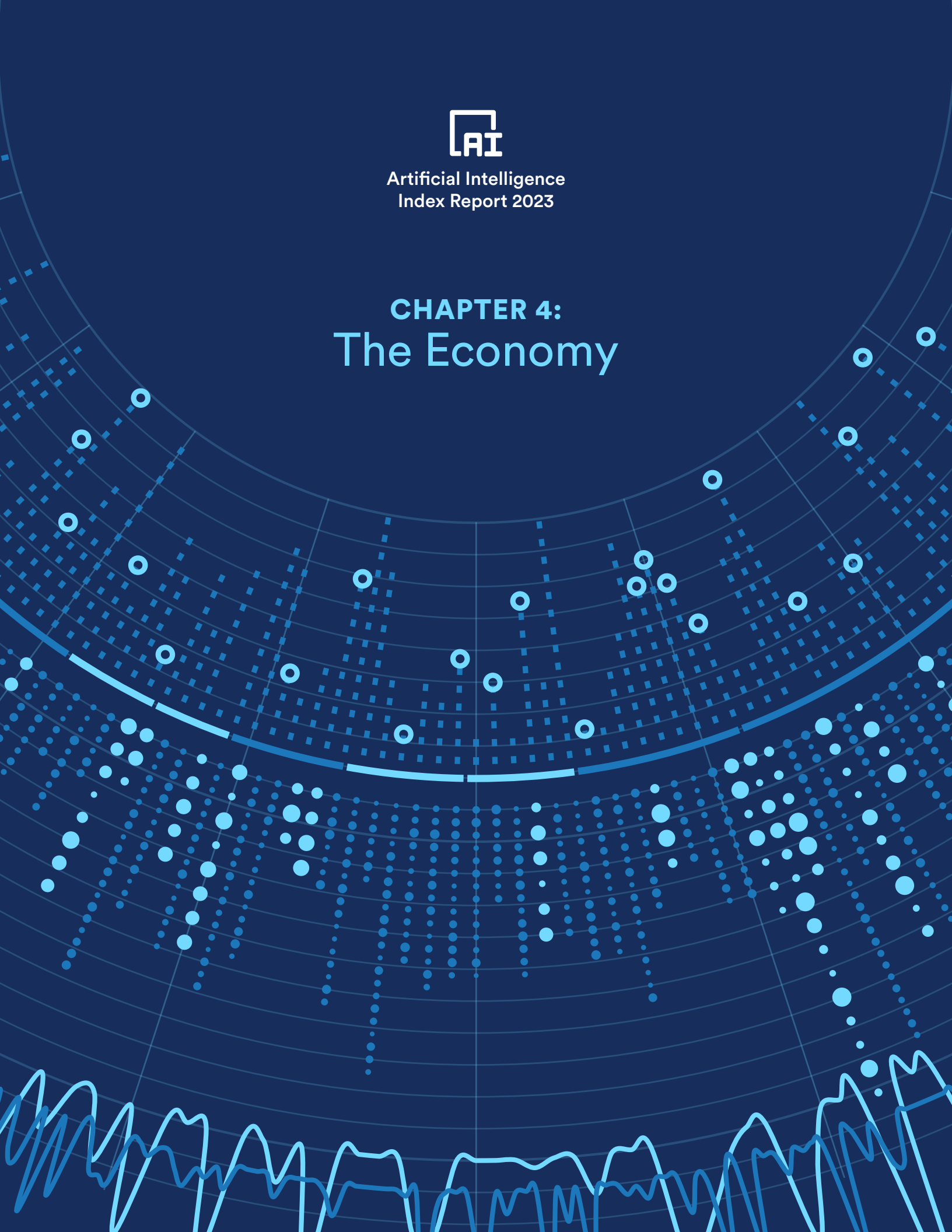
Artificial Intelligence
Index Report 2023

CHAPTER 4:
The Economy



CHAPTER 4 PREVIEW:

The Economy

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Overview

Increases in the technical capabilities of AI systems have led to greater rates of AI deployment in businesses, governments, and other organizations. The heightening integration of AI and the economy comes with both excitement and concern. Will AI increase productivity or be a dud? Will it boost wages or lead to the widespread replacement of workers? To what degree are businesses embracing new AI technologies and willing to hire AI-skilled workers? How has investment in AI changed over time, and what particular industries, regions, and fields of AI have attracted the greatest amount of investor interest?

This chapter examines AI-related economic trends by using data from Lightcast, LinkedIn, McKinsey, Deloitte, and NetBase Quid, as well as the International Federation of Robotics (IFR). This chapter begins by looking at data on AI-related occupations and then moves on to analyses of AI investment, corporate adoption of AI, and robot installations.

Chapter Highlights

The demand for AI-related professional skills is increasing across virtually every American industrial sector.

Across every sector in the United States for which there is data (with the exception of agriculture, forestry, fishing, and hunting), the number of AI-related job postings has increased on average from 1.7% in 2021 to 1.9% in 2022. Employers in the United States are increasingly looking for workers with AI-related skills.

For the first time in the last decade, year-over-year private investment in AI decreased.

Global AI private investment was $91.9 billion in 2022, which represented a 26.7% decrease since 2021. The total number of AI-related funding events as well as the number of newly funded AI companies likewise decreased. Still, during the last decade as a whole, AI investment has significantly increased. In 2022 the amount of private investment in AI was 18 times greater than it was in 2013.

Once again, the United States leads in investment in AI.

The U.S. led the world in terms of total amount of AI private investment. In 2022, the $47.4 billion invested in the U.S. was roughly 3.5 times the amount invested in the next highest country, China ($13.4 billion). The U.S. also continues to lead in terms of total number of newly funded AI companies, seeing 1.9 times more than the European Union and the United Kingdom combined, and 3.4 times more than China.

In 2022, the AI focus area with the most investment was medical and healthcare ($6.1 billion); followed by data management, processing, and cloud ($5.9 billion); and Fintech ($5.5 billion).

However, mirroring the broader trend in AI private investment, most AI focus areas saw less investment in 2022 than in 2021. In the last year, the three largest AI private investment events were: (1) a $2.5 billion funding event for GAC Aion New Energy Automobile, a Chinese manufacturer of electric vehicles; (2) a $1.5 billion Series E funding round for Anduril Industries, a U.S. defense products company that builds technology for military agencies and border surveillance; and (3) a $1.2 billion investment in Celonis, a business-data consulting company based in Germany.

Chapter Highlights (cont'd)

While the proportion of companies adopting AI has plateaued, the companies that have adopted AI continue to pull ahead.

The proportion of companies adopting AI in 2022 has more than doubled since 2017, though it has plateaued in recent years between 50% and 60%, according to the results of McKinsey's annual research survey. Organizations that have adopted AI report realizing meaningful cost decreases and revenue increases.

AI is being deployed by businesses in multifaceted ways.

The AI capabilities most likely to have been embedded in businesses include robotic process automation (39%), computer vision (34%), NL text understanding (33%), and virtual agents (33%). Moreover, the most commonly adopted AI use case in 2022 was service operations optimization (24%), followed by the creation of new AI-based products (20%), customer segmentation (19%), customer service analytics (19%), and new AI-based enhancement of products (19%).

AI tools like Copilot are tangibly helping workers.

Results of a GitHub survey on the use of Copilot, a text-to-code AI system, find that 88% of surveyed respondents feel more productive when using the system, 74% feel they are able to focus on more satisfying work, and 88% feel they are able to complete tasks more quickly.

China dominates industrial robot installations.

In 2013, China overtook Japan as the nation installing the most industrial robots. Since then, the gap between the total number of industrial robots installed by China and the next-nearest nation has widened. In 2021, China installed more industrial robots than the rest of the world combined.

4.1 Jobs

AI Labor Demand

This section reports demand for AI-related skills in labor markets. The data comes from Lightcast, which mined millions of job postings collected from over 51,000 websites since 2010 and flagged listings calling for AI skills.

Global AI Labor Demand

Figure 4.1.1 highlights the percentage of all job postings that require some kind of AI skill. In 2022, the top three countries according to this metric were the United States (2.1%), Canada (1.5%), and Spain (1.3%). For every country included in the sample, the number of AI-related job postings was higher in 2022 than in 2014.[1]

AI Job Postings (% of All Job Postings) by Geographic Area, 2014–22
Source: Lightcast, 2022 | Chart: 2023 AI Index Report

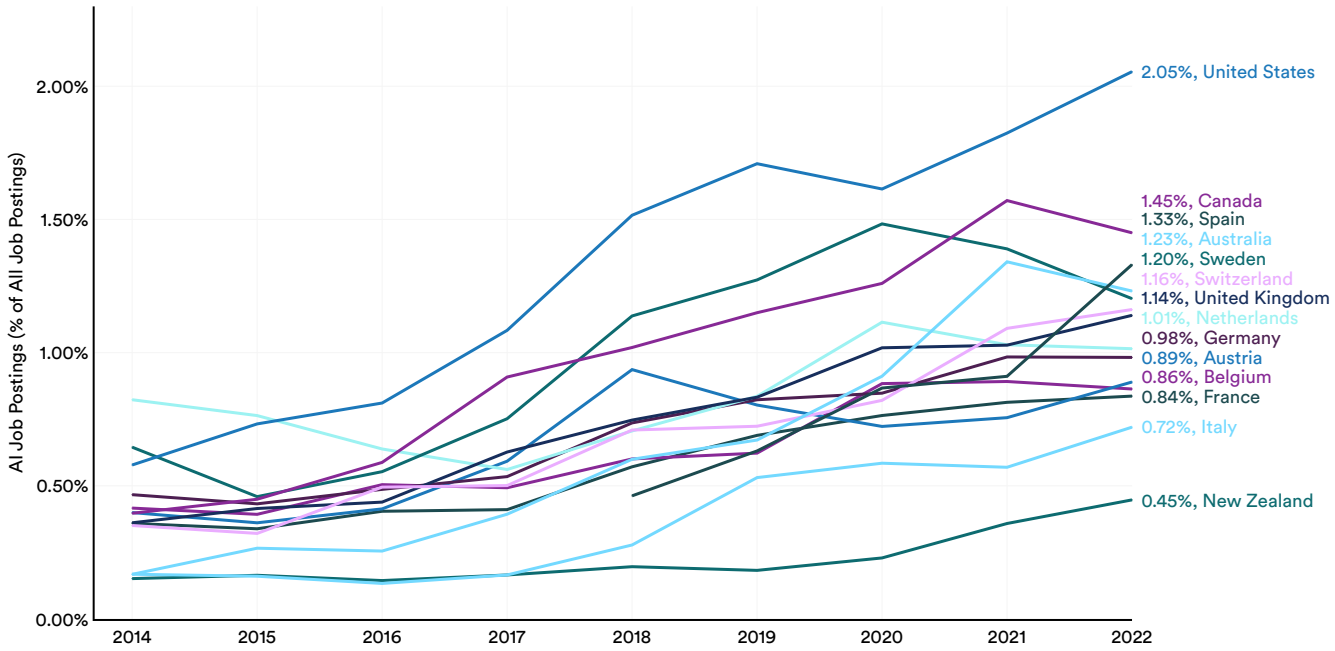

Figure 4.1.1

1 In 2022, Lightcast slightly changed their methodology for determining AI-related job postings from that which was used in previous versions of the AI Index Report. As such, some of the numbers in this chart do not completely align with those featured in last year's report.

U.S. AI Labor Demand by Skill Cluster and Specialized Skill

Figure 4.1.2 showcases the most in-demand AI skill clusters in the U.S. labor market since 2010. The most in-demand skill cluster was machine learning (1.0%), followed by artificial intelligence (0.6%) and natural language processing (0.2%). Every listed AI skill cluster is now more in demand than it was 10 years ago.

AI Job Postings (% of All Job Postings) in the United States by Skill Cluster, 2010–22
Source: Lightcast, 2022 | Chart: 2023 AI Index Report

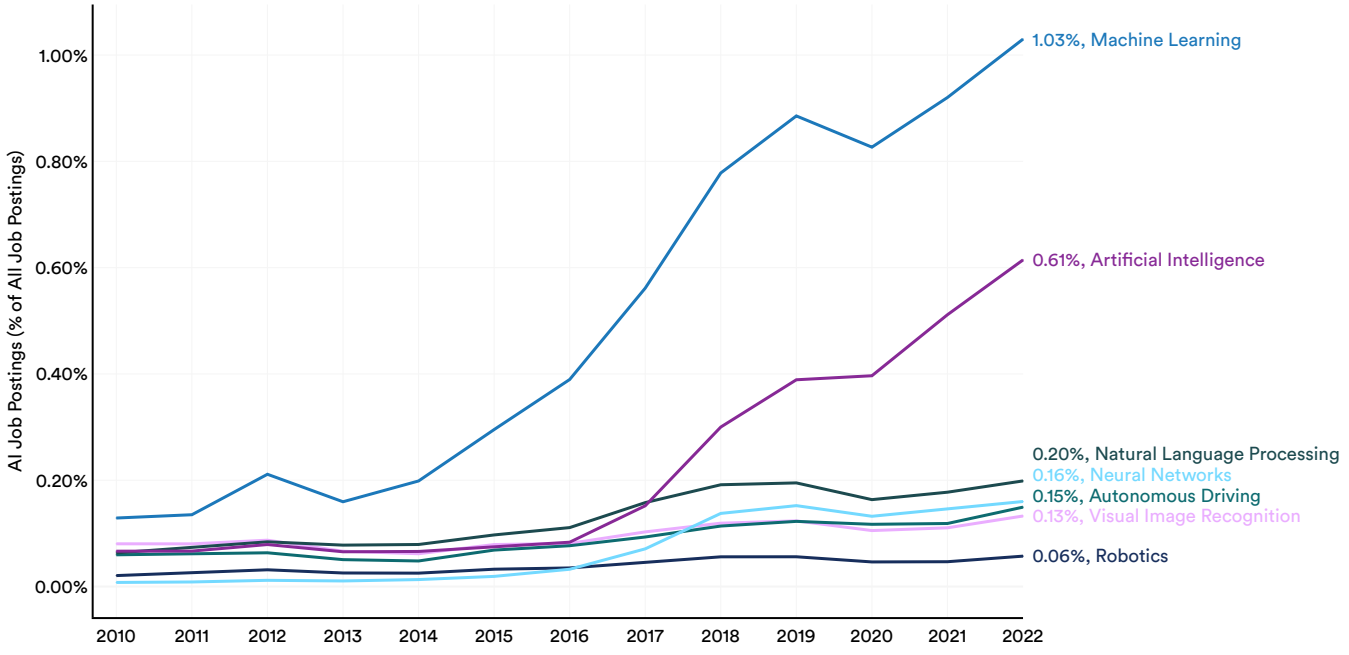

Figure 4.1.2

Figures 4.1.3 and 4.1.4 showcase the top ten specialized skills that were demanded in AI job postings in 2022 compared to 2010–2012[2]. On an absolute level, virtually every specialized skill is more in demand now than a decade ago. The growth in demand for Python is particularly notable, evidence of its growing popularity as an AI coding language.

Top Ten Specialized Skills in 2022 AI Job Postings in the United States, 2010–12 Vs. 2022

Source: Lightcast, 2022 | Chart: 2023 AI Index Report

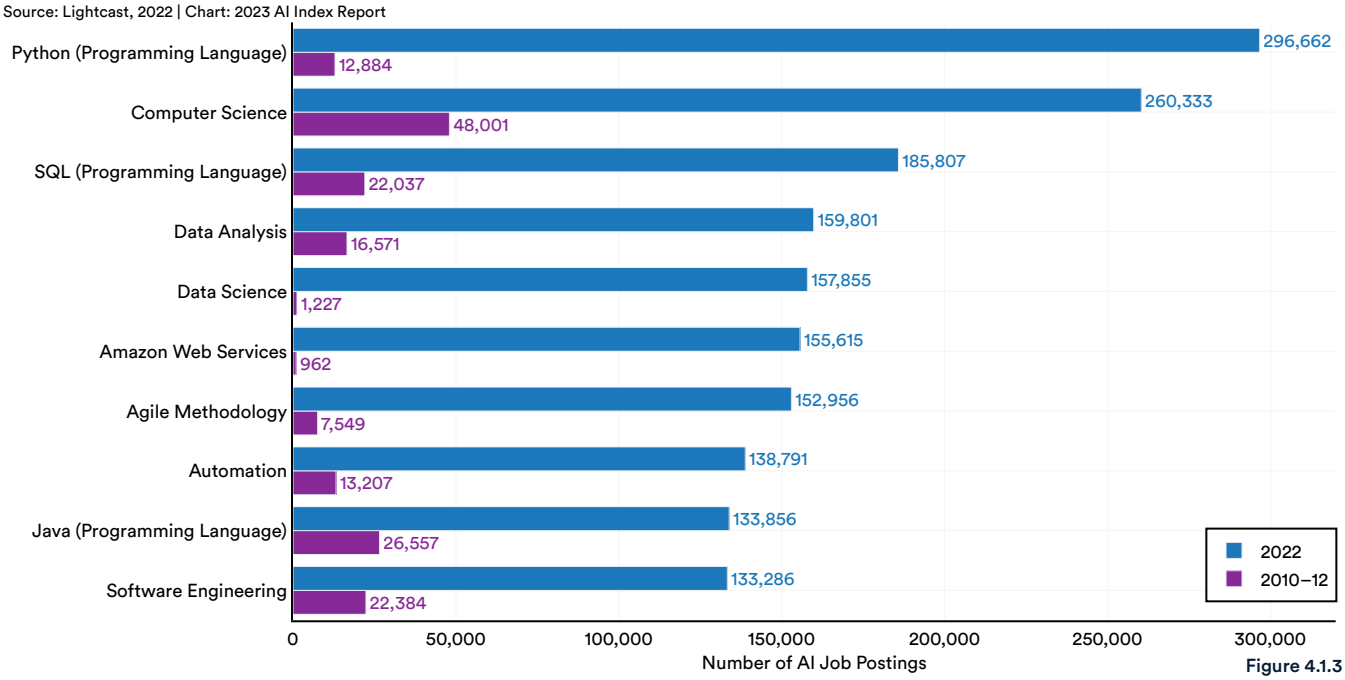

Figure 4.1.3

Top Ten Specialized Skills in 2022 AI Job Postings in the United States by Skill Share, 2010–12 Vs. 2022

Source: Lightcast, 2022 | Chart: 2023 AI Index Report

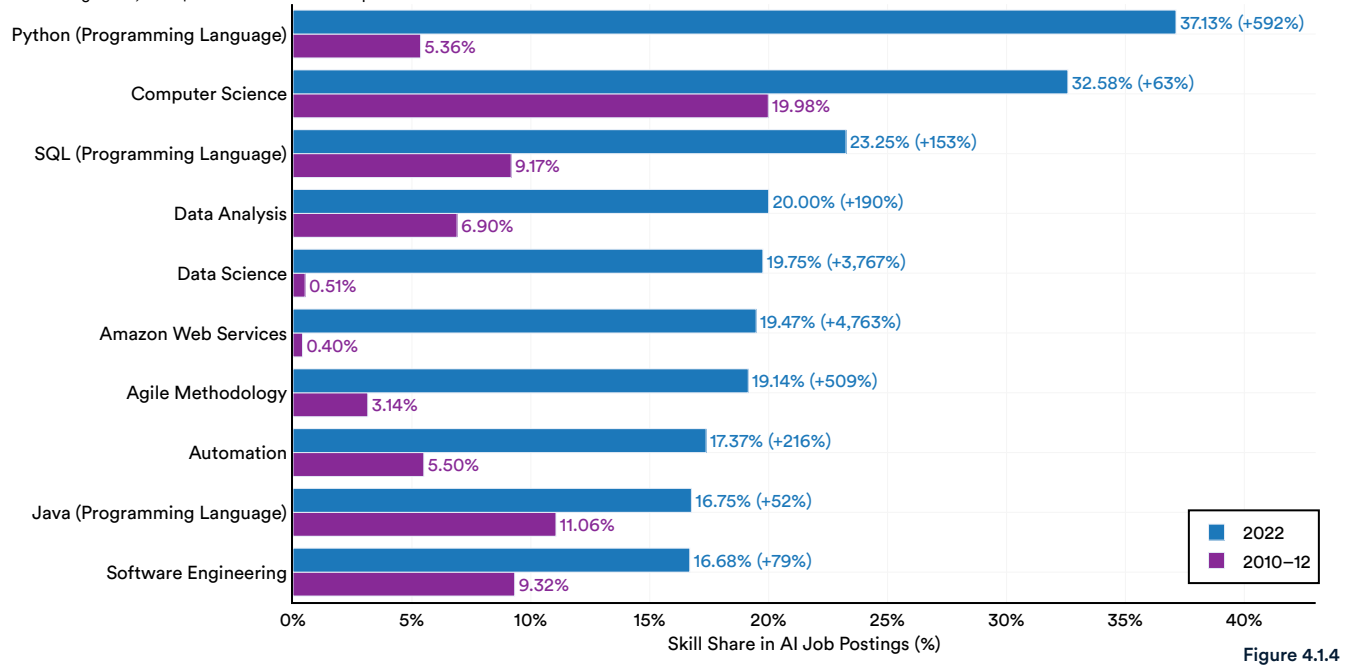

Figure 4.1.4

2 The point of comparison of 2010–2012 was selected because some data at the jobs/skills level is quite sparse in earlier years. Lightcast therefore used the whole set of years 2010–2012 to get a larger sample size for a benchmark from 10 years ago to compare.

U.S. AI Labor Demand by Sector

Figure 4.1.5 shows the percentage of U.S. job postings that required AI skills by industry sector from 2021 to 2022. Across virtually every included sector (with the exception of agriculture, forestry, fishing, and hunting), the number of AI job postings was notably higher in 2022 than in 2021, with the top three sectors being information (5.3%); professional, scientific, and technical services (4.1%); and finance and insurance (3.3%).

AI Job Postings (% of All Job Postings) in the United States by Sector, 2021 Vs. 2022

Source: Lightcast, 2022 | Chart: 2023 AI Index Report

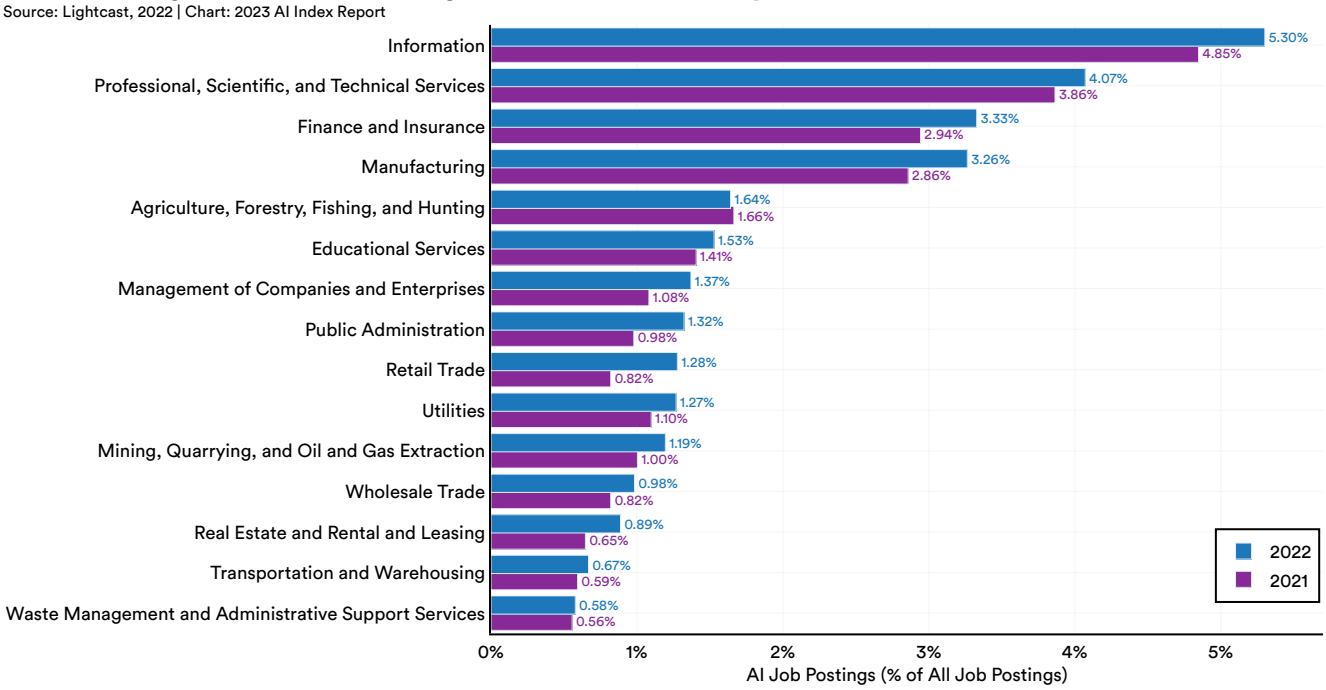

Figure 4.1.5

U.S. AI Labor Demand by State

Figure 4.1.6 highlights the number of AI job postings in the United States by state. The top three states in terms of postings were California (142,154), followed by Texas (66,624) and New York (43,899).

Number of AI Job Postings in the United States by State, 2022
Source: Lightcast, 2022 | Chart: 2023 AI Index Report

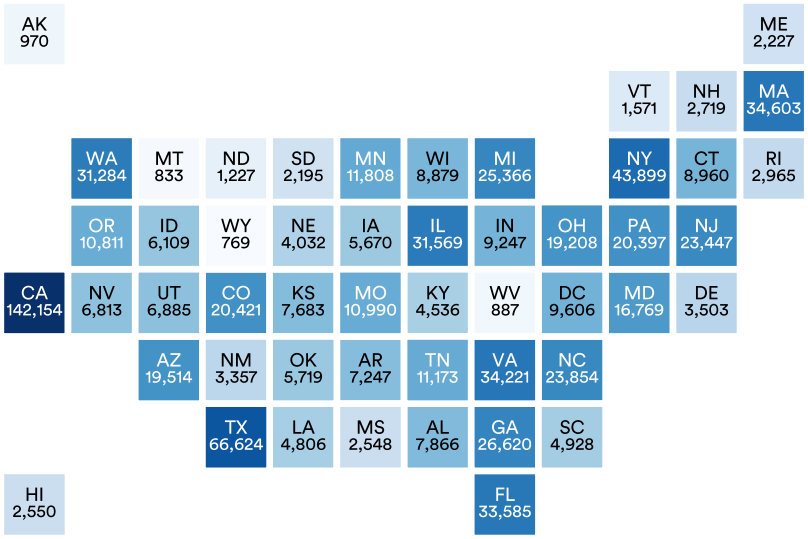

Figure 4.1.6

Figure 4.1.7 demonstrates what percentage of a state's total job postings were AI-related. The top states according to this metric were the District of Columbia (3.0%), followed by Delaware (2.7%), Washington (2.5%), and Virginia (2.4%).

Percentage of U.S. States' Job Postings in AI, 2022
Source: Lightcast, 2022 | Chart: 2023 AI Index Report

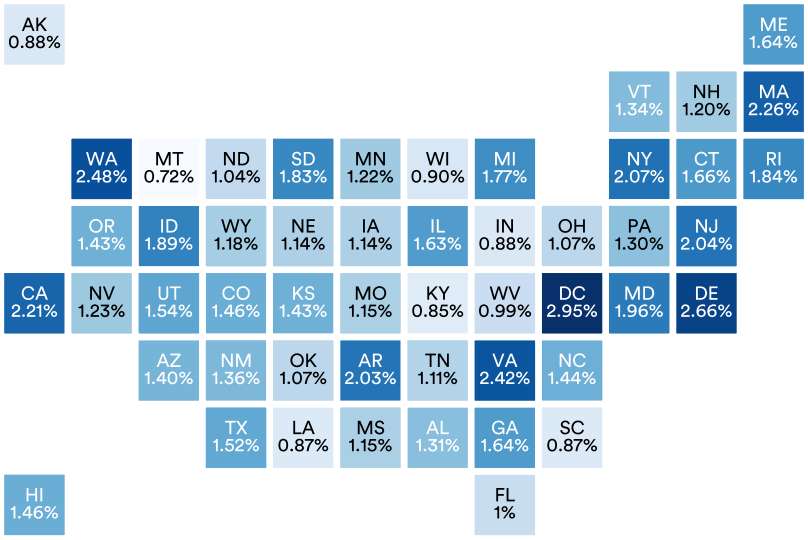

Figure 4.1.7

Which states had the greatest share of AI job postings as a share of all AI job postings in the U.S. in 2022? California was first: Last year 17.9% of all AI job postings in the United States were for jobs based in California, followed by Texas (8.4%) and New York (5.5%) (Figure 4.1.8).

Percentage of United States AI Job Postings by State, 2022
Source: Lightcast, 2022 | Chart: 2023 AI Index Report

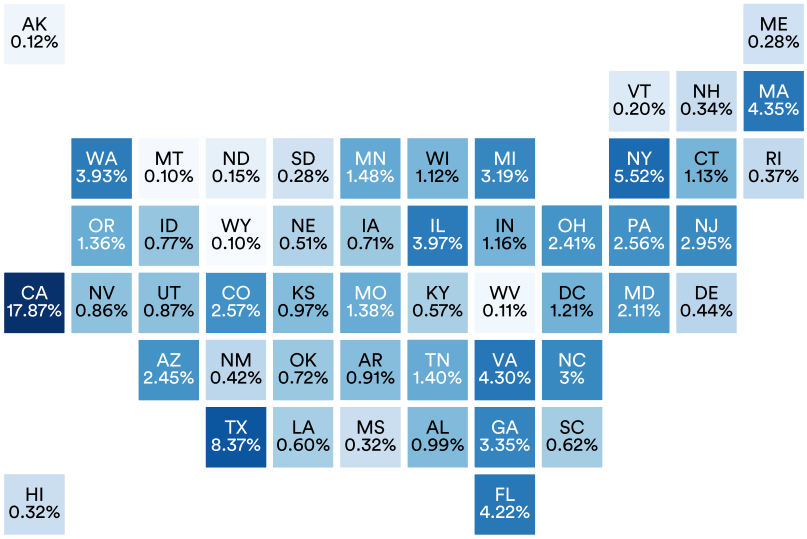

Figure 4.1.8

Figure 4.1.9 highlights the trends over time in AI job postings for four select states that annually report a high number of AI-related jobs: Washington, California, New York, and Texas. For all four, there was a significant increase in the number of total AI-related job postings from 2021 to 2022, suggesting that across these states, employers are increasingly looking for AI-related workers.

Percentage of U.S. States' Job Postings in AI by Select U.S. State, 2010–22
Source: Lightcast, 2022 | Chart: 2023 AI Index Report

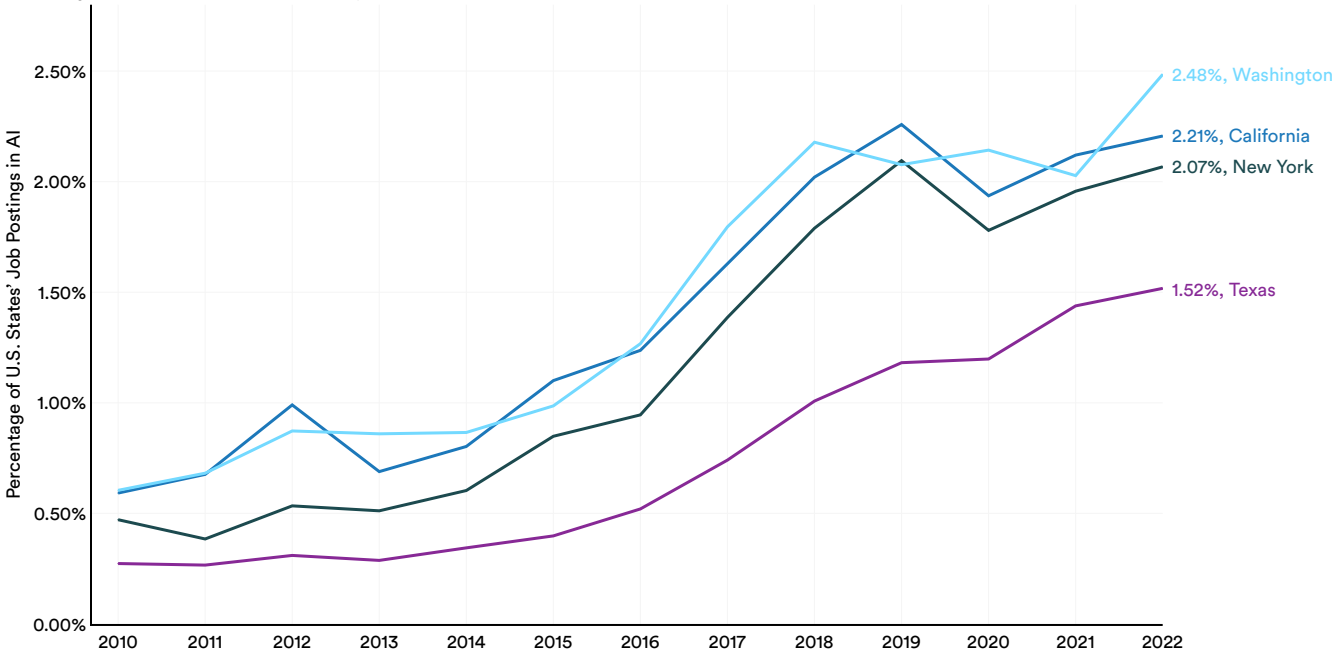

Figure 4.1.9

Figure 4.1.10 highlights the degree to which AI-related job postings have been subdivided among the top four states over time. California's share of all AI job postings has decreased steadily since 2019 while Texas' has marginally increased. The fact that California no longer commands one-quarter of all AI-related jobs suggests that AI jobs are becoming more equally distributed among U.S. states.

Percentage of United States AI Job Postings by Select U.S. State, 2010–22
Source: Lightcast, 2022 | Chart: 2023 AI Index Report

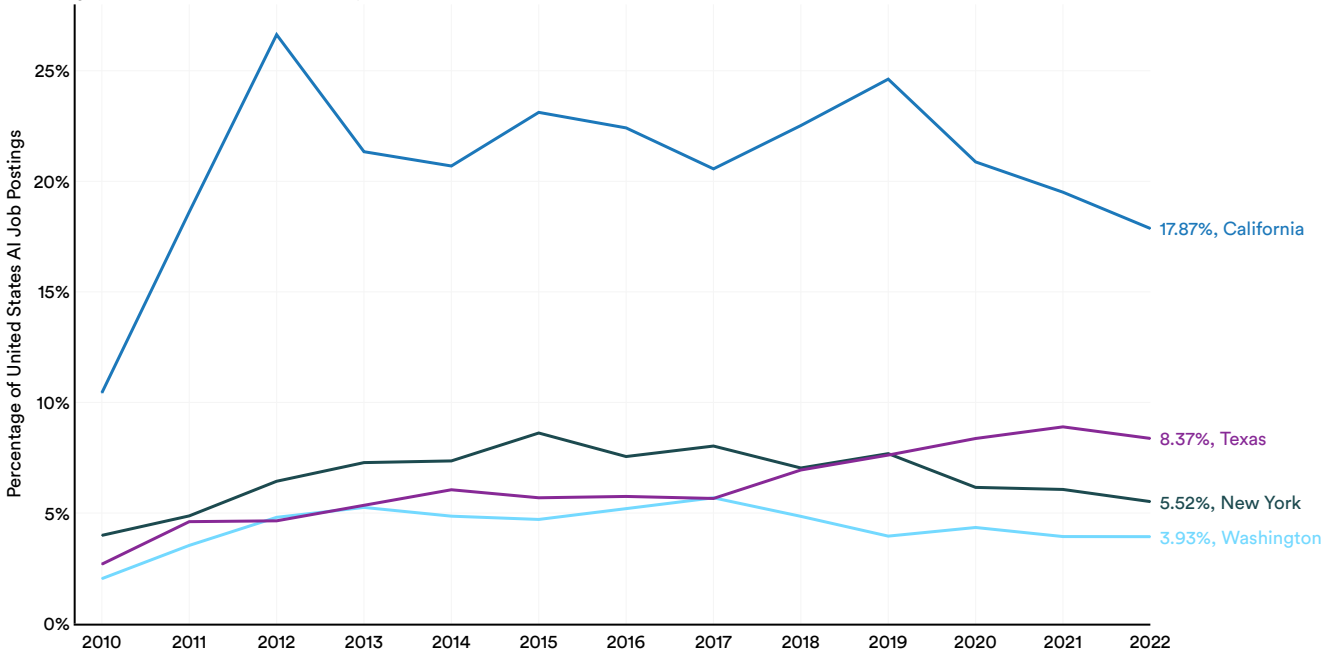

Figure 4.1.10

AI Hiring

Our AI hiring data is based on a LinkedIn dataset of skills and jobs that appear on their platform. The countries included in the sample make at least 10 AI hires each month and have LinkedIn covering at least 40% of their labor force. India is also included in the sample given their increasing significance in the AI landscape, although LinkedIn does not cover 40% of their labor force. Therefore, the insights drawn about India should be interpreted with particular caution.

Figure 4.1.11 highlights the 15 geographic areas that have the highest relative AI hiring index for 2022. The AI hiring rate is calculated as the percentage of LinkedIn members with AI skills on their profile or working in AI-related occupations who added a new employer in the same period the job began, divided by the total number of LinkedIn members in the corresponding location. This rate is then indexed to the average month in 2016; for example, an index of 1.1 in December 2021 points to a hiring rate that is 10% higher than the average month in 2016. LinkedIn makes month-to-month comparisons to account for any potential lags in members updating their profiles. The index for a year is the number in December of that year.

The relative AI hiring index measures the degree to which the hiring of AI talent is changing, more specifically whether the hiring of AI talent is growing faster than, equal to, or more slowly than overall hiring in a particular geographic region. In 2022, Hong Kong posted the greatest growth in AI hiring at 1.4, followed by Spain, Italy and the United Kingdom, and the United Arab Emirates.

Relative AI Hiring Index by Geographic Area, 2022

Source: LinkedIn, 2022 | Chart: 2023 AI Index Report

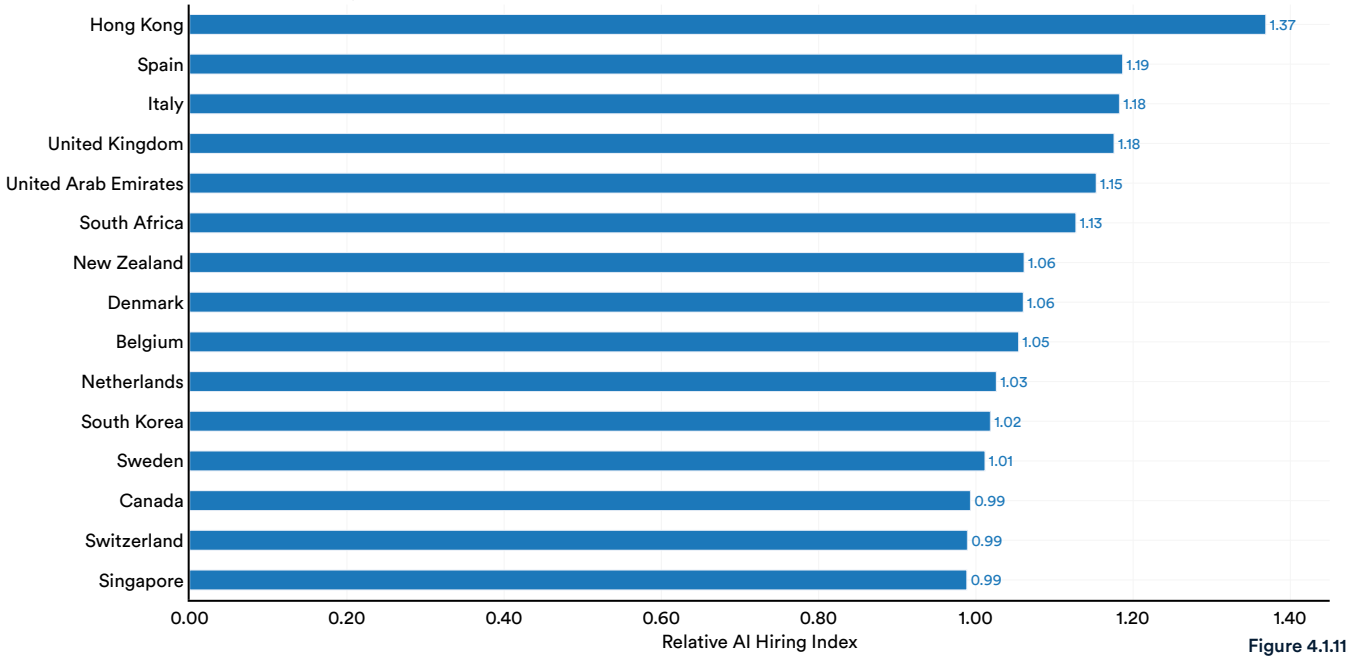

Figure 4.1.11

Figure 4.1.12 highlights how the AI hiring index changes over time for a wide range of countries[3]. Overall, the majority of countries included in the sample have seen meaningful increases in their AI hiring rates since 2016. This trend suggests that those countries are now hiring more AI talent than in 2016. However, for many countries, AI hiring rates seem to have peaked around 2020, then dropped, and have since stabilized.

3 Both Figure 4.1.11 and Figure 4.1.12 report the Relative AI Hiring Index. Figure 4.1.11 reports the Index value at the end of December 2022, while Figure 4.1.12 reports a twelve-month rolling average.

Relative AI Hiring Index by Geographic Area, 2016–22

Source: LinkedIn, 2022 | Chart: 2023 AI Index Report

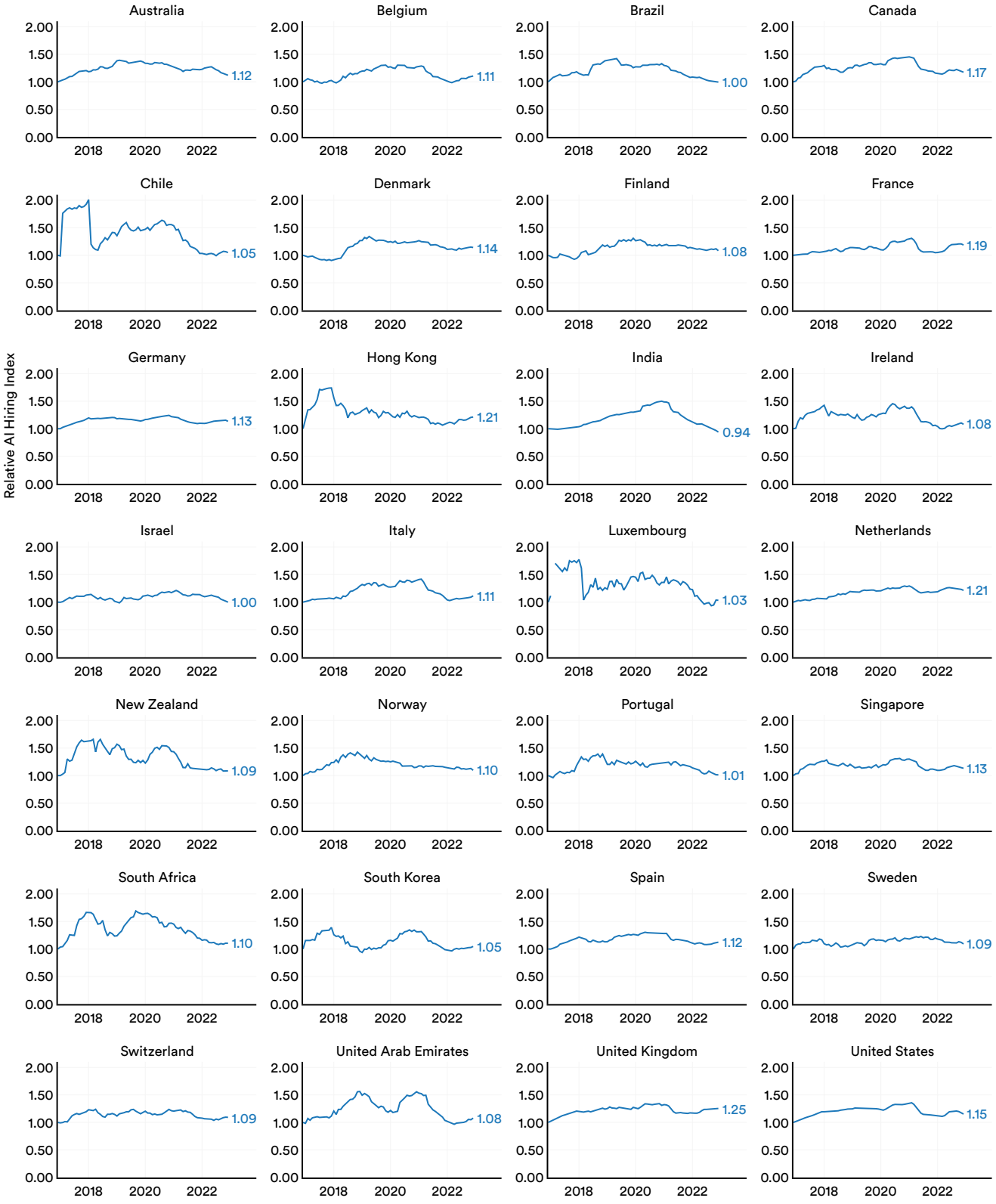

Figure 4.1.12

AI Skill Penetration

The AI skill penetration rate is a metric created by LinkedIn that measures the prevalence of various AI-related skills across occupations. LinkedIn generates this metric by calculating the frequencies of LinkedIn users' self-added skills in a given area from 2015 to 2022, then reweighting those numbers with a statistical model to create the top 50 representative skills in that select occupation.

Global Comparison: Aggregate

Figure 4.1.13 shows the relative AI skill penetration rate of various countries or regions from 2015 to 2022. In this case, the relative AI skill penetration rate can be understood as the sum of the penetration of each AI skill across occupations in a given country or region, divided by the global average across the same occupation. For instance, a relative skill penetration rate of 1.5 means that the average penetration of AI skills in that country or region is 1.5 times the global average across the same set of occupations.

As of 2022, the three countries or regions with the highest AI skill penetration rates were India (3.2), the United States (2.2), and Germany (1.7).

Relative AI Skill Penetration Rate by Geographic Area, 2015–22

Source: LinkedIn, 2022 | Chart: 2023 AI Index Report

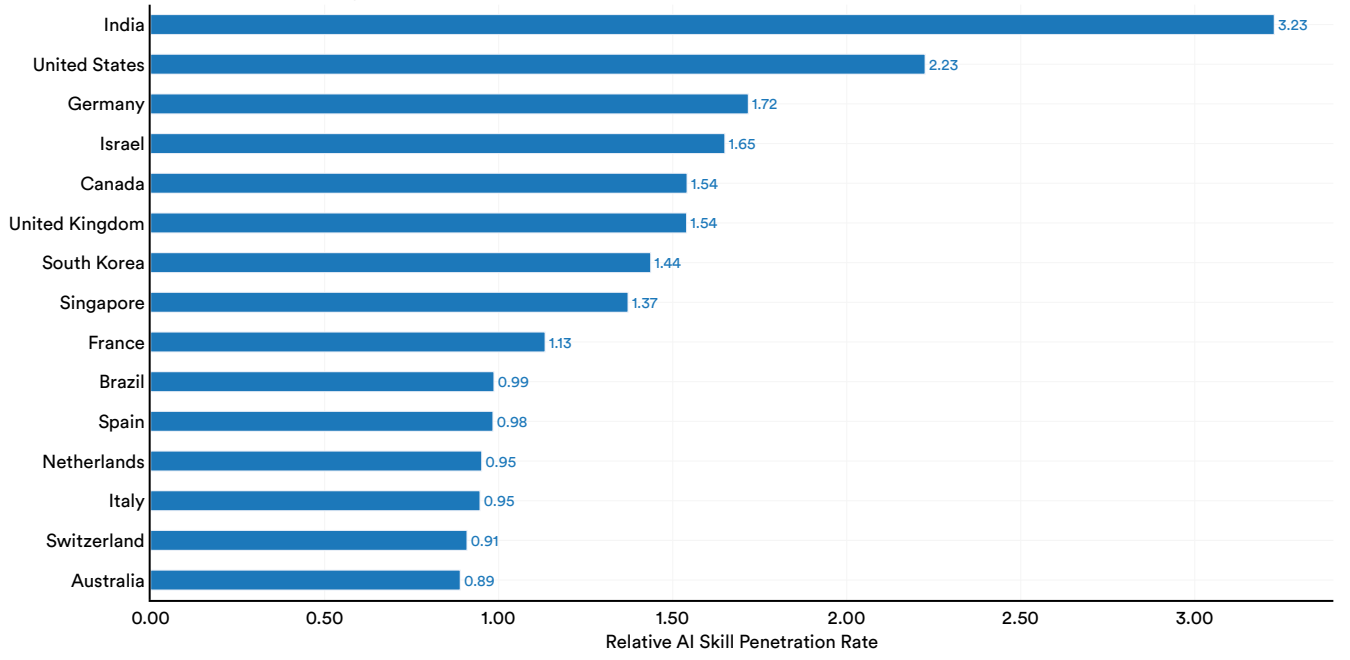

Figure 4.1.13

Global Comparison: By Gender

Figure 4.1.14 disaggregates AI skill penetration rates by gender across different countries or regions. A country's "Relative AI skill penetration rate across genders" for women of 1.5 means that female members in that country are 1.5 times more likely to list AI skills than the average member in all countries pooled together across the same set of occupations in the country. For all countries in the sample, the relative AI skill penetration rate is greater for men than women. India (2.0), the United States (1.3), and Israel (0.9) have the highest reported relative AI skill penetration rates for women.

Relative AI Skill Penetration Rate Across Gender, 2015–22

Source: LinkedIn, 2022 | Chart: 2023 AI Index Report

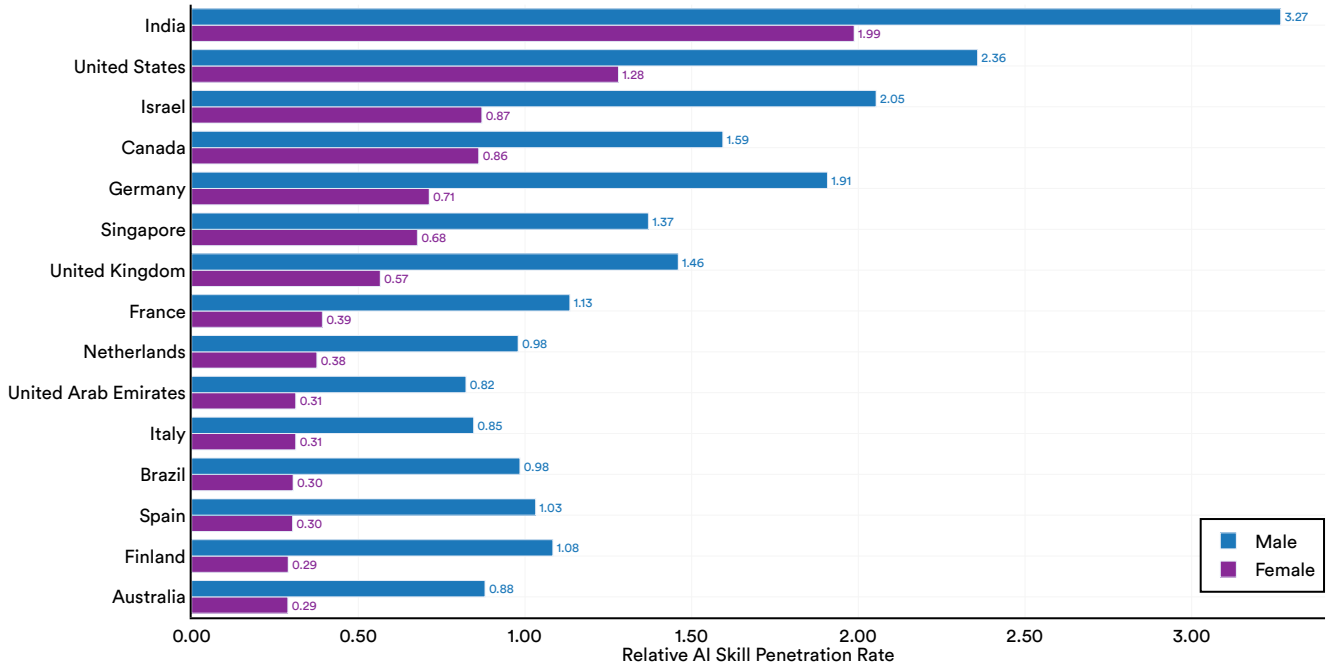

Figure 4.1.14

Using data from NetBase Quid, this section tracks trends in AI-related investments. NetBase Quid tracks data on the investments of over 8 million global public and private companies. NetBase Quid also uses natural language processing techniques to search, analyze, and identify patterns in large, unstructured datasets, like aggregated news and blogs, and company and patent databases. NetBase Quid continuously broadens the set of companies for which it tracks data, so that in this year's AI Index, the reported investment volume for certain years is larger than that of previous reports.

4.2 Investment

Corporate Investment

As AI becomes more and more integrated into the economy, it becomes increasingly important to track AI-related corporate investment. Figure 4.2.1 shows overall global corporate investment in AI from 2013 to 2022. Corporate investment includes mergers and acquisitions, minority stakes, private investment, and public offerings.

For the first time since 2013, year-over-year global corporate investment in AI has decreased. In 2022, total global corporate AI investment was $189.6 billion, roughly a third lower than it was in 2021. Still, in the last decade, AI-related investment has increased thirteenfold.

Global Corporate Investment in AI by Investment Activity, 2013–22

Source: NetBase Quid, 2022 | Chart: 2023 AI Index Report

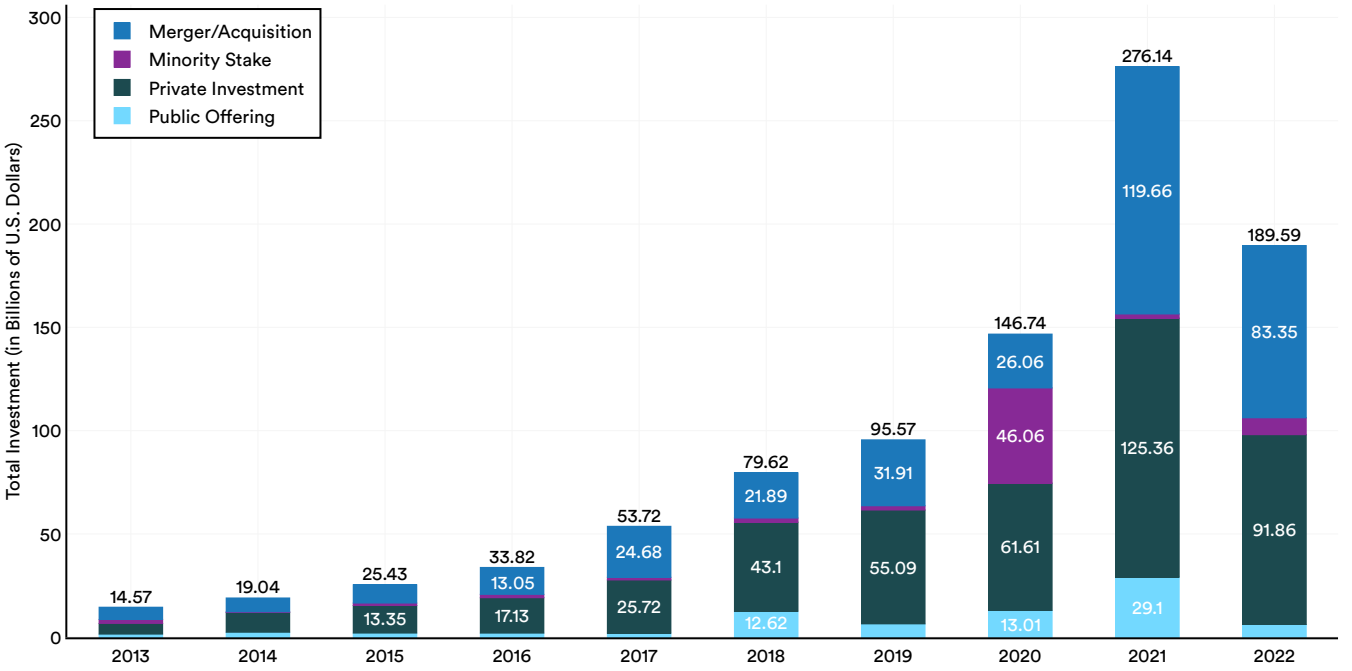

Figure 4.2.1

To provide a fuller context for the nature of AI investment in the last year, Figures 4.2.2 through 4.2.5 highlight the top merger/acquisition, minority stake, private investment, and public offering events in the last year. The greatest single AI investment event was the merger/acquisition of Nuance Communications, valued at $19.8 billion (Figure 4.2.2). The largest minority stake event was for the British company Aveva Group ($4.7 billion) (Figure 4.2.3). The greatest private investment event was GAC Aion New Energy Automobile ($2.5 billion), a Chinese clean energy and automotive company (Figure 4.2.4). Finally, the largest public offering was ASR Microelectronics ($1.1 billion), a Chinese semiconductor company (Figure 4.2.5).

Top Five AI Merger/Acquisition Investment Activities, 2022
Source: NetBase Quid, 2022 | Table: 2023 AI Index Report

Company Name	Headquarters Country	Focus Area	Funding Amount (in Billions USD)
Nuance Communications, Inc.	United States	Artificial Intelligence; Enterprise Software; Healthcare; Machine Learning	19.80
Citrix Systems, Inc.	United States	Data Management, Processing, and Cloud; HR Tech	17.18
Avast Limited	Czech Republic	Data Management, Processing, and Cloud; Fintech; Cybersecurity, Data Protection	8.02
AspenTech Corporation	United States	Manufacturing; Software; Supply Chain Management	6.34
Vivint Smart Home, Inc.	United States	Cybersecurity, Data Protection; Sales Enablement	5.54

Figure 4.2.2

Top Five AI Minority Stake Investment Activities, 2022
Source: NetBase Quid, 2022 | Table: 2023 AI Index Report

Company Name	Headquarters Country	Focus Area	Funding Amount (in Billions USD)
AVEVA Group, PLC	United Kingdom	Chemical; Computer; Data Mining; Electronics; Industrial Manufacturing; Information Technology; Simulation; Software	4.68
Grupo de Inversiones Suramericana, SA	Colombia	Financial Services; Impact Investing; Insurance	1.48
Fractal Analytics Private Limited	India	Analytics; Artificial Intelligence; Big Data; Business Intelligence; Consulting; Machine Learning	0.35
Atrys Health, SA	Spain	Medical and Healthcare	0.28
R Systems International, Ltd.	India	Analytics; Information Technology; IT Management; Software	0.17

Figure 4.2.3

Top Five AI Private Investment Activities, 2022

Source: NetBase Quid, 2022 | Table: 2023 AI Index Report

Company Name	Headquarters Country	Focus Area	Funding Amount (in Billions USD)
GAC Ai¬¥an New Energy Automobile Co., Ltd.	China	Automotive; Clean Energy; Electric Vehicle; Manufacturing	2.54
Idience Co., Ltd.	South Korea	Emergency Medicine; Healthcare; Pharmaceutical	2.15
Uali	Argentina	Drones; Cloud Computing	1.50
Anduril Industries, Inc.	United States	Cybersecurity, Data Protection; AR/VR; Drones	1.50
Celonis, GmbH	Germany	Retail; Industrial Automation, Network; HR Tech; Insurtech	1.22

Figure 4.2.4

Top Five AI Public Offering Investment Activities, 2022

Source: NetBase Quid, 2022 | Table: 2023 AI Index Report

Company Name	Headquarters Country	Focus Area	Funding Amount (in Billions USD)
ASR Microelectronics Co., Ltd.	China	Semiconductor; VC	1.08
iSoftStone Information Technology (Group) Co., Ltd.	China	Data Management, Processing, and Cloud; Cybersecurity, Data Protection	0.73
Jahez International Company for Information Systems Technology	Saudi Arabia	Artificial Intelligence; E-Commerce; Food and Beverage; Food Delivery; Information Technology; Logistics	0.43
Fortior Technology (Shenzhen) Co., Ltd.	China	Electronics; Machine Manufacturing; Semiconductor	0.30
Beijing Deep Glint Technology Co., Ltd.	China	Cybersecurity, Data Protection; Music, Video Content	0.29

Figure 4.2.5

Startup Activity

The next section analyzes private investment trends in artificial intelligence startups that have received over $1.5 million in investment since 2013.

Global Trend

The global private AI investment trend reveals that while investment activity has decreased since 2021, it is still 18 times higher than it was in 2013 (Figure 4.2.6).

Private Investment in AI, 2013–22
Source: NetBase Quid, 2022 | Chart: 2023 AI Index Report

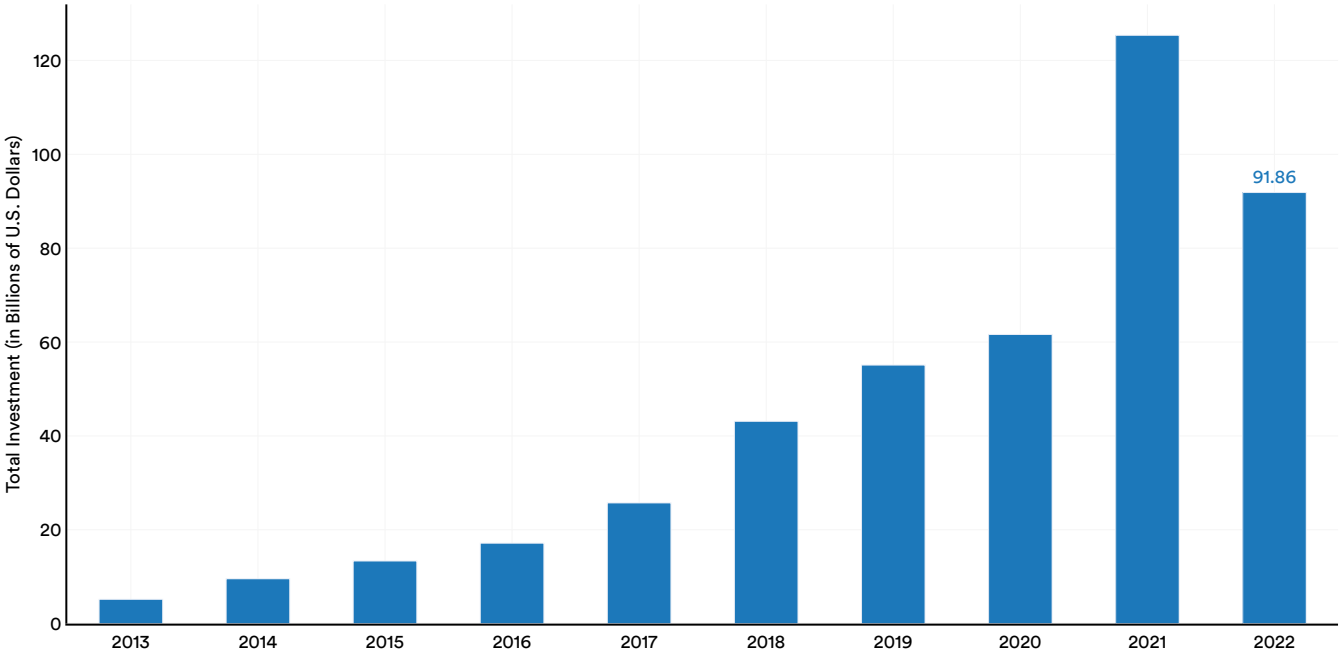

Figure 4.2.6

A similar trend, of short-term decreases but longer-term growth, is evident in data on total private investment events. In 2022 there were 3,538 AI-related private investment events, representing a 12% decrease from 2021 but a sixfold increase since 2013 (Figure 4.2.7). Similarly, the number of newly funded AI companies dropped to 1,392 from 1,669 last year, while having increased from 495 in 2013 (Figure 4.2.8).

Number of Private Investment Events in AI, 2013–22
Source: NetBase Quid, 2022 | Chart: 2023 AI Index Report

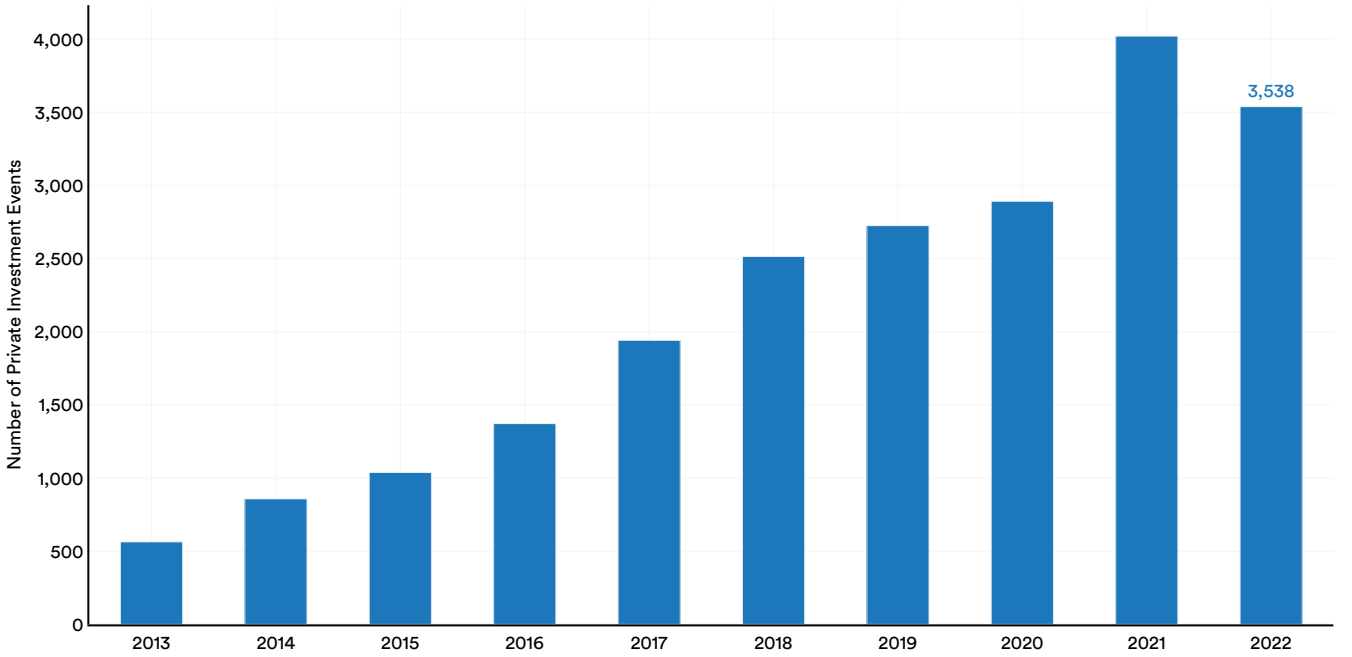

Figure 4.2.7

Number of Newly Funded AI Companies in the World, 2013–22
Source: NetBase Quid, 2022 | Chart: 2023 AI Index Report

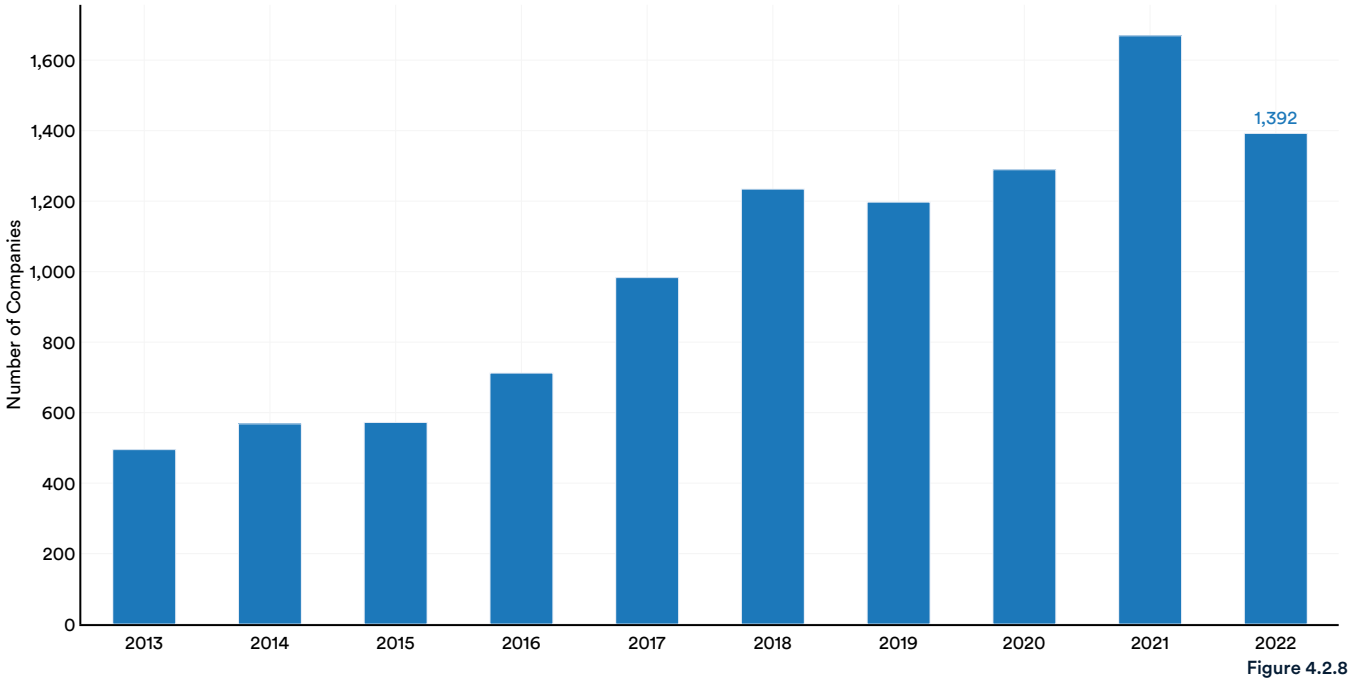

Figure 4.2.8

The year-over-year decrease in AI-related funding is also evident when the funding events are disaggregated by size. Across all size categories, with the exception of ones over $1 billion, the total number of AI funding events decreased (Figure 4.2.9).

AI Private Investment Events by Funding Size, 2021 Vs. 2022
Source: NetBase Quid, 2022 | Table: 2023 AI Index Report

Funding Size	2021	2022	Total
Over $1 Billion	4	6	10
$500 Million – $1 Billion	13	5	18
$100 Million – $500 Million	277	164	441
$50 Million – $100 Million	277	238	515
Under $50 Million	2,851	2,585	5,436
Undisclosed	598	540	1,138
Total	**4,020**	**3,538**	**7,558**

Figure 4.2.9

Regional Comparison by Funding Amount

Once again, the United States led the world in terms of total AI private investment. In 2022, the $47.4 billion invested in the United States was roughly 3.5 times the amount invested in the next highest country, China ($13.4 billion), and 11 times the amount invested in the United Kingdom ($4.4 billion) (Figure 4.2.10).

Private Investment in AI by Geographic Area, 2022
Source: NetBase Quid, 2022 | Chart: 2023 AI Index Report

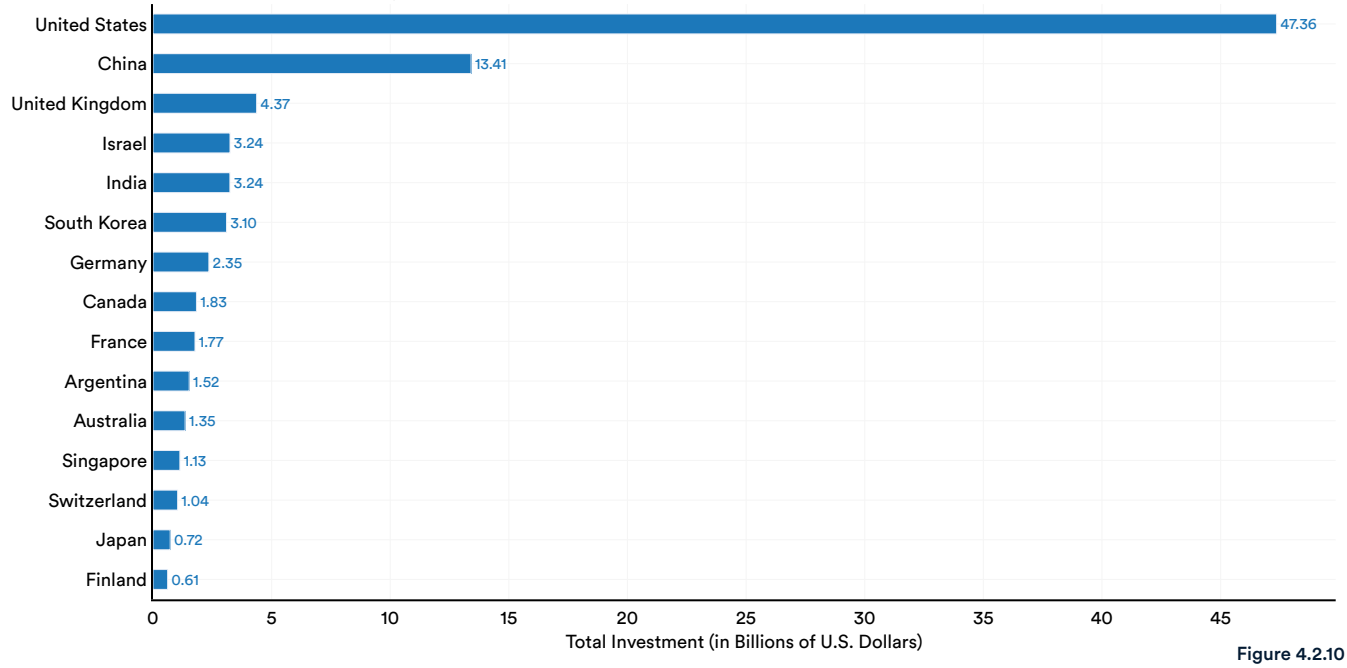

Figure 4.2.10

When private AI investments are aggregated since 2013, the same ranking of countries applies: The United States is first with $248.9 billion invested, followed by China ($95.1 billion) and the United Kingdom ($18.2 billion) (Figure 4.2.11).

Private Investment in AI by Geographic Area, 2013–22 (Sum)

Source: NetBase Quid, 2022 | Chart: 2023 AI Index Report

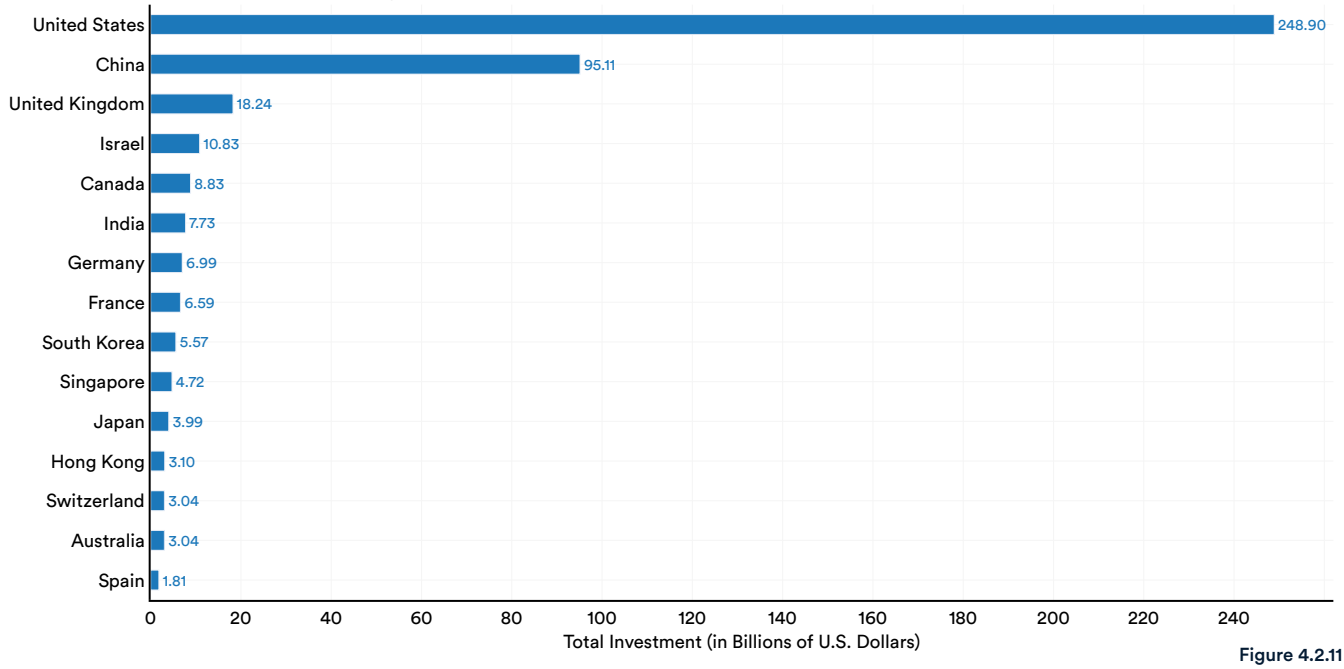

Figure 4.2.11

While the United States continues to outpace other nations in terms of private AI investment, the country experienced a sharp 35.5% decrease in AI private investment within the last year (Figure 4.2.12). Chinese investment experienced a similarly sharp decline (41.3%).

The top five American AI private investment events are highlighted in Figure 4.2.13, the top five European Union and British investments in Figure 4.2.14, and the top five Chinese investments in Figure 4.2.15.

Private Investment in AI by Geographic Area, 2013–22

Source: NetBase Quid, 2022 | Chart: 2023 AI Index Report

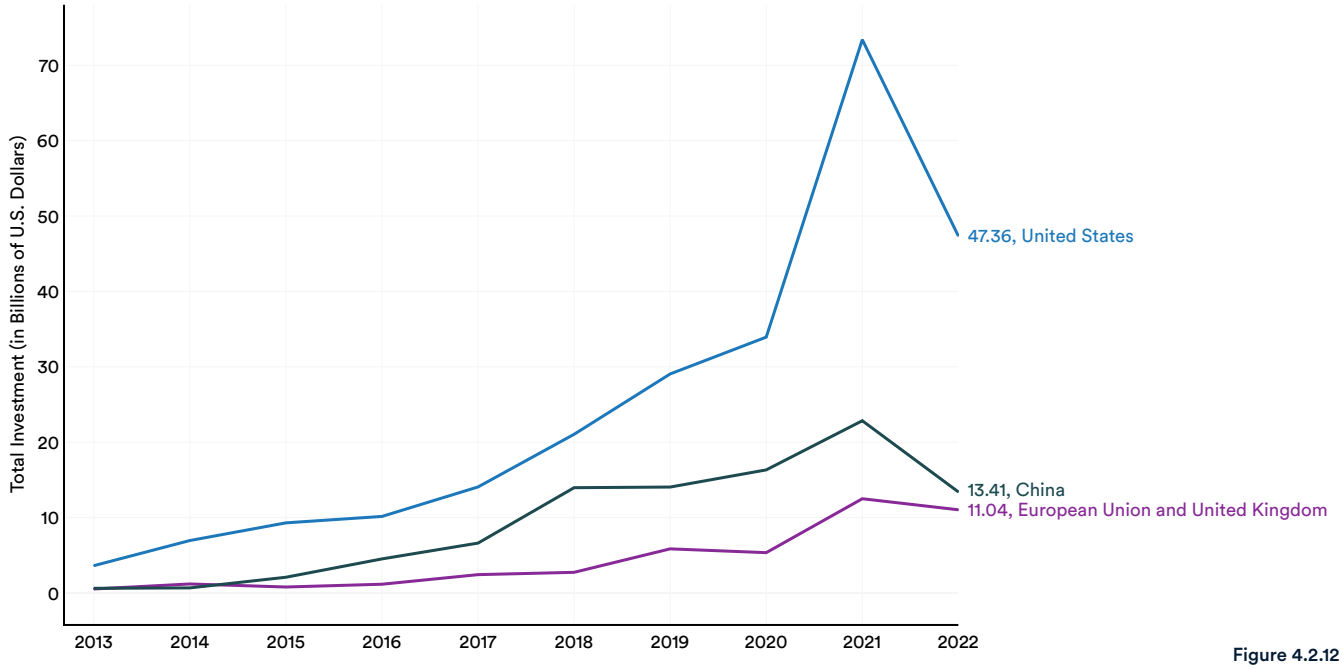

Figure 4.2.12

Top AI Private Investment Events in the United States, 2022

Source: NetBase Quid, 2022 | Table: 2023 AI Index Report

Company Name	Focus Area	Funding Amount (in Billions USD)
Anduril Industries, Inc.	Cybersecurity, Data Protection; AR/VR; Drones	1.50
Faire Wholesale, Inc.	Fintech; Retail; Sales Enablement	0.82
Anthropic, PBC	Artificial Intelligence; Information Technology; Machine Learning	0.58
Arctic Wolf Networks, Inc.	Data Management, Processing, and Cloud; Cybersecurity, Data Protection	0.40
JingChi, Inc.	Data Management, Processing, and Cloud; AV; AR/VR	0.40

Figure 4.2.13

Top AI Private Investment Events in the European Union and United Kingdom, 2022

Source: NetBase Quid, 2022 | Table: 2023 AI Index Report

Company Name	Focus Area	Funding Amount (in Billions USD)
Celonis, GmbH	Retail; Industrial Automation, Network; HR Tech; Insurtech	1.22
Content Square, SAS	Analytics; Artificial Intelligence: CRM: Data Visualization; Digital Marketing; SaaS	0.60
Retail Logistics Excellence - RELEX Oy	Retail	0.57
Cera Care Limited	Medical and Healthcare	0.32
Babylon Holdings Limited	Medical and Healthcare; Music, Video Content	0.30

Figure 4.2.14

Top AI Private Investment Events in China, 2022

Source: NetBase Quid, 2022 | Table: 2023 AI Index Report

Company Name	Focus Area	Funding Amount (in Billions USD)
GAC Ai¬¥an New Energy Automobile Co., Ltd.	Automotive; Clean Energy; Electric Vehicle; Manufacturing	2.54
GAC Ai¬¥an New Energy Automobile Co., Ltd.	Automotive; Clean Energy; Electric Vehicle; Manufacturing	1.11
Beijing ESWIN Technology Group Co., Ltd.	Data Management, Processing, and Cloud; Industrial Automation, Network; Semiconductor; Marketing, Digital Ads; Sales Enablement	0.58
Zhejiang Hozon New Energy Automobile Co., Ltd.	Data Management, Processing, and Cloud; Cybersecurity, Data Protection; Sales Enablement	0.44
Zhejiang Hozon New Energy Automobile Co., Ltd.	Data Management, Processing, and Cloud; Cybersecurity, Data Protection; Sales Enablement	0.32

Figure 4.2.15

Regional Comparison by Newly Funded AI Companies

This subsection studies the number of newly funded AI companies across various geographic areas. As was the case with private investment, the United States led all regions with the largest number of newly funded AI companies at 542, followed by China at 160 and the United Kingdom at 99 (Figure 4.2.16).

Number of Newly Funded AI Companies by Geographic Area, 2022

Source: NetBase Quid, 2022 | Chart: 2023 AI Index Report

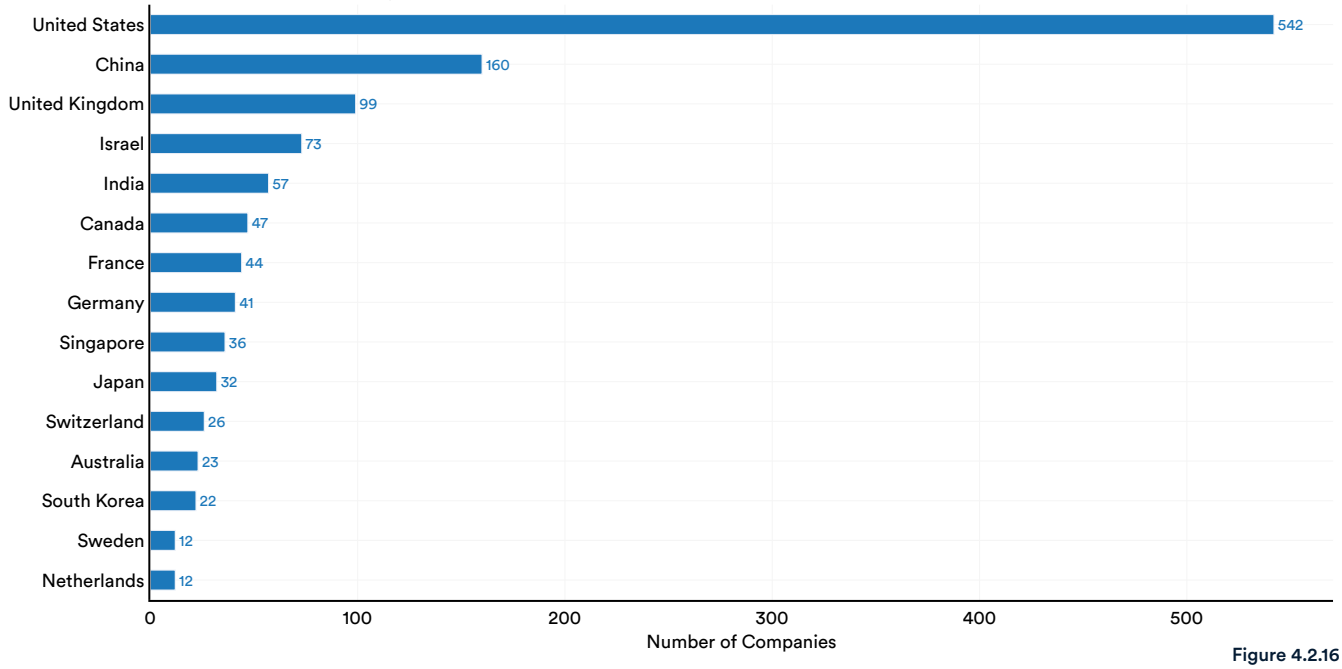

Figure 4.2.16

A similar trend is evident in the aggregate data since 2013. In the last decade, the number of newly funded AI companies in the United States is around 3.5 times the amount in China, and 7.4 times the amount in the United Kingdom (Figure 4.2.17).

Number of Newly Funded AI Companies by Geographic Area, 2013–22 (Sum)

Source: NetBase Quid, 2022 | Chart: 2023 AI Index Report

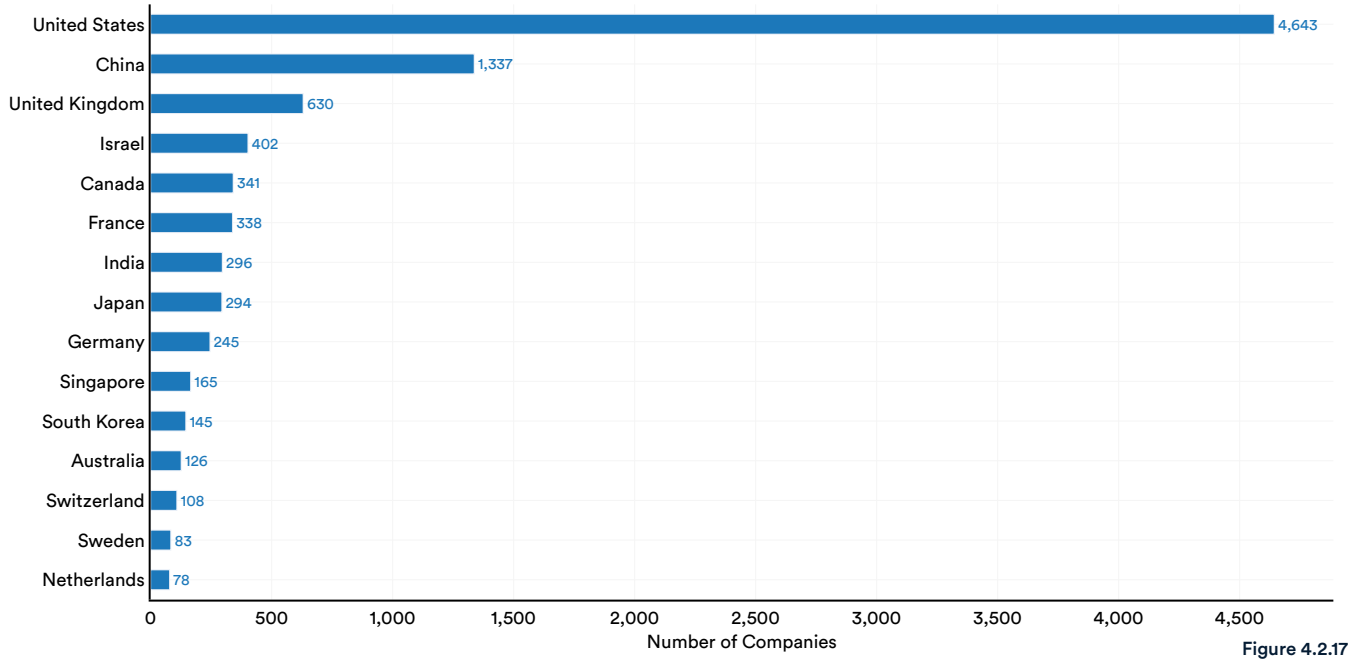

Figure 4.2.17

Figure 4.2.18 breaks down data on newly funded AI companies within select geographic regions. In a trend that goes back a decade, the United States continues to outpace both the European Union and the United Kingdom, as well as China. However, the growth rates of the different regions are relatively similar.

Number of Newly Funded AI Companies by Geographic Area, 2013–22

Source: NetBase Quid, 2022 | Chart: 2023 AI Index Report

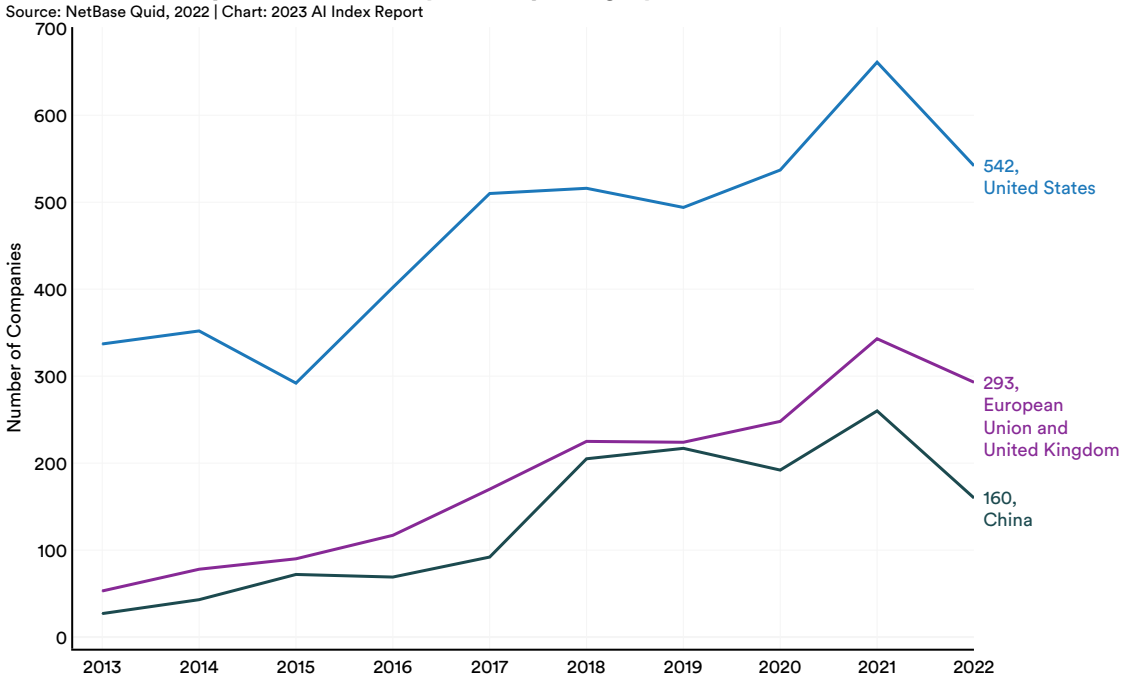

Figure 4.2.18

Focus Area Analysis

Private AI investment can also be disaggregated by focus area. Figure 4.2.19 compares global private AI investment by focus area in 2022 versus 2021. The focus areas that attracted the most investment in 2022 were medical and healthcare ($6.1 billion); data management, processing, and cloud ($5.9 billion); fintech ($5.5 billion); cybersecurity and data protection ($5.4 billion); and retail ($4.2 billion). Mirroring the pattern seen in total AI private investment, the total investment across most focus areas declined in the last year.

Private Investment in AI by Focus Area, 2021 Vs. 2022
Source: NetBase Quid, 2022 | Chart: 2023 AI Index Report

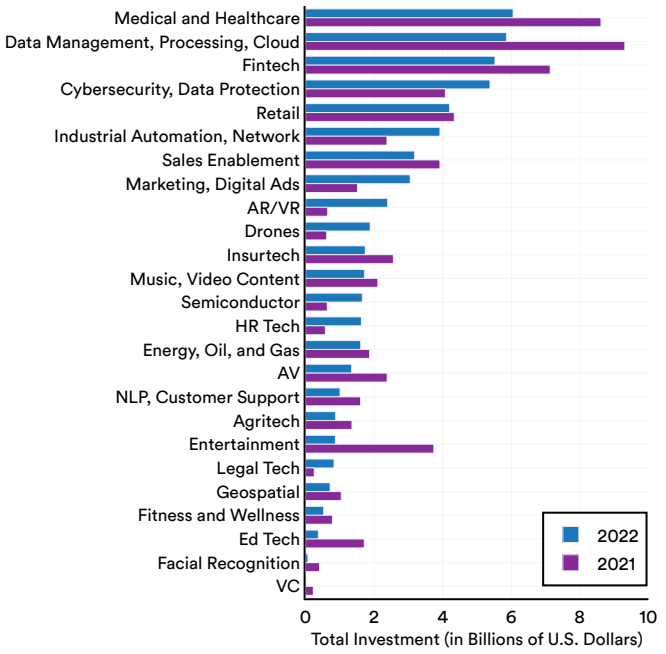

Figure 4.2.19

Figure 4.2.20 presents trends in AI focus area investments. As noted earlier, most focus areas saw declining investments in the last year. However, some of the focus areas that saw increased investments are semiconductor, industrial automation and network, cybersecurity and data protection, drones, marketing and digital ads, HR tech, AR/VR, and legal tech. Still, mirroring a broader trend in AI private investment, most focus areas saw greater amounts of AI private investment in 2022 than they did in 2017.

Private Investment in AI by Focus Area, 2017–22

Source: NetBase Quid, 2022 | Chart: 2023 AI Index Report

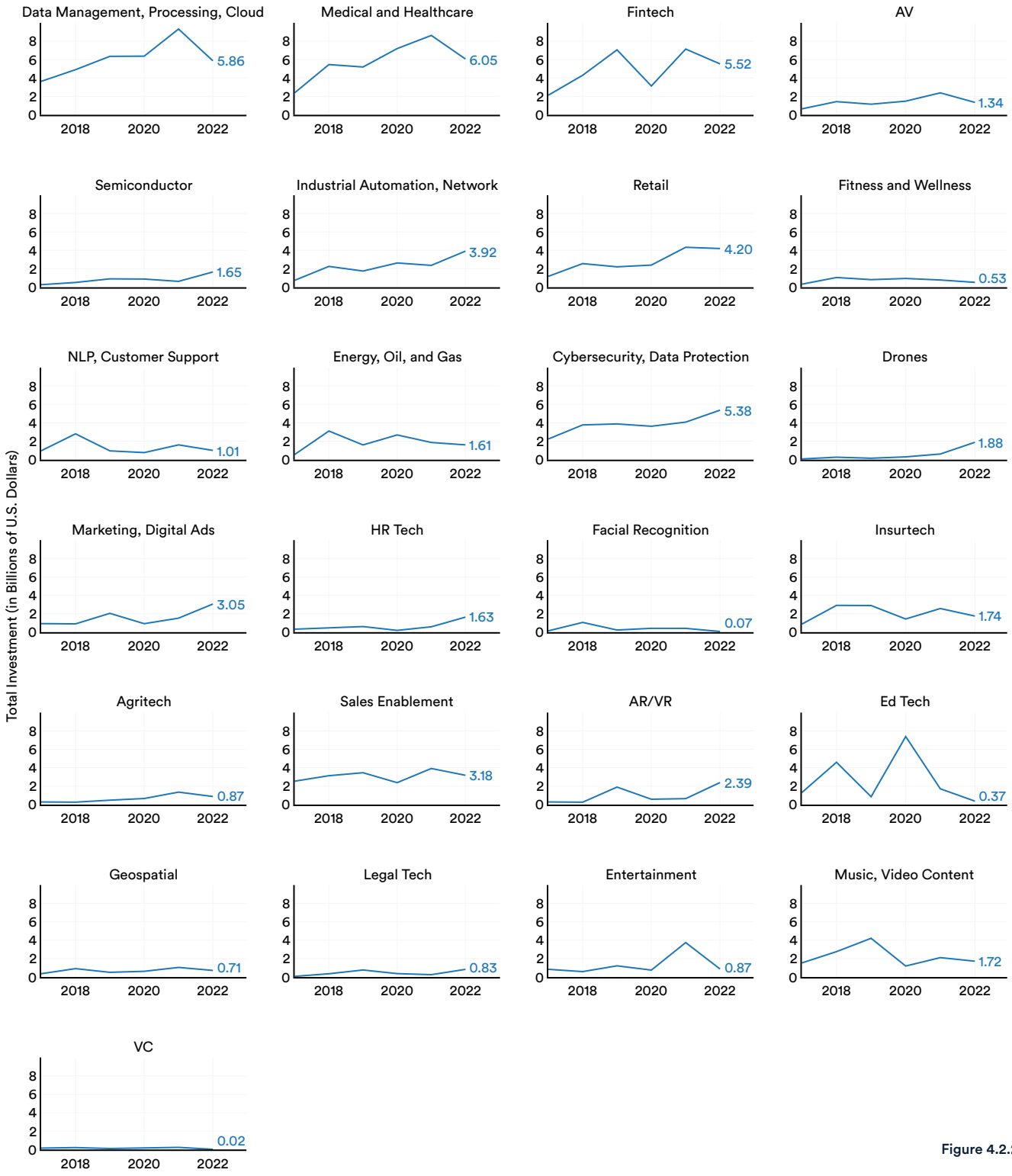

Figure 4.2.20

Finally, 4.2.21 shows private investment in AI by focus area over time within select geographic regions, highlighting how private investment priorities in AI differ across geographies. For example, in 2022, private investment in AI-related drone technology in the United States ($1.6 billion) was nearly 53 times more than that in China ($0.03 billion), and 40 times more than that in the European Union and the United Kingdom ($0.04 billion). Chinese private investment in AI-related semiconductors ($1.02 billion) was 1.75 times more than that in the United States ($0.58 billion), and 102 times more than that in the European Union and the United Kingdom ($0.01 billion).

Private Investment in AI by Focus Area and Geographic Area, 2017–22
Source: NetBase Quid, 2022 | Chart: 2023 AI Index Report

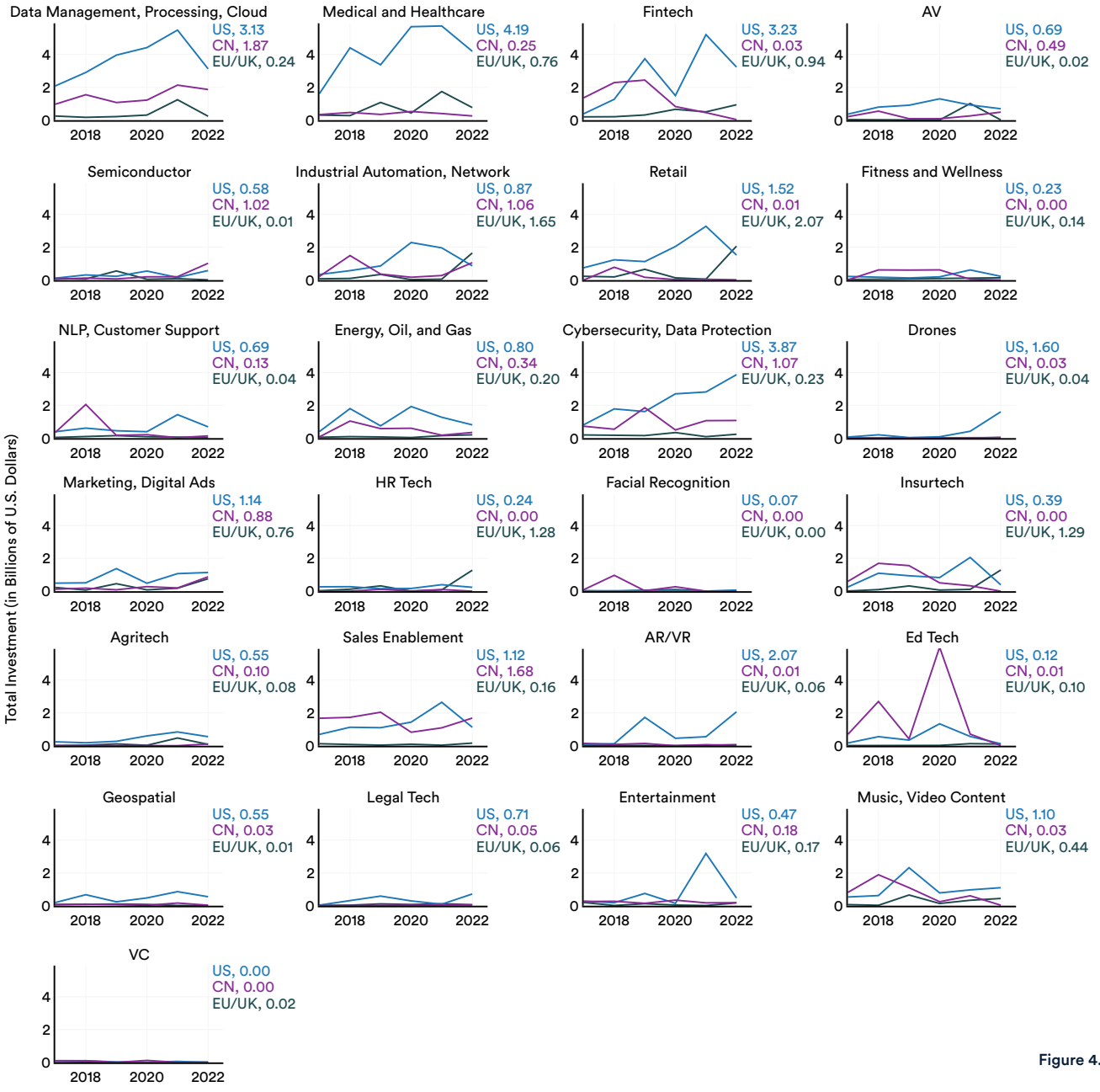

Figure 4.2.21

This section explores how corporations tangibly use AI. First, it highlights industry adoption trends and asks how businesses adopt AI and what particular AI technologies they find most useful, and identifies how AI adoption affects their bottom line. Second, the section considers industry motivations and explores what questions industry leaders consider when thinking about incorporating AI technologies. Finally, it paints a qualitative picture of business AI use by examining trends in AI-related earnings calls.

4.3 Corporate Activity

Industry Adoption

The following subsection on the industry adoption of AI borrows data from McKinsey's "The State of AI in 2022—and a Half Decade in Review," as well as previous years' editions. The 2022 report drew on data from a survey of 1,492 participants representing a wide range of regions, industries, company sizes, functional specialties, and tenures.

Adoption of AI Capabilities

According to the most recent McKinsey report, as of 2022, 50% of surveyed organizations reported having adopted AI in at least one business unit or function (Figure 4.3.1). This total is down slightly from 56% in 2021, although up significantly from 20% in 2017. AI usage has rapidly grown in the past half-decade, but leveled off since 2020.

Share of Respondents Who Say Their Organizations Have Adopted AI in at Least One Function, 2017–22

Source: McKinsey & Company Survey, 2022 | Chart: 2023 AI Index Report

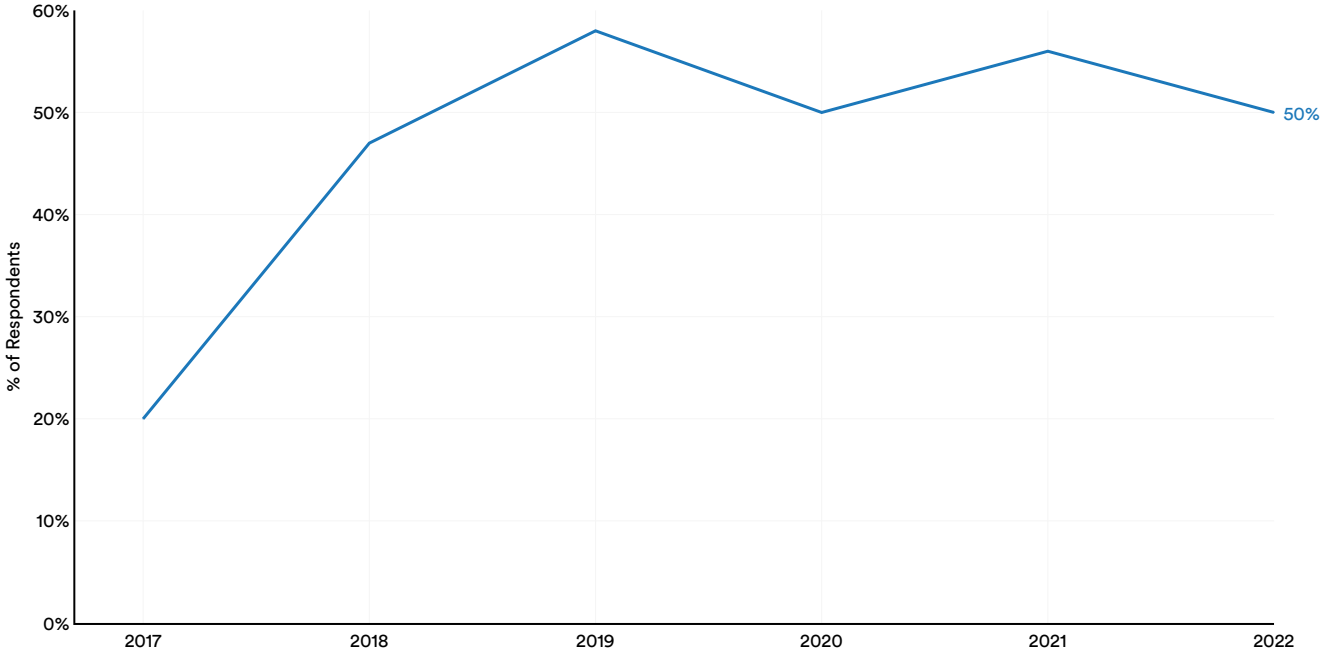

Figure 4.3.1

In the last half-decade, the average number of AI capabilities that organizations have embedded has doubled from 1.9 in 2018 to 3.8 in 2022 (Figure 4.3.2). Some of the AI capabilities that McKinsey features in their survey include recommender systems, NL text understanding, and facial recognition.[4]

Average Number of AI Capabilities That Respondents' Organizations Have Embedded Within at Least One Function or Business Unit, 2018–22

Source: McKinsey & Company Survey, 2022 | Chart: 2023 AI Index Report

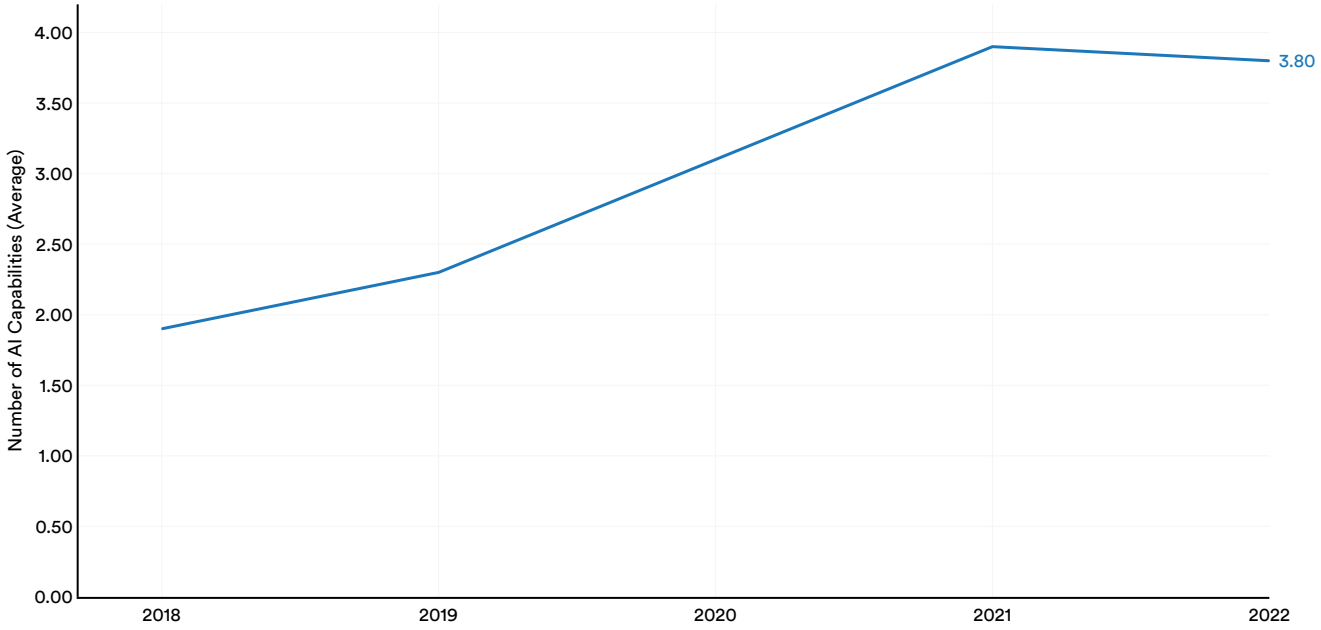

Figure 4.3.2

4 In the 2022 edition of the McKinsey survey, 16 total AI capabilities are considered: computer vision, deep learning, digital twins, facial recognition, GAN, knowledge graphs, NL generation, NL speech understanding, NL text understanding, physical robotics, recommender systems, reinforcement learning, robotic process automation, transfer learning, transformers, and virtual agents.

The most commonly adopted AI use case in 2022 was service operations optimization (24%), followed by the creation of new AI-based products (20%), customer segmentation (19%), customer service analytics (19%), and new AI-based enhancement of products (19%) (Figure 4.3.3).

Most Commonly Adopted AI Use Cases by Function, 2022

Source: McKinsey & Company Survey, 2022 | Chart: 2023 AI Index Report

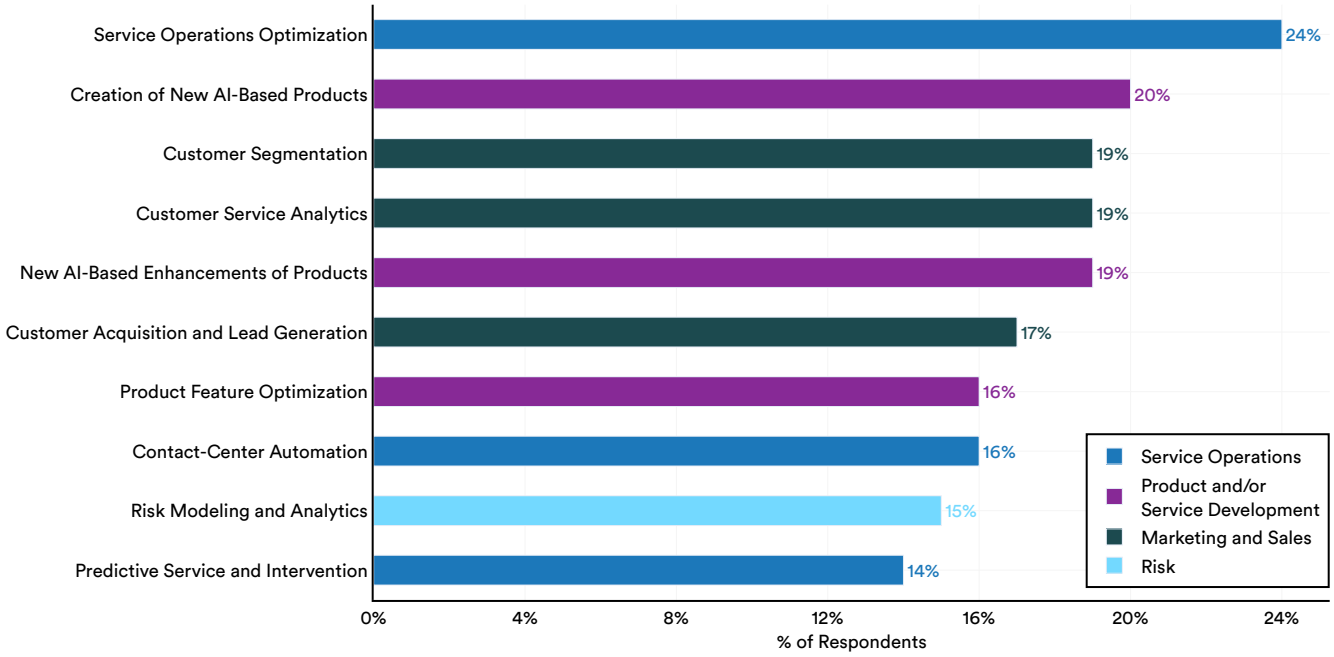

Figure 4.3.3

With respect to the type of AI capabilities embedded in at least one function or business unit, as indicated by Figure 4.3.4, robotic process automation had the highest rate of embedding within high tech/telecom, financial services and business, and legal and professional services industries—the respective rates of embedding were 48%, 47%, and 46%. Across all industries, the most embedded AI technologies were robotic process automation (39%), computer vision (34%), NL text understanding (33%), and virtual agents (33%).

AI Capabilities Embedded in at Least One Function or Business Unit, 2022
Source: McKinsey & Company Survey, 2022 | Chart: 2023 AI Index Report

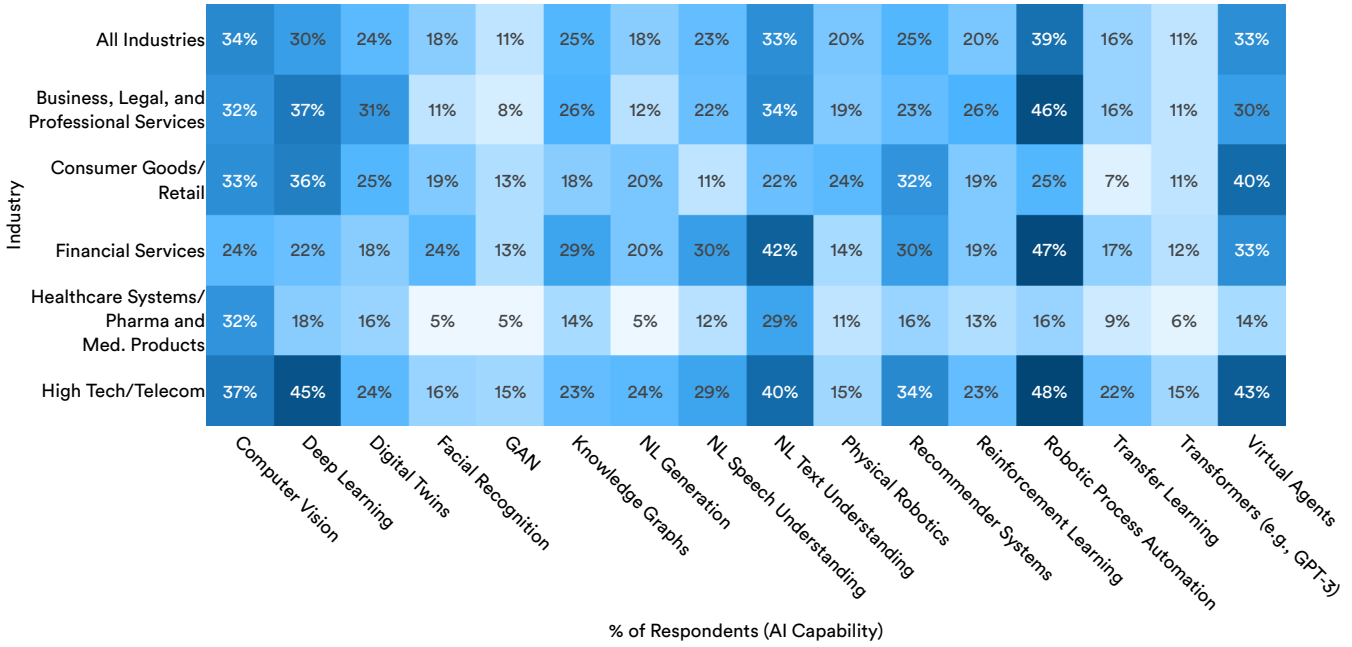

Figure 4.3.4

Figure 4.3.5 shows AI adoption by industry and AI function in 2022. The greatest adoption was in risk for high tech/telecom (38%), followed by service operations for consumer goods/retail (31%) and product and/or service development for financial services (31%).

AI Adoption by Industry and Function, 2022
Source: McKinsey & Company Survey, 2022 | Chart: 2023 AI Index Report

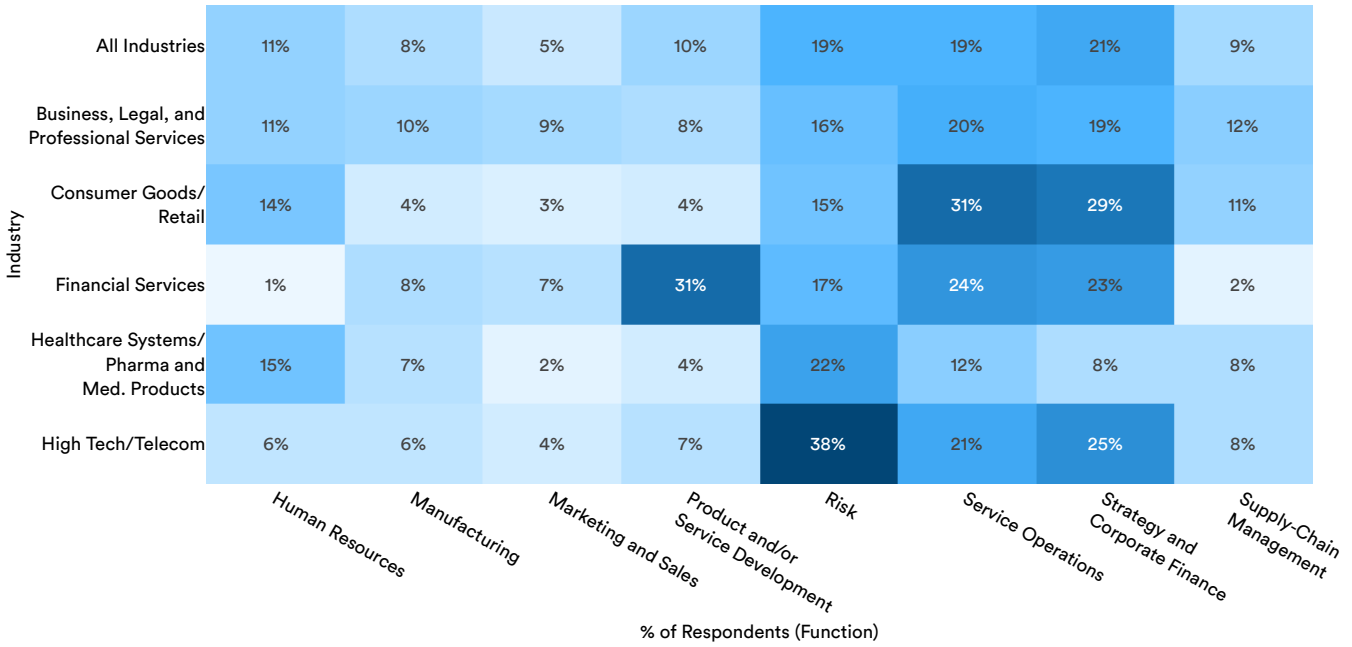

Figure 4.3.5

Figure 4.3.6 shows how rates of AI adoption by industry and AI function vary from 2021 to 2022 in order to demonstrate how rates of AI adoption have changed over the last year. The greatest year-over-year increases were in consumer goods/retail, for strategy and corporate finance (25 percentage points); followed by high tech/telecom, for risk (22 percentage points). The most significant decreases were in high tech/telecom, for product and/or service development (38 percentage points); and healthcare systems, also for product and/or service development (25 percentage points).

Percentage Point Change in Responses of AI Adoption by Industry and Function 2021 Vs. 2022
Source: McKinsey & Company Survey, 2022 | Chart: 2023 AI Index Report

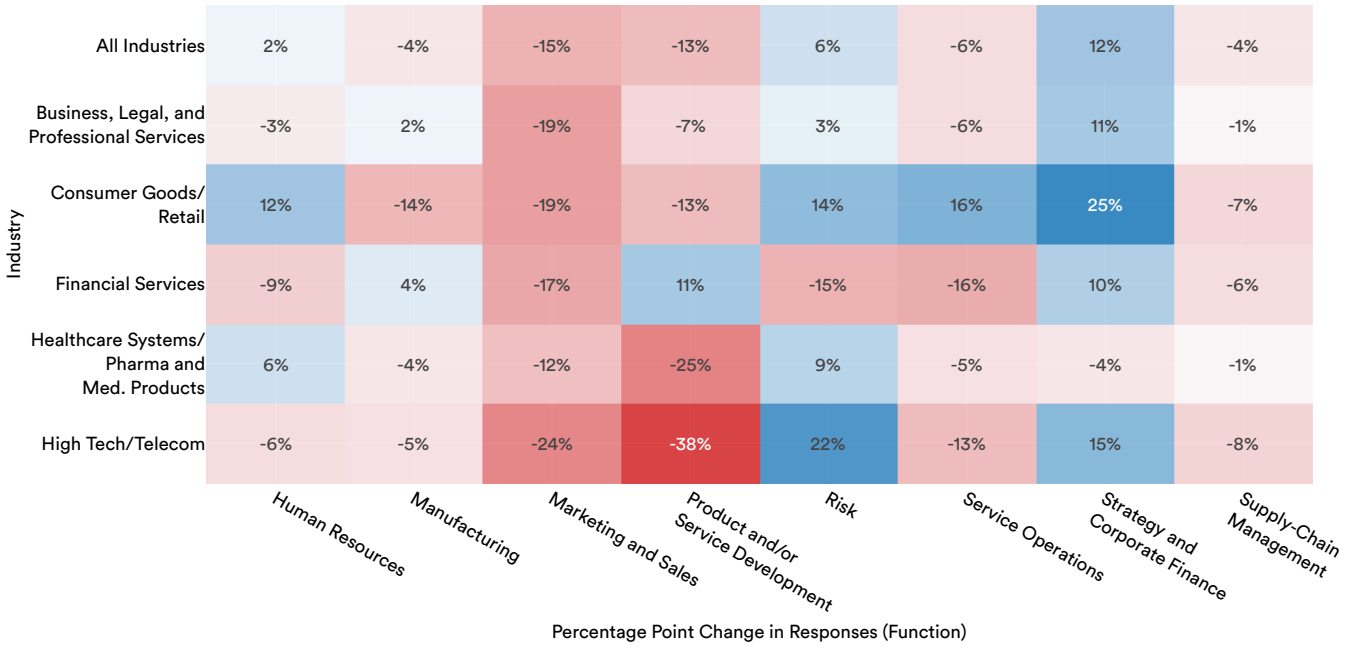

Figure 4.3.6

Organizations report AI adoption leading to both cost decreases and revenue increases. On the cost side, the functions that most respondents saw decreases in as a result of AI adoption were supply chain management (52%), service operations (45%), strategy and corporate finance (43%), and risk (43%) (Figure 4.3.7). On the revenue side, the functions that most respondents saw increases in as a result of AI adoption were marketing and sales (70%), product and/or service development (70%), and strategy and corporate finance (65%).

Cost Decrease and Revenue Increase From AI Adoption by Function, 2021

Source: McKinsey & Company Survey, 2022 | Chart: 2023 AI Index Report

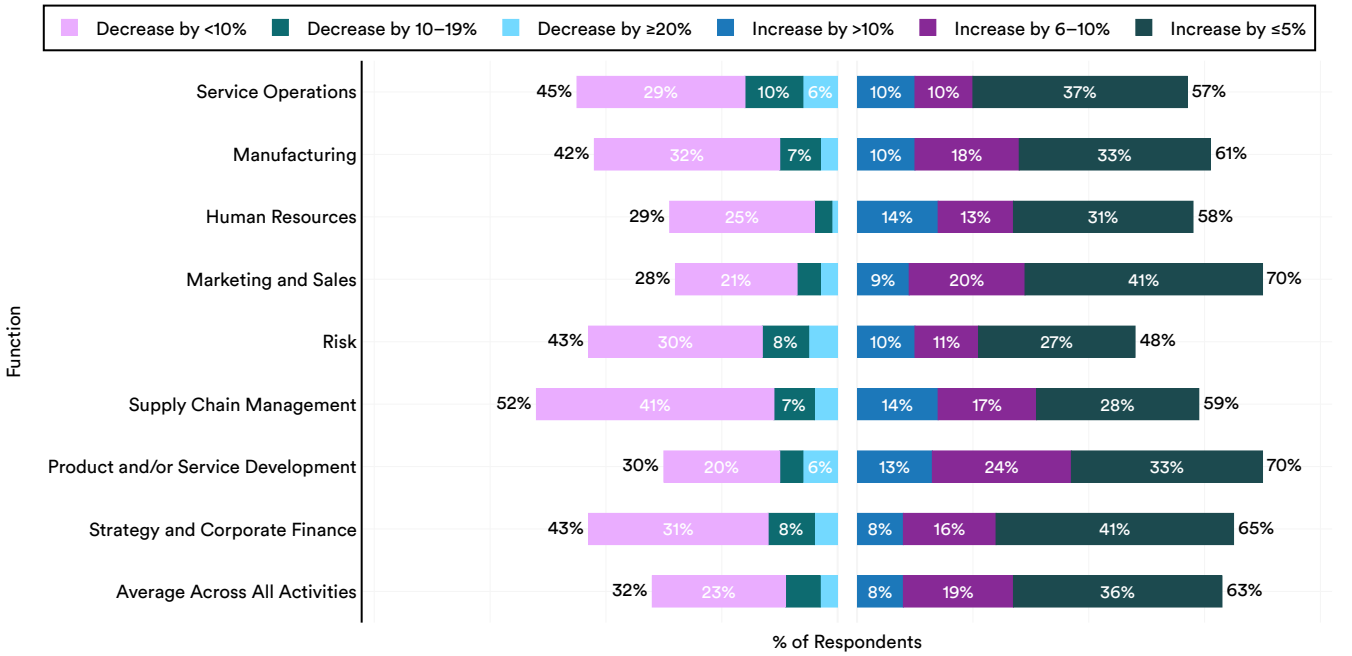

Figure 4.3.7

Figure 4.3.8 shows AI adoption by organizations globally, broken out by regions of the world. In 2022, North America led (59%), followed by Asia-Pacific (55%) and Europe (48%). The average adoption rate across all geographies was 50%, down 6% from 2021. Notably, "Greater China" registered a 20 percentage point decrease from 2021.

AI Adoption by Organizations in the World, 2021 Vs. 2022

Source: McKinsey & Company Survey, 2022 | Chart: 2023 AI Index Report

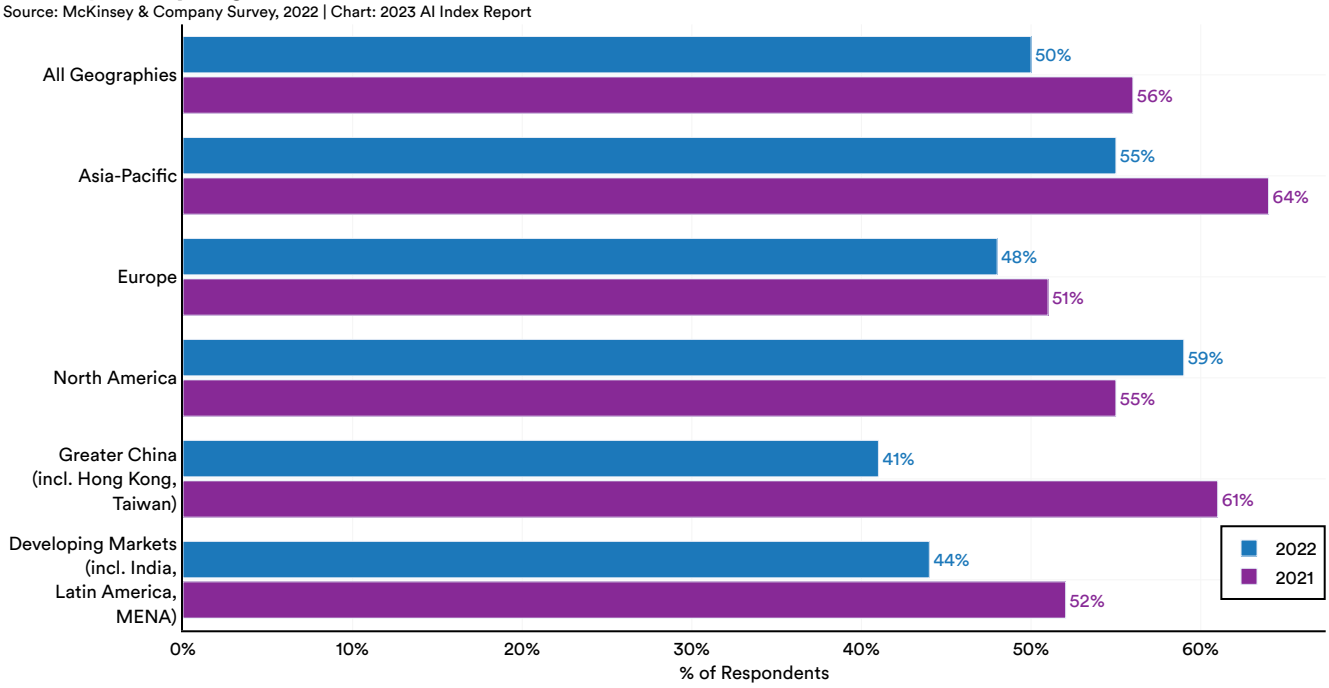

Figure 4.3.8

Consideration and Mitigation of Risks From Adopting AI

As has been the case in the last few iterations of the McKinsey report, in 2022 respondents identified cybersecurity as the most relevant risk when adopting AI technology (59%) (Figure 4.3.9). The next most cited risks were regulatory compliance (45%), personal/individual privacy (40%), and explainability (37%). The least salient risks identified by organizations were national security (13%) and political stability (9%).

Risks From Adopting AI That Organizations Consider Relevant, 2019–22

Source: McKinsey & Company Survey, 2022 | Chart: 2023 AI Index Report

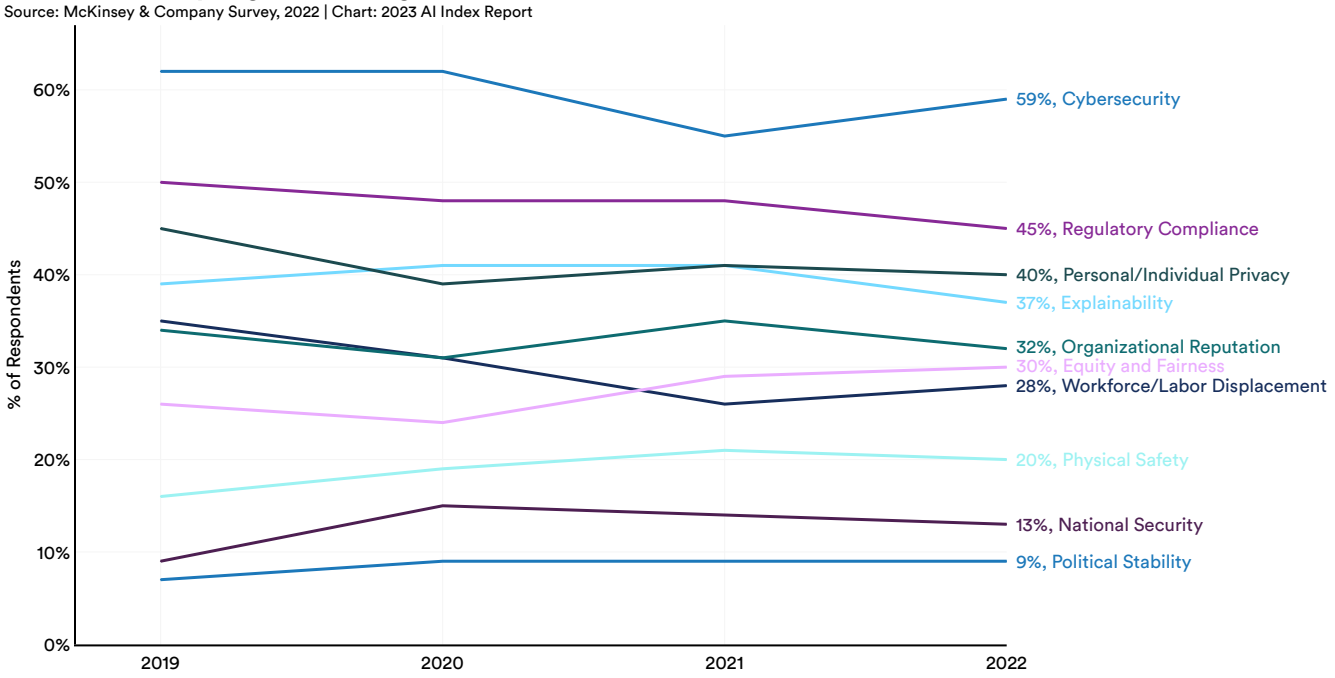

Figure 4.3.9

Figure 4.3.10 highlights the AI risks that organizations are taking steps to mitigate. The top three responses were cybersecurity (51%), followed by regulatory compliance (36%) and personal/individual privacy (28%). As was the case in previous years, there are meaningful gaps between the risks organizations cite as relevant and those which organizations have taken steps to mitigate. For instance, there is a gap of 8 percentage points for cybersecurity, 9 percentage points for regulatory compliance, and 12 percentage points for personal/individual privacy. These differences suggest there is a gap between the awareness organizations have of various risks and their steps taken to mitigate such risks.

Risks From Adopting AI That Organizations Take Steps to Mitigate, 2019–22

Source: McKinsey & Company Survey, 2022 | Chart: 2023 AI Index Report

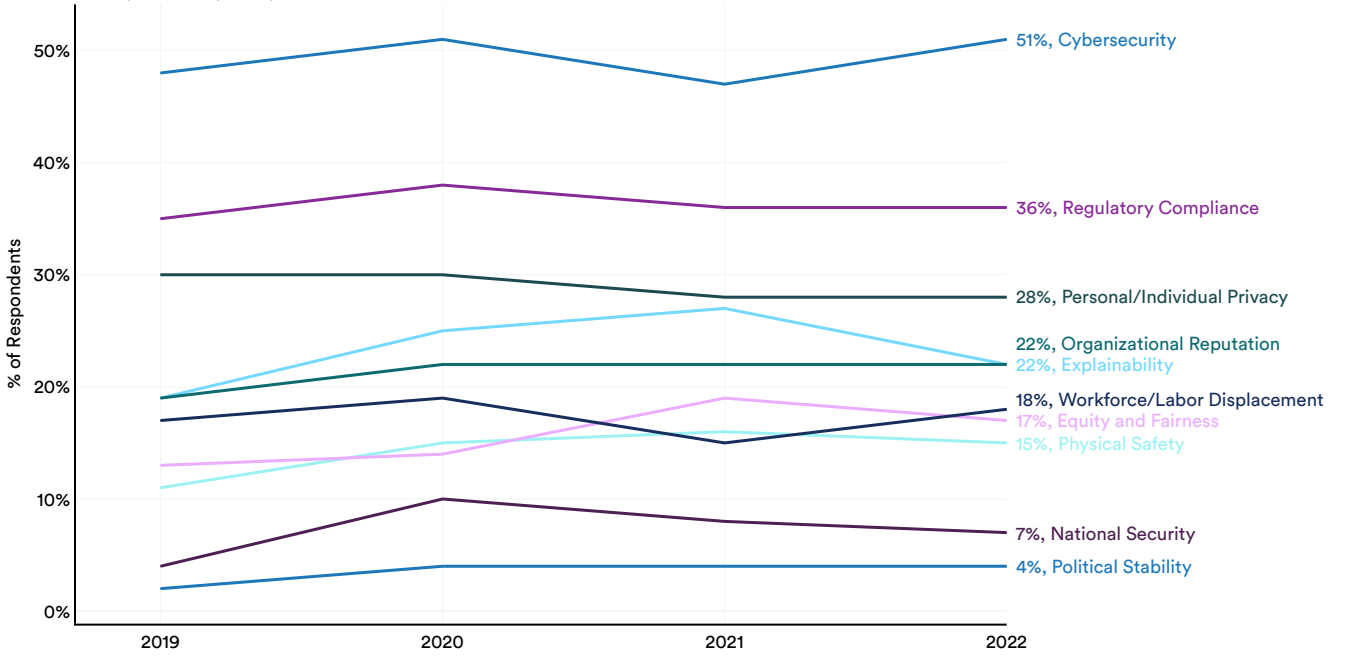

Figure 4.3.10

Narrative Highlight:

The Effects of GitHub's Copilot on Developer Productivity and Happiness

In 2021, launched a technical preview of Copilot, a generative AI tool that enables developers and coders to present a coding problem in natural language and then have Copilot generate a solution in code. Copilot can also translate between various programming languages. In 2022, GitHub surveyed over 2,000 developers who were using the tool to determine its effect on their productivity, well-being, and workflow.[5]

Figure 4.3.11 summarizes the results of the survey. Developers overwhelmingly reported feeling more productive, satisfied, and efficient when working with Copilot. More specifically, 88% of surveyed respondents commented feeling more productive, 74% reported being able to focus on more satisfying work, and 88% claimed to have completed tasks more quickly. One software engineer stated, "[With Copilot] I have to think less, and when I have to think, it's the fun stuff. It sets off a little spark that makes coding more fun and more efficient."[6]

As part of the same survey, GitHub recruited 95 developers and randomly split them into two groups, one of which used Copilot as part of a coding task and the other which did not. The results of this experiment are summarized in Figure 4.3.12. The developers who used Copilot

It took the developers using Copilot only 71 minutes to complete their task—56% less time than the developers who did not use Copilot (161 minutes).

reported a completion rate of 78%, 8 percentage points higher than those who did not use Copilot. Likewise, it only took the developers using Copilot 71 minutes to complete their task, which was 56% less time than the developers who did not use Copilot (161 minutes). These survey and experiment results are evidence of the tangible ways in which AI tools improve worker productivity.

5 Most of the developers surveyed, around 60%, were professional developers; 30% were students and 7% were hobbyists.
6 The quote is taken from this source.

Narrative Highlight:

The Effects of GitHub's Copilot on Developer Productivity and Happiness (cont'd)

Measuring Dimensions of Developer Productivity When Using Copilot: Survey Responses, 2022

Source: GitHub Survey, 2022 | Chart: 2023 AI Index Report

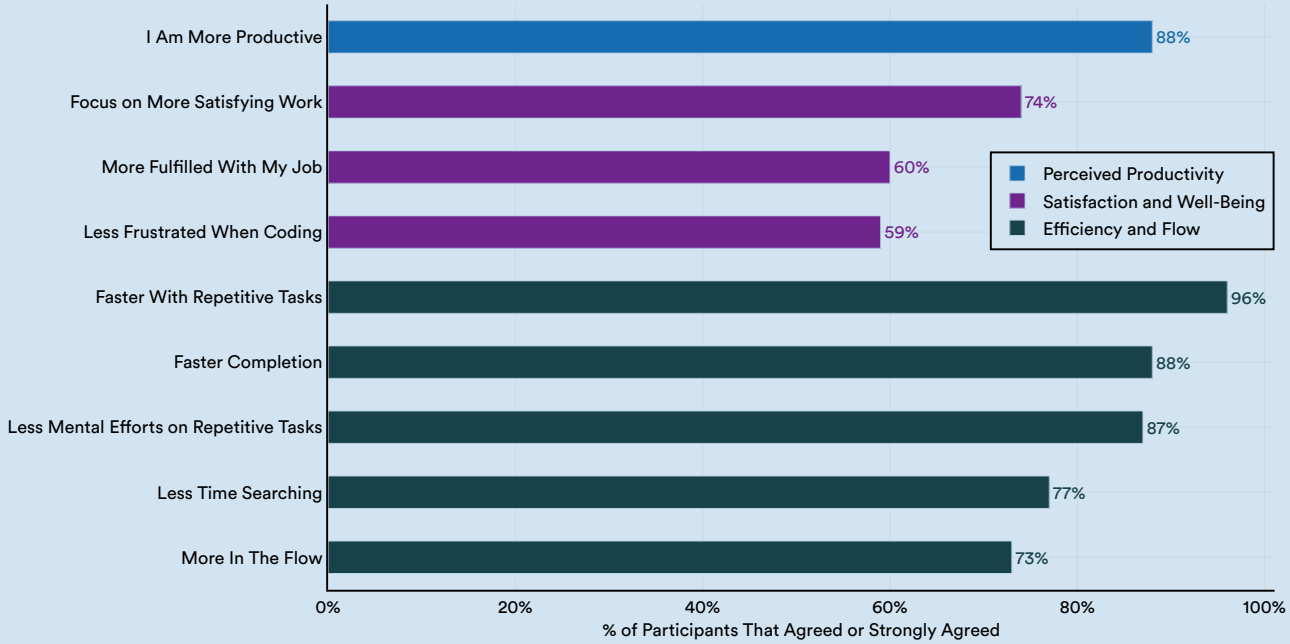

Figure 4.3.11

Summary of the Experiment Process and Results

Source: GitHub Survey, 2022 | Table: 2023 AI Index Report

	Used GitHub Copilot	Did Not Use GitHub Copilot
Number of Developers	45	50
Completion Rate (%)	78	70
Average Time Taken to Complete the Task (Minutes)	71	161

Figure 4.3.12

Industry Motivation

This section explores the motivations industry leaders have in deploying AI and examines the degree to which they feel AI is important, the reasons they are eager to embrace AI, and the factors that have hindered further scaling of AI solutions. The data from this section comes from Deloitte's "State of AI in Enterprise" report, which has surveyed companies about their use of AI since 2017. This year's survey polled 2,620 business leaders from a wide range of countries, industries, and corporate levels.

Perceived Importance of AI

Figures 4.3.13 and 4.3.14 suggest that an overwhelming majority of business leaders perceive AI to be important for their businesses. More specifically, when asked how important AI solutions were for their organization's overall success, 94% responded "important," 5% said "somewhat important," and 1% answered "not important" (Figure 4.3.13).

Similarly, when asked whether they believe that AI enhances performance and job satisfaction, 82% responded "strongly agree/agree," 16% said they "neither agree nor disagree," and only 2% selected "strongly disagree/disagree" (Figure 4.3.14).

Importance of AI Solutions for Organizations' Overall Success
Source: Deloitte Survey, 2022 | Chart: 2023 AI Index Report

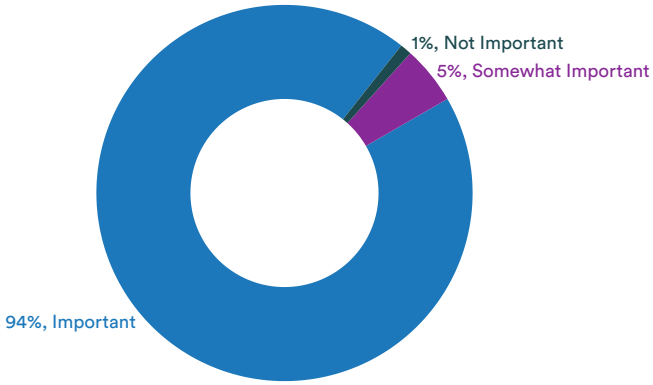

Figure 4.3.13

Believe AI Enhances Performance and Job Satisfaction, 2022
Source: Deloitte Survey, 2022 | Chart: 2023 AI Index Report

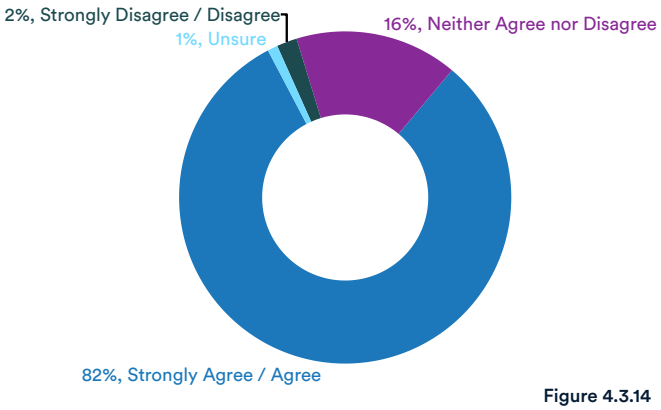

Figure 4.3.14

AI Investments and Implementation Outcomes

In 2022, 76% of surveyed leaders reported expecting to increase AI investments in the next fiscal year (Figure 4.3.15). Although this represents a 9 percentage point decrease since 2021 and a 12 percentage point decrease since 2018, a significantly large portion of business leaders continue to express interest in AI investment.

Expected AI Investment Increase in the Next Fiscal Year
Source: Deloitte Survey, 2022 | Chart: 2023 AI Index Report

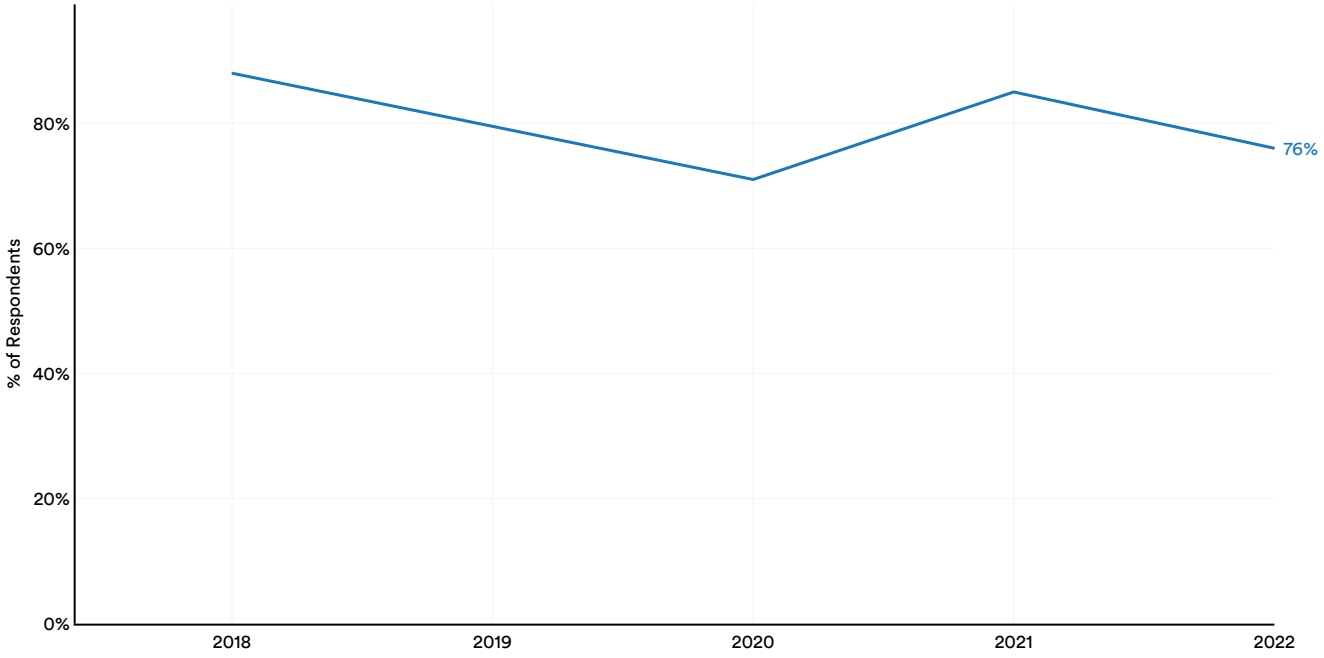

Figure 4.3.15

Figure 4.3.16 highlights the main outcomes that business leaders achieved by embracing AI solutions.[7] The top outcome was lowered costs (37%), followed by improved collaboration across business functions/organizations (34%) and having discovered valuable insights (34%).

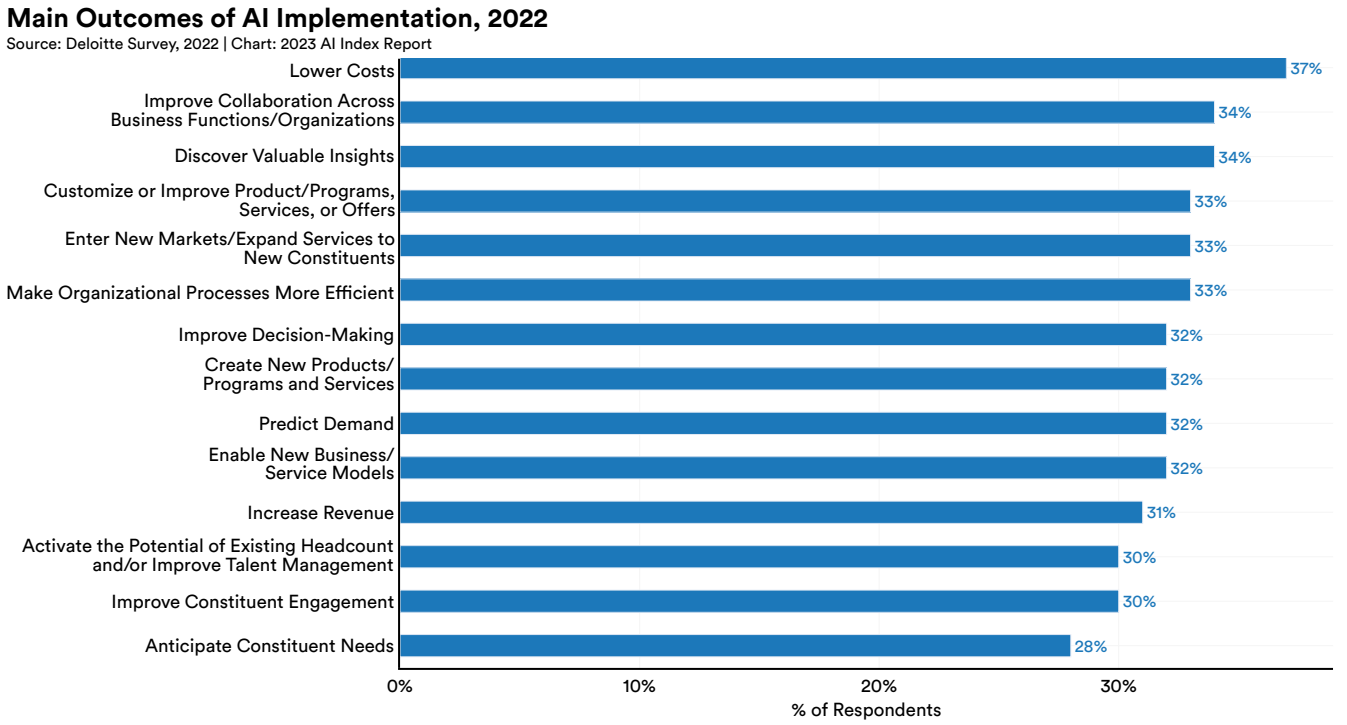

Figure 4.3.16

7 Figure 4.3.16 is drawn from the chart in the Deloitte survey: "Outcomes—'Achieved to a high degree.'"

Challenges in Starting and Scaling AI Projects

The top three challenges that business leaders identified in terms of starting AI-related projects were proving business value (37%), lack of executive commitment (34%), and choosing the right AI technologies (33%) (Figure 4.3.17).

Top Three Challenges in Starting AI Projects, 2022
Source: Deloitte Survey, 2022 | Chart: 2023 AI Index Report

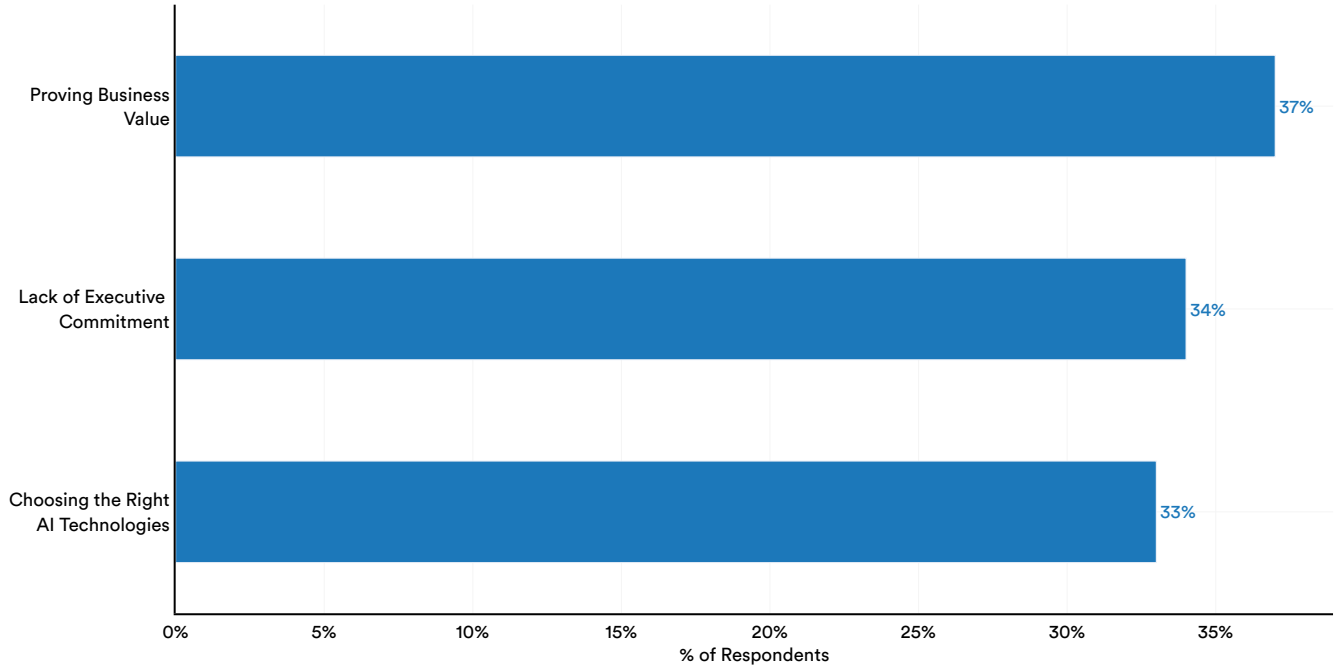

Figure 4.3.17

The main barrier leaders faced in scaling existing AI initiatives was managing AI-related risks (50%), obtaining more data or inputs to train a model (44%), and implementing AI technologies (42%) (Figure 4.3.18).

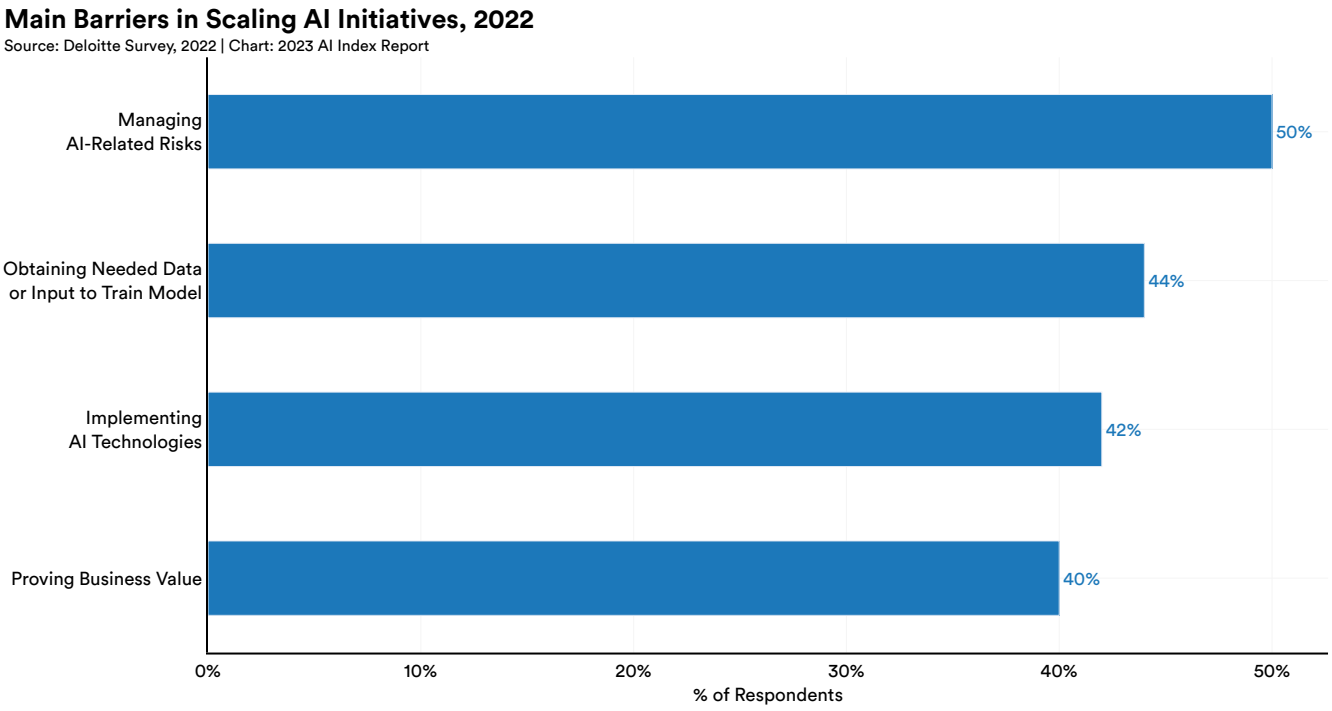

Figure 4.3.18

Earnings Calls

The following subsection presents data from NetBase Quid, which uses natural language processing tools to analyze trends in corporate earnings calls. NetBase Quid analyzed all 2022 earnings calls from Fortune 500 companies, identifying all mentions of "Artificial Intelligence," "AI," "Machine Learning," "ML," and "deep learning."

Aggregate Trends

In the 2022 fiscal year, there were 268 earnings calls from Fortune 500 companies that mentioned AI-related keywords (Figure 4.3.19). The number of such mentions dropped from the previous year, when there were 306, but has increased since 2018 when there were 225.

Number of Fortune 500 Earnings Calls Mentioning AI, 2018–22
Source: NetBase Quid, 2022 | Chart: 2023 AI Index Report

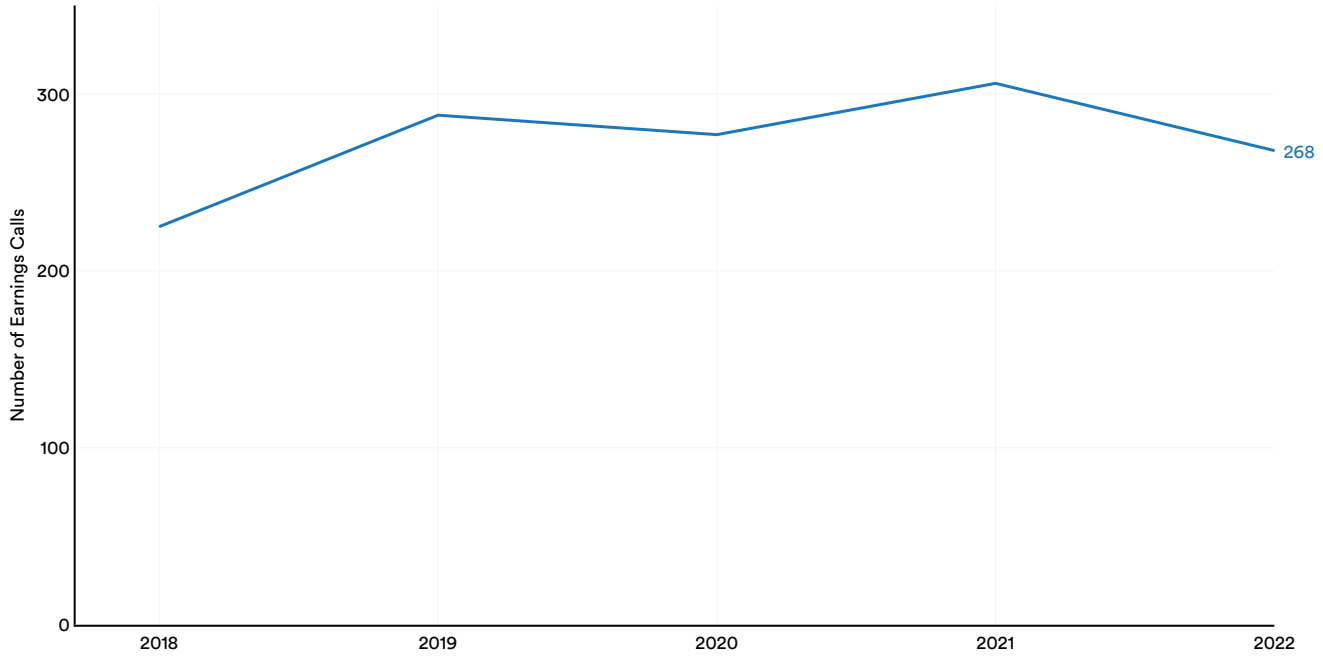

Figure 4.3.19

Specific Themes

Mentions of AI in Fortune 500 earnings calls were associated with a wide range of themes. In 2022, the most cited themes were business integration (10.0%); pricing and inventory management (8.8%); and advertising and marketing (8.8%) (Figure 4.3.20). Compared to 2018, some of the less prevalent AI-related themes in 2022 included deep learning (4.8%), autonomous vehicles (3.1%), and data storage and management (3.0%).

Themes for AI Mentions in Fortune 500 Earnings Calls, 2018 Vs. 2022

Source: NetBase Quid, 2022 | Chart: 2023 AI Index Report

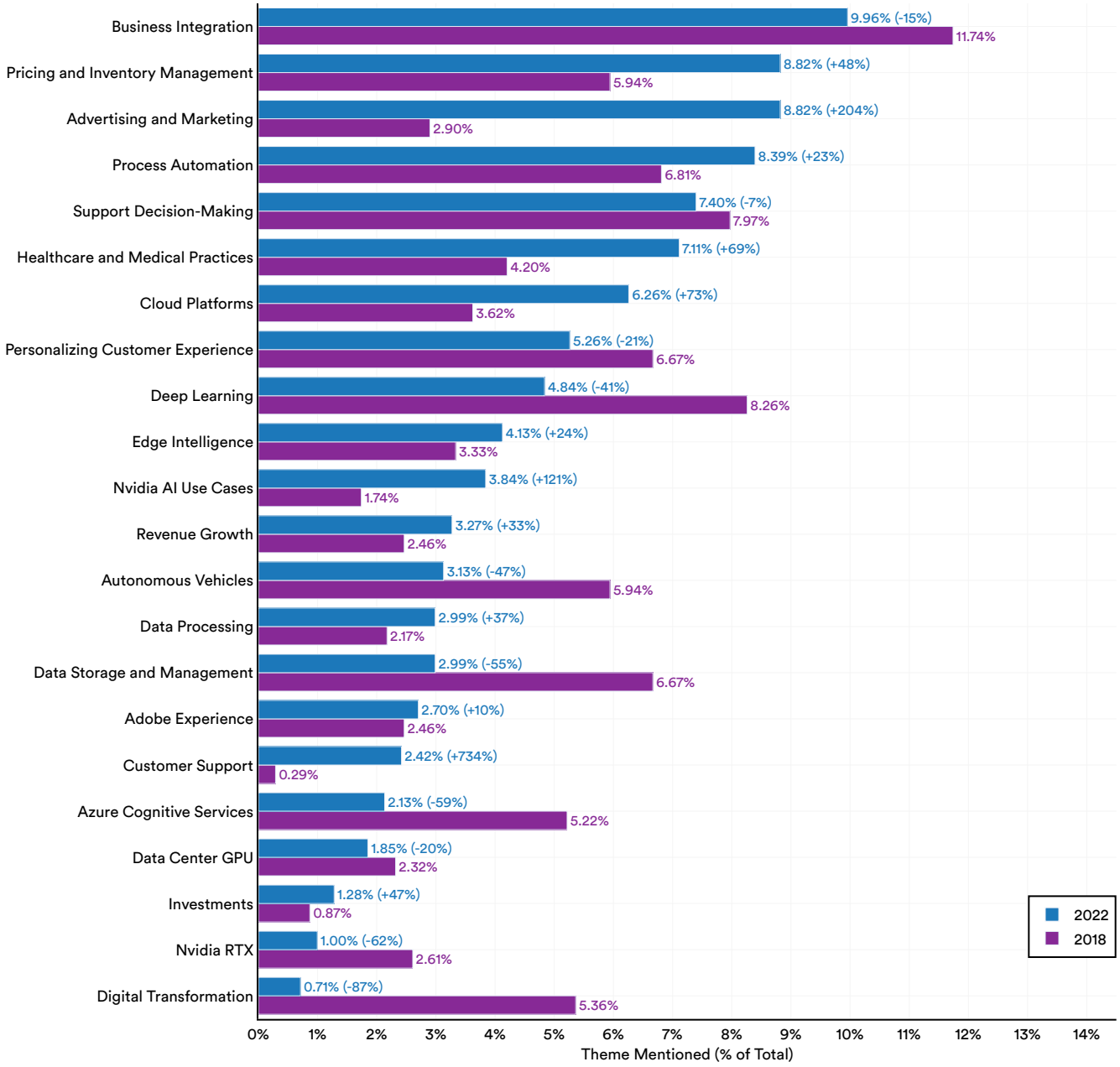

Figure 4.3.20

Narrative Highlight:

What Are Business Leaders Actually Saying About AI?

To better understand business attitudes that surround AI, it is worth looking at AI-related excerpts from the Fortune 500 earnings calls.

For example, on the topic of **business integration**, companies often cite AI and machine learning (ML) use cases to reassure business audiences of safer business practices, growing opportunities, streamlining processes, and capability expansion.

"We **spent $100 million building certain risk and fraud systems** so that when we process payments on the consumer side, losses are down $100 million to $200 million. Volume is way up. That's a huge benefit." *– Jamie Dimon, CEO, JP Morgan Chase & Co. (Q2 2022)*

"Especially in the last year or so, the field of robotics itself has actually changed because with AI and ML coming to the picture, there's **significant developments in the robotics field**. So we think it's a **huge opportunity** for us." *– Raj Subramaniam, CEO, FedEx (Q3 2022)*

"We spent a ton of money on **Cloud**. We spend a ton of money on **adding capabilities**. And over time, **as you do it on one platform, it all becomes more efficient**. So, I think it's a lot of little things, but it adds up with our base of people and fixed cost, it adds up significantly over time. We've been able to maintain our headcount at a level we feel good about, and **we think we can grow massively on top of that without having to add lots of bodies to be able to do it.**" *– Peter Kern, CEO, Expedia Group (Q4 2022)*

In terms of **process automation**, business leaders emphasize the ability of AI tools to accelerate productivity gains and to deliver a better customer experience.

"We continue to drive the **use of automation and artificial intelligence to drive productivity gains** to help offset inflationary pressures." *– Jim Davis, CEO, Quest Diagnostics (Q4 2022)*

"We have improved the experience for customers by **applying artificial intelligence to match them with an expert who is right for their specific situation** and to deliver insights to experts so they can provide excellent service." *– Sasan Goodarzi, CEO, Intuit (Q2 2022)*

"In September, we opened a **next-gen fulfillment center** in Illinois. This 1.1 million square foot facility features robotics, machine learning, and automated storage, resulting in increased productivity and a better service for our customers at faster delivery times." *– John David, CFO, Walmart (Q3 2022)*

Narrative Highlight:

What Are Business Leaders Actually Saying About AI? (cont'd)

The conversation **surrounding pricing and inventory management** saw companies reassuring business audiences on how their use of AI would improve their operational strength, especially in environments of high inflation and supply chain challenges.

"We are ... continuing to refine and invest in machine learning tools that will allow for **more sophisticated competitive pricing** and greater automation at scale."
– *Adrian Mitchell, CFO, Macy's (Q3 2022)*

"Our teams are utilizing technology, innovative data analytics and AI **to forecast supply chain lead times and changes in market demand** to ensure optimal levels. These actions along with our pricing initiatives positively impacted our gross margin in the second quarter."
– *Bert Nappier, CFO, Genuine Parts Company (Q3 2022)*

There is also a vibrant discussion about the ways in which AI can change **healthcare and medical practices**, more specifically to reduce costs, improve the patient experience, and better serve clinicians.

"[Using] machine learning and robotics, we can now **resolve a wide range of prescription drug claims** which previously required the attention of our pharmacists, freeing them up to spend time with patients. This advanced approach **reduces overall cost and improves the patient experience**."
– *Karen Lynch, CEO, CVS Health (Q2 2022)*

"I'd like to highlight productivity efforts in **our preauthorization process where we're leveraging an in-house artificial intelligence solution** to automatically match incoming faxes to the correct authorization requests. This solution creates administrative efficiencies across millions of inbound images. We are also **scaling this solution to multiple business units such as pharmacy and are also expanding the application of this type of AI to provide decision support to clinicians**, which will result in improvements to authorization turnaround times, reduction in friction for providers and creating a better member experience." – *Bruce Broussard, CEO, Humana (Q3 2022)*

"We continue to see opportunities across [the software and analytics] segment as payers, providers, and partners take advantage of our high ROI solutions and **realize the benefits of our data, AI models, and workflow capabilities.**"
– *Neil de Crescenzo, CEO, UnitedHealth Group (Q2 2022)*

Sentiment Analysis

NetBase Quid also runs the AI-related text of Fortune 500 earnings calls through a sentiment analysis machine-learning algorithm that identifies whether the sentiment associated with the mention of AI is positive, mixed, or negative[8]. Overall, since 2018, the sentiment associated with mentions of AI has been overwhelmingly positive (Figure 4.3.21). Mentions of AI were rarely negative, suggesting that large businesses tend to have positive associations when it comes to AI tools.

Sentiment Summary Distribution for AI Mentions in Fortune 500 Earnings Calls by Publication Date, 2018–22

Source: NetBase Quid, 2022 | Chart: 2023 AI Index Report

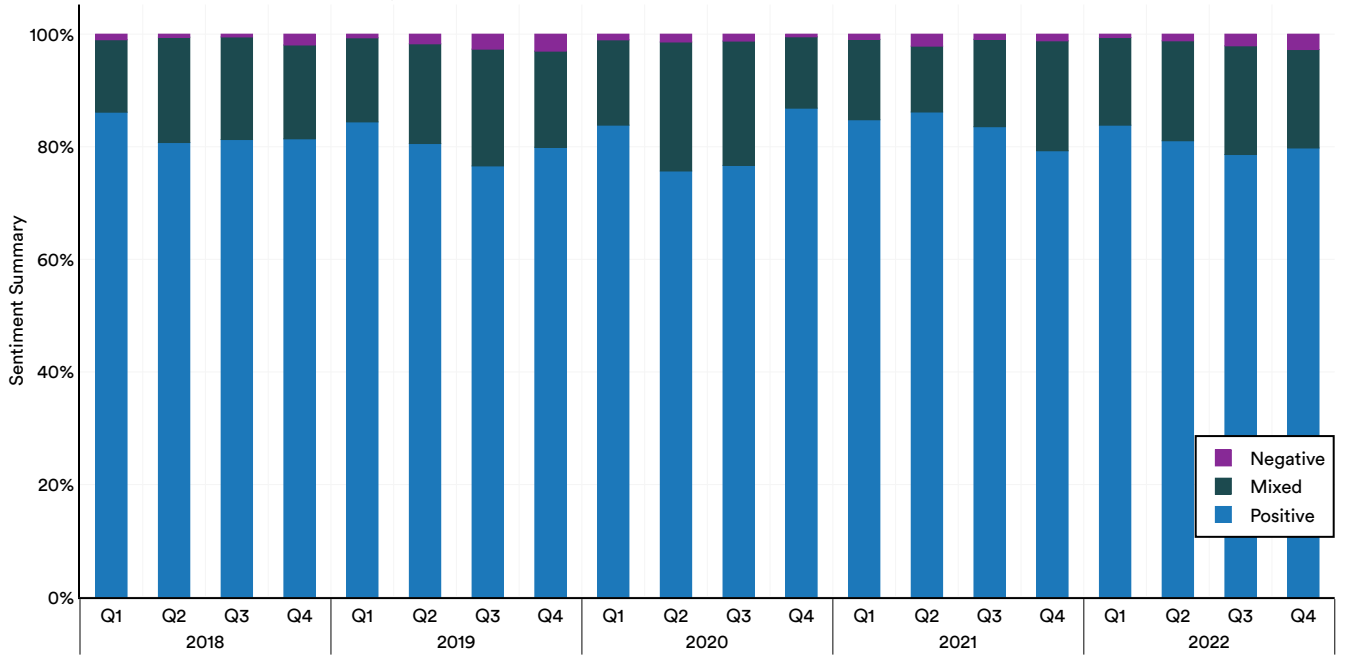

Figure 4.3.21

8 Chapter 2 of the 2023 AI Index highlights trends in the performance of sentiment analysis algorithms.

Given that robots are frequently deployed with AI-based software technologies, it is possible to gain insights on AI-ready infrastructure being deployed in the real world by tracking the installation of industrial robots. Data in this section comes from the International Federation of Robotics (IFR), an international nonprofit organization that works to promote, strengthen, and protect the robotics industry. Every year the IFR releases the World Robotics Report, which tracks global trends in installations of robots.[9]

4.4 Robot Installations

Aggregate Trends

The following subsection includes data on the installation and operation of industrial robots, which are defined as an "automatically controlled, reprogrammable, multipurpose manipulator, programmable in three or more axes, which can be either fixed in place or mobile for use in industrial automation applications."

2021 saw a rebound in the total number of worldwide robot installations. The 517,000 industrial robots installed in 2021 represented a 31.3% increase from 2020 and a 211.5% increase since 2011 (Figure 4.4.1).

Number of Industrial Robots Installed in the World, 2011–21
Source: International Federation of Robotics (IFR), 2022 | Chart: 2023 AI Index Report

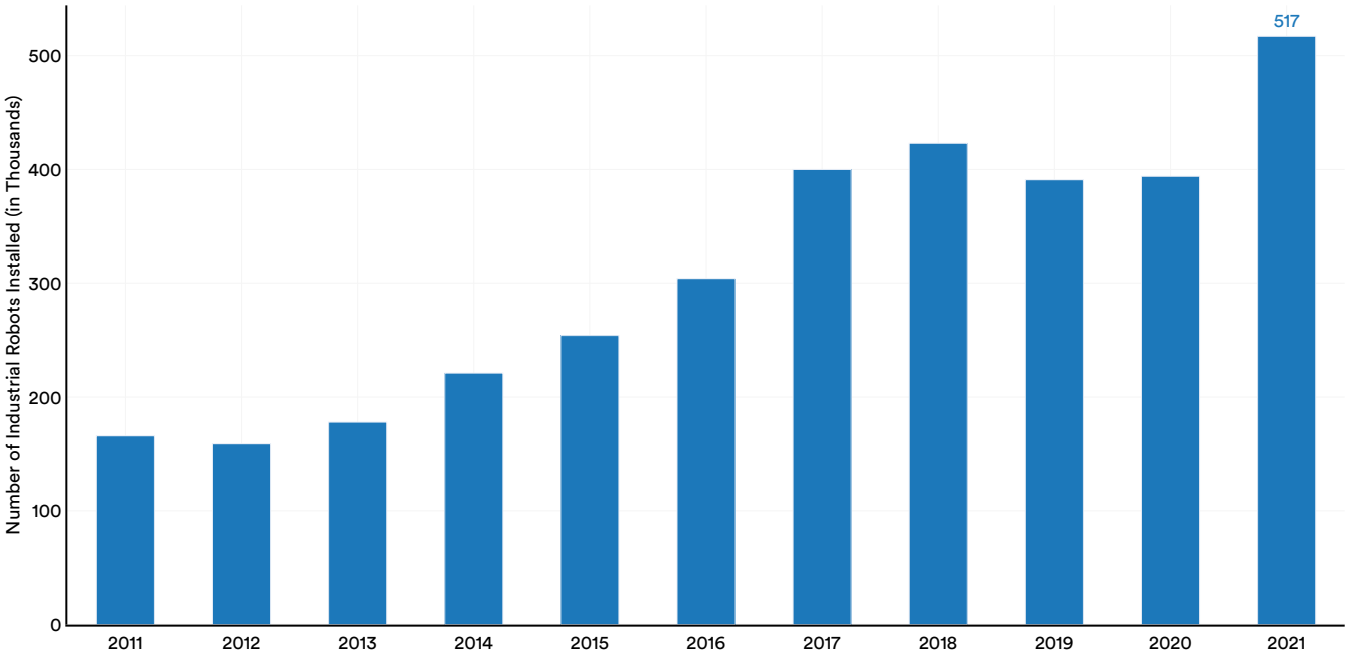

Figure 4.4.1

9 Due to the timing of the IFR's survey, the most recent data is from 2021.

The worldwide operational stock of industrial robots also continues to steadily increase year over year (Figure 4.4.2). The total number of operational industrial robots jumped 14.6% to 3,477,000 in 2021, from 3,035,000 in 2020. In the last decade, the number of industrial robots being installed and the number being used have both steadily increased.

Operational Stock of Industrial Robots in the World, 2011–21
Source: International Federation of Robotics (IFR), 2022 | Chart: 2023 AI Index Report

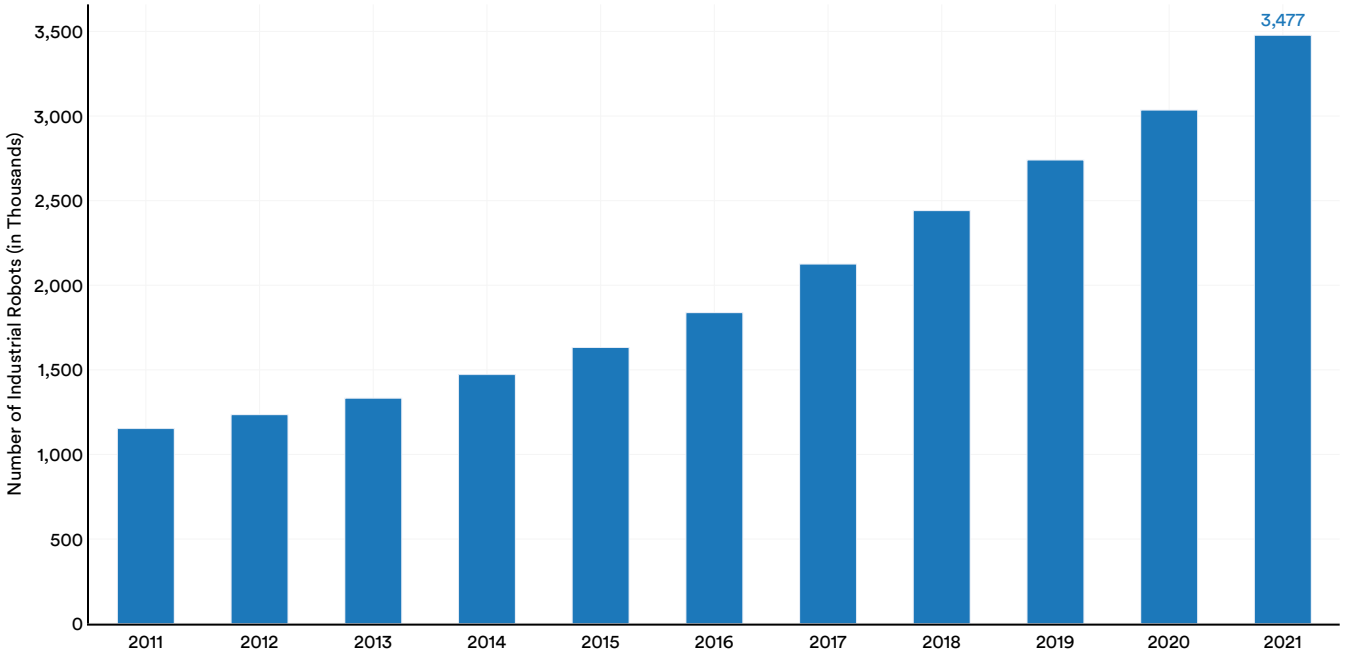

Figure 4.4.2

Industrial Robots: Traditional Vs. Collaborative Robots

A distinction can be drawn between traditional robots that work *for* humans and collaborative robots that are designed to work *with* humans. Recently, the robotics community has been excited about the potential of collaborative robots given that they can be safer, more flexible, and more scalable than traditional robots, and are capable of iterative learning.

In 2017, only 2.8% of all newly installed industrial robots were collaborative (Figure 4.4.3). As of 2021, that number increased to 7.5%. Although traditional industrial robots still lead new installations, the number of collaborative robots is slowly increasing.

Number of Industrial Robots Installed in the World by Type, 2017–21
Source: International Federation of Robotics (IFR), 2022 | Chart: 2023 AI Index Report

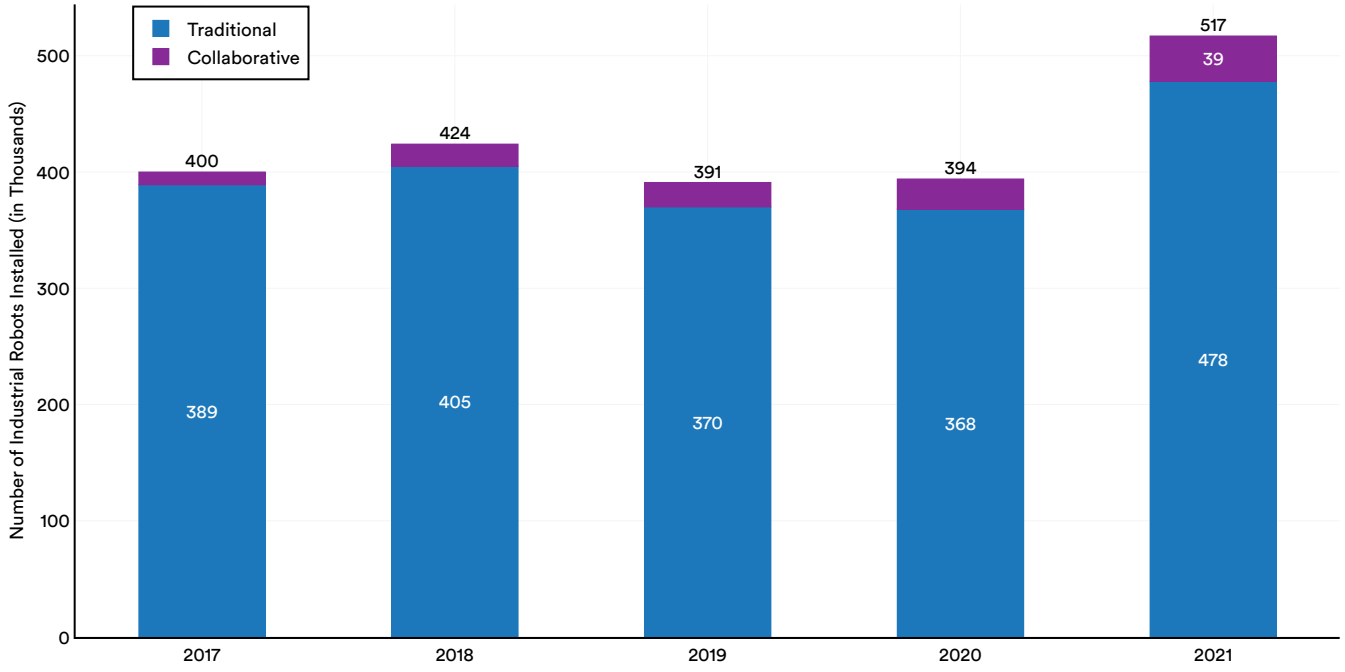

Figure 4.4.3

By Geographic Area

Country-level data on robot installations can illustrate which countries are prioritizing the integration of robots into their economy. In 2021, China installed the most industrial robots, with 268,200, 5.7 times the amount installed by Japan (47,200) and 7.7 times the amount installed by the United States (35,000) (Figure 4.4.4). The countries with the next most installations were South Korea (31,100) and Germany (23,800).

Number of Industrial Robots Installed by Country, 2021
Source: International Federation of Robotics (IFR), 2022 | Chart: 2023 AI Index Report

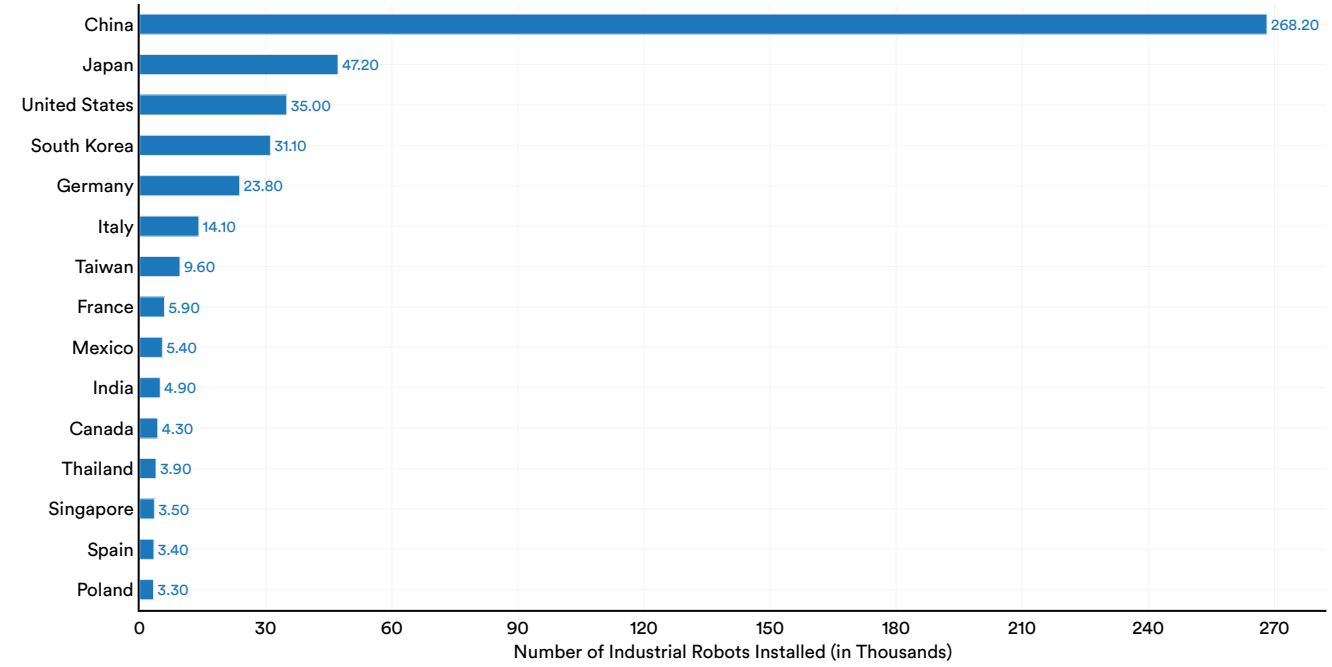

Figure 4.4.4

In 2013, China overtook Japan as the nation installing the most industrial robots (Figure 4.4.5). Since then, the gap between the total number of industrial robots installed by China and the next-nearest nation has only widened. In 2013, Chinese industrial robot installations represented 20.8% of the world's share, whereas in 2021, they represented 51.8%.

Number of New Industrial Robots Installed in Top Five Countries, 2011–21
Source: International Federation of Robotics (IFR), 2022 | Chart: 2023 AI Index Report

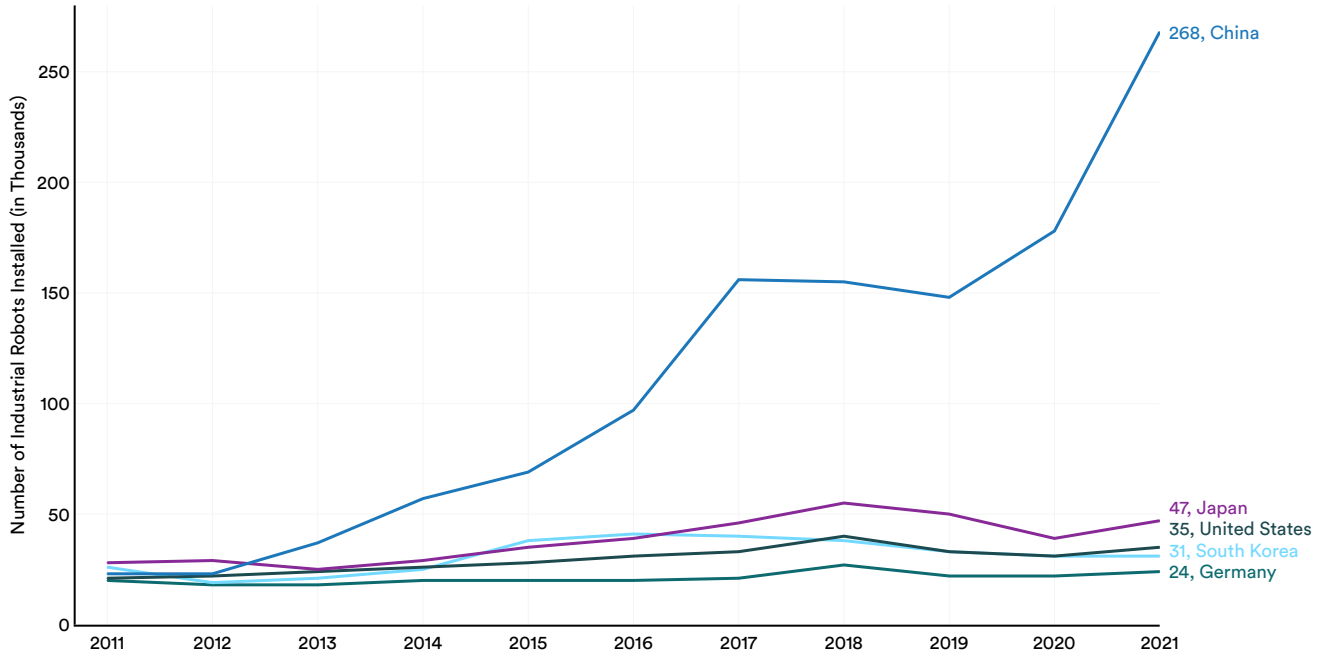

Figure 4.4.5

China consolidated its dominance in industrial robotics in 2021, the first year in which the country installed more industrial robots than the rest of the world combined (Figure 4.4.6).

Number of Industrial Robots Installed (China Vs. Rest of the World), 2016–21
Source: International Federation of Robotics (IFR), 2022 | Chart: 2023 AI Index Report

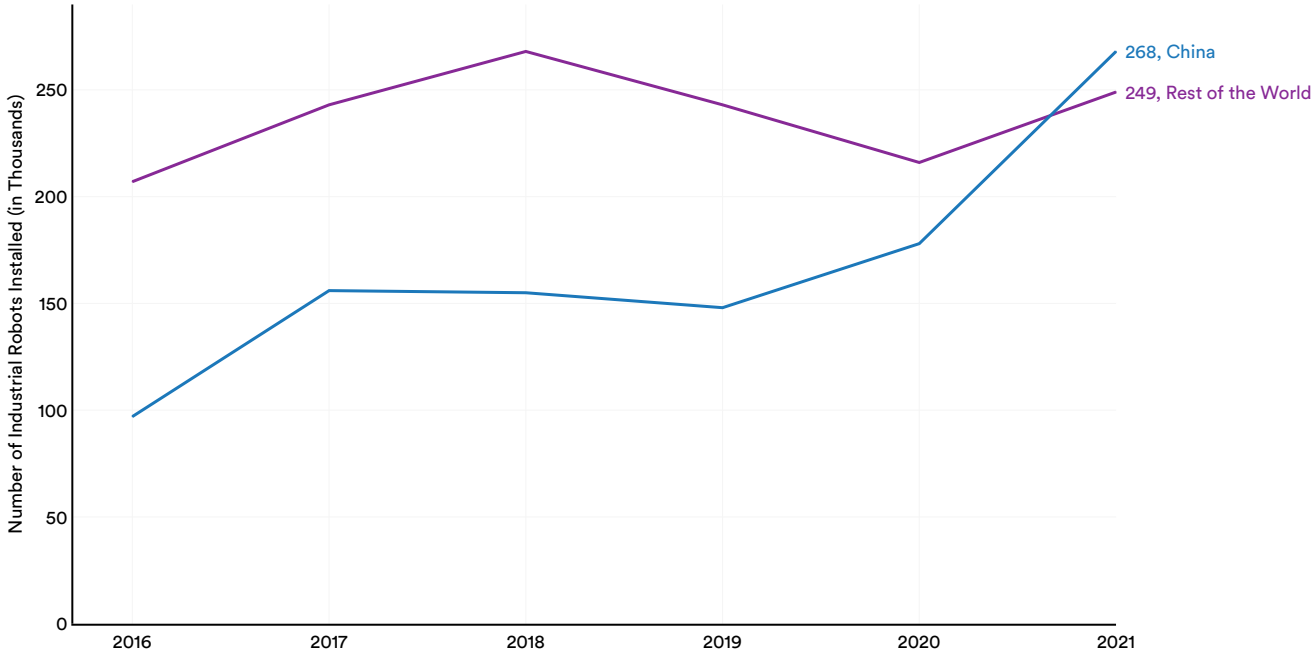

Figure 4.4.6

Figure 4.4.7 shows the annual growth rate of industrial robot installations from 2020 to 2021 by country. Virtually every country surveyed by the IFR reported a yearly increase in the total number of industrial robot installations. The countries that reported the highest growth rates were Canada (66%), Italy (65%), and Mexico (61%).

Annual Growth Rate of Industrial Robots Installed by Country, 2020 Vs. 2021
Source: International Federation of Robotics (IFR), 2022 | Chart: 2023 AI Index Report

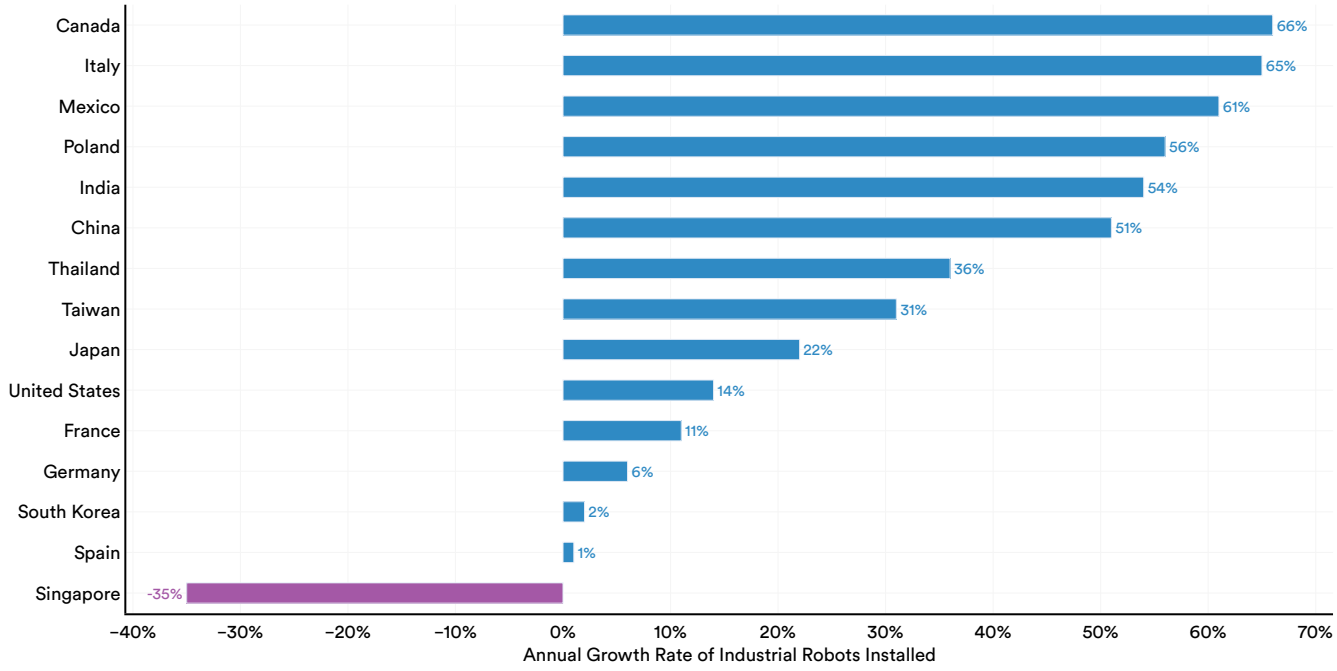

Figure 4.4.7

Narrative Highlight:
Country-Level Data on Service Robotics

Another important class of robots are service robots, which the ISO defines as a robot "that performs useful tasks for humans or equipment excluding industrial automation applications."[10] Figure 4.4.8 is an example of a robot being used in medicine, Figure 4.4.9 illustrates how a robot can help with professional cleaning, and Figure 4.4.10 shows a robot designed for maintenance and inspection.

Service Robots in Medicine
Source: UL Solutions, 2022

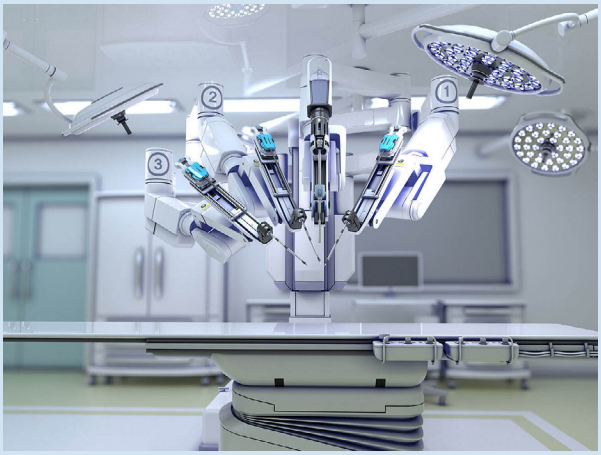

Figure 4.4.8

Service Robots in Professional Cleaning
Source: This Week in FM, 2021

Figure 4.4.9

Service Robots in Maintenance and Inspection
Source: Robotnik, 2022

Figure 4.4.10

10 A more detailed definition can be accessed here.

Narrative Highlight:

Country-Level Data on Service Robotics (cont'd)

Compared to 2020, 2021 saw a higher number of professional service robots installed in the world for several key application areas, including hospitality, medical robotics, professional cleaning, and transportation and logistics (Figure 4.4.11). The category that registered the greatest year-over-year increase was transportation and logistics: In 2021, 1.5 times the number of such service robots were installed as in 2020.

Number of Professional Service Robots Installed in the World by Application Area, 2020 Vs. 2021
Source: International Federation of Robotics (IFR), 2022 | Chart: 2023 AI Index Report

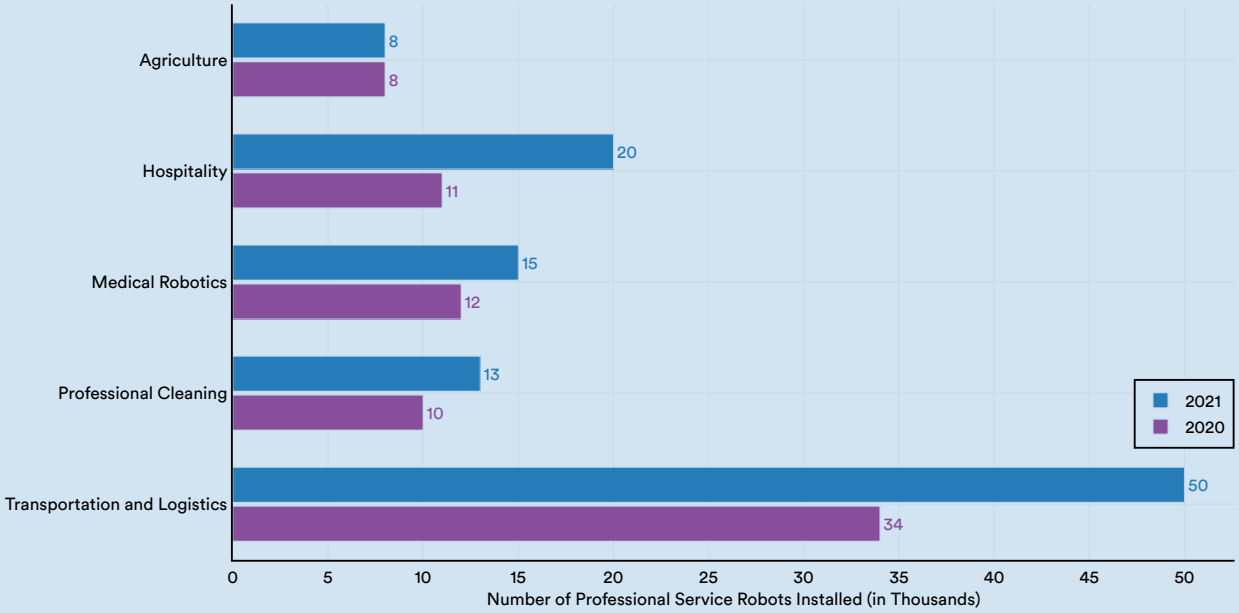

Figure 4.4.11

Narrative Highlight:

Country-Level Data on Service Robotics (cont'd)

As of 2022, the United States has the greatest number of professional service robot manufacturers, roughly 2.16 times as many as the next nation, China. Other nations with significant numbers of robot manufacturers include Germany (91), Japan (66), and France (54) (Figure 4.4.12).

Number of Professional Service Robot Manufacturers in Top Countries by Type of Company, 2022
Source: International Federation of Robotics (IFR), 2022 | Chart: 2023 AI Index Report

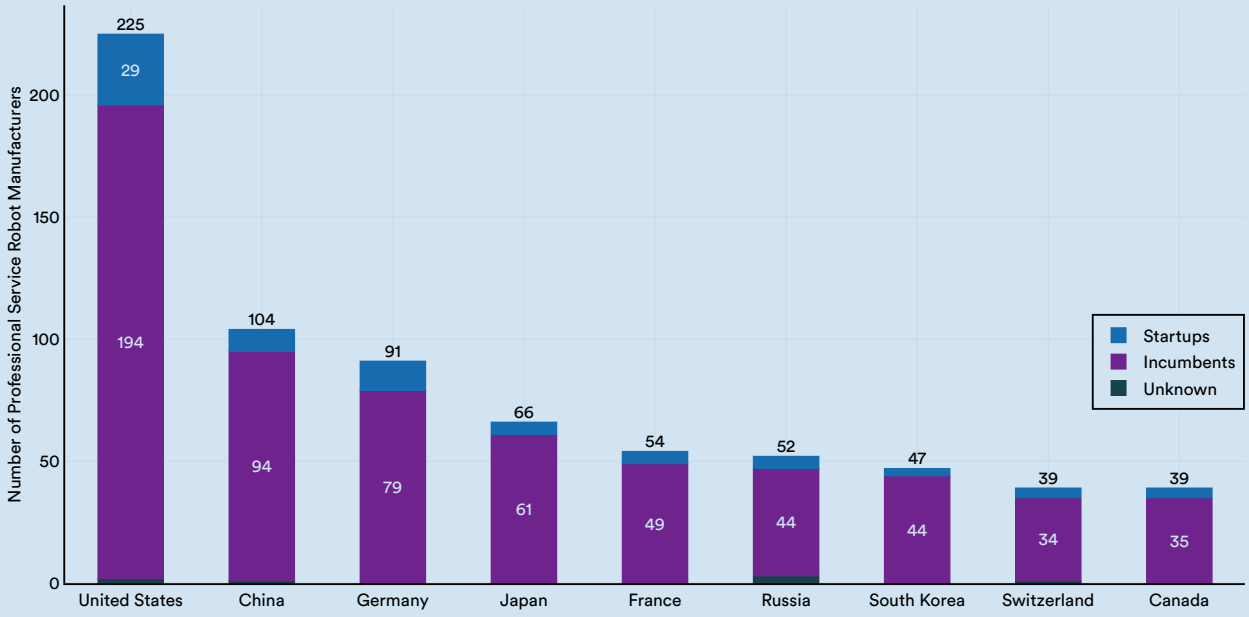

Figure 4.4.12

Sectors and Application Types

On a global level, the sector that saw the greatest amount of robot installations was electrical/electronics (137,000), followed by automotive (119,000) (Figure 4.4.13). Each of the highlighted sectors has recorded increases in the total number of industrial robot installations since 2019.

Number of Industrial Robots Installed in the World by Sector, 2019–21
Source: International Federation of Robotics (IFR), 2022 | Chart: 2023 AI Index Report

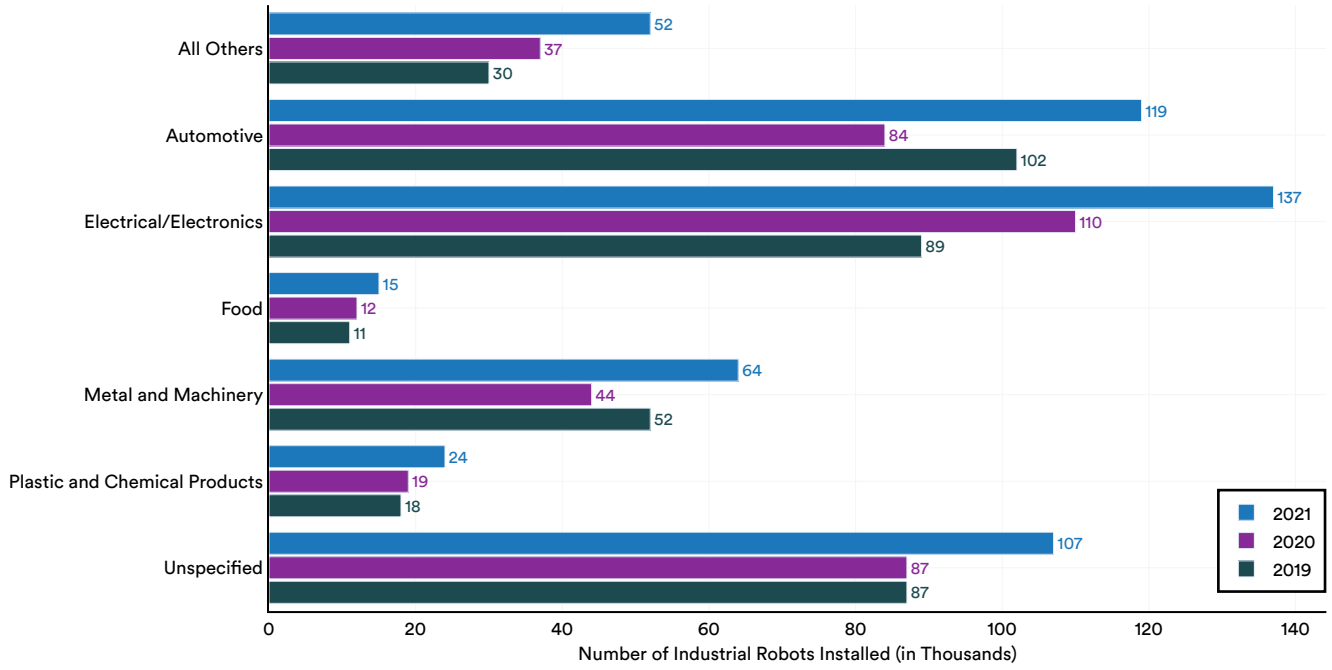

Figure 4.4.13

Robots can also be deployed in a wide range of applications, from assembling to dispensing and handling. Figure 4.4.14 illustrates how the application of industrial robots has changed since 2021. Handling continues to be the application case toward which the most industrial robots are deployed. In 2021, 230,000 industrial robots were installed for handling functions, 2.4 times more than for welding (96,000) and 3.7 times more than for assembling (62,000). Every application category, with the exception of dispensing and processing, saw more robot installations in 2021 than in 2019.

Number of Industrial Robots Installed in the World by Application, 2019–21
Source: International Federation of Robotics (IFR), 2022 | Chart: 2023 AI Index Report

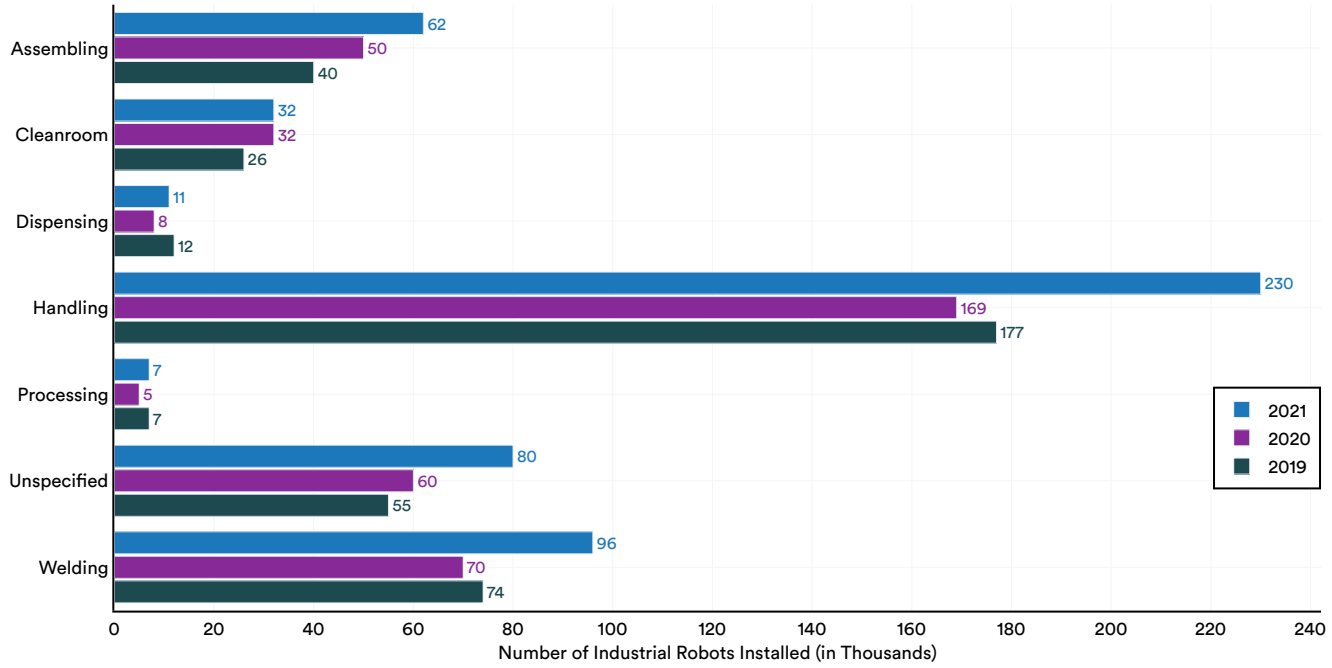

Figure 4.4.14

China Vs. United States

The Chinese industrial sectors that installed the greatest number of industrial robots in 2022 were electrical/electronics (88,000), automotive (62,000), and metal and machinery (34,000) (Figure 4.4.15). Every industrial sector in China recorded a greater number of robot installations in 2021 than in 2019.

Number of Industrial Robots Installed in China by Sector, 2019–21
Source: International Federation of Robotics (IFR), 2022 | Chart: 2023 AI Index Report

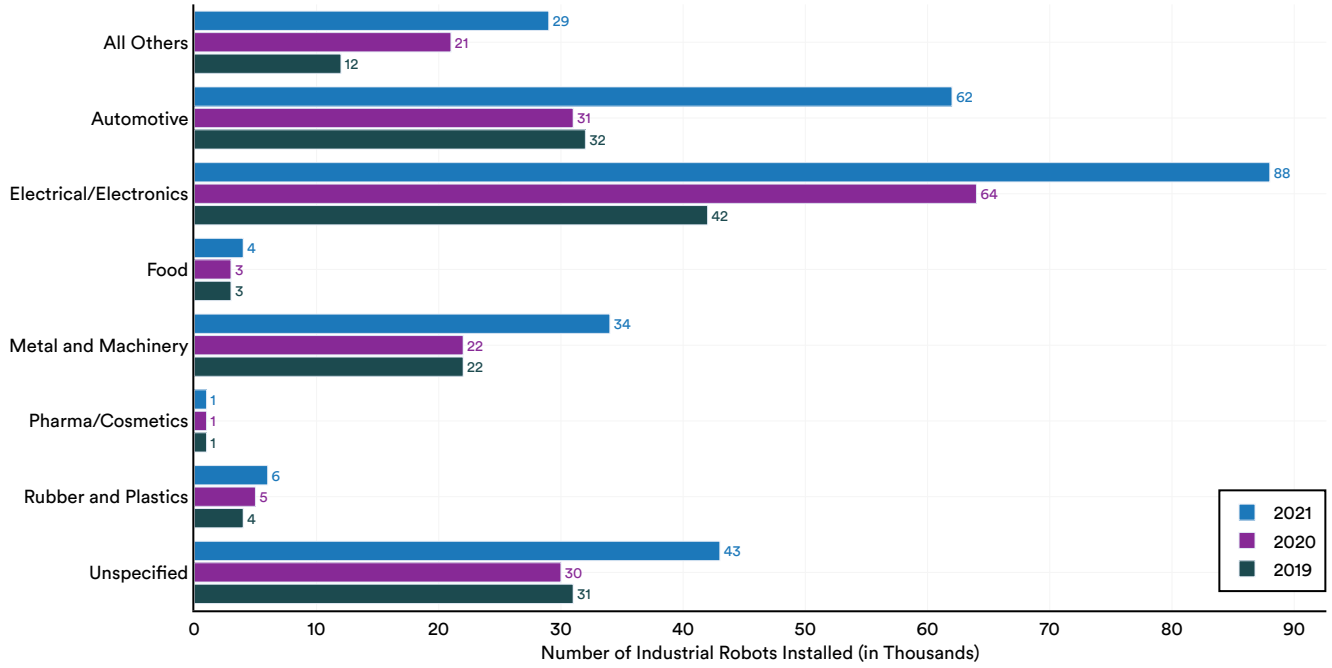

Figure 4.4.15

The automotive industry installed the greatest number of industrial robots in the United States in 2021, although installation rates for that sector decreased year over year (Figure 4.4.16). However, other sectors like food, along with plastic and chemical products, saw year-over-year increases in robot installations.

Number of Industrial Robots Installed in the United States by Sector, 2019–21
Source: International Federation of Robotics (IFR), 2022 | Chart: 2023 AI Index Report

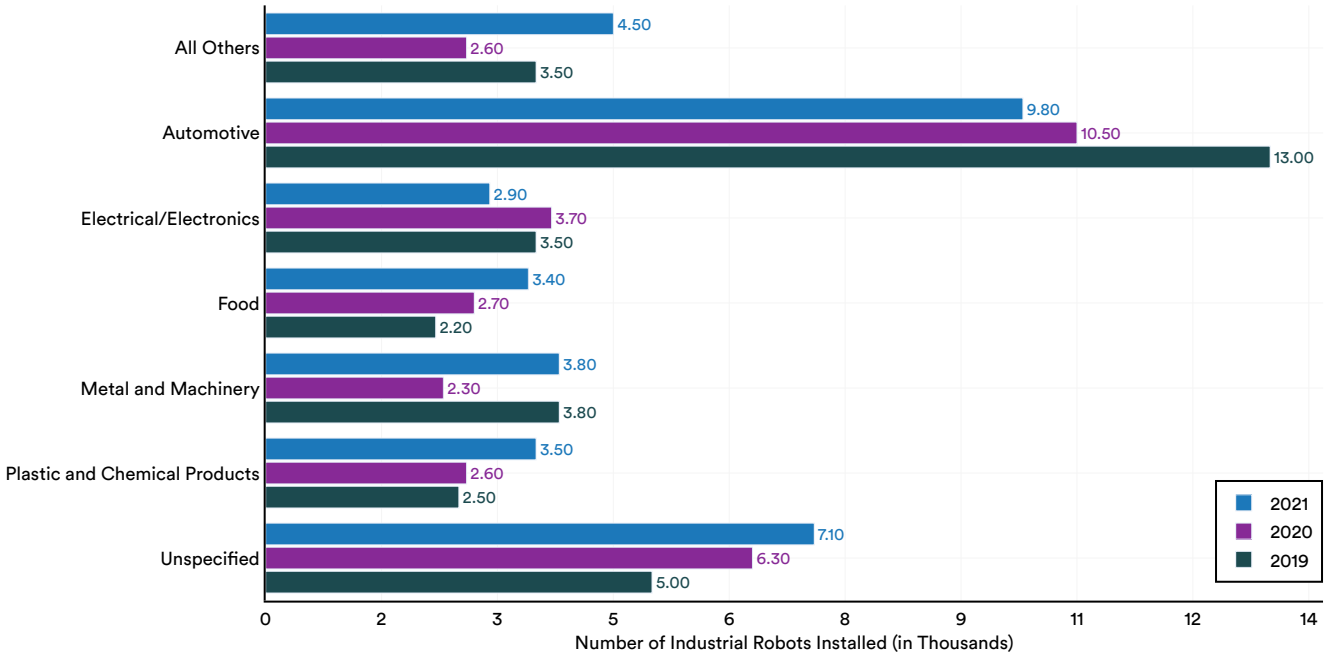

Figure 4.4.16

Appendix

Lightcast

Prepared by Scott Bingham, Julia Nania, Layla O'Kane, and Bledi Taska

Lightcast delivers job market analytics that empower employers, workers, and educators to make data-driven decisions. The company's artificial intelligence technology analyzes hundreds of millions of job postings and real-life career transitions to provide insight into labor market patterns. This real-time strategic intelligence offers crucial insights, such as what jobs are most in demand, the specific skills employers need, and the career directions that offer the highest potential for workers. For more information, visit www.lightcast.io.

Job Posting Data

To support these analyses, Lightcast mined its dataset of millions of job postings collected since 2010. Lightcast collects postings from over 51,000 online job sites to develop a comprehensive, real-time portrait of labor market demand. It aggregates job postings, removes duplicates, and extracts data from job postings text. This includes information on job title, employer, industry, and region, as well as required experience, education, and skills.

Job postings are useful for understanding trends in the labor market because they allow for a detailed, real-time look at the skills employers seek. To assess the representativeness of job postings data, Lightcast conducts a number of analyses to compare the distribution of job postings to the distribution of official government and other third-party sources in the United States. The primary source of government data on U.S. job postings is the Job Openings and Labor Turnover Survey (JOLTS) program, conducted by the Bureau of Labor Statistics. Based on comparisons between JOLTS and Lightcast, the labor market demand captured by Lightcast data represents over 99% of the total labor demand. Jobs not posted online are usually in small businesses (the classic example being the "Help Wanted" sign in a restaurant window) and union hiring halls.

Measuring Demand for AI

In order to measure the demand by employers of AI skills, Lightcast uses its skills taxonomy of over 31,000 skills. The list of AI skills from Lightcast data are shown below, with associated skill clusters. While some skills are considered to be in the AI cluster specifically, for the purposes of this report, all skills below were considered AI skills. A job posting was considered an AI job if it mentioned any of these skills in the job text.

Artificial Intelligence: AIOps (Artificial Intelligence for IT Operations), Applications of Artificial Intelligence, Artificial General Intelligence, Artificial Intelligence, Artificial Intelligence Development, Artificial Intelligence Markup Language (AIML), Artificial Intelligence Systems, Azure Cognitive Services, Baidu, Cognitive Automation, Cognitive Computing, Computational Intelligence, Cortana, Expert Systems, Intelligent Control, Intelligent Systems, Interactive Kiosk, IPSoft Amelia, Knowledge-Based Configuration, Knowledge-Based Systems, Multi-Agent Systems, Open Neural Network Exchange (ONNX), OpenAI Gym, Reasoning Systems, Soft Computing, Syman, Watson Conversation, Watson Studio, Weka

Autonomous Driving: Advanced Driver Assistance Systems, Autonomous Cruise Control Systems, Autonomous System, Autonomous Vehicles, Guidance Navigation and Control Systems, Light Detection and Ranging (LiDAR), OpenCV, Path Analysis, Path Finding, Remote Sensing, Unmanned Aerial Systems (UAS)

Natural Language Processing (NLP): Amazon Textract, ANTLR, BERT (NLP Model), Chatbot, Computational Linguistics, DeepSpeech, Dialog Systems, fastText, Fuzzy Logic, Handwriting Recognition, Hugging Face (NLP Framework), HuggingFace Transformers, Intelligent Agent, Intelligent Software Assistant, Intelligent Virtual Assistant, Kaldi, Latent Dirichlet Allocation, Lexalytics, Machine Translation, Microsoft LUIS, Natural Language Generation, Natural Language Processing, Natural Language Processing Systems, Natural Language Programming, Natural Language Toolkits, Natural Language Understanding, Natural Language User Interface, Nearest Neighbour Algorithm, OpenNLP, Optical Character Recognition (OCR), Screen Reader, Semantic Analysis, Semantic Interpretation for Speech Recognition, Semantic Parsing, Semantic Search, Sentiment Analysis, Seq2Seq, Speech Recognition, Speech Recognition Software, Statistical Language Acquisition, Text Mining, Tokenization, Voice Interaction, Voice User Interface, Word Embedding, Word2Vec Models

Neural Networks: Apache MXNet, Artificial Neural Networks, Autoencoders, Caffe, Caffe2, Chainer, Convolutional Neural Networks, Cudnn, Deep Learning, Deeplearning4j, Keras (Neural Network Library), Long Short-Term Memory (LSTM), OpenVINO, PaddlePaddle, Pybrain, Recurrent Neural Network (RNN), TensorFlow

Machine Learning: AdaBoost, Apache MADlib, Apache Mahout, Apache SINGA, Apache Spark, Association Rule Learning, Automated Machine Learning, Autonomic Computing, AWS SageMaker, Azure Machine Learning, Boosting, CHi-Squared Automatic Interaction Detection (CHAID), Classification And Regression Tree (CART), Cluster Analysis, Collaborative Filtering, Confusion Matrix, Cyber-Physical Systems, Dask (Software), Data Classification, DBSCAN, Decision Models, Decision Tree Learning, Dimensionality Reduction, Dlib (C++ Library), Ensemble Methods, Evolutionary Programming, Expectation Maximization Algorithm, Feature Engineering, Feature Extraction, Feature Learning, Feature Selection, Gaussian Process, Genetic Algorithm, Google AutoML, Google Cloud ML Engine, Gradient Boosting, H2O.ai, Hidden Markov Model, Hyperparameter Optimization, Inference Engine, K-Means Clustering, Kernel Methods, Kubeflow, LIBSVM, Machine Learning, Machine Learning Algorithms, Markov Chain, Matrix Factorization, Meta Learning, Microsoft Cognitive Toolkit (CNTK), MLflow, MLOps (Machine Learning Operations), mlpack (C++ Library), Naive Bayes, Perceptron, Predictionio, PyTorch (Machine Learning Library), Random Forest Algorithm, Recommendation Engine, Recommender Systems, Reinforcement Learning, Scikit-learn (Machine Learning Library), Semi-Supervised Learning, Soft Computing, Sorting Algorithm, Supervised Learning, Support Vector Machine, Test Datasets, Torch (Machine Learning), Training Datasets, Transfer Learning, Unsupervised Learning, Vowpal Wabbit, Xgboost

Robotics: Advanced Robotics, Cognitive Robotics, Motion Planning, Nvidia Jetson, Robot Framework, Robot Operating Systems, Robotic Automation Software, Robotic Liquid Handling Systems, Robotic Programming, Robotic Systems, Servomotor, SLAM Algorithms (Simultaneous Localization and Mapping)

Visual Image Recognition: 3D Reconstruction, Activity Recognition, Computer Vision, Contextual Image Classification, Digital Image Processing, Eye Tracking, Face Detection, Facial Recognition, Image Analysis, Image Matching, Image Processing, Image Recognition, Image Segmentation, Image Sensor, Imagenet, Machine Vision, Motion Analysis, Object Recognition, OmniPage, Pose Estimation, RealSense

LinkedIn

Prepared by Murat Erer and Akash Kaura

Country Sample

Included countries represent a select sample of eligible countries with at least 40% labor force coverage by LinkedIn and at least 10 AI hires in any given month. China and India were included in this sample because of their increasing importance in the global economy, but LinkedIn coverage in these countries does not reach 40% of the workforce. Insights for these countries may not provide as full a picture as other countries, and should be interpreted accordingly.

Skills (and AI Skills)

LinkedIn members self-report their skills on their LinkedIn profiles. Currently, more than 38,000 distinct, standardized skills are identified by LinkedIn. These have been coded and classified by taxonomists at LinkedIn into 249 skill groupings, which are the skill groups represented in the dataset. The top skills that make up the AI skill grouping are machine learning, natural language processing, data structures, artificial intelligence, computer vision, image processing, deep learning, TensorFlow, Pandas (software), and OpenCV, among others.

Skill groupings are derived by expert taxonomists through a similarity-index methodology that measures skill composition at the industry level. LinkedIn's industry taxonomy and their corresponding NAICS codes can be found here.

Skills Genome

For any entity (occupation or job, country, sector, etc.), the skill genome is an ordered list (a vector) of the 50 "most characteristic skills" of that entity. These most characteristic skills are identified using a TF-IDF algorithm to identify the most representative skills of the target entity, while down-ranking ubiquitous skills that add little information about that specific entity (e.g., Microsoft Word).

TF-IDF is a statistical measure that evaluates how representative a word (in this case a skill) is to a selected entity). This is done by multiplying two metrics:

1. The term frequency of a skill in an entity (TF).
2. The logarithmic inverse entity frequency of the skill across a set of entities (IDF). This indicates how common or rare a word is in the entire entity set. The closer IDF is to 0, the more common the word.

So if the skill is very common across LinkedIn entities, and appears in many job or member descriptions, the IDF will approach 0. If, on the other hand, the skill is unique to specific entities, the IDF will approach 1. More details are available at LinkedIn's Skills Genome and LinkedIn-World Bank Methodology.

AI Skills Penetration

The aim of this indicator is to measure the intensity of AI skills in an entity (a particular country, industry, gender, etc.) through the following methodology:

- Compute frequencies for all self-added skills by LinkedIn members in a given entity (occupation, industry, etc.) in 2015–2021.
- Re-weight skill frequencies using a TF-IDF model to get the top 50 most representative skills in that entity. These 50 skills compose the "skill genome" of that entity.
- Compute the share of skills that belong to the AI skill group out of the top skills in the selected entity.

Interpretation: The AI skill penetration rate signals the prevalence of AI skills across occupations, or the intensity with which LinkedIn members utilize AI skills in their jobs. For example, the top 50 skills for the occupation of engineer are calculated based on the weighted frequency with which they appear in LinkedIn members' profiles. If four of the skills that engineers possess belong to the AI skill group, this measure indicates that the penetration of AI skills is estimated to be 8% among engineers (i.e., 4/50).

Jobs or Occupations

LinkedIn member titles are standardized and grouped into approximately 15,000 occupations. These are not sector- or country-specific. These occupations are further standardized into approximately 3,600 occupation representatives. Occupation representatives group occupations with a common role and specialty, regardless of seniority.

AI Jobs and Occupations

An **"AI" job (technically, occupation representative)** is an occupation representative that requires AI skills to perform the job. Skills penetration is used as a signal for whether **AI skills** are prevalent in an occupation representative in any sector where the occupation representative may exist. Examples of such occupations include (but are not limited to): machine learning engineer, artificial intelligence specialist, data scientist, computer vision engineer, etc.

AI Talent

A LinkedIn member is considered **AI talent** if they have explicitly added AI skills to their profile and/or they are occupied in an AI occupation representative. The counts of AI talent are used to calculate talent concentration metrics. For example, to calculate the country level AI talent concentration, we use the counts of AI talent at the country level vis-a-vis the counts of LinkedIn members in the respective countries.

Relative AI Skills Penetration

To allow for skills penetration comparisons across countries, the skills genomes are calculated and a relevant benchmark is selected (e.g., global average). A ratio is then constructed between a country's and the benchmark's AI skills penetrations, controlling for occupations.

Interpretation: A country's relative AI skills penetration of 1.5 indicates that AI skills are 1.5 times as frequent as in the benchmark, for an overlapping set of occupations.

Global Comparison

For cross-country comparison, we present the relative penetration rate of AI skills, measured as the sum of the penetration of each AI skill across occupations in a given country, divided by the average global penetration of AI skills across the overlapping occupations in a sample of countries.

Interpretation: A relative penetration rate of 2 means that the average penetration of AI skills in that country is two times the global average across the same set of occupations.

Global Comparison: By Industry

The relative AI skills penetration by country for industry provides an in-depth sectoral decomposition of AI skill penetration across industries and sample countries.

Interpretation: A country's relative AI skill penetration rate of 2 in the education sector means that the average penetration of AI skills in that country is two times the global average across the same set of occupations in that sector.

Global Comparison: By Gender

The "Relative AI Skills Penetration by Gender" metric provides a cross-country comparison of AI skill penetrations within each gender, comparing countries' male or female AI skill penetrations to the global average of the same gender. Since the global averages are distinct for each gender, this metric should only be used to compare country rankings within each gender, and not for cross-gender comparisons within countries.

Interpretation: A country's AI skills penetration for women of 1.5 means that female members in that country are 1.5 times more likely to list AI skills than the average female member in all countries pooled together across the same set of occupations that exist in the country/gender combination.

Global Comparison: Across Gender

The "Relative AI Skills Penetration Across Genders" metric allows for cross-gender comparisons within and across countries globally, since we compare the countries' male and female AI skill penetrations to the same global average regardless of gender.

Interpretation: A country's "Relative AI Skills Penetration Across Genders" for women of 1.5 means that female members in that country are 1.5 times more likely to list AI skills than the average member in all countries pooled together across the same set of occupations that exist in the country.

Relative AI Hiring Index

LinkedIn Hiring Rate or Overall Hiring Rate is a measure of hires normalized by LinkedIn membership. It is computed as the percentage of LinkedIn members who added a new employer in the same period the job began, divided by the total number of LinkedIn members in the corresponding location.

AI Hiring Rate is computed following the overall hiring rate methodology, but only considering members classified as AI talent.

Relative AI Hiring Index is the pace of change in AI Hiring Rate normalized by the pace of change in Overall Hiring Rate, providing a picture of whether hiring of AI talent is growing at a higher, equal, or lower rate than overall hiring in a market. The relative AI Hiring Index is equal to 1.0 when AI hiring and overall hiring are growing at the same rate year on year.

Interpretation: Relative AI Hiring Index shows how fast each country is experiencing growth in AI talent hiring relative to growth in overall hiring in the country. A ratio of 1.2 means the growth in AI talent hiring has outpaced the growth in overall hiring by 20%.

Changelog From Methodology Included in Last Year's AI Index

1. LinkedIn ramped a new version of its industry taxonomy (see details here).

    a. This has resulted in changes to our top level five key industries. We have made the full-time series available for each industry (as with prior years).

        i. "Software & IT Services" industry evolved into a wider "Technology, Information and Media," which encompasses media and telecommunications as well as other sub-industries.

        ii. Former "Hardware & Networking" industry does not exist in the new taxonomy, so we introduced "Professional Services" industry as the fifth industry in scope which contains a high concentration of AI talent.

        iii. Remaining "Education," "Manufacturing," and "Financial Services" (formerly known as "Finance") also had updates in their coverage resulting from the inclusion of more granular sub-industries.

    b. This also resulted in minor changes in magnitudes for some metrics since the distinct number of industries, as well as the distinct number of AI occupations defined within each country-industry pair have changed:

        i. We define AI occupations (occupation representatives that require AI skills to perform the job) and the respective definition of AI Talent at Country-Industry level. For example, data engineers working in the technology, information, and media industry in Germany may be identified as holding an AI occupation, whereas data engineers working in the construction industry in the United Arab Emirates may not be identified as AI Talent. Following the introduction of a more granular industry taxonomy with improved accuracy, our AI Talent identifications have been improved, and results have been reflected to the entirety of time series for each relevant metric.

        ii. The following metrics have been impacted by this change in industry taxonomy: AI Talent Concentrations, and Relative AI Hiring Rates. No directional changes were observed, only minor changes in magnitudes.

2. We introduced a methodology change into Relative Skills Penetration metrics:

    a. In the past, the data used to calculate these metrics were limited to top five industries with the highest AI skill penetration globally: "Software & IT Services," "Hardware & Networking," "Manufacturing," "Education," and "Finance" industries. This year we updated our coverage to all industries.

NetBase Quid

Prepared by Bill Valle and Nicole Seredenko

NetBase Quid delivers AI-powered consumer and market intelligence to enable business reinvention in a noisy and unpredictable world. The software applies artificial intelligence to reveal patterns in large, unstructured datasets and to generate visualizations that enable users to make smart, data-driven decisions accurately, quickly, and efficiently. NetBase Quid uses Boolean query to search for focus areas, topics, and keywords within social media, news, forums and blogs, companies, and patents data sources, as well as other custom datasets. NetBase Quid then visualizes these data points based on the semantic similarity.

Search, Data Sources, and Scope

Over 8 million global public and private company profiles from multiple data sources are indexed in order to search across company descriptions, while filtering and including metadata ranging from investment information to firmographic information, such as founded year, HQ location, and more. Company information is updated on a weekly basis. The NetBase Quid algorithm reads a big amount of text data from each document to make links between different documents based on their similar language. This process is repeated at an immense scale, which produces a network with different clusters identifying distinct topics or focus areas. Trends are identified based on keywords, phrases, people, companies, and institutions that NetBase Quid identifies, and the other metadata that is put into the software.

Data

Companies

Organization data is embedded from Capital IQ and Crunchbase. These companies include all types of companies (private, public, operating, operating as a subsidiary, out of business) throughout the world. The investment data includes private investments, M&A, public offerings, minority stakes made by PE/VCs, corporate venture arms, governments, and institutions both within and outside the United States. Some data is simply unreachable—for instance, when investors' names or funding amounts are undisclosed.

NetBase Quid embeds Capital IQ data as a default and adds in data from Crunchbase for the data points that are not captured in Capital IQ. This not only yields comprehensive and accurate data on all global organizations, but it also captures early-stage startups and funding events data. Company information is updated on a weekly basis.

Earnings Calls

NetBase Quid leverages earnings call transcript data embedded from Seeking Alpha. For this report, NetBase Quid has analyzed mentions of AI-related keywords across all earnings call transcripts from Fortune 500 companies from January 2018 through December 2022. New earnings call transcript data is updated in NetBase Quid on the 1st and 15th of every month.

Search Parameters

Boolean query is used to search for focus areas, topics, and keywords within the archived company database, within their business descriptions and websites. We can filter out the search results by HQ regions, investment amount, operating status, organization type (private/public), and founding year. NetBase Quid then visualizes these companies by semantic similarity. If there are more than 7,000 companies from the search result, NetBase Quid selects the 7,000 most relevant companies for visualization based on the language algorithm.

Boolean Search: "artificial intelligence" or "AI" or "machine learning" or "deep learning"

Companies:

- Global AI and ML companies that have received investments (private, IPO, M&A) from January 1, 2013, to December 31, 2022.
- Global AI and ML companies that have received over $1.5M for the last 10 years (January 1, 2013, to December 31, 2022): 7,000 out of 7,500 companies have been selected through NetBase Quid's relevance algorithm.

Target Event Definitions

- Private investments: A private placement is a private sale of newly issued securities (equity or debt) by a company to a selected investor or a selected group of investors. The stakes that buyers take in private placements are often minority stakes (under 50%), although it is possible to take control of a company through a private placement as well, in which case the private placement would be a majority stake investment.
- Minority investment: These refer to minority stake acquisitions in NetBase Quid, which take place when the buyer acquires less than 50% of the existing ownership stake in entities, asset products, and business divisions.
- M&A: This refers to a buyer acquiring more than 50% of the existing ownership stake in entities, asset products, and business divisions.

McKinsey & Company

Data used in the Corporate Activity-Industry Adoption section was sourced from the McKinsey Global Survey "The State of AI in 2022—and a Half Decade in Review."

The online survey was in the field from May 3, 2022, to May 27, 2022, and from August 15, 2022, to August 17, 2022, and garnered responses from 1,492 participants representing a full range of regions, industries, company sizes, functional specialties, and tenures. Of those respondents, 744 said their organization had adopted AI in at least one function and were asked questions about their organization's AI use. To adjust for differences in response rates, the data is weighted by the contribution of each respondent's nation to global GDP.

The AI Index also considered data from previous iterations of the survey. More specifically, the AI index made use of data from:

The State of AI in 2021

The State of AI in 2020

Global AI Survey: AI Proves Its Worth, But Few Scale Impact (2019)

AI Adoption Advances, But Foundational Barriers Remain (2018)

GitHub

Data on the effects of GitHub's Copilot on developer productivity and happiness was sourced from the GitHub Copilot Survey conducted in 2022.

The survey was emailed to 17,420 users who had opted in to receive communications and were using GitHub Copilot for their daily programming activities. Between February 10, 2022, and March 6, 2022, the authors received 2,047 responses that could be matched with usage measurements during the four-week period leading up to March 12, 2022. The survey contained multiple-choice questions on demographic information and Likert-type questions on different aspects of productivity, which were randomized in the order of appearance to the user.

More details can be found in Ziegler at al., 2022.

Deloitte

Data used in the Corporate Activity-Industry Motivation section was sourced from Deloitte's "State of AI in the Enterprise" surveys.

More specifically, the AI Index made use of the following sources of information:

Deloitte's State of AI in the Enterprise, 5th Edition Report (2022)

State of AI in the Enterprise, 4th Edition (2021)

Deloitte's State of AI in the Enterprise, 3rd Edition (2020)

State of AI in the Enterprise, 2nd Edition (2018)

The 2017 Deloitte State of Cognitive Survey (2017)

To obtain a global view of how AI is transforming organizations, Deloitte surveyed 2,620 global business leaders between April 2022 and May 2022. Thirteen countries were represented: Australia (100 respondents), Brazil (115 respondents), Canada (175 respondents), China (200 respondents), France (130 respondents), Germany (150 respondents), India (200 respondents), Israel (75 respondents), Japan (100 respondents), Singapore (100 respondents), South Africa (75 respondents), the United Kingdom (200 respondents), and the United States (1,000 respondents). All participating companies have adopted AI technologies and are AI users. Respondents were required to meet one of the following criteria: responsible for AI technology spending or approval of AI investments, developing AI technology strategies, managing or overseeing AI technology implementation, serving as an AI technology subject matter specialist, or making or influencing decisions around AI technology. To complement the blind survey, Deloitte conducted qualitative telephone interviews with 15 AI specialists from various industries. More details are available on Deloitte's website.

International Federation of Robotics (IFR)

Data presented in the Robot Installations section was sourced from the "World Robotics 2022" report.