# R2R

We Negate.

Our Sole contention is AI development.

Artificial intelligence is the process of using computers to extract patterns from data, and these computers will spot patterns much more efficiently, accurately, and cheaply than humans can.

The ability to cheaply predict patterns will revolutionize the economy.

First, by lowering prices.

Ayehu technology writes that “In terms of actual savings, AI has been proven to cut business process costs by anywhere from 25% to 40% on average. In the IT field, AI can bring about a savings of as much as 40-55%..”

Second, by creating more jobs.

The efficiency gains of AI will allow for unprecedented economic expansion, making goods cheaper to produce, which in turn leads to more customers, which drives demand for more product. Forbes finds that AI will also enhance the existing labor force by making human workers more productive: “92% of senior manufacturing executives believe that "Smart Factory" digital technologies such as artificial intelligence will allow them to improve their degrees of productivity”

This is why Chowdry of Forbes finds on net that the growth of artificial intelligence could create 58 million net new jobs in the next few years.

The large tech companies have seen the promise of artificial intelligence and are racing for a piece of the pie. A 2017 Economist article explains: the technology giants are investing feverishly to get a lead over each other in AI. The largest tech firms, including Alphabet (Google’s parent), Amazon, Apple, Facebook, IBM and Microsoft are investing huge sums to develop their AI capabilities.

The tech giants are driving development in artificial intelligence and their massive size provides advantages that smaller companies do not possess.

First, money.

The incredible profitability of the tech giants gives them a great ability to innovate and take a long-term view. Josh Zoffer at Yale Law School writes in 2019: The tech giants invest not primarily to protect their

current cash flows but to create new innovative products and technologies. Big tech firms are unique in their ability to invest this way.

For example, tech expert Kai Fu Lee explains in his 2018 book AI superpowers: In terms of funding, Google dwarfs even its own government: US federal funding for math and computer science research amounts to less than half of google's own R&D budget. That spending spree has bought Alphabet, Google's parent company, an outsized share of the world's brightest AI minds. Of the top one hundred AI researchers and engineers, around half are already working for Google.

New and small firms are much more vulnerable to swings and do not have the room or money to attract talent and innovate. Zoffer explains: without high and relatively protected cash flows, investors do not seem to tolerate such behavior, which even big tech's detractors acknowledge.

Second, Is data aggregation.

AI development necessities the collection of masses of data, something only big tech companies can do. Franklin Foer at the Atlantic writes in 2017: The dominant firms are the ones that have amassed the most complete portraits of us. They have tracked us most extensively as we travel across the Internet, and they have the computing power required to interpret our travels. This advantage becomes everything, and it compounds over time. Bottomless pools of data are required to create machines that effectively learn—and only these megacorporations have those pools of data. In all likelihood, no rival to Google will ever be able to match its search results, because no challenger will ever be able to match its historical record of searches or the compilation of patterns it has uncovered.

For this reason, it is crucial that we leave tech giants intact. In his 2018 book "AI Superpowers," Kai Fu Lee writes:
In the age of AI implementation, data is the core. That's because once computing power and engineering talent reach a certain threshold, the quantity of data becomes decisive in determining the overall power and accuracy of an algorithm. The more examples of a given phenomenon a network is exposed too, the more accurately it can pick out patterns and identify things in the real world.

Enforcing antitrust regulations against these companies would stunt the development of artificial intelligence, with devastating economic ramifications.

It is for these reasons that we negate.

1. Also can't research into AI innovation

2. Raising prices

**Large firms innovate better than small firms for a number of reasons**

**Economist 11** 12-17-2011, "Big and clever," Economist, https://www.economist.com/business/2011/12/17/big-and-clever //DF

Joseph Schumpeter, after whom this column is named, argued both sides of the case. In 1909 he said that small companies were more inventive. In 1942 he reversed himself. **[1] Big firms have more incentive to invest in new products**, he decided, **because they can sell them to more people and reap greater rewards more quickly**. In a competitive market, inventions are quickly imitated, so a small inventor's investment often fails to pay off. These days the second Schumpeter is out of fashion: people assume that little start-ups are creative and big firms are slow and bureaucratic. But that is a gross oversimplification, says Michael Mandel of the Progressive Policy Institute, a think-tank. In a new report on "scale and innovation", he concludes that today's economy favours big companies over small ones. Big is back, as this newspaper has argued. And big is clever, for three reasons. First, says Mr Mandel, **[2] economic growth is increasingly driven by big ecosystems** such as the ones that cluster around Apple's iPhone or Google's Android operating system**. These ecosystems need to be managed by a core company that has the scale and skills to provide technological leadership**. Second, **[3] globalisation puts more of a premium on size than ever before.** To capture the fruits of innovation it is no longer enough to be a big company by American standards. You need to be able to stand up to emerging-world giants, many of which are backed by something even bigger: the state. Third, many **[4] of the most important challenges for innovators involve vast systems**, such as education and health care, or giant problems, such as global warming. **To make a serious change to a complex system, you usually have to be big.** If true, this argument has profound implications for policymakers (though Mr Mandel does not spell them out). Western governments are obsessed with promoting small businesses and fostering creative ecosystems. But if large companies are the key to innovation, why not concentrate instead on creating national champions? Anti-trust regulators have strained every muscle to thwart the creation of monopolies (for example, by preventing AT&T, a telecoms firm, from taking over the American arm of T-Mobile). But if one behemoth is likely to be more innovative than two smaller companies, why not allow the merger to take place? What should we make of Mr Mandel's argument? He is right that the old "small is innovative" argument is looking dated. Several of the champions of the new economy are firms that were once hailed as plucky little start-ups but have long since grown huge, such as Apple, Google and Facebook. (In August Apple was the world's largest listed company by market capitalisation.) **American firms with 5,000 or more people spend more than twice as much per worker on research and development as those with 100-500.** The likes of Google and Facebook reap colossal rewards from being market-makers rather than market-takers. **[5] Big companies have a big advantage in recruiting today's most valuable resource: talent.** (Graduates have debts, and many prefer the certainty of a salary to the lottery of stock in a start-up.) Large firms are getting better at avoiding bureaucratic stagnation: they are flattening their hierarchies and opening themselves up to ideas from elsewhere. Procter & Gamble, a consumer-goods giant, gets most of its ideas from outside its walls. Sir George Buckley, the boss of 3M, a big firm with a 109-year history of innovation, argues that companies like his can combine the virtues of creativity and scale. 3M likes to conduct lots of small experiments, just like a start-up. But it can also mix technologies from a wide range of areas and, if an idea catches fire, summon up vast resources to feed the flames.

## Big tech companies produce huge innovations, and the motivate smaller companies to innovate and get bought up by them

**Cowen 19** Tyler Cowen [Ph.D., holds the Holbert L. Harris Chair in Economics at George Mason University. He is the author of a number of textbooks and other thought-provoking works, including *The Complacent Class*, as well as writing the most-read economics blog worldwide, marginalrevolution.com], 2019 "Big Business: A Love Letter to an American Anti-Hero," St. Martin's Press, pages 102-103, 107-109, 116-117 //DF

A new set of charges, however, comes from another direction: that the major tech companies dominate their platforms and therefore may be stifling innovation. For instance, if Google controls search and Facebook dominates one segment of social networking, maybe those companies won't work so hard to introduce new services. Furthermore, those large and successful companies may be evolving into stultifying bureaucracies, afraid that new ideas might transform the market and threaten their dominance. To cite a possible example, if social networking becomes the primary means for accessing artificial intelligence (AI), maybe Facebook would lose its dominant market position to some other company better at AI, and in turn Facebook might steer the market away from AI to protect its current position. A related fear is that large, monopolizing tech companies will buy up potential upstart competitors, with the foreclosing of potential competition. Indeed, we've seen Google buy over 190 companies, including DejaNews, YouTube, Android, Motorola Mobile, and Waze, while Facebook has bought up Instagram, Spool, Threadsy, and WhatsApp, among numerous others, and purchased intellectual property from former rival Friendster. In theory, you can imagine how those arguments might carry some weight. Yet **[1] in practice the major tech companies have proven to be vigorous innovators.** Furthermore, **[2] the prospect of being bought up by Google or one of the other tech giants has boosted the incentive for others to innovate**, and it has given struggling companies access to capital and expertise when they otherwise might have folded or never started in the first place.

UQ:

US and China locked in an intense battle for global dominance.

Whichever country controls tech will win the battle.

US has tech superiority right now that is underlined by a strong and innovative tech sector

The trade war has weakened US tech companies

Link:

Antitrust against US tech giants will kill our golden goose

Need several links for this

1) Higher prices

The world's nations can commit to American technology: buying Apple phones, using Google search, driving Teslas, and managing a fleet of personal robots made by a startup in Seattle. Or they can commit to China: using the equivalents built by Alibaba and Tencent, connecting through the 5G network constructed by Huawei and ZTE, and driving autonomous cars built by Baidu. The choice is a fraught one. **If you are a poor country that lacks the capacity to build your own data network, you're going to feel loyalty to whoever helps lay the pipes at low cost.** It will all seem uncomfortably close to the arms and security pacts that defined the Cold War.

No one can be certain what happens next. **In the US, in the wake of controversies surrounding the 2016 election and user privacy, a growing number of Republicans and Democrats want to regulate America's tech giants and rein them in. At the same time, China has stiffened its resolve to become an AI superpower and export its techno-authoritarian revolution—which means the US has a vital national interest in ensuring that its tech firms remain world leaders. For now, there is nothing close to a serious debate about how to address this dilemma.**

2) Worse products because of scale advantages

3) Less R&D

4) Smaller companies that get bought out by larger companies

5) Can better weather shocks from innovative failures (ex. iPad, Google Glass, Amazon services)

IL:

Weakening of US tech companies gives China the edge for global tech dominance

Impact:

Chinese global tech dominance bad

1) Loss of American economic growth
2) Authoritarian practices exported to other countries

# Cut Card

Cost savings will allow businesses to expand and hire more workers.

Second, this will allow companies to make goods more cheaply and expand production dramatically.

McKinsy Continues that "But there are other complements to prediction that have been discussed a lot less frequently. One is human judgment. We use both prediction and judgment to make decisions. We've never really unbundled those aspects of decision making before—we usually think of human decision making as a single step. Now we're unbundling decision making. The machine's doing the prediction, making the distinct role of judgment in decision making clearer. So as the value of human prediction falls, the value of human judgment goes up because AI doesn't do judgment—it can only make predictions and then hand them off to a human to use his or her judgment to determine what to do with those predictions.

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**Nizri 18** Gabby Nizri, 2-2-2018, "Using Intelligent Automation to Reduce Operating Costs," Ayehu, https://ayehu.com/using-intelligent-automation-reduce-operating-costs/ //DF

First, let's consider the actual concept behind intelligent automation. This is essentially the term given to technology which involves the use of software powered by artificial intelligence (AI) and machine learning to perform certain business processes and functions, typically in the IT realm. The more sophisticated the automation platform, the more high-volume workflows it can perform, thereby making it all the more impactful to both the IT department as well as the business as a whole. And with AI in the mix, the platform can evolve independently to support continuous process improvement and help business leaders make smarter, more data-drive decisions. Intelligent automation is poised to make a significant and lasting impact on the business world, particularly because it will reduce the need to outsource work. While outsourcing was once considered the most effective way to manage costs while still producing a high-level output, AI powered automation will make this practice all but obsolete soon enough. That's because it's even more practical. Rather than having to pay outside workers, all tasks can be moved back in-house and handled electronically. Subsequently, this reduces errors and enhances security. It also allows for better scalability. **In terms of actual savings, intelligent automation has been proven to cut business process costs by anywhere from 25% to 40% on average. In the IT field, automation can bring about a savings of as much as 40-55%. That's because the efficiency and productivity of multiple software robots can take the place of one full-time employee.** Eventually, as more decision makers begin to recognize the benefits and embrace intelligent automation, this 3:1 ratio will continue to improve, as will efficiency, productivity and cost savings.

**Second, by creating more jobs.**

**The efficiency gains of AI will allow for unprecedented economic expansion, making goods cheaper to produce, which in turn leads to more customers, which drives demand for more product. Forbes finds that AI will also enhance the existing labor force by making human workers more productive: "92% of senior manufacturing**

**executives believe that "Smart Factory" digital technologies such as artificial intelligence will allow them to improve their degrees of productivity"**

**Gordon 18** Arnie Gordon, 7-2-2018, "Can AI Really Improve Industrial Production Efficiency?," Forbes, https://www.forbes.com/sites/forbestechcouncil/2018/07/02/can-ai-really-improve-industrial-production-efficiency/#1737998c145f //DF

To begin with, early success with AI means that development in this field is likely to grow and continue. AI has already been used to create superior processes in healthcare, finance utilities and e-commerce. To frame this in terms of manufacturing, the Annual Manufacturing Report of 2018 (registration required) from The Manufacturer discovered that **92% of senior manufacturing executives believe that "Smart Factory" digital technologies such as artificial intelligence will allow them to improve their degrees of productivity and empower their staff to work more intelligently.** Despite this bright outlook, doubt still exists. In a recent survey (purchase required) from MIT and the Boston Consulting Group, they discovered that a gap exists between an organization's AI ambitions and its ability to execute on them, with just one in five companies merging AI solutions with their processes. On a similar note, the global research firm Forrester (purchase required) found that 58% of business and tech professionals are researching AI systems, but only 12% are currently using them.

**This is why Chowdry of Forbes finds on net that the growth of artificial intelligence could create 58 million net new jobs in the next few years.**

Amit Chowdhry, September 2018, "Artificial Intelligence To Create 58 Million New Jobs By 2022, Says Report," Forbes, https://www.forbes.com/sites/amitchowdhry/2018/09/18/artificial-intelligence-to-create-58-million-new-jobs-by-2022-says-report/#78c44bba4d4b (NK)

Machines and algorithms in the workplace are expected to create 133 million new roles, but cause 75 million jobs to be displaced by 2022 according to a new report from the World Economic Forum (WEF) called "The Future of Jobs 2018." **This means that the growth of artificial intelligence could create 58 million net new jobs in the next few years**. With this net positive job growth, there is expected to be a **major shift in quality, location and permanency for the new roles. And companies are expected to expand the use of contractors doing specialized work and utilize remote staffing**. In 2025, machines are expected to perform more current work tasks than humans compared to 71% being performed by humans as of now. Due to this transformation, it will have a major impact on the global workforce. This report is intended to provide guidance on how to improve the quality of the work being done by humans and how people should become prepared for emerging roles. And it is based on a survey of chief human resources officers and strategy executives from more than 300 global companies across 12 industries and 20 emerging economies. Plus the report has determined that 54% of employees of large companies would need to up-skill in order to fully harness these growth opportunities. Over half of the companies surveyed said that they plan to train only employees in key roles and only one-third are planning to train at-risk workers. Nearly 50% of all companies are expecting their full-time workforce to shrink by 2022 due to automation, but 40% are expecting to extend their workforce and more than 25% are expecting automation to create new roles in the enterprise. "It is critical that business take an active role in supporting their existing workforces through reskilling and upskilling, that individuals take a proactive approach to their own lifelong learning, and that governments create an enabling environment to facilitate this workforce transformation. This is the key challenge of our time," said World Economic Forum founder and executive chairman Klaus Schwab. Some of the fastest growing job opportunities across all industries include data analysts, software developers and social media specialists. Plus **jobs that require "human skills" like sales and marketing, innovation and customer service are also expected to increase in demand.** Some of the jobs that are expected to go away include data entry, payroll and certain accounting functions. The WEF is working across multiple industries to design roadmaps to respond to these new opportunities. The respondents provided three strategies to cope with these challenges. This includes hiring wholly new permanent staff with skills around new technologies, completely automating certain work tasks and retraining existing employees. And a smaller number of companies are expecting to allocate the work to freelancers and temporary workers.

## The large tech companies have seen the promise of artificial intelligence and are racing for a piece of the pie. A 2017 Economist article explains:

2017, "Google leads in the race to dominate artificial intelligence," Economist, https://www.economist.com/business/2017/12/07/google-leads-in-the-race-to-dominate-artificial-intelligence (NK)

COMMANDING the plot lines of Hollywood films, covers of magazines and reams of newsprint, the contest between artificial intelligence (AI) and mankind draws much attention. Doomsayers warn that AI could eradicate jobs, break laws and start wars. But such predictions concern the distant future. The **competition today is not between humans and machines but among the world's technology giants, which are investing feverishly to get a lead over each other in AI**. An exponential increase in the availability of digital data, the force of computing power and the brilliance of algorithms has fuelled excitement about this formerly obscure corner of computer science. **The West's largest tech firms, including Alphabet (Google's parent), Amazon, Apple, Facebook, IBM and Microsoft are investing huge sums to develop their AI capabilities**, as are their counterparts in China. Although it is difficult to separate tech firms' investments in AI from other kinds, so far in 2017 (see chart 1) companies globally have completed around $21.3bn in mergers and acquisitions related to AI, according to PitchBook, a data provider, or around 26 times more than in 2015.

## The tech giants are driving development in artificial intelligence and their massive size provides advantages that smaller companies do not possess.

## First, money.

## The incredible profitability of the tech giants gives them a great ability to innovate and take a long-term view. Josh Zoffer at Yale Law School writes in 2019:

**Zoffer 19** Josh Zoffer [Yale Law School], 5-2019, "Short-Termism and Antitrust's Innovation Paradox," Stanford Law Review https://www.stanfordlawreview.org/online/short-termism-and-antitrusts-innovation-paradox/ //DF

Simultaneously, economists have noted the rise of "superstar firms" that dominate their markets, contributing to the sort of concentration exhibited among big tech firms. As David Autor and his co-authors have observed, "[t]he industries where concentration has grown are those that have been increasing their innovation most rapidly." Today, the top 1% of firms as measured by economic profit invest in R&D at nearly three times the rate of median firms. Most strikingly, recent research has found that from the late nineteenth century to the present, just forty firms account for about 36% of all breakthrough innovations, as measured by textual analysis of similarities across patents. At any given point in time, the number of highly innovative firms is even smaller. Big tech firms stand out from other large companies for two reasons. First, their R&D spending is exceptional. Alphabet, Amazon, Apple, Facebook, and Microsoft together accounted for nearly a quarter of reported R&D spending for the entire S&P 500 in 2017 and nearly 18% for all North American public companies. Second, and more importantly, big tech firms—especially Alphabet, Amazon, and Facebook—invest differently than even other superstar firms. Unlike, for example, pharmaceutical companies whose business models require high investment for sustained success, the big tech firms are not especially capital intensive.28Open this footnote 28 See Jonathan Haskel & Stian Westlake, Capitalism Without Capital: The Rise of the Intangible Economy 23-24 (2018); Tim Koller et al., Valuation: Measuring and Managing the Value of Companies 700 (6th ed. 2015) ("Most business require significant capital to grow. This is not the case for Internet companies."); John Melloy, Warren Buffett: It Doesn't Really Take Any Money To Run the Largest Companies in America, CNBC (May 6, 2017, 1:19 PM EDT), https://perma.cc/59HB-XVU7. ...Open this footnote **They invest not primarily to protect their current cash flows but**—if their public statements on strategy are to be taken at face value—**to create new products and technologies "that could eventually become the next Google**."29Open this footnote 29 Thompson, supra note 13; see also Richard Waters, FT Interview with Google Co-Founder and CEO Larry Page, Fin. Times (Oct. 31, 2014), https://perma.cc/95CQ-4893. ...Open this footnote Those sorts of breakthroughs are essential for long-term productivity growth and job creation, although productivity-driven economic shifts pose other questions of cost and adverse

redistribution beyond the scope of this Essay.30Open this footnote 30 Productivity growth driven by superstar firms must be weighed against the potential downward pressure these firms and market concentration put on labor share of income and against the distributional effects of new technologies. See Daron Acemoglu & Pascual Restrepo, Automation and New Tasks: How Technology Displaces and Reinstates Labor 3-5, 15-16 (Mar. 5, 2019) (unpublished manuscript), https://perma.cc/6YUT-6CGF; Autor et al., supra note 24, at 3, 11-12, 23-24; Suresh Naidu et al., Antitrust Remedies for Labor Market Power, 132 Harv. L. Rev. 536, 553-69 (2018). It remains an open question exactly how much market concentration, assuming it is pro-innovative and productivity-enhancing, should be tolerated when it comes at the cost of technology-driven job displacement and declining demand for low-skilled labor. The traditional view holds that jobs lost to technology will ultimately be replaced as productive technologies create new opportunities. But aggregate evidence has masked underlying distributional effects that leave lower-skilled workers worse off, even if aggregate labor demand remains unchanged. See David Autor & Anna Salomons, Does Productivity Growth Threaten Employment? 4-6 (June 19, 2017) (paper prepared for European Central Bank Forum on Central Banking), https://perma.cc/D2FZ-EBQW. ...Open this footnote The short-termism hypothesis is not without its detractors. Critics argue that there is no short-termism effect;31Open this footnote 31 See Roe, supra note 10, at 980. that even if there is some short-termism distortion, it is worth it for the discipline imposed by the shareholder regime of quarterly reporting;32Open this footnote 32 See Barzuza & Talley, supra note 19, at 4, 47-51; Fried, supra note 6, at 1565 ("[S]hort-term shareholders . . . may have greater incentives and ability to discipline managers . . . . [F]avoring long-term shareholders by impeding short-term shareholders may lead to higher managerial agency costs."). ...Open this footnote that other markets with less shareholder-centric corporate governance—especially Germany and Japan—have not outperformed the U.S.;33Open this footnote 33 See Walter Frick, Worries About Short-Termism Are 40 Years Old, But Are They Overblown?, Harv. Bus. Rev. (Aug. 23, 2017), https://perma.cc/M2HC-QUBA. ...Open this footnote and that any observed relationship between performance and short-termism may be simple correlation or a case of reverse causation.34Open this footnote 34 Lawrence Summers, The Jury Is Still Out on Corporate Short-Termism, Fin. Times (Feb. 9, 2017), https://perma.cc/9UKT-L5YM. ...Open this footnote But much of this criticism rests on non-falsifiable comparisons to a hypothesized market free of undisciplined managers. Critics cannot prove that alleged disciplinary effects of short-termism outweigh its costs. Moreover, these arguments fail to explain why big tech firms appear immune from short-termism, or least behave differently. The correlation criticism similarly does not address innovation-based concerns with breaking up long-term firms. It merely ascribes a Schumpterian rationality to their differential performance. If they are long-term because they are better, not better because they are long-term, there are still risks in breaking them up.35Open this footnote 35 See Joseph A. Schumpeter, Capitalism, Socialism, and Democracy 81-101 (3d ed. 1950) (explaining why large, integrated firms are best-positioned to succeed and innovate). ...Open this footnote The importance of big tech cannot be understated in light of the short-termism hypothesis. If correct, that theory suggests that big tech firms are unique (or nearly so) in their ability to invest this way. Without high and relatively protected cashflows, investors do not seem to tolerate such behavior, which even big tech's detractors acknowledge.36Open this footnote 36 See, e.g., Khan, supra note 4, at 713 n.8, 748 n.195 ("In its 16 years as a public company, Amazon has received unique permission from Wall Street to concentrate on expanding its infrastructure, increasing revenue at the expense of profit." (quoting David Streitfield, As Competition Wanes, Amazon Cuts Back Discounts, N.Y. Times (July 4, 2013), https://perma.cc/NS3X-MWAM)). ...Open this footnote Should big tech's positioning be undercut, these firms' contributions to innovation and productivity in their present forms could be difficult to replace. It might be the case that other firms would step in to capture the opportunities left on the table without big tech. But the implications of the short-termism hypothesis and evidence from the superstars literature suggest that big tech's replaceability in the private sector is far from clear, at least in the near-term.37Open this footnote 37 See Atkinson & Lind, supra note 12, at 209-12 (explaining "innovation industries'" unique characteristics); Kogan et al., supra note 16, at 688-89, 702 (describing how innovation capacity is highly unequal in its distribution among firms). ...Open this footnote The answer, whether or not big tech firms are broken up, may lie in substantially increasing public sector investment.38Open this footnote 38 See Ben S. Bernanke, Promoting Research and Development The Government's Role, Issues in Sci. & Tech., Summer 2011, at 38-39; Steven J. Markovich, Promoting Innovation Through R&D, Council on Foreign Rel. (Nov. 2, 2012), https://perma.cc/D67K-GHHX. ...Open this footnote Without government-funded R&D, however, a significant decline in big tech's investment spending could be damaging to economic growth.

## For example, tech expert Kai Fu Lee explains in his 2018 book AI superpowers:

**Lee 18** Kai-Fu Lee [chairman and CEO of Sinovation Ventures and the president of Sinovation Ventures' Artificial Intelligence Institute. Sinovation, which manages $1.7 billion in dual-currency investment funds, is a leading venture capital firm focused on developing the next generation of Chinese high-tech companies], 2018, "AI superpowers : China, Silicon Valley, and the new world order," Houghton Mifflin Harcourt, page 93 //NK

But if the next deep learning is destined to be discovered in the corporate world, Google has the best shot at it. Among the Seven AI Giants, Google—more precisely, its parent company, Alphabet, which owns DeepMind and its self-driving subsidiary Waymo—stands head and shoulders above the rest. It was one of the earliest companies to see the potential in deep learning and has devoted more resources to harnessing it than any other company. **In terms of funding, Google dwarfs even its own government: U.S. federal funding for math and computer science research amounts to less than half of Google's own R&D budget. That spending spree has bought Alphabet an outsized share of the world's brightest AI minds.**

**Of the top one hundred AI researchers and engineers, around half are already working for Google.**

"The other half are distributed among the remaining Seven Giants, academia, and a handful of smaller startups. Microsoft and Facebook have soaked up substantial portions of this group, with Facebook bringing on superstar researchers like Yann LeCun. Of the Chinese giants, Baidu went into deep-learning research earliest—even trying to acquire Geoffrey Hinton's startup in 2013 before being outbid by Google—and scored a major coup in 2014 when it recruited Andrew Ng to head up its Silicon Valley AI Lab. Within a year, that hire was showing outstanding results. By 2015, Baidu's AI algorithms had exceeded human abilities at Chinese speech recognition. It was a great accomplishment, but one that went largely unnoticed in the United States. In fact, when Microsoft reached the same milestone a year later for English, the company dubbed it a "historic achievement." Ng left Baidut in 2017 to create his own AI investment fund, but the time he spent at the company both testified to Baidu's ambitions and strengthened its reputation for research.

## New and small firms are much more vulnerable to swings and do not have the room or money to attract talent and innovate. Zoffer explains: without high and relatively protected cash flows, investors do not seem to tolerate such behavior, which even big tech's detractors acknowledge.

**Zoffer 19** Josh Zoffer [Yale Law School], 5-2019, "Short-Termism and Antitrust's Innovation Paradox," Stanford Law Review

https://www.stanfordlawreview.org/online/short-termism-and-antitrusts-innovation-paradox/ //DF

Simultaneously, economists have noted the rise of "superstar firms" that dominate their markets, contributing to the sort of concentration exhibited among big tech firms. As David Autor and his co-authors have observed, "[t]he industries where concentration has grown are those that have been increasing their innovation most rapidly." Today, the top 1% of firms as measured by economic profit invest in R&D at nearly three times the rate of median firms. Most strikingly, recent research has found that from the late nineteenth century to the present, just forty firms account for about 36% of all breakthrough innovations, as measured by textual analysis of similarities across patents. At any given point in time, the number of highly innovative firms is even smaller. Big tech firms stand out from other large companies for two reasons. First, their R&D spending is exceptional. Alphabet, Amazon, Apple, Facebook, and Microsoft together accounted for nearly a quarter of reported R&D spending for the entire S&P 500 in 2017 and nearly 18% for all North American public companies. Second, and more importantly, big tech firms—especially Alphabet, Amazon, and Facebook—invest differently than even other superstar firms. Unlike, for example, pharmaceutical companies whose business models require high investment for sustained success, the big tech firms are not especially capital intensive.28Open this footnote 28 See Jonathan Haskel & Stian Westlake, Capitalism Without Capital: The Rise of the Intangible Economy 23-24 (2018); Tim Koller et al., Valuation: Measuring and Managing the Value of Companies 700 (6th ed. 2015) ("Most business require significant capital to grow. This is not the case for Internet companies."); John Melloy, Warren Buffett: It Doesn't Really Take Any Money To Run the Largest Companies in America, CNBC (May 6, 2017, 1:19 PM EDT), https://perma.cc/59HB-XVU7. ...Open this footnote **They invest not primarily to protect their current cash flows but**—if their public statements on strategy are to be taken at face value—**to create new products and technologies "that could eventually become the next Google**."29Open this footnote 29 Thompson, supra note 13; see also Richard Waters, FT Interview with Google Co-Founder and CEO Larry Page, Fin. Times (Oct. 31, 2014), https://perma.cc/95CQ-4893. ...Open this footnote Those sorts of breakthroughs are essential for long-term productivity growth and job creation, although productivity-driven economic shifts pose other questions of cost and adverse redistribution beyond the scope of this Essay.30Open this footnote 30 Productivity growth driven by superstar firms must be weighed against the potential downward pressure these firms and market concentration put on labor share of income and against the distributional effects of new technologies. See Daron Acemoglu & Pascual Restrepo, Automation and New Tasks: How Technology Displaces and Reinstates Labor 3-5, 15-16 (Mar. 5, 2019) (unpublished manuscript), https://perma.cc/6YUT-6CGF; Autor et al., supra note 24, at 3, 11-12, 23-24; Suresh Naidu et al., Antitrust Remedies for Labor Market Power, 132 Harv. L. Rev. 536, 553-69 (2018). It remains an open question exactly how much market concentration, assuming it is pro-innovative and productivity-enhancing, should be tolerated when it comes at the cost of technology-driven job displacement and declining demand for low-skilled labor. The traditional view holds that jobs lost to technology will ultimately be replaced as productive technologies create new opportunities. But aggregate evidence has masked underlying distributional effects that leave lower-skilled workers worse off, even if aggregate labor demand remains unchanged. See David Autor & Anna Salomons, Does Productivity Growth Threaten Employment? 4-6 (June 19, 2017) (paper prepared for European Central Bank Forum on Central Banking), https://perma.cc/D2FZ-EBQW. ...Open this footnote The short-termism hypothesis is not without its detractors. Critics argue that there is no short-termism effect;31Open this footnote 31 See Roe, supra note 10, at 980. that even if there is some short-termism distortion, it is worth it for the discipline imposed by

the shareholder regime of quarterly reporting;32Open this footnote 32 See Barzuza & Talley, supra note 19, at 4, 47-51; Fried, supra note 6, at 1565 ("[S]hort-term shareholders . . . may have greater incentives and ability to discipline managers . . . . [F]avoring long-term shareholders by impeding short-term shareholders may lead to higher managerial agency costs."). ...Open this footnote that other markets with less shareholder-centric corporate governance—especially Germany and Japan—have not outperformed the U.S.;33Open this footnote 33 See Walter Frick, Worries About Short-Termism Are 40 Years Old, But Are They Overblown?, Harv. Bus. Rev. (Aug. 23, 2017), https://perma.cc/M2HC-QUBA. ...Open this footnote and that any observed relationship between performance and short-termism may be simple correlation or a case of reverse causation.34Open this footnote 34 Lawrence Summers, The Jury Is Still Out on Corporate Short-Termism, Fin. Times (Feb. 9, 2017), https://perma.cc/9UKT-L5YM. ...Open this footnote But much of this criticism rests on non-falsifiable comparisons to a hypothesized market free of undisciplined managers. Critics cannot prove that alleged disciplinary effects of short-termism outweigh its costs. Moreover, these arguments fail to explain why big tech firms appear immune from short-termism, or least behave differently. The correlation criticism similarly does not address innovation-based concerns with breaking up long-term firms. It merely ascribes a Schumpterian rationality to their differential performance. If they are long-term because they are better, not better because they are long-term, there are still risks in breaking them up.35Open this footnote 35 See Joseph A. Schumpeter, Capitalism, Socialism, and Democracy 81-101 (3d ed. 1950) (explaining why large, integrated firms are best-positioned to succeed and innovate). ...Open this footnote The importance of big tech cannot be understated in light of the short-termism hypothesis. If correct, that theory suggests that big tech firms are unique (or nearly so) in their ability to invest this way. Without high and relatively protected cashflows, investors do not seem to tolerate such behavior, which even big tech's detractors acknowledge.36Open this footnote 36 See, e.g., Khan, supra note 4, at 713 n.8, 748 n.195 ("In its 16 years as a public company, Amazon has received unique permission from Wall Street to concentrate on expanding its infrastructure, increasing revenue at the expense of profit." (quoting David Streitfield, As Competition Wanes, Amazon Cuts Back Discounts, N.Y. Times (July 4, 2013), https://perma.cc/NS3X-MWAM)). ...Open this footnote Should big tech's positioning be undercut, these firms' contributions to innovation and productivity in their present forms could be difficult to replace. It might be the case that other firms would step in to capture the opportunities left on the table without big tech. But the implications of the short-termism hypothesis and evidence from the superstars literature suggest that big tech's replaceability in the private sector is far from clear, at least in the near-term.37Open this footnote 37 See Atkinson & Lind, supra note 12, at 209-12 (explaining "innovation industries'" unique characteristics); Kogan et al., supra note 16, at 688-89, 702 (describing how innovation capacity is highly unequal in its distribution among firms). ...Open this footnote The answer, whether or not big tech firms are broken up, may lie in substantially increasing public sector investment.38Open this footnote 38 See Ben S. Bernanke, Promoting Research and Development The Government's Role, Issues in Sci. & Tech., Summer 2011, at 38-39; Steven J. Markovich, Promoting Innovation Through R&D, Council on Foreign Rel. (Nov. 2, 2012), https://perma.cc/D67K-GHHX. ...Open this footnote Without government-funded R&D, however, a significant decline in big tech's investment spending could be damaging to economic growth.

## Second, is data aggregation.

## AI development necessities the collection of masses of data, something only big tech companies can do. Franklin Foer at the Atlantic writes in 2017:

**Foer 17** Franklin Foer [staff writer at The Atlantic and former editor of The New Republic], 2017, "World Without Mind: The Existential Threat of Big Tech," Penguin Press, pages 187-188 //DF

A portrait of a psyche is a powerful thing. It allows companies to predict our behavior and anticipate our wants. With data, it is possible to know where you will be tomorrow within twenty meters and to predict, with reasonable accuracy, whether your romantic relationship will last. Capitalism has always dreamed of activating the desire to consume, the ability to tap the human brain to stimulate its desire for products that it never contemplated needing. Data helps achieve this old dream. It makes us more malleable, easier to addict, prone to nudging. It's the reason that Amazon recommendations for your next purchase so often result in sales, or why Google ads result in clicks. **The dominant firms are the ones that have amassed the most complete portraits of us. They have tracked us most extensively as we travel across the Internet, and they have the computing power required to interpret our travels. This advantage becomes everything, and it compounds over time. Bottomless pools of data are required to create machines that effectively learn—and only these megacorporations have those pools of data. In all likelihood, no rival to Google will ever be able to match its search results, because no challenger will ever be able to match its historical record of searches or the compilation of patterns it has uncovered.** In this way, data is unlike oil. Oil is a finite resource; data is infinitely renewable. It continuously allows the new monopolists to conduct experiments to master the anticipation of trends, to better understand customers, to build superior algorithms. Before he went to Google, as the company's chief economist, Hal Varian cowrote an essential handbook called Information Rules. Varian

predicted that data would exaggerate the workings of the market. “Positive feedback makes the strong get stronger and the weak get weaker, leading to extreme outcomes.” One of these extreme outcomes is the proliferation of data-driven monopolies.

## For this reason, it is crucial that we leave tech giants intact. In his 2018 book “AI Superpowers,” Kai Fu Lee writes:

**Lee 18** Kai-Fu Lee [chairman and CEO of Sinovation Ventures and the president of Sinovation Ventures’ Artificial Intelligence Institute. Sinovation, which manages $1.7 billion in dual-currency investment funds, is a leading venture capital firm focused on developing the next generation of Chinese high-tech companies], 2018, “AI superpowers : China, Silicon Valley, and the new world order,” Houghton Mifflin Harcourt, page 13 //NK

This brings us to the second major transition, from the age of expertise to the age of data. Today, successful AI algorithms need three things: big data, computing power, and the work of strong—but not necessarily elite—AI algorithm engineers. Bringing the power of deep learning to bear on new problems requires all three, but **in this age of implementation, data is the core. That’s because once computing power and engineering talent reach a certain threshold, the quantity of data becomes decisive in determining the overall power and accuracy of an algorithm.** “In deep learning, there’s no data like more data. **The more examples of a given phenomenon a network is exposed to, the more accurately it can pick out patterns and identify things in the real world.** Given much more data, an algorithm designed by a handful of mid-level AI engineers usually outperforms one designed by a world-class deep-learning researcher. Having a monopoly on the best and the brightest just isn’t what it used to be. Elite AI researchers still have the potential to push the field to the next level, but those advances have occurred once every several decades. While we wait for the next breakthrough, the burgeoning availability of data will be the driving force behind deep learning’s disruption of countless industries around the world.

## Big data is critical, as the name of the game is no longer who can make the next groundbreaking AI innovation, but who best can implement what has already been done. Lee furthers:

**Lee 18** Kai-Fu Lee [chairman and CEO of Sinovation Ventures and the president of Sinovation Ventures’ Artificial Intelligence Institute. Sinovation, which manages $1.7 billion in dual-currency investment funds, is a leading venture capital firm focused on developing the next generation of Chinese high-tech companies], 2018, “AI superpowers : China, Silicon Valley, and the new world order,” Houghton Mifflin Harcourt, page 13 //NK

Deep-learning pioneer Andrew Ng has compared AI to Thomas Edison’s harnessing of electricity: a breakthrough technology on its own, and one that once harnessed can be applied to revolutionizing dozens of different industries. Just as nineteenth-century entrepreneurs soon began applying the electricity breakthrough to cooking food, lighting rooms, and powering industrial equipment, today’s AI entrepreneurs are doing the same with deep learning. **Much of the difficult but abstract work of AI research has been done, and it’s now time for entrepreneurs to roll up their sleeves and get down to the dirty work of turning algorithms into sustainable businesses.** That in no way diminishes the current excitement around AI; implementation is what makes academic advances meaningful and what will truly end up changing the fabric of our daily lives. The age of implementation means we will finally see real-world applications after decades of promising research, something I’ve been looking forward to for much of my adult life. But making that distinction between discovery and implementation is core to understanding how AI will shape our lives and what—or which country—will primarily drive that progress. During the age of discovery, progress was driven by a handful of elite thinkers, virtually all of whom were clustered in the United States and Canada. Their research insights and unique intellectual innovations led to a sudden and monumental ramping up of what computers can do. Since the dawn of deep learning, no other group of researchers or engineers has come up with innovation on that scale. THE AGE OF DATAThis brings us to the second major transition, from the age of expertise to the age of data. Today, successful AI algorithms need three things: big data, computing power, and the work of strong—but not necessarily elite—AI algorithm engineers. Bringing the power of deep learning to bear on new problems requires all three, but in this age of implementation, data is the core.

That's because once computing power and engineering talent reach a certain threshold, the quantity of data becomes decisive in determining the overall power and accuracy of an algorithm. "In deep learning, there's no data like more data. The more examples of a given phenomenon a network is exposed to, the more accurately it can pick out patterns and identify things in the real world. **Given much more data, an algorithm designed by a handful of mid-level AI engineers usually outperforms one designed by a world-class deep-learning researcher. Having a monopoly on the best and the brightest just isn't what it used to be.** Elite AI researchers still have the potential to push the field to the next level, but those advances have occurred once every several decades. While we wait for the next breakthrough, the burgeoning availability of data will be the driving force behind deep learning's disruption of countless industries around the world.

# Frontlines

# R/T Acquisitions hurt innovation

**The tech giants buy the startups that have developed good technology, and thus present a threat to their business. The giants have an incentive to use the technology that the startup developed to improve their competitive advantage (ex. Kiva robotics helping Amazon ship goods; Google acquiring Waze). In fact, the tech giants can make better use of those innovations because they can apply them to many different industries (ex. Google bought Globaly and used its satellite technology**

# Data

## R/T Open Access

### 1. Big tech companies don't give away their data

**Foer 17** Franklin Foer [staff writer at The Atlantic and former editor of The New Republic], 2017, "World Without Mind: The Existential Threat of Big Tech," Penguin Press, pages 187-188 //DF

A portrait of a psyche is a powerful thing. It allows companies to predict our behavior and anticipate our wants. With data, it is possible to know where you will be tomorrow within twenty meters and to predict, with reasonable accuracy, whether your romantic relationship will last. Capitalism has always dreamed of activating the desire to consume, the ability to tap the human brain to stimulate its desire for products that it never contemplated needing. Data helps achieve this old dream. It makes us more malleable, easier to addict, prone to nudging. It's the reason that Amazon recommendations for your next purchase so often result in sales, or why Google ads result in clicks. **The dominant firms are the ones that have amassed the most complete portraits of us. They have tracked us most extensively as we travel across the Internet, and they have the computing power required to interpret**

**our travels. This advantage becomes everything, and it compounds over time. Bottomless pools of data are required to create machines that effectively learn—and only these megacorporations have those pools of data. In all likelihood, no rival to Google will ever be able to match its search results, because no challenger will ever be able to match its historical record of searches or the compilation of patterns it has uncovered.** In this way, data is unlike oil. Oil is a finite resource; data is infinitely renewable. It continuously allows the new monopolists to conduct experiments to master the anticipation of trends, to better understand customers, to build superior algorithms. Before he went to Google, as the company's chief economist, Hal Varian cowrote an essential handbook called Information Rules. Varian predicted that data would exaggerate the workings of the market. "Positive feedback makes the strong get stronger and the weak get weaker, leading to extreme outcomes." One of these extreme outcomes is the proliferation of data-driven monopolies.

### 2. Only big tech companies can share the data that they use

## R/T Data Brokers

### 1. The costs are too high

**Castellanos and Shah 19** Sara Castellanos and Agam Shah, 6-18-2019, "Small Businesses Aren't Rushing Into AI," WSJ, https://www.wsj.com/articles/small-businesses-arent-rushing-into-ai-11560078000 //DF
**Artificial intelligence** over the past decade has shifted from research theories to actual practices in corporate offices. But it **isn't within the reach of many smaller companies, yet. The high upfront costs of AI tools, scarcity of people who can implement the technology at individual operations, and more pressing IT expenses have widened the gap in AI implementation.** But a range of players, from large technology vendors to startups, are coming up with tools that allow small businesses to use the technology without a data scientist on staff. Still, even with such tools, it can take time for any company, large or small, to implement a new technology into its business processes. The operational efficiency of an AI system, while desirable, is still far from a priority for many companies.

### 2. It's not just data, it's about being in control of the collection and manipulation of the data. You need to direct the collection of the data so you can shape it to your needs

# R/T AI Innovation

AI isn't about bright ideas, it's about data. It's about computers that can spot patterns and use those patterns to make machines more powerful. For AI to be able to spot patterns, it needs reams and reams of data, which only the Big Tech companies possess.

# R/T AI is Biased

**AI will replicate society's biases until we recognize this and begin devleoping it against these trends. IBM and Microsoft have already begone doing this and having the deepest data set is key to this process.**

Jason Bloomberg Aug 13, 2018 "Bias Is AI's Achilles Heel. Here's How To Fix It," Forbes,

https://www.forbes.com/sites/jasonbloomberg/2018/08/13/bias-is-ais-achilles-heel-heres-how-to-fix-it/

The first step in finding a solution to AI-generated bias is to recognize that there's a problem. "We know that AI, machine learning and deep learning can produce dangerous results if unchecked by extrapolating outdated mores to predict the future," says Chad Steelberg, CEO of Veritone. "The result would be the perpetuation of unjust perceptions of the past. Any responsible AI technology must be aware of these limitations and take the steps to avoid them."

IBM IBM +0% is one vendor that is investing in creating balanced data sets. "AI holds significant power to improve the way we live and work, but only if AI systems are developed and trained responsibly, and produce outcomes we trust," write IBM fellows Aleksandra Mojsilovic and John R. Smith. "Making sure that the system is trained on balanced data, and rid of biases is critical to achieving such trust."

In addition to better data sets, IBM is also calling for better training and awareness generally. "The power of advanced innovations, like AI, lies in their ability to augment, not replace, human decision-making," Mojsilovic and Smith continue. "It is therefore critical that any organization using AI — including visual recognition or video analysis capabilities — train the teams working with it to understand bias, including implicit and unconscious bias, monitor for it, and know how to address it."

Microsoft is also tackling this problem. "This is an opportunity to really think about what values we are reflecting in our systems, and whether they are the values we want to be reflecting in our systems," says Hanna Wallach, senior researcher at Microsoft Research New York City and an adjunct associate professor in the College of Information and Computer Sciences at the University of Massachusetts Amherst. "If we are training machine learning systems to mimic decisions made in a biased society, using data generated by that society, then those systems will necessarily reproduce its biases."

Facial recognition is one of the best-known applications of deep learning, and bias in this area can be especially pernicious, because it skews against people of color. However, there are other areas where AI bias can present complex challenges.

Recruitment, in particular, is one of these areas, as many HR professionals look to AI to ease the burden of candidate selection – a process that has always been plagued by bias. "Identifying high-potential candidates is very subjective," says Alan Todd, founder and CEO at CorpU. "People pick who they like based on unconscious biases."

Exceedingly narrow data sets can also lead to less diverse candidate pools. "If the examples you're using to train the system fail to include certain types of people, then the model you develop might be really bad at assessing those people," explains Solon Barocas, assistant professor in Cornell's information science department.

# R/t Surveillance and Descrimation

### 1. Harder to pressure

### 2. Increases social mobility

### 3. IBM is using AI to fight descrimination

**Hale 18** Kori Hale, 9-25-2018, "IBM's Unbiased Approach To AI Discrimination," Forbes, https://www.forbes.com/sites/korihale/2018/09/25/ibms-unbiased-approach-to-ai-discrimination/#2902d7367118 //DF

Artificial intelligence is becoming increasingly more commonplace in daily life, with companies looking to incorporate it across their platforms. Still in its early stages, the technology has been shrouded in secrecy and shunned for apparent built in racial bias that amplifies existing stereotypes. Since it's one of the most disputed parts of technology, IBM is trying to provide transparency and level the playing field. The Breakdown You Need to Know **Racial bias comes in many forms with AI and is primarily reflected in the lack of diversity going into the data algorithms it's trained on**. IBM **researchers have been busy coming up with ways to reduce bias in the datasets used to train AI machine learning systems.** This is a big deal if you're rejecting someone for a job, a loan, or deciding on whether or not they should go to prison due to AI data. The software giant has developed a rating system that can rank the relative fairness of an AI platform and explains how decisions are made. IBM is going to launch its AI Fairness 360 toolkit and make the new software easily accessible by the open source community, as a way to combat the current state of homogeneous developers. "**The fully automated software service explains decision-making and detects bias in AI models at runtime – as decisions are being made – capturing potentially unfair outcomes as they occur**. Importantly, it also automatically recommends data to add to the model to help mitigate any bias it has detected," IBM wrote in a statement.

# R/T AI Bad

### 1. AI is good. AI isn't automation, which is just about machines replacing humans, but AI is just about seeing patterns in data that make industries more efficient and create jobs

### Tech advances make the tech easier to use by low-skill workers

**Agarwal 19** Rajshree Agarwal [Rudy Lamone Chair and Professor of Entrepreneurship and Strategy at the University of Maryland], 1-16-2019, "Why Low-Skilled Workers Will Win In The Robot Revolution," Forbes,

https://www.forbes.com/sites/washingtonbytes/2019/01/16/why-low-skilled-workers-will-win-in-the-robot-revolution/#1db3ba807538 //DF

These remedies are unnecessary. A new working paper helps explain why. The research focuses on machine learning and artificial intelligence at patent offices, where teams must evaluate prior innovation to determine if new applications qualify for protection. Triangulating the insights from this study with lessons from history, there are at least three universal rules that apply anytime humans interact with technology. **Interfaces will evolve to boost access for low-skilled workers** First, as technological interfaces improve, more people come in from the fringes of the economy. **Early room-sized computers needed scientists in white lab coats just to turn on the machines and feed paper punch cards into the right slots. Plumbers, auto mechanics and factory workers didn't get anywhere near the secured laboratories.** The disclaimer from old television shows could have applied: "Don't try this at home." Computer users look much different today. Even children routinely do things that required Fortran fluency in the past. It's not that unskilled workers have gotten so much smarter. It's that **user interfaces have gotten so much simpler, shifting power to the masses.** WYSIWYG "what you see is what you get" editors, popularized by Apple, broke the doors to computer usage wide open. Suddenly, **even novices could write word documents, store recipes, play solitaire and manage family checkbooks.** The options have multiplied since then. **People today can edit video, translate text into dozens of languages and even run background checks on potential dates — all while standing in line at the grocery store.** IBM engineers could do none of that in the 1950s. The economy will grow as humans and machines team up Second, **machines don't really replace humans or make them obsolete.** The opposite is actually true. **Machines complement humans and make them more productive, more valuable and ultimately more secure.** We see this with patent applications. Machines working alone sometimes miss prior innovation that might disqualify an application. That's where human judgment comes in. But humans are not as efficient as machines in processing data. As noted in the 2018 bestseller, Prediction Machines, the best results come when both sides work together, combining the prediction power of artificial intelligence with the creative and critical genius of humans. Consider the lessons from banking and retail. Tellers panicked when ATMs emerged in the 1970s. Nasdaq traders resisted when digital technology threatened manual phone orders in the 1980s. And cashiers complained when self-checkout lanes appeared at grocery and department stores in the 1990s. People raised concerns each step of the way about technological unemployment. But something else happened instead. The economy grew. The World Bank estimates that more than half of humanity now has access to digital currency, which has helped billions of people lift themselves out of poverty. If society tried going back to pre-automation days, global markets would collapse overnight. The United States alone would need the bulk of its labor force just to keep pace with daily financial transactions that have climbed to $14 trillion in U.S. currency. That would be a lot of zeros to count manually, even if workers had their old battery-powered calculators with blinking orange-red numbers. Clearly, current levels of productivity would not be possible without mobile money and electronic payment options. Economic growth depends on technology. But at the same time, it depends on people. They need each other. John Henry had it wrong when he challenged a steam-powered rock drilling machine to a contest. When people step back and let machines do what they do best, people free themselves to do what they do best. For high-skilled workers, this might mean writing the code that sets the automation in motion. For low-skilled workers, it might mean interacting with technology in specialized ways that don't require advanced degrees. Expertise at all educational levels helps grow the economy.

**Reese 19** Byron Reese [CEO and publisher of the technology research company Gigaom, and the founder of several high-tech companies. He has spent the better part of his life exploring the interplay of technology with human history. He is the author of the books "Infinite Progress"; "How Technology and the Internet Will End Ignorance, Disease, Hunger, Poverty, and War"], 2-13-2019, "The Great Myth of the AI Skills Gap," Singularity Hub, https://singularityhub.com/2019/02/13/ai-wont-create-a-skills-gap-heres-what-will-happen-instead/ //DF

It is important to note that both sides of the debate are in agreement at this point. Unquestionably, technology destroys low-skilled, low-paying jobs while creating high-skilled, high-paying ones. So, is that the end of the story? As a society are we destined to bifurcate into two groups, those who have training and earn high salaries in the new jobs, and those

with less training who see their jobs vanishing to machines? Is this latter group forever locked out of economic plenty because they lack training? No. The question, "Can a fast food worker become a geneticist?" is where the error comes in. Fast food workers don't become geneticists. What happens is that a college biology professor becomes a geneticist. Then a high-school biology teacher gets the college job. Then the substitute teacher gets hired on full-time to fill the high school teaching job. All the way down. The question is not whether those in the lowest-skilled jobs can do the high-skilled work. Instead the question is, "Can everyone do a job just a little harder than the job they have today?" If so, and I believe very deeply that this is the case, then every time technology creates a new job "at the top," everyone gets a promotion. This isn't just an academic theory—it's 200 years of economic history in the west. **For 200 years, with the exception of the Great Depression, unemployment in the US has been between 2 percent and 13 percent**. Always. Europe's range is a bit wider, but not much. **If I took 200 years of unemployment rates and graphed them, and asked you to find where the assembly line took over manufacturing, or where steam power rapidly replaced animal power, or the lightning-fast adoption of electricity by industry, you wouldn't be able to find those spots.** They aren't even blips in the unemployment record. You don't even have to look back as far as the assembly line to see this happening. It has happened non-stop for 200 years. **Every fifty years, we lose about half of all jobs, and this has been pretty steady since 1800.** How is it that for 200 years we have lost half of all jobs every half century, but never has this process caused unemployment? Not only has it not caused unemployment, but during that time, we have had full employment against the backdrop of rising wages. How can wages rise while half of all jobs are constantly being destroyed? Simple. Because **new technology always increases worker productivity. It creates new jobs, like web designer and programmer, while destroying low-wage backbreaking work. When this happens, everyone along the way gets a better job.** Our current situation isn't any different than the past. The nature of technology has always been to create high-skilled jobs and increase worker productivity. This is good news for everyone.

**ATM Example (Reese - Singularity Hub)**

Byron Reese, 1-1-2019, "AI Will Create Millions More Jobs Than It Will Destroy. Here's How," Singularity Hub, https://singularityhub.com/2019/01/01/ai-will-create-millions-more-jobs-than-it-will-destroy-heres-how/ (NK)

Then along came a new, even bigger technology: artificial intelligence. You hear the same refrain: "It will destroy jobs." **Consider the ATM**. If you had to point to a technology that looked as though it would replace people, the ATM might look like a good bet; it is, after all, an automated teller machine. **And yet, there are more tellers now than when ATMs were widely released.** How can this be? Simple: ATMs lowered the cost of opening bank branches, and banks responded by opening more**, which required hiring more teller**s. In this manner, **AI will create millions of jobs that are far beyond our ability to imagine.** For instance, AI is becoming adept at language translation—and according to the US Bureau of Labor Statistics, demand for human translators is skyrocketing. Why? If the cost of basic translation drops to nearly zero, the cost of doing business with those who speak other languages falls. Thus, it emboldens companies to do more business overseas, creating more work for human translators. AI may do the simple translations, but humans are needed for the nuanced kind.

## Big tech companies are using AI in health care

**Huynh 19** Nancy Huynh, 2-27-2019, "How the "Big 4" Tech Companies Are Leading Healthcare Innovation," Healthcare Weekly, https://healthcareweekly.com/how-the-big-4-tech-companies-are-leading-healthcare-innovation/ //DF

According to the Center for Medicare and Medicaid Services (CMS), US health spending has already reached 3.3 trillion dollars in 2016 and is expected to increase 5.5% annually on average through 2026. In the eyes of Google, Amazon, Apple, and Microsoft, healthcare presents a tremendous business opportunity – it's no wonder the top tech companies are looking to lead healthcare innovation. At a high level, **each of**

**the "Big 4" tech companies are leveraging their own core business strengths to reinvent healthcare by developing and collaborating on new tools for patients**, care providers, and insurers that will position them for healthcare domination. Google: top tech companies, healthcare innovation **Google sees the future of healthcare through the lens of structured data and AI** – and rightly so, considering about a third of the world's data is generated from the healthcare industry. **By leveraging its strengths in AI and machine learning to make sense of vast amounts of health data, Google can position itself as healthcare innovation leader.** At a high level, Google aims to stand out in healthcare by applying its AI capabilities in the areas of disease detection, data interoperability, and health insurance. According to Google AI, "We think that AI is poised to transform medicine, delivering new, assistive technologies that will empower doctors to better serve their patients." By collaborating with doctors in the US and abroad, Google has already developed an algorithm that can diagnose diabetic retinopathy in images at a level of accuracy likened to that of board-certified ophthalmologists. In 2017, Google's life sciences division Verily, Duke University School of Medicine, and Stanford Medicine launched Project Baseline. This longitudinal study of approximately 10,000 people (and potentially millions of data points) over a four year period aims to establish a "baseline" of good health and understanding the onset and risk factors for disease. In a recent report by CNBC, Verily "has been in talks with insurers about jointly bidding for contracts that would involve taking on risk for hundreds of thousands of patients." The data-driven solution that Verily provides could mean disruption of the health insurance industry, by increasing patient engagement, speeding up intervention, and lowering costs of care. Google is the most active among its big tech rivals in acquiring and investing in AI talent and applications. Since its first round of funding in 2009, Alphabet's venture arm, Google Ventures (GV), has backed nearly 60 health-related enterprises ranging from genetics to telemedicine.

**Lagasse 19** Jeff Lagasse, Associate Editor, 11-28-2019, "How artificial intelligence can be used to reduce costs and improve outcomes in total joint replacement surgery," Healthcare Finance News, https://www.healthcarefinancenews.com/news/how-artificial-intelligence-can-be-used-reduce-costs-and-improve-outcomes-total-joint //DF

Total joint replacement surgery is one of the most prevalent and expensive surgeries in the U.S., and a study published in the Annals of Translational Medicine indicates that **costs and outcomes for such surgeries can be improved by using artificial intelligence platforms.** Specifically, the research examined the efficacy of PreHab AI technology from mobile technology company PeerWell. Offering pre-operative education, PreHab was associated with a reduction in surgery costs of $1,215 -- with one big catch: It had to be delivered in person by a physical therapist. Many insurance plans only allow for a small number of paid physical therapy sessions per year, making surgeons reluctant to use them before surgery. IMPACT The platform was able to deliver effective preoperative optimization without the need for clinicians, findings showed. **A patient's use of PeerWell led to significant cost reductions including a 25 percent drop in hospital length of stay, an 80 percent increase in going home without the need for home care, and a 91 percent reduction in discharges to skilled nursing facilities.** The platform uses patient data to create personalized daily plans to get patients ready for surgery. Plans include video physical therapy, nutrition counseling, comprehensive anxiety management and pain resilience training, home preparation guidance and medical risk management. By using machine learning, PeerWell can also glean clinically relevant data from ordinary smartphones. For example, using the accelerometer and gyroscope, it can track range of motion. Or, by using the smartphone camera, it can identify trip and fall hazards in the home. THE TREND The largest insurers in the world, including Medicare, have changed regulations to put the onus on care providers to reduce costs while maintaining high quality. This dynamic has left many surgeons and hospitals in a bind, shouldering more administrative work for less reimbursement. **Medicare's randomized trial of a new bundled payment model for hip and knee replacement surgeries led to $812 in savings per procedure, or a 3.1 percent reduction in costs**, when compared with traditional means of paying for care, research found this month. The bundled payment model was also associated with a reduction in use of skilled nursing care after the hospitalization, but had no effects on complication rates among patients.

## 2. AI is inevitable, so it's better that we do it. Without AI innovation, the US will loose so much competitive potential

## The battle over AI dominance will shape the battle for global influence between the US and China

**Stratfor 19** Stratfor Worldview [a geopolitical intelligence and advisory firm], 3-24-2019, "America and China's Great AI Competition: What Is Driving It," National Interest, https://nationalinterest.org/print/blog/buzz/america-and-chinas-great-ai-competition-what-driving-it-48677 //DF

AI is both a driver and a consequence of structural forces reshaping the global order. Aging demographics – an unprecedented and largely irreversible global phenomenon – is a catalyst for AI development. As populations age and shrink, financial burdens on the state mount and labor productivity slows, sapping economic growth over time. Advanced industrial economies already struggling to cope with the ill effects of aging demographics with governments that are politically squeamish toward immigration will relentlessly look to machine learning technologies to increase productivity and economic growth in the face of growing labor constraints. **The global race for AI supremacy will feature prominently in a budding great power competition between the United States and China.** China was shocked in 2016 when Google DeepMind's AlphaGo beat the world champion of Go, an ancient Chinese strategy game (Chinese AI state planners dubbed the event their "Sputnik moment"), and has been deeply shaken by U.S. President Donald Trump's trade wars and the West's growing imperative to keep sensitive technology out of Chinese competitors' hands. Just in the past couple of years alone, China's state focus on AI development has skyrocketed to ensure its technological drive won't suffer a short circuit due to its competition with the United States. Do or Die for Beijing The United States, for now, has the lead in AI development when it comes to hardware, research and development, and a dynamic commercial AI sector. China, by the sheer size of its population, has a much larger data pool, but is critically lagging behind the United States in semiconductor development. Beijing, however, is not lacking in motivation in its bid to overtake the United States as the premier global AI leader by 2030. And while that timeline may appear aggressive, **China's ambitious development in AI in the coming years will be unfettered by the growing ethical, privacy and antitrust concerns occupying the West**. China is also throwing hundreds of billions of dollars into fulfilling its AI mission, both **in collaboration with its standing tech champions and by encouraging the rise of unicorns**, or privately held startups valued at $1 billion or more. By incubating and rewarding more and more startups, Beijing is finding a balance between focusing its national champions on the technologies most critical to the state (sometimes by taking an equity stake in the company) without stifling innovation. In the United States, on the other hand, it would be disingenuous to label U.S.-based multinational firms, which park most of their corporate profits overseas, as true "national" champions. Instead of the state taking the lead in funding high-risk and big-impact research in emerging technologies as it has in the past, the roles in the West have been flipped; private tech companies are in the driver's seat while the state is lunging at the steering wheel, trying desperately to keep China in its rear view. The Ideological Battleground The United States may have thought its days of fighting globe-spanning ideological battles ended with the Cold War. Not so. AI development is spawning a new ideological battlefield between the United States and China, pitting the West's notion of liberal democracy against China's emerging brand of digital authoritarianism. As neuroscientist Nicholas Wright highlights in his article, "How Artificial Intelligence Will Reshape the Global Order," China's 2017 AI development plan "describes how the ability to predict and grasp group cognition means 'AI brings new opportunities for social construction.'" Central to this strategic initiative is China's diffusion of a "social credit system" (which is set to be fully operational by 2020) that would assign a score based on a citizen's daily activities to determine everything from airfare class and loan eligibility to what schools your kids are allowed to attend. It's a tech-powered, state-driven approach to parse model citizens from the deplorables, so to speak. The ability to harness AI-powered facial recognition and surveillance data to shape social behavior is an appealing tool, not just for Beijing, but for other politically paranoid states that are hungry for an alternative path to stability and are underwhelmed by the West's messy track record in promoting democracy. Wright describes how Beijing has exported its Great

Firewall model to Thailand and Vietnam to barricade the internet while also supplying surveillance technology to the likes of Iran, Russia, Ethiopia, Zimbabwe, Zambia and Malaysia. Not only does this aid China's goal of providing an alternative to a U.S.-led global order, but it widens China's access to even wider data pools around the globe to hone its own technological prowess.

# Extras

## AI

### Link – Data

#### These companies need to share data to improve products

**Mayer 18** Viktor Mayer-SchöNberger, 9-2018, "A Big Choice for Big Tech," Foreign Affairs, https://www.foreignaffairs.com/articles/world/2018-08-13/big-choice-big-tech //DF

To solve this problem, some experts have suggested breaking up digital superstars, so that they no longer control the marketplace, the information that flows among market participants, and the decision assistants. The model would be the robust antitrust enforcement that led to the breakup of Standard Oil, in 1911, and AT&T, in 1984. A less drastic alternative might draw inspiration from the steps taken by regulators in the 1990s to force Microsoft to stop bundling a Web browser with its operating system and, more recently, to prevent Google from favoring its own services in its search results. But **by reducing firms' ability to use large amounts of data, such measures would reduce market efficiency and leave consumers worse off. If**, for instance, **Amazon were broken up into a marketplace and a separate tool to provide recommendations, the latter would no longer have access to the huge streams of data generated by the former.** Nor would a breakup improve competition. Alternative recommendation engines would not see the market data either, so their suggestions would be no better. It would not really matter how regulators broke a firm up—whether they created many little Googles, for instance, or split YouTube from Google Search—because after the breakup, all the new entities would have less information to learn from, leading to inferior products and services overall. Similarly, although restricting the ways digital superstars can collect or use data—through tougher privacy laws, for instance—might fragment markets and thus improve their resilience, the quality of recommendations would deteriorate absent sufficient data, leading to inefficient transactions and reduced consumer welfare.

# What is Artificial Intelligence?

## AI means machines that learn and respond to stimulation in ways similar to humans

**West and Allen 18** Darrell M. West [Vice President and Director - Governance Studies Founding Director - Center for Technology Innovation] and John R. Allen [President, The Brookings Institution], 4-24-2018, "How artificial intelligence is transforming the world," Brookings, https://www.brookings.edu/research/how-artificial-intelligence-is-transforming-the-world/ //DF

I. QUALITIES OF ARTIFICIAL INTELLIGENCE Although there is no uniformly agreed upon definition, AI generally is thought to refer to "machines that respond to stimulation consistent with traditional responses from humans, given the human capacity for contemplation, judgment and intention."[3] According to researchers Shubhendu and Vijay, these software systems "make decisions which normally require [a] human level of expertise" and help people anticipate problems or deal with issues as they come up.[4] As such, they operate in an intentional, intelligent, and adaptive manner. Intentionality Artificial intelligence algorithms are designed to make decisions, often using real-time data. They are unlike passive machines that are capable only of mechanical or predetermined responses. Using sensors, digital data, or remote inputs, they combine information from a variety of different sources, analyze the material instantly, and act on the insights derived from those data. With massive improvements in storage systems, processing speeds, and analytic techniques, they are capable of tremendous sophistication in analysis and decisionmaking. Intelligence AI generally is undertaken in conjunction with machine learning and data analytics.[5] Machine learning takes data and looks for underlying trends. If it spots something that is relevant for a practical problem, software designers can take that knowledge and use it to analyze specific issues. All that is required are data that are sufficiently robust that algorithms can discern useful patterns. Data can come in the form of digital information, satellite imagery, visual information, text, or unstructured data. Adaptability AI systems have the ability to learn and adapt as they make decisions. In the transportation area, for example, semi-autonomous vehicles have tools that let drivers and vehicles know about upcoming congestion, potholes, highway construction, or other possible traffic impediments. Vehicles can take advantage of the experience of other vehicles on the road, without human involvement, and the entire corpus of their achieved "experience" is immediately and fully transferable to other similarly configured vehicles. Their advanced algorithms, sensors, and cameras incorporate experience in current operations, and use dashboards and visual displays to present information in real time so human drivers are able to make sense of ongoing traffic and vehicular conditions. And in the case of fully autonomous vehicles, advanced systems can completely control the car or truck, and make all the navigational decisions.

# AI Applications

## The expansion of AI will have staggering effects on the global economy. Bughin of Mckinsey writes in 2018 that:

Jacques Bughin, September, 2018, "Notes from the AI frontier: Modeling the impact of AI on the world economy," McKinsey & Company, https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-modeling-the-impact-of-ai-on-the-world-economy (NK)

Several barriers might hinder rapid adoption and absorption (see video, "A minute with the McKinsey Global Institute: Challenges of adopting automation technology"). For instance, late adopters might find it difficult to generate impact from AI, because front-runners have already captured AI opportunities and late adopters lag in developing capabilities and attracting talent. **Nevertheless, at the global average level of adoption and absorption implied by our simulation, AI has the potential to deliver additional global economic activity of around $13 trillion by 2030, or about 16 percent higher cumulative GDP compared with today.** This amounts to 1.2 percent additional GDP growth per year. If delivered, this impact

would compare well with that of other general-purpose technologies through history. A number of factors, including labor automation, innovation, and new competition, affect AI-driven productivity growth. Micro factors, such as the pace of adoption of AI, and macro factors, such as the global connectedness or labor-market structure of a country, both contribute to the size of the impact.

## Finance: AI will make trades and loans more accurate and data-driven, and will help to spot fraud

**West and Allen 18** Darrell M. West [Vice President and Director - Governance Studies Founding Director - Center for Technology Innovation] and John R. Allen [President, The Brookings Institution], 4-24-2018, "How artificial intelligence is transforming the world," Brookings, https://www.brookings.edu/research/how-artificial-intelligence-is-transforming-the-world/ //DF

Finance Investments in financial AI in the United States tripled between 2013 and 2014 to a total of $12.2 billion.[9] According to observers in that sector, "Decisions about loans are now being made by software that can take into account a variety of finely parsed data about a borrower, rather than just a credit score and a background check."[10] In addition, there are so-called robo-advisers that "create personalized investment portfolios, obviating the need for stockbrokers and financial advisers."[11] These advances are designed to take the emotion out of investing and undertake decisions based on analytical considerations, and make these choices in a matter of minutes. A prominent example of this is taking place in stock exchanges, where high-frequency trading by machines has replaced much of human decisionmaking. People submit buy and sell orders, and computers match them in the blink of an eye without human intervention. Machines can spot trading inefficiencies or market differentials on a very small scale and execute trades that make money according to investor instructions.[12] Powered in some places by advanced computing, these tools have much greater capacities for storing information because of their emphasis not on a zero or a one, but on "quantum bits" that can store multiple values in each location.[13] That dramatically increases storage capacity and decreases processing times. Fraud detection represents another way AI is helpful in financial systems. It sometimes is difficult to discern fraudulent activities in large organizations, but AI can identify abnormalities, outliers, or deviant cases requiring additional investigation. That helps managers find problems early in the cycle, before they reach dangerous levels.[14]

## AI will improve autonomous vehicles

**West and Allen 18** Darrell M. West [Vice President and Director - Governance Studies Founding Director - Center for Technology Innovation] and John R. Allen [President, The Brookings Institution], 4-24-2018, "How artificial intelligence is transforming the world," Brookings, https://www.brookings.edu/research/how-artificial-intelligence-is-transforming-the-world/ //DF

Transportation represents an area where AI and machine learning are producing major innovations. Research by Cameron Kerry and Jack Karsten of the Brookings Institution has found that over $80 billion was invested in autonomous vehicle technology between August 2014 and June 2017. Those investments include applications both for autonomous driving and the core technologies vital to that sector.[28] Autonomous vehicles—cars, trucks, buses, and drone delivery systems—use advanced technological capabilities. Those features include automated vehicle guidance and braking, lane-changing systems, the use of cameras and sensors for collision avoidance, the use of AI to analyze information in real time, and the use of high-performance computing and deep learning systems to adapt to new circumstances through detailed maps.[29] Light detection and ranging systems (LIDARs) and AI are key to navigation and collision avoidance. LIDAR systems combine light and radar instruments. They are mounted on the top of vehicles that use imaging in a 360-degree environment from a radar and light beams to measure the speed and distance of surrounding objects. Along with sensors placed on the front, sides, and back of the vehicle, these instruments provide information that keeps fast-moving cars and trucks in their own lane, helps them avoid other vehicles, applies brakes and steering when needed, and does so instantly so as to avoid accidents. Advanced software enables cars to learn from the experiences of other vehicles on the road and adjust their guidance

systems as weather, driving, or road conditions change. This means that software is the key—not the physical car or truck itself. Since these cameras and sensors compile a huge amount of information and need to process it instantly to avoid the car in the next lane, autonomous vehicles require high-performance computing, advanced algorithms, and deep learning systems to adapt to new scenarios. This means that software is the key, not the physical car or truck itself.[30] Advanced software enables cars to learn from the experiences of other vehicles on the road and adjust their guidance systems as weather, driving, or road conditions change.[31] Ride-sharing companies are very interested in autonomous vehicles. They see advantages in terms of customer service and labor productivity. All of the major ride-sharing companies are exploring driverless cars. The surge of car-sharing and taxi services—such as Uber and Lyft in the United States, Daimler's Mytaxi and Hailo service in Great Britain, and Didi Chuxing in China—demonstrate the opportunities of this transportation option. Uber recently signed an agreement to purchase 24,000 autonomous cars from Volvo for its ride-sharing service.[32] However, the ride-sharing firm suffered a setback in March 2018 when one of its autonomous vehicles in Arizona hit and killed a pedestrian. Uber and several auto manufacturers immediately suspended testing and launched investigations into what went wrong and how the fatality could have occurred.[33] Both industry and consumers want reassurance that the technology is safe and able to deliver on its stated promises. Unless there are persuasive answers, this accident could slow AI advancements in the transportation sector.

## AI will improve health care through medical detection

**West and Allen 18** Darrell M. West [Vice President and Director - Governance Studies Founding Director - Center for Technology Innovation] and John R. Allen [President, The Brookings Institution], 4-24-2018, "How artificial intelligence is transforming the world," Brookings, https://www.brookings.edu/research/how-artificial-intelligence-is-transforming-the-world/ //DF

**AI tools are helping designers improve computational sophistication in health care.** For example, Merantix is a German company that applies deep learning to medical issues. It has an application in medical imaging that "detects lymph nodes in the human body in Computer Tomography (CT) images."[21] According to its developers, the key is labeling the nodes and identifying small lesions or growths that could be problematic. Humans can do this, but radiologists charge $100 per hour and may be able to carefully read only four images an hour. If there were 10,000 images, the cost of this process would be $250,000, which is prohibitively expensive if done by humans. What deep learning can do in this situation is train computers on data sets to learn what a normal-looking versus an irregular-appearing lymph node is. After doing that through imaging exercises and honing the accuracy of the labeling, radiological imaging specialists can apply this knowledge to actual patients and determine the extent to which someone is at risk of cancerous lymph nodes. Since only a few are likely to test positive, it is a matter of identifying the unhealthy versus healthy node. AI has been applied to congestive heart failure as well, an illness that afflicts 10 percent of senior citizens and costs $35 billion each year in the United States. **AI tools are helpful because they "predict in advance potential challenges ahead and allocate resources to patient education, sensing, and proactive interventions that keep patients out of the hospital**."[22]

**Guo 18** Weisi Guo,, 10-15-2018, "Retool AI to forecast and limit wars," Journal Nature, https://www.nature.com/articles/d41586-018-07026-4 //DF

**Armed violence is on the rise and we don't know how to stop** it1. **Since 2011, conflicts worldwide have killed up to 100,000 people a year**, three-quarters of whom were in Afghanistan, Iraq and Syria. The rate of major wars has decreased over the past few decades. But the number of civil conflicts has doubled since the 1960s, and terrorist attacks have become more frequent in the past ten years. The nature of conflict is changing. Wars are waged less often between states, but increasingly within them by armed groups — more than 1,000 such groups operated in Syria at the peak of its civil war in 2013. They vary in size from a few local militias to tens of thousands of experienced fighters. Advances in technology makes attacks more precise, coordinated and deadly. Civilians are increasingly targeted. By 2016, wars had displaced more than 65 million people worldwide from their homes. More than half were children. **The costs are huge. The United Nations spent more than US$20 billion in**

**2016 on humanitarian aid. Violent countries are weakened economically.** For example, since 1996, wars have cost the Democratic Republic of the Congo almost one-third of its gross domestic product2. Wars stifle progress towards many of the UN Sustainable Development Goals. Nations spend relatively little on preventing conflicts. UN peacekeeping efforts in 2016–17 cost around $7 billion, equivalent to less than 1% of global military spending. Yet peacekeepers have prevented conflicts from erupting in the wake of crises3. For example, within one month of a disputed presidential election in Gambia in 2016, West African countries sent troops to maintain security. And interventions can stop them from recurring, as in El Salvador's civil war in 1991 and in Bosnia and Herzegovina in 1995. Reform predictive policing Governments and the international community often have little warning of impending crises. **Likely trouble spots can be flagged a few days or sometimes weeks in advance using algorithms that forecast risks**, similar to those used for predicting policing needs and extreme weather. For conflict risk prediction, these codes estimate the likelihood of violence by extrapolating from statistical data4 and analysing text in news reports to detect tensions and military developments (see go.nature.com/2oczqep). **Artificial intelligence (AI) is poised to boost the power of these approaches.** Several examples are under way. These include Lockheed Martin's Integrated Crisis Early Warning System, the Alan Turing Institute's project on global urban analytics for resilient defence (run by W.G. and A.W.) and the US government's Political Instability Task Force. Future AI and conflict models need to do more than make predictions: they must offer explanations for violence and strategies for preventing it. This will be difficult because conflict is dynamic and multi-dimensional. And the data collected today are too narrow, sparse and disparate.

## National security: the US must invest in AI to guard itself against cyberattacks from enemies like China, and to keep up the pace with them in warfare

**West and Allen 18** Darrell M. West [Vice President and Director - Governance Studies Founding Director - Center for Technology Innovation] and John R. Allen [President, The Brookings Institution], 4-24-2018, "How artificial intelligence is transforming the world," Brookings, https://www.brookings.edu/research/how-artificial-intelligence-is-transforming-the-world/ //DF

National security AI plays a substantial role in national defense. Through its Project Maven, the American military is deploying AI "to sift through the massive troves of data and video captured by surveillance and then alert human analysts of patterns or when there is abnormal or suspicious activity."[15] According to Deputy Secretary of Defense Patrick Shanahan, the goal of emerging technologies in this area is "to meet our warfighters' needs and to increase [the] speed and agility [of] technology development and procurement."[16] The big data analytics associated with AI will profoundly affect intelligence analysis, as massive amounts of data are sifted in near real time—if not eventually in real time—thereby providing commanders and their staffs a level of intelligence analysis and productivity heretofore unseen. Command and control will similarly be affected as human commanders delegate certain routine, and in special circumstances, key decisions to AI platforms, reducing dramatically the time associated with the decision and subsequent action. In the end, warfare is a time competitive process, where the side able to decide the fastest and move most quickly to execution will generally prevail. Indeed, artificially intelligent intelligence systems, tied to AI-assisted command and control systems, can move decision support and decisionmaking to a speed vastly superior to the speeds of the traditional means of waging war. So fast will be this process, especially if coupled to automatic decisions to launch artificially intelligent autonomous weapons systems capable of lethal outcomes, that a new term has been coined specifically to embrace the speed at which war will be waged: hyperwar. **While the ethical and legal debate is raging over whether America will ever wage war with artificially intelligent autonomous lethal systems, the Chinese and Russians are not nearly so mired in this debate, and we should anticipate our need to defend against these systems operating at hyperwar speeds**. The challenge in the West of where to position "humans in the loop" in a hyperwar scenario will ultimately dictate the West's capacity to be competitive in this new form of conflict.[17] Just as AI will profoundly affect the speed of warfare, the proliferation of zero day or zero second cyber threats as well as polymorphic malware will challenge even the most sophisticated signature-based cyber protection. This forces significant improvement to existing cyber defenses. Increasingly, vulnerable systems are

migrating, and will need to shift to a layered approach to cybersecurity with cloud-based, cognitive AI platforms. This approach moves the community toward a "thinking" defensive capability that can defend networks through constant training on known threats. This capability includes DNA-level analysis of heretofore unknown code, with the possibility of recognizing and stopping inbound malicious code by recognizing a string component of the file. This is how certain key U.S.-based systems stopped the debilitating "WannaCry" and "Petya" viruses**. Preparing for hyperwar and defending critical cyber networks must become a high priority because China, Russia, North Korea, and other countries are putting substantial resources into AI.** In 2017, China's State Council issued a plan for the country to "build a domestic industry worth almost $150 billion" by 2030.[18] As an example of the possibilities, the Chinese search firm Baidu has pioneered a facial recognition application that finds missing people. In addition, cities such as Shenzhen are providing up to $1 million to support AI labs. That country hopes AI will provide security, combat terrorism, and improve speech recognition programs.[19] The dual-use nature of many AI algorithms will mean AI research focused on one sector of society can be rapidly modified for use in the security sector as well.[20]

# AI in China

## China is making rapid strides in AI; even though it lags the US, it will benefit massively

**West and Allen 18** Darrell M. West [Vice President and Director - Governance Studies Founding Director - Center for Technology Innovation] and John R. Allen [President, The Brookings Institution], 4-24-2018, "How artificial intelligence is transforming the world," Brookings, https://www.brookings.edu/research/how-artificial-intelligence-is-transforming-the-world/ //DF

AI is not a futuristic vision, but rather something that is here today and being integrated with and deployed into a variety of sectors. This includes fields such as finance, national security, health care, criminal justice, transportation, and smart cities. There are numerous examples where AI already is making an impact on the world and augmenting human capabilities in significant ways.[6] One of the reasons for the growing role of AI is the tremendous opportunities for economic development that it presents. A project undertaken by PriceWaterhouseCoopers estimated that "artificial intelligence technologies could increase global GDP by $15.7 trillion, a full 14%, by 2030."[7] That includes advances of $7 trillion in China, $3.7 trillion in North America, $1.8 trillion in Northern Europe, $1.2 trillion for Africa and Oceania, $0.9 trillion in the rest of Asia outside of China, $0.7 trillion in Southern Europe, and $0.5 trillion in Latin America. China is making rapid strides because it has set a national goal of investing $150 billion in AI and becoming the global leader in this area by 2030. Meanwhile, a McKinsey Global Institute study of China found that "AI-led automation can give the Chinese economy a productivity injection that would add 0.8 to 1.4 percentage points to GDP growth annually, depending on the speed of adoption."[8] Although its authors found that China currently lags the United States and the United Kingdom in AI deployment, the sheer size of its AI market gives that country tremendous opportunities for pilot testing and future development.

In May 2017, AlphaGo triumphed again, this time over Ke Jie, a Chinese Go master, ranked at the top of the world. Two months later, China unveiled its Next Generation Artificial Intelligence Development Plan, a document that laid out the country's strategy to become the global leader in AI by 2030. And with this clear signal from Beijing, it was as if a giant axle began to turn in the machinery of the industrial state. Other Chinese government ministries soon issued their own plans, based on the strategy sketched out by Beijing's planners. Expert advisory groups and industry alliances cropped up, and local governments all over China began to fund AI ventures.

China's tech giants were enlisted as well. Alibaba, the giant online retailer, was tapped to develop a "City Brain" for a new Special Economic Zone being planned about 60 miles southwest of Beijing. Already, in

the city of Hangzhou, the company was soaking up data from thousands of street cameras and using it to control traffic lights with AI, optimizing traffic flow in much the way AlphaGo had optimized for winning moves on the Go board; now Alibaba would help design AI into a new megacity's entire infrastructure from the ground up.

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On October 18, 2017, China's president, Xi Jinping, stood in front of 2,300 of his fellow party members, flanked by enormous red drapes and a giant gold hammer and sickle. As Xi laid out his plans for the party's future over nearly three and a half hours, he named artificial intelligence, big data, and the internet as core technologies that would help transform China into an advanced industrial economy in the coming decades. It was the first time many of these technologies had explicitly come up in a president's speech at the Communist Party Congress, a once-in-five-years event.

At the dawn of a new stage in the digital revolution, the world's two most powerful nations are rapidly retreating into positions of competitive isolation, like players across a Go board. And what's at stake is not just the technological dominance of the United States. At a moment of great anxiety about the state of modern liberal democracy, AI in China appears to be an incredibly powerful enabler of authoritarian rule. Is the arc of the digital revolution bending toward tyranny, and is there any way to stop it?

AFTER THE END of the Cold War, conventional wisdom in the West came to be guided by two articles of faith: that liberal democracy was destined to spread across the planet, and that digital technology would be the wind at its back. The censorship, media consolidation, and propaganda that had propped up Soviet-era autocracies would simply be inoperable in the age of the internet. The World Wide Web would give people free, unmediated access to the world's information. It would enable citizens to organize, hold governments accountable, and evade the predations of the state.

China has two fundamental advantages over the US in building a robust AI infrastructure, and they're both, generally, advantages that authoritarian states have over democratic ones. The first is the sheer scope of the data generated by Chinese tech giants. Think of how much data Facebook collects from its users and how that data powers the company's algorithms; now consider that Tencent's popular WeChat app is basically like Facebook, Twitter, and your online bank account all rolled into one. China

has roughly three times as many mobile phone users as the US, and those phone users spend nearly 50 times as much via mobile payments. China is, as The Economist first put it, the Saudi Arabia of data. Data privacy protections are on the rise in China, but they are still weaker than those in the US and much weaker than those in Europe, allowing data aggregators a freer hand in what they can do with what they collect. And the government can access personal data for reasons of public or national security without the same legal constraints a democracy would face. Of course, data isn't everything: Any technological system depends on a whole stack of tools, from its software to its processors to the humans who curate noisy inputs and analyze results. And there are promising subfields of AI, such as reinforcement learning, that generate their own data from scratch, using lots of computing power. Still, China has a second big advantage as we move into the era of AI, and that's the relationship between its largest companies and the state. In China, the private-sector companies at the cutting edge of AI innovation feel obliged to keep Xi's priorities in mind. Under Xi, Communist Party committees within companies have expanded. Last November, China tapped Baidu, Alibaba, Tencent, and iFlytek, a Chinese voice-recognition software company, as the inaugural members of its "AI National Team." The message was clear: Go forth, invest, and the government will ensure that your breakthroughs have a market not just in China, but beyond. **During the original Cold War, the US relied on companies like Lockheed, Northrop, and Raytheon to develop cutting-edge strategic technology.** Technically, these companies were privately owned. In practice, their vital defense mission made them quasipublic entities. (Indeed, long before the phrase "too big to fail" was ever used to describe a bank, it was applied to Lockheed.) Fast forward to today, and the companies at the forefront of AI—Google, Facebook, Amazon, Apple, and Microsoft—don't exactly wear flag pins on their lapels. This past spring, employees at Google demanded that the company pull out of a Pentagon collaboration called Project Maven. The idea was to use AI for image recognition in Defense Department missions. Ultimately, Google's management caved. Defense Department officials were bitterly disappointed, especially given that Google has a number of partnerships with Chinese technology companies. "It is ironic to be working with Chinese companies as though that is not a direct channel to the Chinese military," says former secretary of defense Ashton Carter, "and not to be willing to operate with the US military, which is far more transparent and which reflects the values of our society. We're imperfect for sure, but we're not a dictatorship."

## Impact – Economic Growth

Author, 10-23-2018, "The AI Cold War That Threatens Us All," WIRED, https://www.wired.com/story/ai-cold-war-china-could-doom-us-all/ //DF

In a way, Putin's line is a bit overwrought. AI is not a hill that one nation can conquer or a hydrogen bomb that one country will develop first. Increasingly, AI is simply how computers work; it's a broad term describing systems that learn from examples—or follow rules—to make independent decisions. Still, it's easily the most important advance in computer science in a generation. Sundar Pichai, the CEO of Google, has compared it to the discovery of electricity or fire. A country that strategically and smartly implements AI technologies throughout its workforce will likely grow faster, even as it deals with the disruptions that AI is likely to cause. Its cities will run more efficiently, as driverless cars and smart infrastructure cut congestion. Its largest businesses will have the best maps of consumer behavior. Its people will live longer, as AI revolutionizes the diagnosis and treatment of disease. And its military will project more power, as autonomous weapons replace soldiers on the battlefield and pilots in the skies, and as cybertroops wage digital warfare. "I can't really think of any mission that

doesn't have the potential to be done better or faster if properly integrated with AI," says Will Roper, an assistant secretary of the US Air Force. And these benefits may compound with interest. So far, at least, AI appears to be a centralizing force, among companies and among nations. The more data you gather, the better the systems you can build; and better systems allow you to collect more data. "AI will become concentrated, because of the inputs required to pull it off. You need a lot of data and you need a lot of computing power," says Tim Hwang, who leads the Harvard-MIT Ethics and Governance of AI Initiative.

## Tech Giants compete against one another

Petit, 2016, Stanford, "TECHNOLOGY GIANTS, THE "MOLIGOPOLY" HYPOTHESIS AND HOLISTIC COMPETITION: A PRIMER" file:///Users/noahkaye2/Downloads/Petit-16.pdf (NK)

Unlike the textbook model of the single product ingot monopolist, **the moligopolists are conglomerates.** Surely, all have a core business: Google is predominantly a "search" company; Apple a communication and media devices firm; Facebook a social network; Amazon an online retailer; and Microsoft an operating systems developer. **But all are active in a variety of other areas.** Often, the moligopolists have entered – or been dragged – into adjacent businesses. Since 2004, Google has developed an e-mail service, an Internet browser, an Operating System ("OS") for mobile and a social network. And Microsoft, who was initially thought to be a software company, made significant forays into hardware with gaming devices and tablets (not to talk of the infamous Zune music player).64 Apple, a computer-engineering firm, has morphed into a manufacturer of wearables of all sorts including, headphones, speakers and wristwatches. To the untrained eye, Facebook and Amazon may, look like more core-centric, focused companies. However, Facebook has slowly diversified its portfolio of activities, through a series of acquisitions (notably, of Instagram, WhatsApp and Oculus Rift).65 And Amazon can no longer be reduced to an online bookstore or an online mall: Amazon Web Services is reported to be the market leader in cloud computing services.66 Besides those casual observations, market research data points to the same direction. The company profiles published by the MarketLine interface has a section entitled "Major Products and Services" which pictures each of the tech giants as a multi-product firm active on a large number of market segments.67 The chart bellow provides a summary of the data found through MarketLine.

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To be sure, the moligopolists are not identical conglomerates. Significant discrepancies exist in the breadth of their product and/or service diversification. Apple and Facebook are, for example, narrower conglomerates than Google, Microsoft and Amazon.71 Moreover, the moligopolists have embraced distinct business models. Apple maintains a closed ecosystem, whilst Google has embraced a more opened architecture. Facebook is the epitome of freemiums, whilst Amazon prices ancillary services and Microsoft practices product versioning. **By and large, however, the tech giants seem to be conglomerates that compete against each other.**72 This finding, which is not spectacular in itself, is perhaps more arresting from a financial theory perspective. Financial experts distaste conglomerates. Firms organized as conglomerates are typically undervalued by financial investors compared to comparable single-product firms. The traditional explanation is that a conglomerate is subject to greater agency problems than single-product firms.73 Accordingly, one shall not expect to see conglomerates as the dominant organizational structure of large publicly listed companies like the tech giants.

## China Rise forces US innovation (Roberts - Australia University)

Anthea Roberts, 5-28-2019, "The U.S.-China Trade War Is a Competition for Technological Leadership," Lawfare, https://www.lawfareblog.com/us-china-trade-war-competition-technological-leadership (NK)

Until recently, the United States was fairly dismissive when it came to Chinese innovation capacity, viewing China as a "copycat nation" that could only steal or "rip off" technological innovations. Yet China has made significant investments in research and development in recent years, and Chinese companies have made impressive stridesforward across a range of areas, including ICT and artificial intelligence (AI). **As China seeks to move itself forward, the United States now faces an imperative to maintain its "technological supremacy." It accordingly has an interest in defending its existing technological dominance, hobbling the technological ambitions of its upcoming rival China and doubling down on its own technological advancement to ensure it retains its edge going forward**. It is difficult to develop a coherent strategy about how to protect America's technological supremacy. One of the chief problems is that views differ over whether openness in trading, investment, and research and development with an economic and strategic competitor represents a security risk (because of the

possibility of knowledge and material transfers) or a security gain (because it bolsters thriving technology industries that are then best placed to retain their innovative edge). For example, Hugo Meijer's work on U.S. export controls contrasts the views of "Control Hawks," who believe that exporting sensitive technologies to competitors is a security risk, with those of "Run Faster" advocates, who argue that strict export controls may actually damage U.S. security by undermining the competitiveness of the commercial industrial base upon which the Pentagon relies for advanced defense technology.

## PWC AI Study

PWC,, 2017, "AI to drive GDP gains of $15.7 trillion with productivity, personalisation improvements," PwC press room, https://press.pwc.com/News-releases/ai-to-drive-gdp-gains-of--15.7-trillion-with-productivity--personalisation-improvements/s/3cc702e4-9cac-4a17-85b9-71769fba82a6 (NK)

**Global GDP will be 14% higher in 2030 as a result of AI – the equivalent of an additional $15.7 trillion. This makes it the biggest commercial opportunity in today's fast changing economy** according to new research by PwC. Drawing on a detailed analysis of the business impact of AI *Sizing the prize* outlines the economies that are set to gain the most from AI. AI will contribute $15.7 trillion to the global economy in 2030, more than the current output of China and India combined. **Labour productivity improvements** are expected to account for over half of all economic gains from AI over the period 2016-2030. **Increased consumer demand** resulting from AI-enabled product enhancements will account for the rest. The greatest economic gains from AI will be in China (26% boost to GDP in 2030) and North America (14.5% boost), equivalent to a total of $10.7 trillion and accounting for almost 70% of the global economic impact.

## US China AI Competition

New America, 2019, "Why US-China Ai Competition Matter," https://www.newamerica.org/cybersecurity-initiative/reports/essay-reframing-the-us-china-ai-arms-race/why-us-china-ai-competition-matters/ (NK)

Competing AI development in the United States and China needs to be reframed from the AI arms race rhetoric, but that doesn't mean AI development itself doesn't matter. In fact, the opposite is true. We are in an era of great power competition, and **U.S. policymakers must pay greater attention to artificial intelligence development domestically and in China**, primarily for two reasons. **First, artificial intelligence will have a profound impact on state power, mainly through economic growth and enhanced military capability. Second, global leaders in AI will set norms around its use—and around the use of technology in society writ large—which will have important influence on other "undecided" states and the future international order**. This is why American policymakers should focus on engaging with China on AI projects without giving up critical expertise or technologies that could potentially enhance harmful applications of artificial intelligence, whether they are in governance, business, or the military.

A Battle over Talent and Standards  But wherever pockets of tech innovation already exist on the Continent, those relatively few companies and individuals are already prime targets for U.S. and Chinese tech juggernauts prowling the globe for AI talent. AI experts are a precious global commodity. According to a 2018 study by Element AI, there are roughly 22,000 doctorate-level researchers in the world, but only around 3,000 are actually looking for work and around 5,400 are presenting their research at AI conferences. U.S. and Chinese tech giants are using a variety of means – mergers and acquisitions, aggressive poaching, launchings labs in cities like Paris, Montreal and Taiwan – to gobble up this tiny talent pool.  Even as Europe struggles to build up its own tech champions, the European Union can use its market size and conscientious approach to ethics, privacy and competition to push back on encroaching tech giants through hefty fines, data localization and privacy rules, taxation and investment restrictions. The bloc's rollout of its General Data Protection Regulation (GDPR) is designed to give Europeans more control over their personal data by limiting data storage times, deleting data on request and monitoring for data breache**s. While big-tech firms have the means to adapt and pay fines, the move threatens to cripple smaller firms struggling to comply with the high cost of compliance**. It also fundamentally restricts the continental data flows needed to fuel Europe's AI startup culture.  The United States in many ways shares Europe's

concerns over issues like data privacy and competition, but it has a fundamentally different approach in how to manage those concerns. The European Union is effectively prioritizing individual privacy rights over free speech, while the United States does the reverse. Brussels will fixate on fairness, even at the cost of the bloc's own economic competitiveness, while Washington will generally avoid getting in the way of its tech champions. For example, while the European Union will argue that Google's dominance in multiple technological applications is by itself an abuse of its power that stifles competition, the United States will refrain from raising the antitrust flag unless tech giants are using their dominant position to raise prices for consumers.