon, Microsoft, Facebook and WhatsApp, but also Apple, IBM, Netflix, Airbnb and Uber or Lyft. Chinese-backed equivalents include Alibaba and its online shopping website Taobao, the Alipay payment platform (occupying 54% of the Chinese market), and Tencent, with its social messaging app WeChat and WeChat Pay (32% of the Chinese market). Further examples include QQ Wallet, Baidu and Didi Chuxing, the player that drove Uber out of China. Interestingly, Didi is now itself in a battle with Meituan-Dianping (a tech unicorn backed by Tencent).

In line with its strategy to lead, China's government has supported its "national champions" with substantial funding, encouraged domestic companies to acquire chip technology through overseas deals, and made long-term bets on supercomputing facilities. Baidu and startups like Cambricon are designing chips specifically for use by AI algorithms.

And above everything, as we've mentioned, is the access to large quantities of data as a crucial driver for any AI system. This is a distinct advantage for China, given the sheer size of its domestic market. Consider China's progress in allowing for AI uptake, driven by big data from one fifth of all humans on the planet, combined with its gladiatorial entrepreneurs, unique internet ecosystem, and a proactive government push, and it's not too hard to imagine a shift of AI supremacy in its favor. In robotics, however, European firms — especially German - may still play a global competitive role. Germany's AI strategy plays to its industrial strengths, drawing on data use in cyber-physical manufacturing and the industrial IoT.

Of dragons and eagles

The battle between China and the US is well-installed and looks set to intensify. Geopolitics will increasingly be determined by power struggles in the AI field, and who wins most from this new technology. Even if China has a numbers advantage over the USA when it comes to data as the new oil, this alone will not be sufficient to gain AI supremacy. The theoretical frameworks for deep learning innovation remain indispensable. And here, the US is still in the lead. Although China may currently have the edge in face recognition algorithms, and smartphone apps for financial services are leapfrogging, Google and other US companies in Silicon Valley are still ahead of the AI game. Moreover, China does not yet have the international data necessary to reduce biases for apps that could be used beyond its national borders.

Above everything is the access to large quantities of data as a crucial driver for any AI system. This is a distinct advantage for China.



Competitive intelligence – the talent angle

This said, it is not too difficult to imagine that China may gain an advantage by having established clusters of world-class AI innovation centers by 2030. Developing AI systems depends on quantity *and* quality. And China has a significant manpower advantage in 'training' and labelling the data that are needed by AI applications, consumer uses or domestic surveillance, for example.

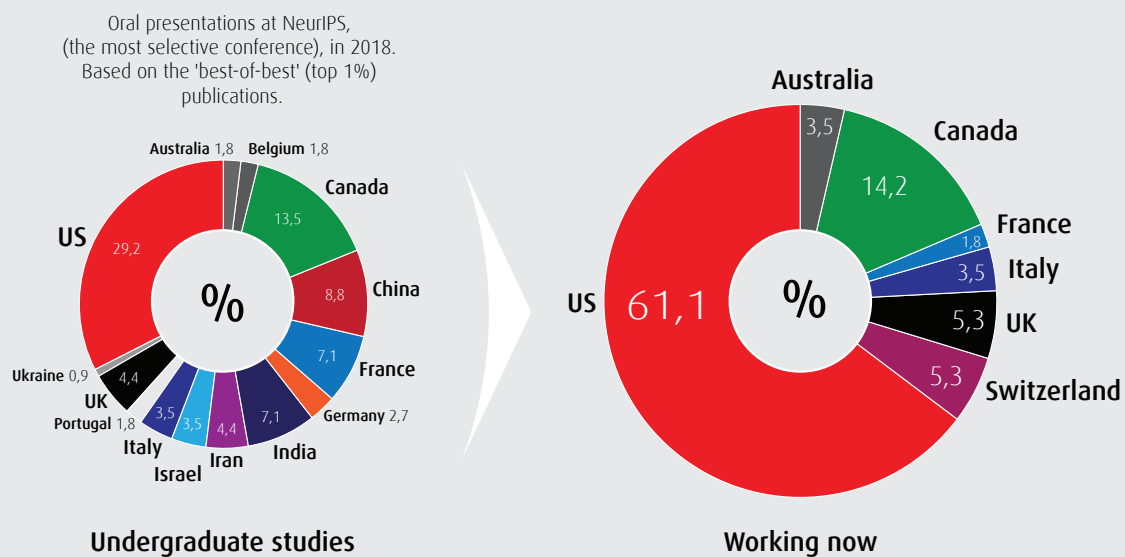
Certainly, as late as 2018, China was still dwarfed by the US regarding the number of experienced AI professionals in its ranks: 50,000 versus 850,000¹. And even if lower-tech AI is flourishing all over China, access is still beyond most people's imagination.

Still, China has been highly creative in the application layer of AI, with rapid user adoption and acceptance, creating a strong feedback loop. Its fundamental AI research is focused on image and speech processing, image recognition, machine vision, speech recognition and natural language processing (NLP). These key AI-enabling technologies, (first developed at Canadian and US research centers), are now applied to all market-leading smartphones. Particularly in image recognition, China has already become world-class, dominating in global competitions. Leading companies in NLP include Flytek, Baidu, Megvil (Face+++)² and SenseTime.

The Paulson Institute in Chicago is "dedicated to fostering a US-China relationship that serves to maintain global order in a rapidly evolving world." Its think tank, MacroPolo, recently studied the national origins of elite AI researchers². It found that 29% of oral presentations at a major conference were made by undergraduates from the US (in terms of their country of origin, and/or the institution to which they were affiliated). But the second highest country was China (9%). Looking at where elite AI researchers work today, it found that the US absorbs an even greater share (61%), observing a "global brain drain, US brain gain." In short, the majority of elite (and upper tier) research happens at US institutions relying on foreign-born talent for over half their research output. Chinese researchers are an important source of global AI talent, and most end up studying in the US, and working for US companies. Elsewhere, however, there is evidence that ethnic Chinese researchers are also returning from the US, and that China is turning the tables on the brain (and corporate) acquisition flow.

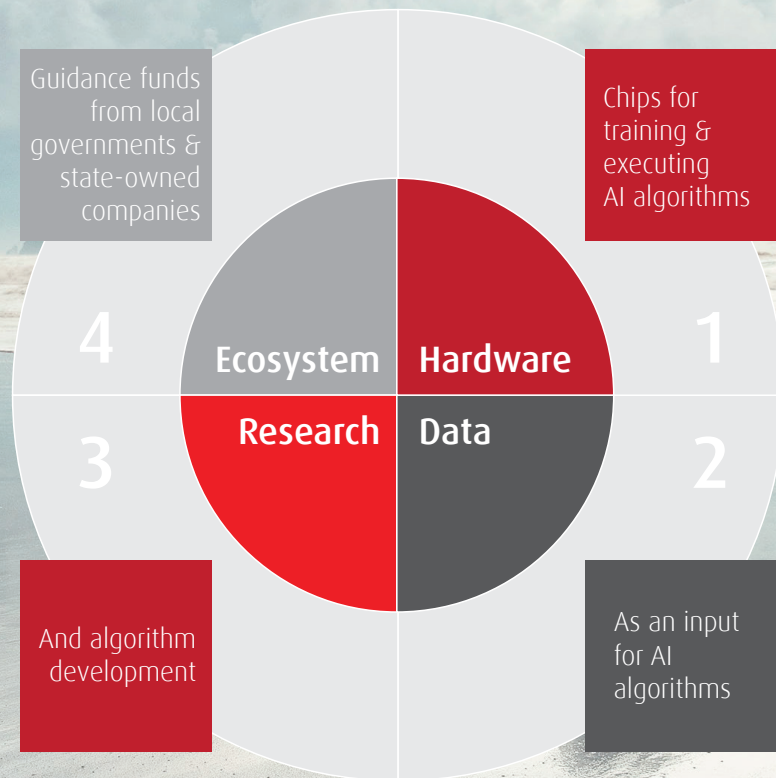
Global brain drain, US brain gain

Analysis by Joy Dantong Ma, MacroPolo/Paulson Institute



1 - Ding, J., (2018) Deciphering China's AI Dream, Centre for the Governance of AI, Future of Humanity Institute, University of Oxford
 2 - Sheehan, M., Ma, D., (2020) The Global Balance and Flow of AI Research Talent, The Paulson Institute's Macro Polo

China's national AI strategy is based on the overall development of 4 factors



How can we assess the current state of AI capabilities across the four drivers of AI development of both superpowers? It rather depends on where you look for the evidence.

The Artificial Intelligence Potential Index (AIPI) estimates a country's overall AI capability. According to a 2018 assessment³, China's AIPI score was 17/100, about half of the US score of 33. Its author concluded: "China currently trails the US in every driver except for access to data". We need to keep in mind that this AIPI score is relative and that individual companies may gain a specific competitive advantage that is not necessarily quantified at the aggregate AIPI level. Also, a lot can happen in two years in China.

3 - Ding, J., (2018) Deciphering China's AI Dream, Centre for the Governance of AI, Future of Humanity Institute, University of Oxford

A Case of Collaboration

Microsoft Asia (MSRA) in Beijing was the first major foreign computer science research institute. Many of China's top technology entrepreneurs and AI scientists have passed through its doors.

'Deep Residual Learning for Image Recognition' * a method for dramatically improving the performance of the neural networks underlying the current AI boom is the most cited research paper in any field over the last five years. It set new records for computer vision and was later applied to hundreds of other applications, including Google's AlphaGo Zero.

Sheehan, M., Ma, D., (2020) *The Global Balance and Flow of AI Research Talent, The Paulson Institute's Macro Polo*

*He, K., et al., (2016), *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*

Even if the US is in the lead in theoretical potential, China is implementing at speed, with fewer legacy systems to unwind.

Indeed, just a year later, another report suggested the gap was closing. Whilst the US led in four out of six categories (talent, research, development, and hardware), China was found to lead in two areas (adoption and data). Overall, the US scored 44 out of 100 available points, China 32, and the European Union, 23⁴.

Furthermore, even if the US is in the lead in theoretical potential, China is implementing at speed, with fewer legacy systems to unwind.

In overall terms, it is probably fair to assume that economic benefits are the primary and immediate driving force behind China's development of AI. It can enable the country to dramatically improve its productivity levels and meet GDP targets. Estimates place AI's impact on the Chinese economy at US\$ 7 trillion by 2030-2035, or a quarter of future GDP. AI's contribution to GDP growth is estimated to be 1-2% annually.

China's adoption of AI technologies could also have implications for social stability (in a supervisory and security capacity). Still, AI will undeniably benefit a broad range of the public services we mentioned at the beginning of this article, such as judicial and medical care.



4 - Castro, D., McLaughlin, M., and Chivot, E., (2019) Who Is Winning the AI Race: China, the EU or the United States? Center for Data Innovation



A new world order?

Anticipating AI's challenges to the global order requires a better understanding of the different fields in which they could have an impact. Georgetown Professor Nicholas Wright distinguishes three facets, which we summarize here:

1	2	3
Political regimes	Social sectors	Singularity and the sense of self
Liberal democracies could compete with authoritarianism: New AI-related technologies may help reinvigorate the idea that more authoritarian regimes are better placed to enrich their citizens and maintain social order. Particularly the latter seems to be harder to achieve in polarized democratic regimes.	Practical AI applications will transform multiple, fundamental fields: Whether in the transport sector, (e.g. in autonomous driving cars), in beneficial healthcare applications, or social use.	Fundamental research in AI algorithms is inching towards a point of 'singularity'. This irreversible technological growth may have profound consequences on our self-concept as humans.

Indeed, any unequal power fight over AI supremacy could undermine the current world order; the distribution of power between and amongst states and other key actors. If this distribution has previously allowed a relatively stable pattern of relationships and behaviors, then AI could turn that all around in a potentially destructive manner.

AI in general is interpreted by a number of scientists as part of a surveillance system, be it by a Silicon Valley company that can accurately predict behavior and thus potentially manipulate it, or by any government that is able to closely monitor its citizens.

For these reasons, it may become the newest tool to aim for some kind of global supremacy in the form of increased soft power, through (for example) the concrete impact of AI applications on domestic behavior. Indeed, global institutions and norms create a significant arena for competition.



Wise Digital Leadership

Another threat posed by AI is the possibility of social disorder and political collapse stemming from widespread unemployment and the gaping inequality between the AI 'haves' and 'have-nots'. Ethical concerns require a robust civil society. The growing battle between economic powers risks making economics even more transactional than is already the case. One of the major risks is that one party or another chooses only to magnify the capabilities of AI without taking its safety aspects into account.

Regulations and some form of global governance may become necessary, and these will need to be implemented without stifling AI research. As always, we only can hope that the rewards will outweigh the downsides of this innovative technology. However, this will require social and political choices that align our interests as a community and society. The aim should not just be to outsmart the other party, but to be wise enough not to allow destructive forces to prevail.

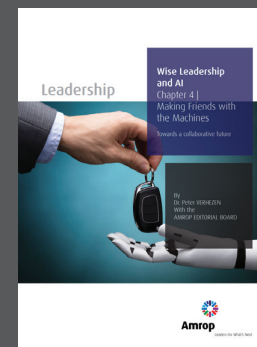
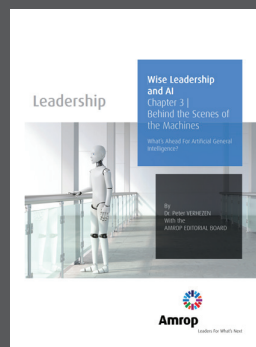
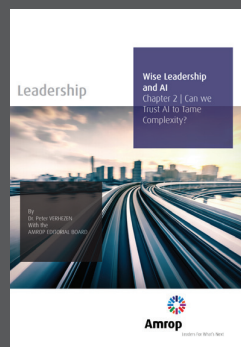
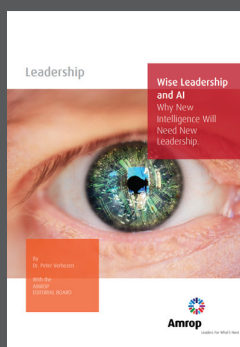
And yes, we should understand the limits and darker side of artificial intelligence, without underestimating the scale, scope and speed of potential AI disruption.

Only wise, measured and mindful leaders will be able to define and imagine some form of global good for these innovative but ethically-neutral techniques, realistically implementing them in our specific world context.

The last word goes to Jimmy Chen, Managing Partner of Amrop China: "The New Intelligent Economy requires multi-faceted leadership talent; professionals with sound knowledge of technology, people and operations management. These people are in scarce supply. Even the most senior digital leaders are often only in their 30s. If senior IT talent is plentiful, then digital experts are a new breed, emerging only 5-6 years ago in China." The artificial intelligence race, after all, remains a very human struggle.

The New Intelligent Economy requires multi-faceted management talent — professionals who know technology, people and operations. These people are in scarce supply.

AI and Wisdom | Further Reading from Amrop



www.amrop.com/insights

References

- Burkhardt, R., Hohn, N. & C. Wigley, (2019). "Leading your organization to responsible AI", McKinsey Analytics, May
- Castro, D., McLaughlin, M., and Chivot, E., (2019) Who Is Winning the AI Race: China, the EU or the United States? Center for Data Innovation
- Davenport, T.H. & R. Ronanki, (2018), "Artificial Intelligence for the Real World. Don't start with moon shots", Harvard Business Review, January-February: 108-116
- Ding, J., (2018), Deciphering China's AI Dream, Oxford, Future of Humanity Institute
- Erisman, Porter, (2015), Alibaba's World. How a remarkable Chinese company is changing the face of global business, London, Palgrave MacMillan,
- Finlay, S., (2018), Artificial Intelligence and Machine Learning for Business. A no-nonsense guide to Data-driven Technologies, London, Relativistic Publications
- Ford, M., (2018), Architects of Intelligence. The truth about AI from the people building it, Birmingham, Packt Publishing
- Fournoy, M. & M. Sulmeyer, (2018), "Battlefield Internet. A Plan for Securing Cyberspace", Foreign Affairs, September-October: 40-46
- Furr, N. & A. Shipilov, (2019), "Digital doesn't have to be Disruptive. The best results can come from adaptation rather than reinvention", Harvard Business Review, July-August: 94-103
- Gupta, S., (2018), Driving Digital Strategy. A guide to reimagining your business, Boston MA, Harvard Business School Press
- Hennessey, S., (2017), "Deterring Cyberattacks. How to reduce vulnerability", Foreign Affairs, Nov-Dec: 39-46
- Kiron, D. & M. Schrage, (2019), "Strategy for and with AI", MIT Sloan Management Review, Summer: 30-35
- Kizza, J.M., (2017), Ethical and Social Issues in the Information Age, Cham, Springer
- Klotz, F. (interviewing S. Athey), (2019), "The Perils of Applying AI Prediction to complex decisions", MIT Sloan Management Review, Summer
- Knight, W., (2019), "China's AI awaking", MIT Technology Review, Vol. 120(6): 66-72
- Lanier, J., (2013), Who owns the Future, London, Penguin
- Lee, Kai-Fu, (2018), AI Superpowers China, Silicon Valley, and the New World Order, New York, Houghton Mifflin Harcourt Publishing Company
- Libert, B; Beck, M & J. Wind, (2016), The Network Imperative. How to survive and grow in the Age of Digital Business Models, Cambridge MA, Harvard Business Review Press
- Likens, S. & K. Kersey, (2019), "Automating trust with new technologies", Strategy + Business, May
- Lindstrom, M., (2008), Buyology: Truth and Lies about Why we Buy, New York, Broadway Books
- Lohr, S., (2015), Data-ism. The revolution transforming decision-making, consumer behavior, and almost everything else, New York, HarperCollins
- London, S., Chui, M. & C. Whigley, (2019), "The ethics of Artificial Intelligence", McKinsey & Company, January
- Luger, G.F. & W.A. Stubblefield, (1998), Artificial Intelligence. Structures and Strategies for Complex Problem Solving, Harlow; Reading; Berkeley, Addison Wesley Longman
- Pentland, A., (2011), "Society's nervous system: Building Effective Government, Energy and Public Health Systems", MIT Open Access Articles, October: <http://dspace.mit.edu/handle/1721.1/66256>
- Pentland, A., (2015), Social Physics. How social networks can make us smarter, London, Penguin Books
- Polson, N. & J. Scott, (2018), AIQ. How Artificial Intelligence works and how we can harness its power for a better world, London, Bantam Press-Penguin
- Posner, E.A. & E.G. Weyl, (2018), Radical Markets. Uprooting Capitalism and Democracy for a Just Society, Princeton, Princeton University Press
- Priest, D., Krishnamurthy & A. Blanter, (2018), "The New Automation is Smart, Fast and Small. Emerging digital tools and techniques are reinventing large-scale IT initiatives, one process at a time", Strategy + Business, April
- Rao, A. & E. Cameron, (2018), "The future of Artificial Intelligence depends on Trust", Strategy + Business, Autumn, July 31
- Russell, S., (2019), Human Compatible. Artificial Intelligence and the Problem of Control



Schneider, S., (2019), *Artificial You. AI and the future of your Mind*, Princeton & Oxford, Princeton University Press

Schouteden, C., Sturges, D, Chow, E., Meloni, M., Engineer, N., Lange, A., Meegan, B, Boradkar, P, Wahlund, C.J., Pinner, D., Saleh, T., (2018), "Artificial Intelligence and the Circular Economy. AI as a tool to accelerate the Transition", Ellen MacArthur Foundation + Google + McKinsey & Company

Schoemaker & Tetlock, (2017), "Building more intelligent enterprises", MIT Sloan Management Review, Spring, Vol. 58(3): 27-37

Schwartz, J.; Thomson, J. & A. Kleiner, (2016), "The Neuroscience of Strategic Leadership. Research shows how leaders can take the high road less traveled", *Strategy + Business*, December

Sheehan, M., Ma, D., (2020) *The Global Balance and Flow of AI Research Talent*, The Paulson Institute's Macro Polo

Stevens-Davidowitz, Seth, (2019), *Everybody Lies. What the Internet can tell us who we really are*, New York, Penguin

Sumpter, D., (2018), *Outnumbered. From Facebook and Google to fake news and filter-bubbles – the Algorithms that control our lives*, London ; Oxford ; New York, Bloomsbury Sigma

Tarafdar, M; Beath, C.M. & J.W. Ross, (2019), "Using AI to enhance Business Operations", MIT Sloan Management Review, Summer: 37-44

Tenner, E. (2018), *The Efficiency Paradox. What big data can't do*, New York, Alfred Knopf Ed

Verhezen, P. & P. Chambers, (2019), "Hacking and the darker side of social media", *Strategic Review*, Jan-March, Vol. 9(1): 25-32

Verhezen, P., Chambers, P. & S. De Haes, (2018), "Cyber-threats: Facing the Faceless", *Strategic Review*, Vol. 8(2): 24-40

Weil, P. & S. Woerner, (2018), *What's your Digital Business Model? Six questions to help you build the Next-Generation Enterprise*, Boston, Harvard Business Review Press

Wessel, M. & N. Helber, (2020), "A crisis of Ethics in Technology of Innovation", MIT Sloan Management Review, Spring: 71-76

Wright, N.D. (Ed), (2019), *Artificial Intelligence, China, Russia, and the Global Order*, Alabama Maxwell Airforce Base, Air University Press

Zeng, M., (2018), *Smart Business. What Alibab's success reveals about the Future of Strategy*, Boston MA, Harvard Business Review Press

Zigales, L., (2012), *A Capitalism for the People, Recapturing the lost genius of American prosperity*, New York, Basic Books

Zuboff, S., (2019), *The Age of Surveillance Capitalism. The Fight for a Human Future at the new frontier of power*, London, Profile Books



About Dr. Peter Verhezen

Peter is Visiting Professor for Business in Emerging Markets and Strategy and Sustainability at the University of Antwerp and Antwerp Management School (Belgium).

As Principal of Verhezen & Associates and Senior Consultant in Governance at the International Finance Corporation (World Bank) in Asia Pacific, Peter advises boards and top executives on governance, risk management and responsible leadership. He has authored a number of articles and books in the domain.

www.verhezen.net

About Amrop

With offices in all world regions, Amrop is a trusted advisor in Executive Search, Board and Leadership Services.

Amrop advises the world's most dynamic organizations on finding and positioning Leaders For What's Next: top talent, adept at working across borders in markets around the world.

Amrop's mission: Shaping Sustainable Success Through Inspiring Leaders.

www.amrop.com/offices

©2019 The Amrop Partnership SCRL. All rights reserved

Editing and design by Steffi Gande.

Photography by 123RF and Matt Lee, Steven Lelham, Jeremy Lapack, Joshua Earle, (Unsplash).