



Artificial Intelligence Beckons the Next Wave of Growth

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Introduction

Not too long ago, humanity perceived the evolution of human-like reasoning and thinking by computer systems as a distant breakthrough in technology. Nowadays, Artificial Intelligence (AI) is the center of attention of all industry leaders, as it has become the new driver of economic value. From home assistants that have learned speech from sound, to self-driving cars that use deep learning to recognize the vehicle’s surroundings, to healthcare applications that are able to integrate data across platforms to enhance care solutions, AI will spur historically unmatched growth opportunities.

Table of Contents

What is “AI”, anyway?	Page 2
AI progress will likely be exponential	Page 2
What can AI do today?	Page 4
A brief look at AI-linked companies	Page 6
Barriers to adoption / risks	Page 7
Conclusion	Page 8

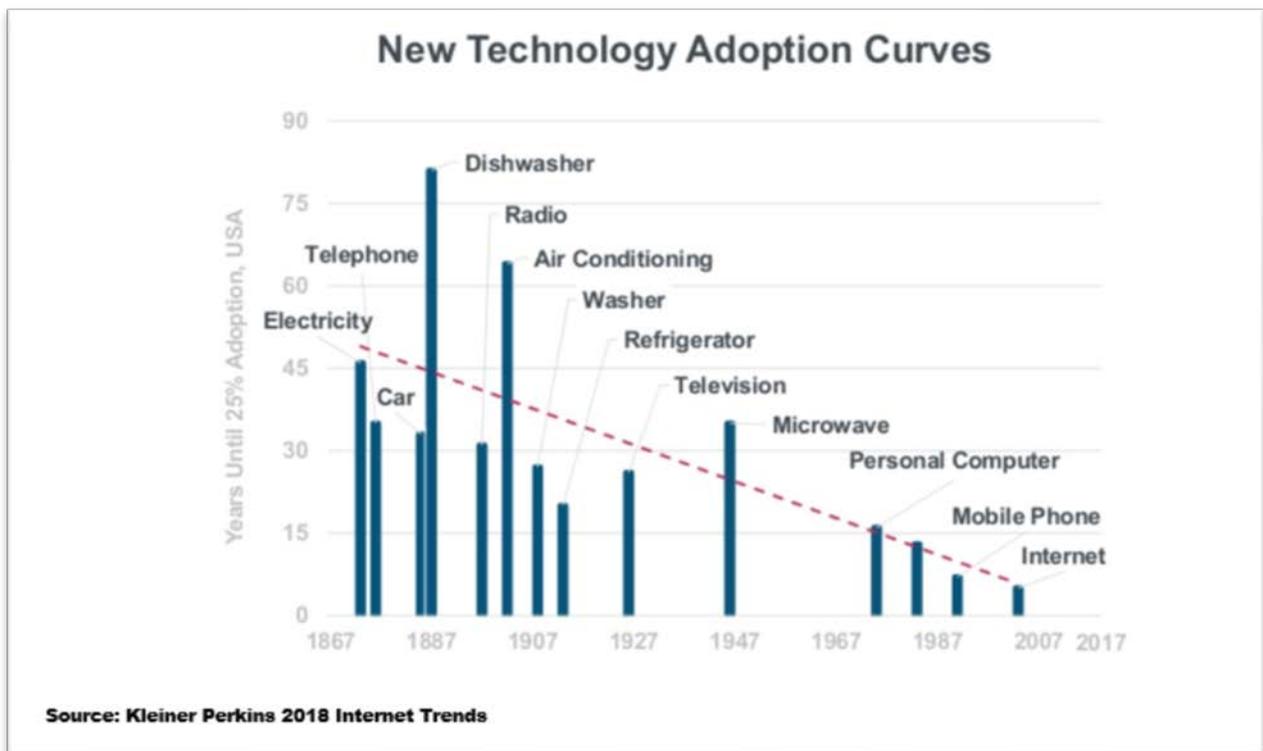
What is “AI”, anyway?

“AI”, or Artificial Intelligence, is the mimicking of human intelligence by computer systems. It differs from traditional machine learning and legacy software in that, beyond sensing and predicting, it is able to reason, discover meaning, learn from experiences, and interact. AI is the combination of multiple technologies that have evolved into sensing structured and unstructured data, comprehending and depicting information, and improving past results. Big data, algorithm improvements, and decreasing costs of computer power have made AI a reality.

As of now, we have experienced and are making progress on “narrow AI”. “Narrow AI” refers to a computer system that is able to replicate or emulate a specific human task (e.g. speech and image recognition, self-driving vehicles, playing board games, etc.), but not multiple tasks. This does not mean “narrow AI” is not complex, but falls short of “general AI” in that it cannot solve a diversity of tasks, just as a human brain can do.

AI progress will likely be exponential

There is no doubt that AI will disrupt every single industry and economy, but let’s be clear, no one really knows exactly how AI will look like a decade from now. It has been said that the greatest failing of the human mind is the inability to understand the exponential function¹. History is full of cases of human shortcomings in understanding evolution and also fearing it. For example, even more than 2,000 years ago, Socrates, one of the great Greek philosophers, feared the development of writing. He believed that as people started relying more on written words, they would cease to exercise their mind and become

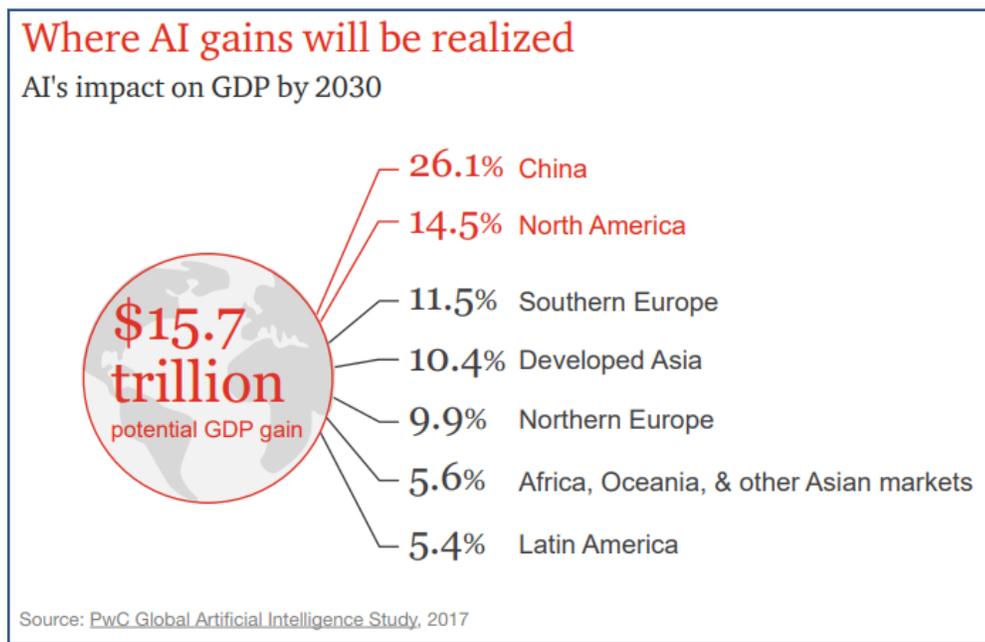


¹ Albert A. Bartlett with Robert G. Fuller, Vicki L. Plano, and John A. Rodgers (2004). *The Essential Exponential! For the Future of Our Planet*. Lincoln, NE: Center for Science, Mathematics & Computer Education, University of Nebraska.

forgetful. He could not foresee that writing and reading would serve as tools to spread information, spur fresh ideas, and expand human knowledge. I could just go on with many examples, but the fact is that despite the challenge of understanding the exponential function, new technology adoption curves have just shrunk over time.

Today, the historic resemblance to AI's evolution is strong. Let's look at what Alphabet's (Google's parent company) AI research arm, DeepMind, has done with its discoveries. DeepMind created [AlphaGo](#), the first computer program to defeat the strongest Go player in history, Lee Sedol. Go is viewed as the most challenging of classical board games, much more complex than chess, with the number of possible board configurations larger than the number of atoms in the known universe (10 to the power of 170). AlphaGo proves that AI is evolving even beyond what its creators ever thought, self-learning continuously from new data and iteration and performing better than its human programmers. If you have not watched the documentary of AlphaGo (available on Netflix), I would highly recommend you add it to your watchlist.

Let's stick to what we know now. According to PricewaterhouseCoopers (PwC), AI will add \$15.7 trillion to the global GDP by 2030². The U.S. could be taking 14.5%, or \$2.28 trillion, with a lower corporate tax rate, and provisions from repatriating cash from overseas as propellers of investment in AI. Nevertheless, the U.S. has a noninitial position, with China standing apart, taking home 26.1%, or \$4.10 trillion. To put this into perspective, the current U.S. GDP is greater than \$20 trillion, and China's GDP is greater \$12 trillion. Thus, AI could potentially generate as much economic output as the mean of the two largest economies in the world.



China has mobilized local governments to spur AI entrepreneurship and this was reflected in 2017, when China accounted for 48% of the world's total AI startup funding compared to America's 38%³. China has been more permissive than the U.S. and other European peers when it comes to data gathering and implementation, a key factor for AI development. In the U.S. and Europe, the mega-cap internet companies like Google and Facebook have struggled to work around privacy issues.

² Retrieved from: <https://www.pwc.com/us/en/advisory-services/assets/ai-predictions-2018-report.pdf>

³ Retrieved from: <https://www.cbinsights.com/research/in-ai-china-us/>

What can Artificial Intelligence do today?

“AI is more important than what fire or electricity has meant to humanity.”

Sundar Pichai,
CEO, Google

AI has the potential to become ubiquitous and, in the words of Google’s CEO Sundar Pichai, “AI is more important than what fire or electricity has meant to humanity.” Today there are just a handful of immediate applications:

Amplified Automation: According to Forrester Research estimates, around 50% of the current work activities are technically automatable. Here, we are talking not only about manufacturing-like processes, but also administrative and analytical processes, also known as knowledge work. AI provides the ability to be a growth source by automating complex tasks in which systems self-learn and improve processes materially.

It is key to understand that as part of amplified automation, computer systems are learning to learn entirely on their own. The previously mentioned example of AlphaGo gives us great color. AlphaGo Zero, its latest version, started as a blank slate on which its developers just inputted the rules of Go. The system then played against itself and learned from a feedback loop at a speed unmatched by any human mind. The results are astonishing, the computer is teaching itself, generating continuously better results, and being unrivalled by humans.

Enhance Judgement: AI is boosting efficiency and productivity by generating outcomes leveraged by big data. AI systems sit in massive amounts of data and can come up with analysis and decisions in just seconds (e.g. Alphabet’s Verily and IBM’s Watson can support more accurate diagnosis than a group of doctors by analyzing historical patient data and delivering hyper-personalized solutions). In addition, as a result of greater accuracy, AI will enhance a customer’s trust and boost economic activity.

Resource Reallocation: As processes are automated by AI, employees have the opportunity to spend time in value-adding activities, augmenting their productivity. Rather than displacing employment, AI will change the nature of it. In fact, the net effect is expected to be positive, with 2.3 million new jobs created while eliminating 1.8 million by 2020⁴.

Humans working alongside computer systems will be critical for successful implementation of AI technologies. Through collaborative intelligence, organizations have achieved the most significant performance improvements by combining the leadership, teamwork, creativity and social skills of humans, and the speed, scalability, and quantitative capabilities of AI⁵.

⁴ Retrieved from: <https://www.gartner.com/newsroom/id/3837763>

⁵ H. James Wilson and Paul R. Daugherty (2018). *Collaborative Intelligence: Humans and AI Are Joining Forces*. Harvard Business Review.

The impact of AI in industries will occur across the board. All industries will increasingly apply AI, as it is significantly applied to both physical and knowledge work. The leaders of organizations are expecting significant improvements in performance and competitive advantages. According to MIT Sloan and The Boston Consulting Group, 85% of executives believe AI will allow their company to obtain or sustain a competitive advantage⁶.

I would argue that, indeed, competitive advantages will be strengthened, but those companies that are usually “followers” or “late-adopters” will struggle to survive as the pace of AI evolution is faster than ever. There are many front-runners across multiple industries, but before we discover some of those names, it is pertinent to understand the high potential use case by industries:

-  **Healthcare:** AI-powered diagnostics using the patient’s historical data along with many other clinical cases and extensive healthcare literature to identify deviations in health condition. This type of AI is enhancing doctors’ diagnoses and accuracy of treatment recommendations.
-  **Energy:** AI is being used to map out energy usage and allow customers to track fluctuations in energy rate to more efficiently use storage. AI is also implemented as a predictive tool in the exploration of oil reserves and in the detection of potential infrastructure failures with a combination of analytics, sensors, and operational data⁷.
-  **Transportation:** Self-driving vehicles that will serve to transport travelers across cities, and also in the logistics business with self-driving trucks on long-haul, increasing utilization rates (24/7) and leading to lower costs.
-  **Financial Services:** AI implementation has served for algorithmic stock trading applications, credit card fraud detection, and enhancing the investment advice process⁸.
-  **Retail:** AI is eliminating the need for customers to go out shopping or even to browse online, because it is delivering personalized item recommendations to their door on a regular schedule⁹. AI is also being tested in stores, turning brick-and-mortar into smart-stores, featuring smart mirrors that display any product on shoppers.
-  **Manufacturing:** AI is creating “lights-out” factories, run entirely by robots which can build themselves, test themselves and inspect themselves¹⁰.

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MIT Sloan

The Boston Consulting Group

⁶ S. Ransbotham, D. Kiron, P. Gerbert, and M. Reeves, “Reshaping Business With Artificial Intelligence,” MIT Sloan Management Review and The Boston Consulting Group, September 2017.

⁷ Retrieved from: <https://www.cbinsights.com/research/artificial-intelligence-energy-industry/>

⁸ Tim Harty (2018). *The Emerging Role of Artificial Intelligence in Financial Services*. Thomson Reuters.

⁹ Retrieved from: <https://www.forbes.com/sites/bernardmarr/2018/05/25/stitch-fix-the-amazing-use-case-of-using-artificial-intelligence-in-fashion-retail/#6eac78513292>

¹⁰ Retrieved from: <https://www.forbes.com/sites/insights-intelai/2018/07/17/how-ai-builds-a-better-manufacturing-process/>

A brief look at AI-linked companies

Alphabet (Google's parent company) – Still generating ~86% of revenue from search ads on the Google and YouTube platforms, Alphabet has positioned itself in multiple secular growth end-markets. Beyond the sustainability of an approximate 20% annual revenue growth of search ads, as ad dollars shift from TV and Radio to Online channels, Alphabet is looking at multiple sectors ripe for disruption. Only ~1% of the total revenue comes from “Other Bets”, a line item in Alphabet’s financials that includes Waymo, the leader in autonomous driving technology; Verily, developing tools to collect and organize health data to increase care accuracy and productivity; DeepMind, a leading AI research lab; and many other subsidiaries. As monetization of “Other Bets” is enhanced, I could expect Alphabet to accelerate its top-line revenue growth rate. On top of that, Google is developing AI chips in-house. Google’s TPU features a new architecture “systolic array”, which reuses the same input several times, without repeatedly having to store it back in a separate memory or register, claiming to be the world’s fastest AI chip¹¹.

Nvidia – Not only with an early lead in AI, but expanding its verticals into multiple end-markets, Nvidia is set to capitalize structural trends. Since 1999, the creation of Nvidia’s GPU redefined computer graphics has consolidated Nvidia as the leading semiconductor company for video games, a segment that keeps growing >35% on an annualized basis, as gaming is becoming the new social media platform and enhanced visual effects. Nvidia just launched its Turing architecture which makes real-time ray tracing, (a technique to enhance lights and shadows to produce a high degree of realism), possible for the first time. In addition to gaming, Nvidia’s open platform for autonomous driving has 370+ partners on it, and whoever becomes the leading autonomous driving company, it is very likely they will be using Nvidia chips. In Data Centers, the company’s fastest growing segment, all of the world’s major internet companies and cloud service providers now use Nvidia’s GPUs. These GPUs are the engine of modern data centers, delivering breakthrough performance with fewer servers, resulting in faster insights and lower costs¹².

Guidewire Software – As the number one software company in the Property and Casualty (P&C) industry, with almost 100% retention rates, Guidewire is revolutionizing an industry that largely relies on legacy systems. Guidewire’s AI is progressing rapidly, tackling millions of policy servicing request emails with natural language processing (NLP) that makes it possible to read through all emails and service customers in record time, opening service channels with AI-based chatbots, and enabling automated fast-track claims with predictive analytics and automatic image analysis. With these tools, insurers are able to service customers faster, accurately define policy premiums, and mitigate the risk of fraudulent claims.

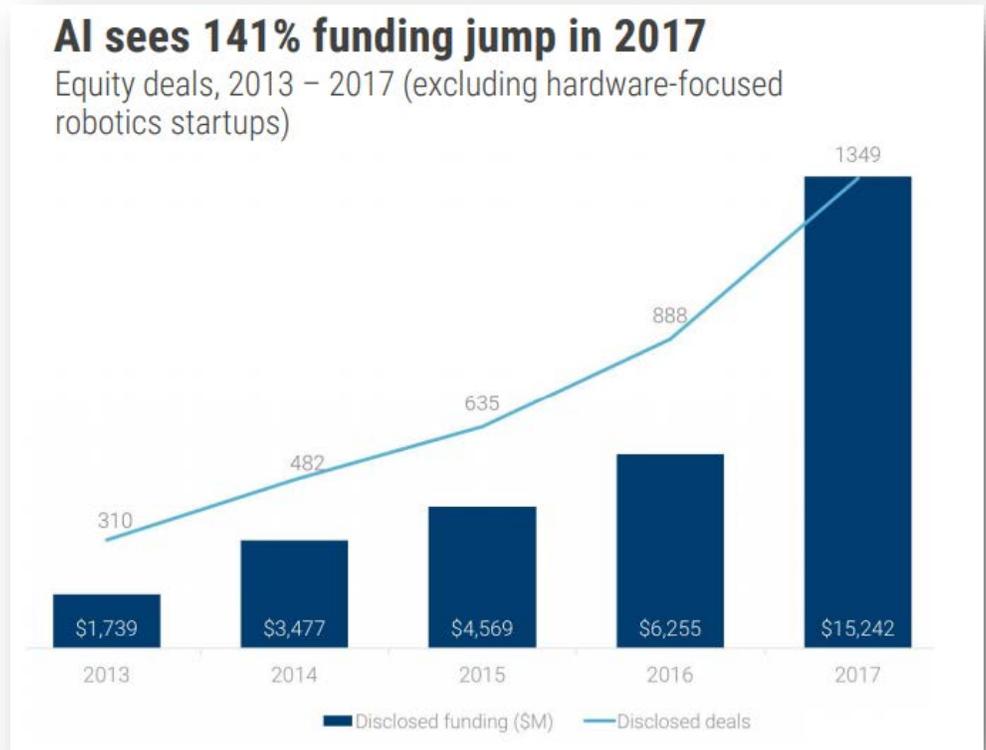
Alibaba Group – With more than 576 million active consumers on its platform, Alibaba has become one of the most successful companies in China and worldwide. Known for its robust core commerce capabilities, which still represents 85% of its total revenue and is growing >60% year-over-year, Alibaba is investing heavily in AI applications such as AI-powered algorithms to recommend products to potential buyers, drones that deliver packages, highly automated warehouses that process

¹¹ Bloomberg New Energy Finance. (2018). *Bloomberg NEF Technology Radar: The AI edition*.

¹² Retrieved from: <https://www.nvidia.com/en-us/data-center/solutions/>

millions of shipments each day, smart stores (“new retail strategy”) that will offer a high degree of digitalization and enhanced customer experience in brick-and-mortar locations, city brains used in cities to holistically optimize urban public resources such as police and medical assistance, and even facial recognition technology for payments.

We could argue here that these companies are very large and with vast amount of resources to research, develop, and implement AI technologies throughout their business processes. Nevertheless, there have been more than 1,300 new AI startups since the beginning of 2017 with over \$15.2B in funding poured in just in that year, or 141% increase from 2016¹³. Thus, there is no shortage of AI related companies out there.



Source: CB Insights

Barriers to adoption / risks

As in many transformational periods, there are several reasons why organizations either succeed or fail. Here, I’ll cover two of those which happen to be very pertinent.

1 AI talent wars – According to *The New York Times*¹⁴, tech giants are battling to recruit AI specialists, some with Ph.D.’s and some with experience in the field, with salaries in the mid-six-figures range or \$300,000 to \$500,000. CB Insights even identified listed salaries of \$567,000-\$624,000 for a senior machine learning researcher at BMW China.

Tencent, a major internet company in China, recently issued a report stating that the estimated number of qualified AI workers is approximately 300,000, with 100,000 of those still studying. The gap? 700,000 AI workers of the million workers required to meet the technological needs of companies.

As educational requirements evolve to meet the increasing demand of AI specialists, those companies with sufficient leverage to recruit will likely succeed in the AI race. In some cases, the deep pockets of tech giants are not enough to attract the best candidates, with some AI experts choosing smaller startups for equity ownership.

¹³ CB Insights: Top AI Trends to Watch in 2018

¹⁴ Retrieved from: <https://www.nytimes.com/2017/10/22/technology/artificial-intelligence-experts-salaries.html>

Cyberattacks could proliferate – Malicious behavior could try to exploit the vulnerability of systems that can be outcompeted by AI. Data has been a headline-grabber for a while, with many data breaches occurring in 2017, and regulators trying to implement safeguarding measures.

According to PwC, in other parts of the enterprise, many organizations may choose to go slow on AI, but in cybersecurity there is no holding back. Attackers will use AI, so defenders will have to use it, too. If an organization’s IT department or cybersecurity provider isn’t already using AI, it has to start thinking immediately about AI’s short- and long-term security applications¹⁵.

Many pundits have gone on expressing their fears about AI surpassing human intelligence, including Elon Musk, who has said AI will be an “immortal dictator, from which we could never escape.” He argued that AI is “the biggest risk we face as civilization” and urged leading AI companies and developers to carefully invest in the technology. Whether it is rational to fear AI at this point in its development or not, it is certainly still far from becoming an immediate threat for humanity.

Conclusion

Secular growth opportunities should be part of anyone’s investment portfolio. The importance of identifying those companies that are poised to benefit from multidecade growth opportunities is fundamental and widely acknowledged by the investment community.

Expectations for Artificial Intelligence are unequivocally sky-high, but its exponential nature and ubiquitousness potential, if complemented with explainability (the ability for decision makers to understand and use AI) will make AI the driver of the next wave of growth.

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¹⁵ Retrieved from: <https://www.pwc.com/us/AI2018>