

INFER July / August / September 2022 Update

Which countries will become more competitive in AI research, technology, and human capital in the coming decade?

Published 27 October 2022

Which countries will become more competitive in AI research, technology, and human capital in the coming decade?

REPORT HIGHLIGHTS

INFER data from 12 forecasting questions on AI competitiveness suggest the EU will increase the greatest from their current status quo over the next decade.

Will U.S. domestic labor demand for AI skills equal or exceed 3.2% for December 2022?

 **Forecast: 11% chance that it will; a 14% decrease since 30 June 2022**

EXAMPLE RATIONALE SUPPORTING CURRENT FORECAST:

The trend has been flat or even decreasing slightly this whole year, and although the data only goes through July currently, it's below 3%. ([@thsavage](#), 9/28/22)

See more details on Page 10

BASED ON

935
FORECASTS

by

357
FORECASTERS

75% of Forecasters
were INFER Pros

RECENCY

Good

75% of forecasts made or
updated in the last 30 days

Forecast as of 9/30/22

Future U.S. Competitiveness



Status quo assumption: If forecasts align with the current state presented in the OECD.AI datasets, the U.S. will rank relatively high in research and human capital metrics and especially high in technology metrics.

See Appendix C for detailed methodology

Future Chinese Competitiveness



Status quo assumption: If forecasts align with the current state presented in the OECD.AI datasets, China will rank relatively high in research metrics and average in technology metrics. Human capital data is not available for China.

See Appendix C for detailed methodology

Future E.U. Competitiveness



Status quo assumption: If forecasts align with the current state presented in the OECD.AI datasets, the E.U. will rank low to average in research, technology, and human capital metrics.

See Appendix C for detailed methodology

*Please note that due to unforeseen issues with the resolution data, 5 questions that were in the previous report have been replaced with similar, but new, questions in this report. As a result, aggregate forecasts should not be compared across reports.

Overview

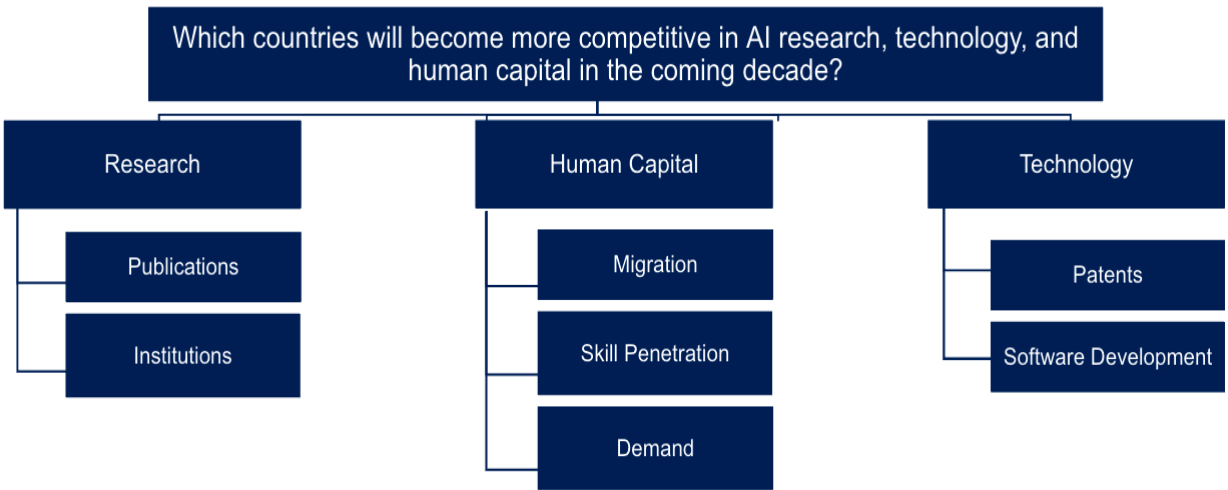
Over the coming decade, leadership in artificial intelligence (AI) will be critical for any country to compete effectively in the global economy. Emerging leaders will shape the norms governing how AI is used domestically and internationally. In what has been dubbed the “[global AI arms race](#),” governments are rapidly stepping up efforts to gain dominance and unlock AI’s disruptive potential.

Historically, the United States has led the world in AI-related research output, but others are working to increase competitiveness and claim a leadership role in this emerging sector. In 2017, China explicitly [stated](#) its goal to become the leader in AI by 2030, and is now a world leader in AI [publications](#) and patents. European countries [have been](#) investing in the creation of many AI-related jobs in the private sector. South Korea, Japan, and India are also increasing funding for the development and research of AI to ensure competitiveness in the AI era. The U.S. responded to the shifting landscape in 2020 by founding the [National AI Initiative](#), embracing a whole-of-government approach to ensure continued U.S. leadership in the field.

Tracking Progress With INFER

To better understand how the competitiveness of key countries is changing, INFER launched a strategic question focused on various key areas within AI development. Below, you can see how INFER [decomposed](#) this strategic question to develop forecast questions relevant to each area.

Using the [OECD’s \(Organization for Economic Cooperation and Development\) and metrics and methods](#), we identified three contributing factors in AI competitiveness: research, human capital, and technology. Research covers academic advancements and achievements; human capital will include issues concerning the people working in AI; and technology deals with innovation and development of AI technology. Asking forecast questions covering these three factors and their subfactors for the U.S., China, and the European Union enabled us to assess the strategic question: Which countries will become more competitive in AI research, technology, and human capital in the coming decade?



Questions will focus on comparing the strengths of the US, China, European Union, India, and the United Kingdom across these contributing factors and subfactors. Other countries that are competitive within a single contributing factor or subfactor may also be included.

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*The questions on pages 20-29 were all published on 7 September 2022. Due to unforeseen issues with the resolution data, we had to remove and void 5 questions that were on the previous report and replace them with these 5 questions.

How many European Union countries will have an AI skill migration greater than 2 per 100,000 in 2022?

AI skills migration refers to the AI talent gained or lost due to migration trends. As demand for AI talent grows, competing effectively in AI requires countries to compete for limited supply. A skill migration rate of 2 per 100,000 represents a high net migration flow, and in 2021, [6 European Union countries had AI skill migration greater than 2](#): Austria, Estonia, Finland, Germany, Ireland, and Luxembourg.

Based on 133 forecasts by 35 forecasters:

Possible Answer	INFER % Chance on 5/30	INFER % Chance on 6/30	INFER % Chance on 9/30
Less than 3	1%	1% (0%)	1% (0%)
Between 3 and 5, inclusive	9%	7% (-2%)	8% (+1%)
Between 6 and 7, inclusive	47%	43% (-4%)	46% (+3%)
Between 8 and 10, inclusive	39%	45% (+6%)	42% (-3%)
More than 10	4%	4% (0%)	3% (-1%)

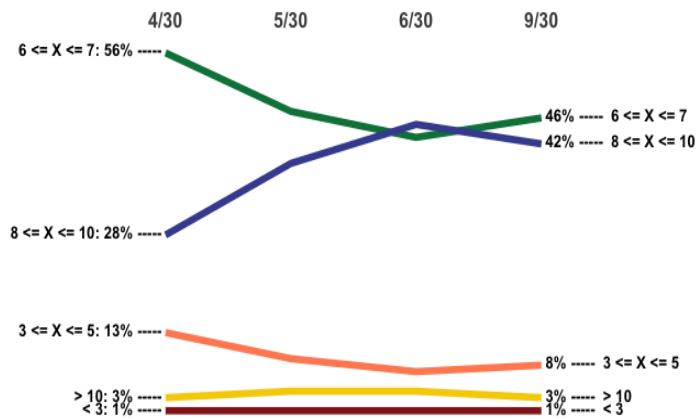
Summary of Forecaster Rationales [\(See Live Forecasts and Rationales\)](#)

*** = Summary of forecast rationales made in the last 30 days**

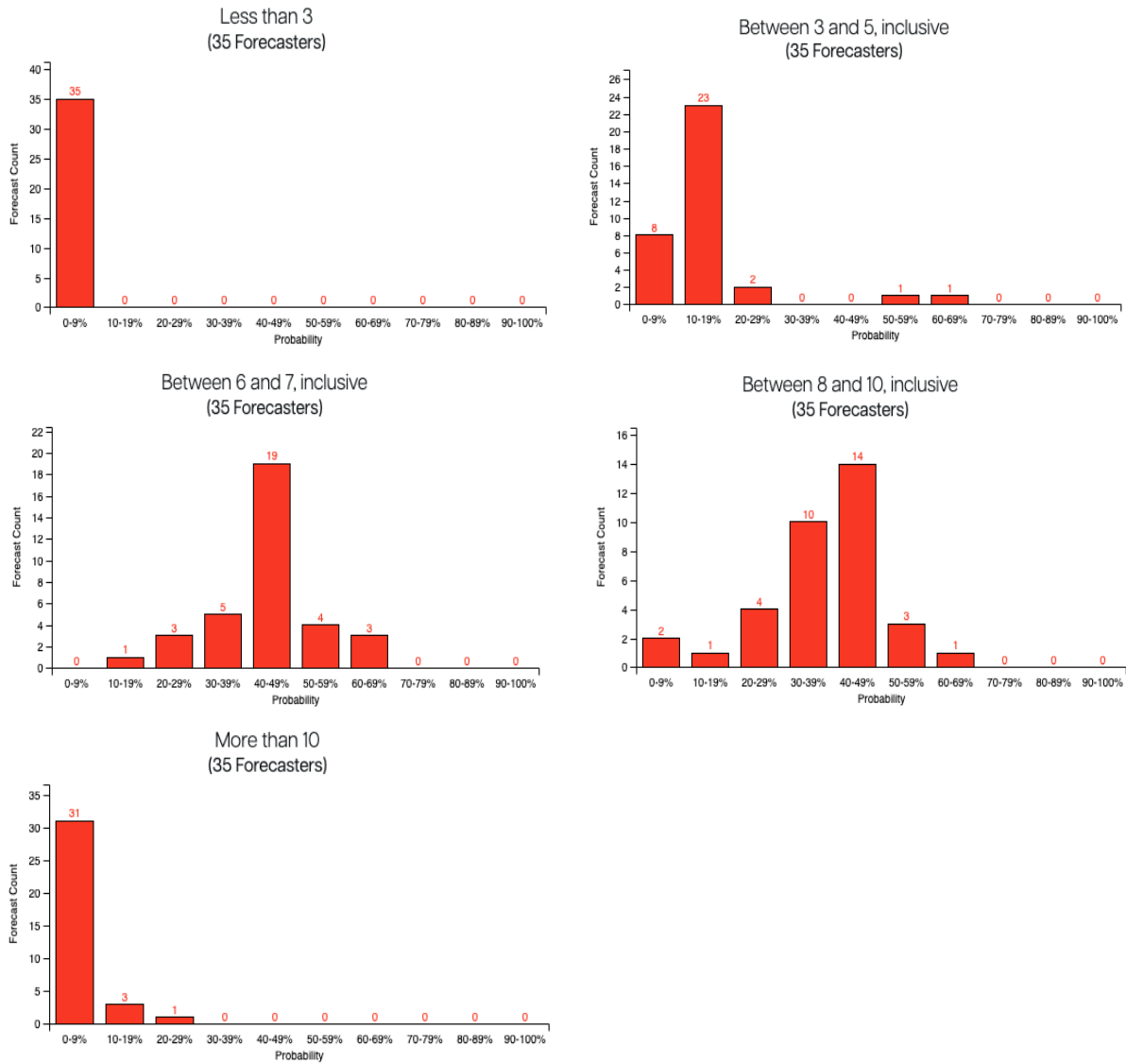
Will be 7 or less:	Will be 8 or more:
<ul style="list-style-type: none">▪ While migration is always present, remote working is more common as of right now, causing a disconnect between remote migration and physical migration. (@MiguelGM, 9/27/22) *▪ With distance work increasing, the percentage of migration will be lower as companies requiring AI skills will need to offer distance work to be competitive. (@Andhem2020, 7/15/22)▪ Austria, Finland, and Ireland all are technically sitting right above 2.0 and could fall back below. (@MullenAustin, 4/28/22).	<ul style="list-style-type: none">▪ Sweden, the Netherlands, and Denmark could easily be >2 next year, as they are all desirable destinations for workers. (@qassiov, 6/30/22)▪ As COVID restrictions decrease it makes sense that this would stay the same or increase compared to last year. (@fionack, 6/28/22)▪ With 6 E.U. countries at a level of 2 or greater for AI migration, it seems only plausible that the number will grow in 2022. (@tjc142, 6/5/22)▪ By June 2021, 20 Member States and Norway had adopted national AI strategies, signaling a broader focus on attracting AI talent. (@Himanshu, 4/30/22)

How many European Union countries will have an AI skill migration greater than 2 per 100,000 in 2022?

Consensus Trend (See the latest consensus trend [here](#).)



Forecast Distributions (See the most up-to-date distributions [here](#).)



What percentage of contributions to Github’s “very high impact” AI projects will be from China in 2022?

GitHub is the main provider of Internet hosting for software development, and the primary place for collaboration for many technology organizations and software developers.¹ A country’s share of contributions to “very high-impact” projects on GitHub reflects both the quality of their contributions and the level of influence they have on AI software development. China’s share rose to 25.5% in 2021, surpassing both the EU and the previous leader, the U.S.

Based on 134 forecasts by 38 forecasters:

Possible Answer	INFER % Chance on 5/30	INFER % Chance on 6/30	INFER % Chance on 9/30
Less than 22%	51%	50% (-1%)	57% (+7%)
More than or equal to 22% but less than 27%	39%	39% (0%)	35% (-4%)
More than or equal to 27%	10%	11% (+1%)	8% (-3%)

Summary of Forecaster Rationales [\(See Live Forecasts and Rationales\)](#)

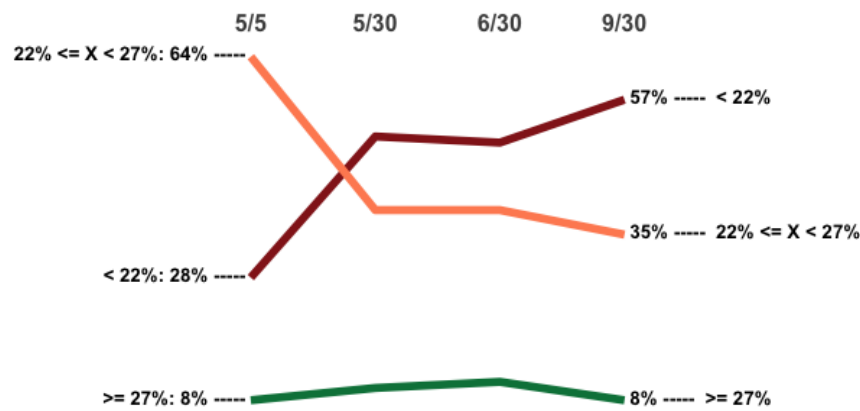
* = Forecast Rationales made in the last 30 days

Less than 22%:	More than or equal to 22% but less than 27%	More than or equal to 27%:
<ul style="list-style-type: none">▪ Numbers are being lowered given China’s increasing economic and COVID difficulties. (@cmeinel, 9/8/22) *▪ With harsh lockdowns and migration away from GitHub, China is not contributing as much as other countries with less-stringent policies. (@qassiov, 6/30/22)▪ China is making statements about sequestering source code for national security reasons. While some China developers might experiment with submitting code, a national security law might freeze out any initiative. (@TDHesslink, 6/28/22)	<ul style="list-style-type: none">▪ The percentage of contributions for China based on the last five years has been ~25%, 15%, 20%, 20%, and 15%. The general trend has been upwards, and China broke through 22% for the first time last year. (@sanyer, 9/8/22) *▪ Supply chain disruptions due to zero COVID policies are likely to cause this to be lower than perhaps expected, but this does not automatically mean a large decrease will occur. (@fionack, 6/28/22)▪ China’s 2021 contribution rate was 25.6%. (@shaun-ee, 6/29/22)	<ul style="list-style-type: none">▪ Recent developments in Chinese AI research bode well for their contributions to the global AI sphere. (@TRIDENT, 7/28/22)▪ China’s increases in the higher impact tiers implies they’re doing something right about getting people on board their projects; and/or that those getting on board are (proportionally or not) more and more identifying as Chinese. (@btv, 6/11/22)▪ There has been a rise in contributions throughout the past several years. (@emmakate, 5/26/22)

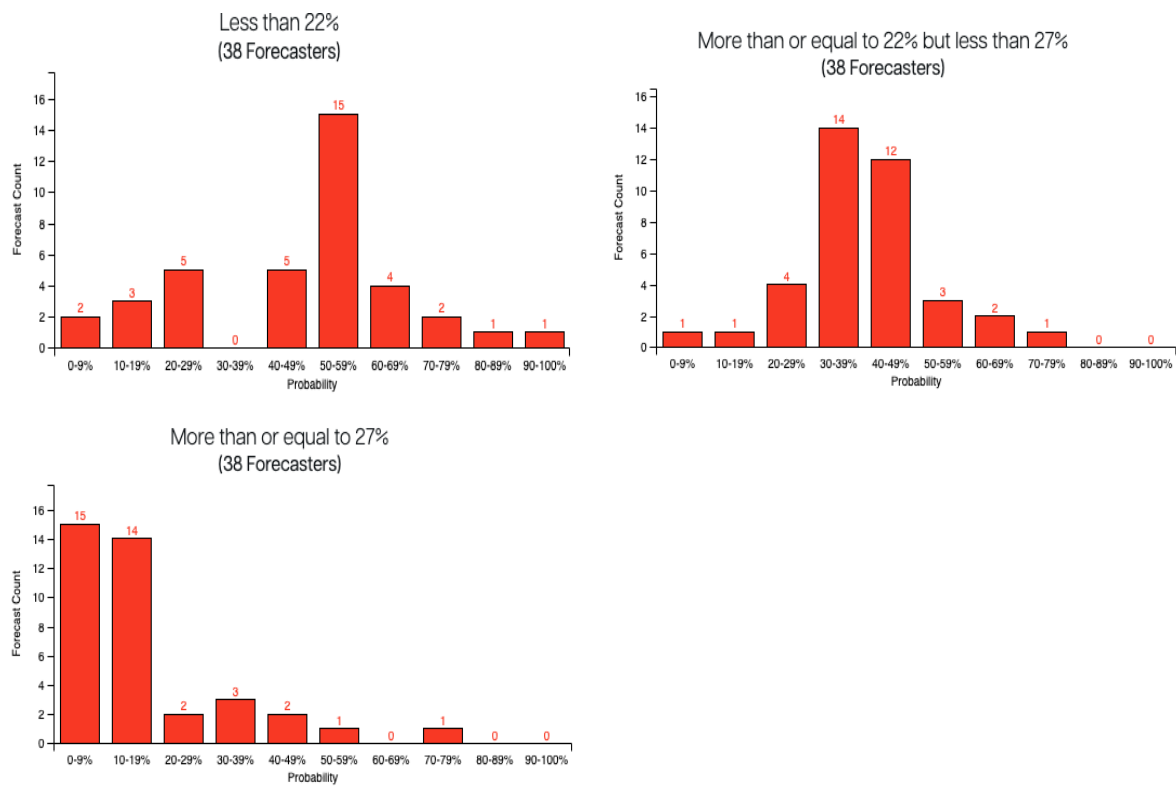
¹<https://oecd.ai/en/github>

What percentage of contributions to Github’s “very high impact” AI projects will be from China in 2022?

Consensus Trend (See the latest consensus trend [here](#).)



Forecast Distributions (See the most up-to-date distributions [here](#).)



Will U.S. domestic labor demand for AI skills equal or exceed 3.2% for December 2022?

Domestic labor demand for artificial intelligence represents the extent to which AI skills are becoming an important part of a nation’s job market. In the U.S., demand has grown 0.3% to 0.4% per year since 2020. Demand of 3.2%, i.e., a 3.2% probability that an AI skill appears in an IT-related job posting, would represent a similar 0.35% increase year-over-year.

Based on 137 forecasts by 46 forecasters:

Possible Answer	INFER % Chance on 5/30	INFER % Chance on 6/30	INFER % Chance on 9/30
Yes	59%	25% (-34%)	11% (-14%)
No	41%	75% (+34%)	89% (+14%)

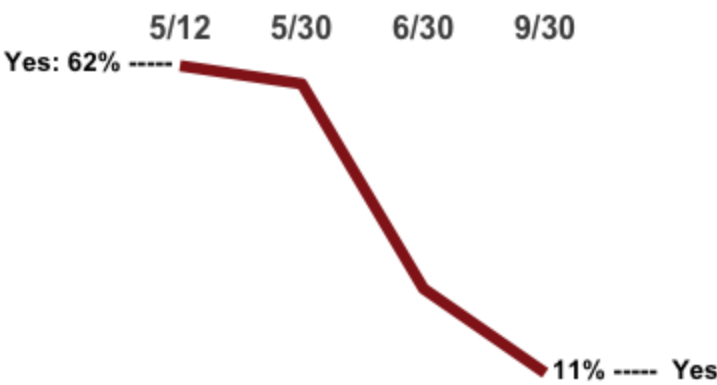
Summary of Forecaster Rationales [\(See Live Forecasts and Rationales\)](#)

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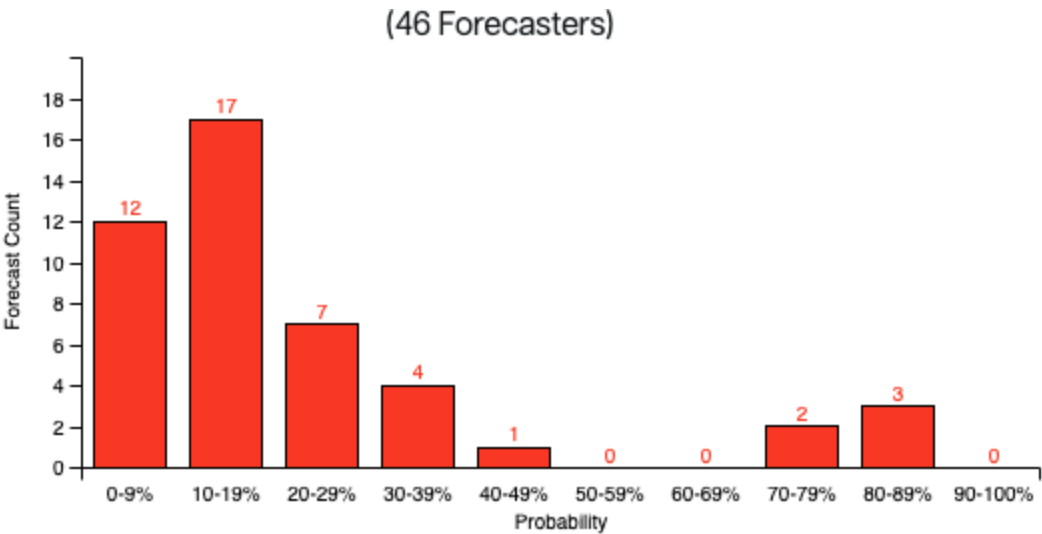
Yes:	No:
<ul style="list-style-type: none">▪ AI skills will be in greater demand as a percentage of the domestic labor demand, even if the demand decreases as a whole. Big tech companies aren’t experiencing anything others aren’t. (@mbbernstein, 7/31/22)▪ The US demand has increased by .6 % to .7 % over the past 15 months. If that trend continues, the US will pick up another .3% to .4% over the remaining 8 months of 2022. That gain appears to put the US at 3.2% to 3.3% by Dec 2022. (@sepeskoe, 5/31/22)▪ Private industries focusing on AI are rapidly expanding and AI applications in non-tech-centered domains are becoming more apparent and acceptable. (@alanflu, 5/31/22)	<ul style="list-style-type: none">▪ The trend has been flat or even decreasing slightly this whole year, and although the data only goes through July currently, it’s below 3%. (@thsavage, 9/28/22) *▪ 0.2 percentage points would be a big jump from now, and the chances of that happening in the next few months seem slim. (@qassiov, 9/18/22) *▪ US investments for AI have steeply declined since Q1. (@Brcharm, 8/11/22)▪ Many tech companies are slowing or outright freezing hiring, while others are going a step further and laying employees off—and the pace seems to be accelerating. (@cmeinel, 5/12/22)

Will U.S. domestic labor demand for AI skills equal or exceed 3.2% for December 2022?

Consensus Trend (See the latest consensus trend [here](#).)



Forecast Distributions (See the most up-to-date distributions [here](#).)



How will the U.S. rank in AI skills penetration in 2022?

AI skills penetration refers to the prevalence of LinkedIn members with AI skills across occupations and measures the intensity of AI skills in a given country. The U.S. ranked first overall in AI skills penetration in 2016, before being eclipsed first by India in 2017 and then Korea in 2022.

Based on 120 forecasts by 45 forecasters:

Possible Answer	INFER % Chance on 5/30	INFER % Chance on 6/30	INFER % Chance on 9/30
1	3%	2% (-1%)	3% (+1%)
2	18%	21% (+3%)	23% (+2%)
3	53%	56% (+3%)	53% (-3%)
4 or lower	27%	21% (-6%)	21% (0%)

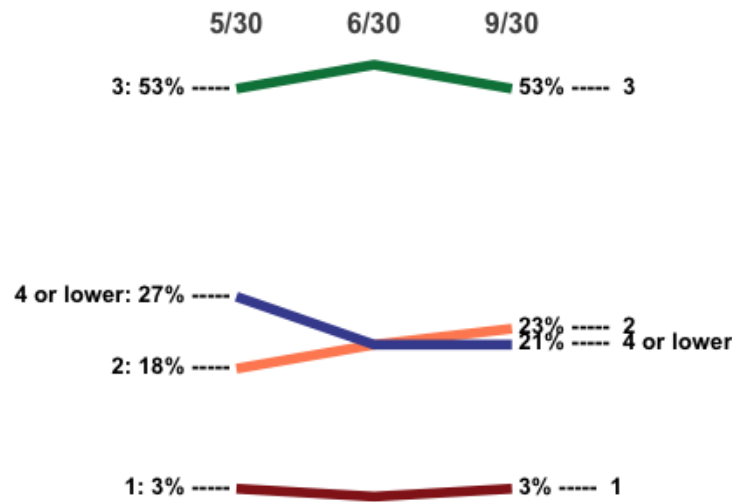
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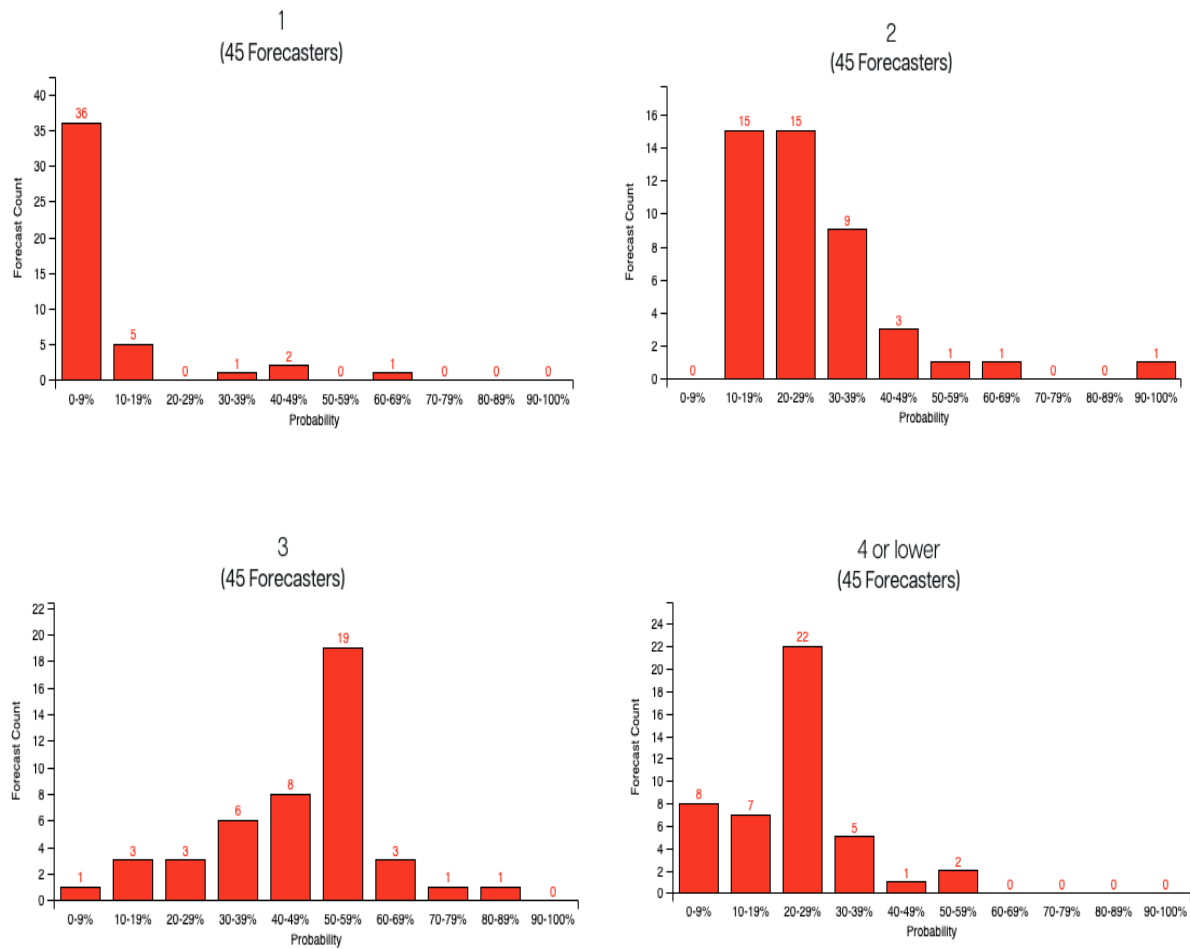
3:	4 or lower:	2:
<ul style="list-style-type: none">▪ Korea could have some sort of noise that makes it dropping back down possible, but it is unlikely. (@RyanBeck, 9/30/22) *▪ The U.S. is currently at #3. (@emmakate, 6/30/22)▪ Historical trends dictate a decrease in skills penetration, but not a significant enough one to drop beyond third place. (@bekahcha, 5/31/22)	<ul style="list-style-type: none">▪ The US will continue to fall in the rankings over the next 3 or so years, as some small countries will specialize more in industries that make heavy use of AI skills, while the US has a diverse range of industries. (@Tolga, 9/22/22) *▪ AI skills are becoming increasingly important in Canada and a handful of other countries, perhaps at a rate higher than that seen in the US. (@belikewater, 7/12/22)▪ It's possible that Canada or Singapore will take over from the U.S., especially if there is a difference in government initiatives. (@sebawj, 6/10/22)	<ul style="list-style-type: none">▪ The U.S. has been second in four of the last five years. (@Himanshu, 6/30/22)▪ Since the contribution of the USA in the AI field is immense, it's likely that new graduates will continue to put these skills in their LinkedIns to appear desirable. (@AditiS, 6/30/22)

How will the U.S. rank in AI skills penetration in 2022?

Consensus Trend (See the latest consensus trend [here.](#))



Forecast Distributions (See the most up-to-date distributions [here.](#))



Which country or union will have the second most citations of “high impact” AI scientific publications in 2022?

Research citations measure the impactfulness of a publication by indicating the number of times other researchers have used their findings in their own research. Since 2019, China has published the most “high impact” articles, and its lead over other countries has grown each year. The U.S. and EU have both held second place since then, and India has shown signs of catching up in recent years as well.

Based on 116 forecasts by 41 forecasters:

Possible Answer	INFER % Chance on 5/30	INFER % Chance on 6/30	INFER % Chance on 9/30
China	7%	4% (-3%)	4% (0%)
EU	52%	56% (+4%)	53% (-3%)
United States	31%	33% (+2%)	34% (+1%)
India	9%	6% (-3%)	8%(+2%)
Other	1%	1% (0%)	1% (0%)

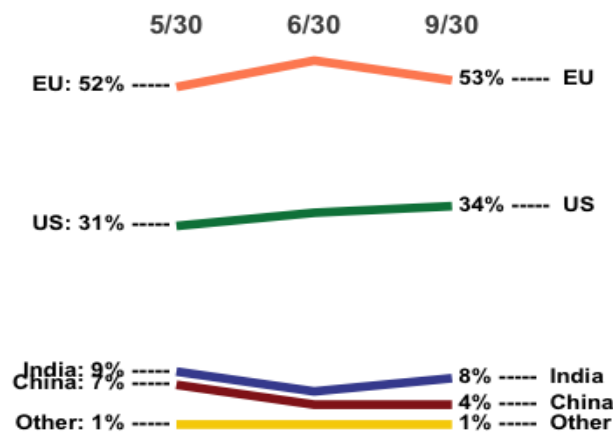
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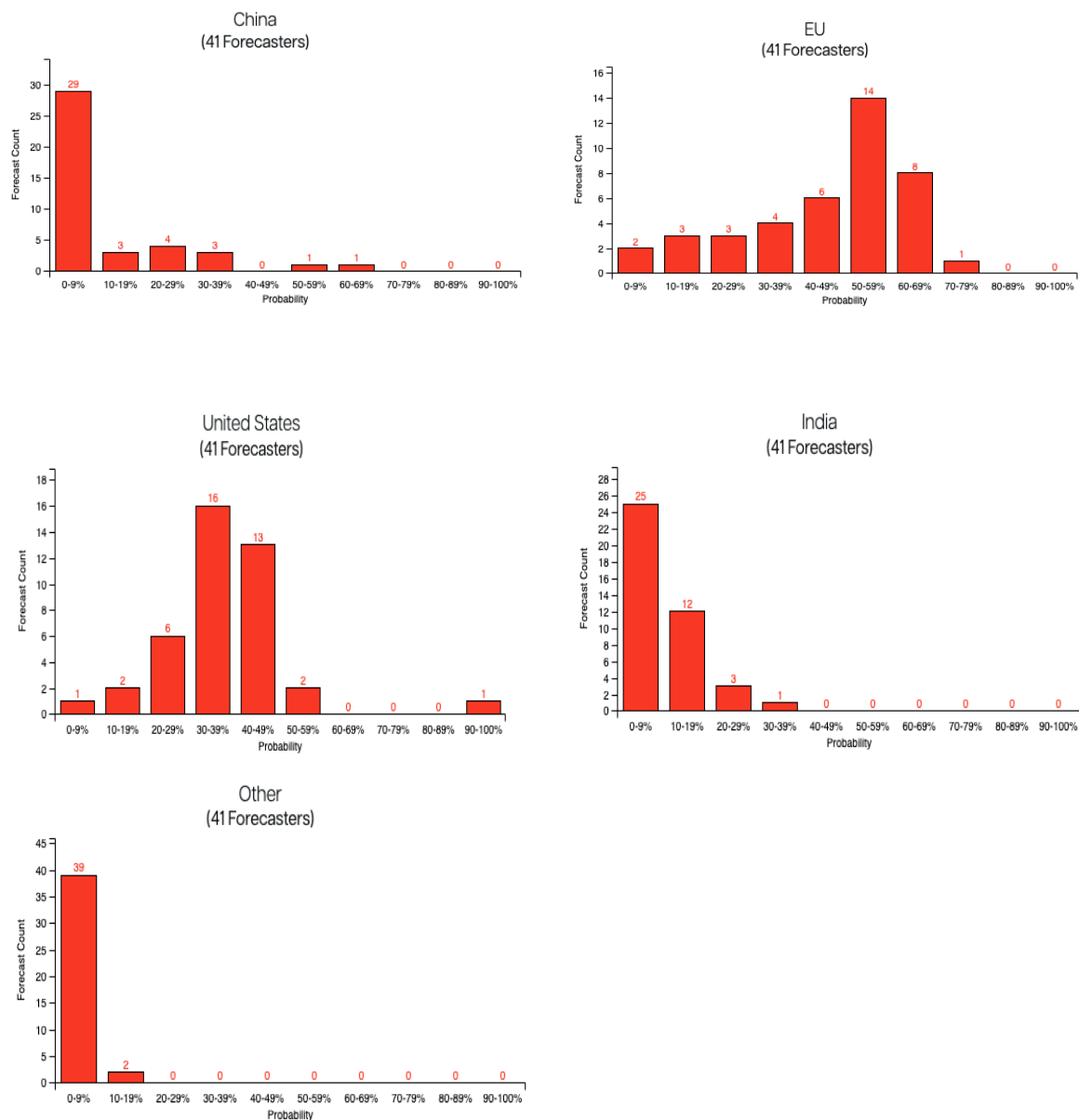
EU	U.S.	India / China / Other:
<ul style="list-style-type: none">▪ While the US will be the second most citations as a country, the sum of EU countries will put them over the US. (@o-maverick, 8/27/22)▪ The U.S. is likely to continue its downward trend while the EU remains relatively stable, giving it the #2 spot. (@MullenAustin, 5/27/22)	<ul style="list-style-type: none">▪ The U.S. downward trend may be due to a reversion to the mean after several highly- cited papers in 2015/2016 as opposed to a historical trend. (@shaun-ee, 6/30/22)▪ The U.S. has never held the third spot or lower in the past four years, even during years when it dropped. (@Himanshu, 6/2/22)	<ul style="list-style-type: none">▪ These can swing 5 percentage points pretty easily year to year, so India could be the winner here, with the positive trajectory they’re on. (@johnnycaffeine, 8/9/22)▪ The number of papers coming out of China is rising steadily year by year as well as the citation impact of those papers, while Europe’s has been dropping significantly. (@BenjaminSturgeon, 5/31/22)

Which country or union will have the second most citations of “high impact” AI scientific publications in 2022?

Consensus Trend (See the latest consensus trend [here](#).)



Forecast Distributions (See the most up-to-date distributions [here](#).)



What percentage of contributions to Github’s “very high impact” AI projects will be from the EU in 2022?

GitHub is the main provider of Internet hosting for software development, and the primary place for collaboration for many technology organizations and software developers.² A country’s share of contributions to “very high-impact” projects on GitHub reflects both the quality of their contributions and the level of influence they have on AI software development. The EU’s share of contributions has fallen in recent years, while countries like China and India have seen their percentages rise.

Based on 95 forecasts by 34 forecasters:

Possible Answer	INFER % Chance 5/30	INFER % Chance 6/30	INFER % Chance 9/30
Less than 10%	18%	11% (-7%)	13% (+2%)
More than or equal to 10% but less than 15%	44%	38% (-6%)	38% (0%)
More than or equal to 15% but less than 20%	33%	43% (+10%)	41% (-2%)
More than or equal to 20%	5%	9% (+4%)	8% (-1%)

Summary of Forecaster Rationales [\(See Live Forecasts and Rationales\)](#)

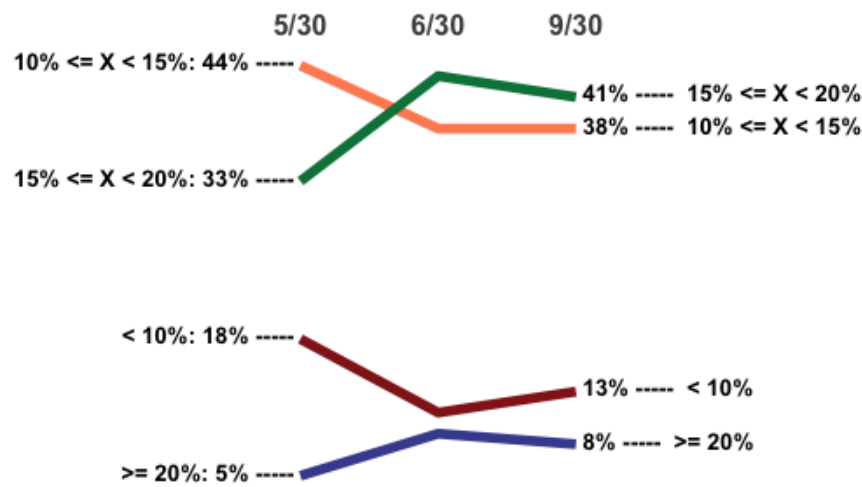
*** = Forecast Rationales made in the last 30 days**

Less than 15%:	15% or more:
<ul style="list-style-type: none">▪ 2021 had a steep drop, so expect the drop to continue due to the past year’s conflict in Europe. (@YIAung, 9/14/22) *▪ China and India seem to have strong growth, lowering the EU percentage in turn. (@Paul_Rowan, 7/21/22)▪ The overall number of “very high impact” projects has been decreasing continuously since 2017. (@shaun-ee, 6/29/22)▪ The EU has been sitting fairly consistently at 15% up until 2021, where it dropped down to 11.5%. (@MullenAustin, 5/27/22)	<ul style="list-style-type: none">▪ Due to the war, people in the EU will be interested in starting new initiatives to replace goods or services that come from both countries. Those initiatives will likely include software development. (@tguanangui, 8/30/22)▪ Historical data has been between 15-20% of contributions have come from European contributors. (@mudiku, 6/13/22)▪ The E.U. does a lot in scientific research, disproportionate to its population, making it likely to translate over into AI contributions. (@gmp71, 5/31/22)

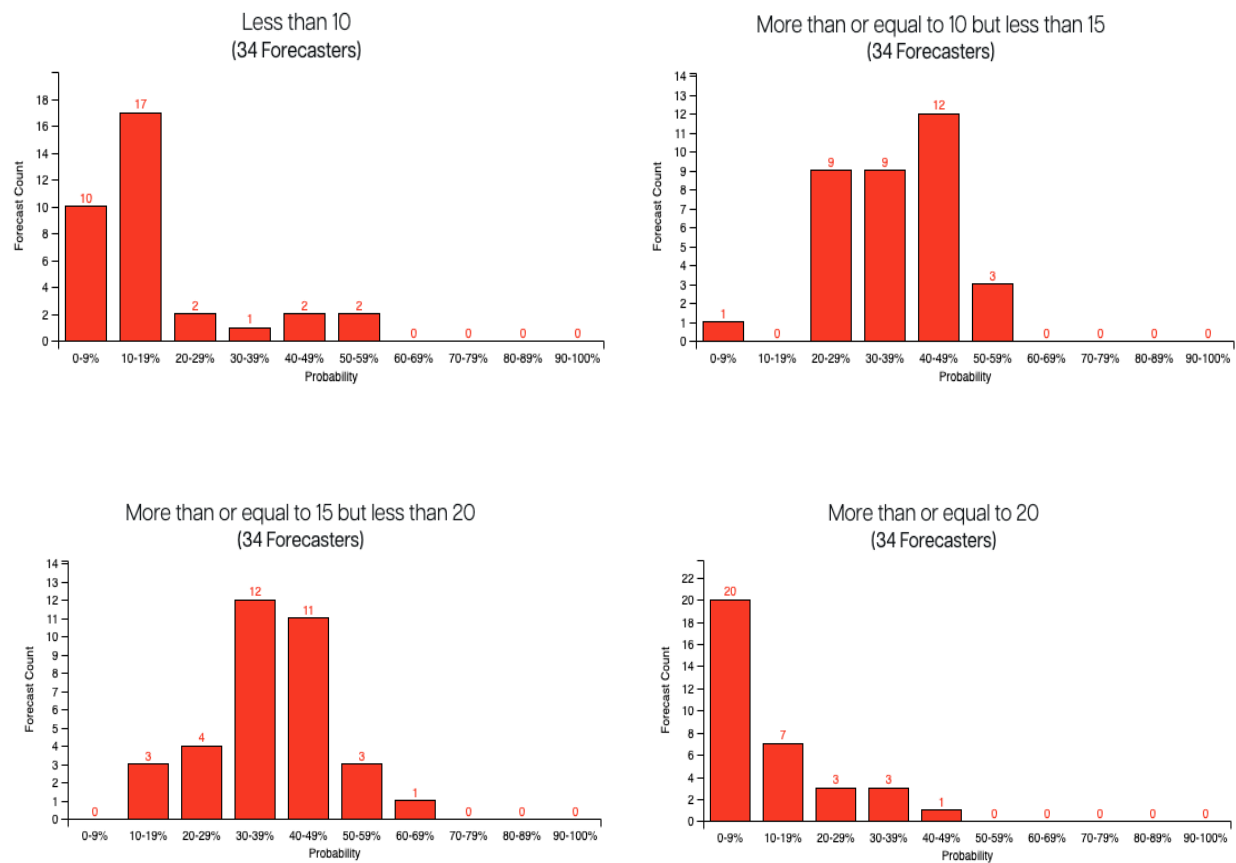
²<https://oecd.ai/en/github>

What percentage of contributions to Github’s “very high impact” AI projects will be from the EU in 2022?

Consensus Trend (See the latest consensus trend [here](#).)



Forecast Distributions (See the most up-to-date distributions [here](#).)



How many AI scientific publications will be published by EU institutions in 2022?

Enhancing national research and development capabilities is a key component of many national AI strategies,³ and the number of scientific publications produced reflects a country’s overall research output. The number of AI scientific publications published by EU institutions has risen consistently from about 1,500 in 2016 to just over 3,000 in 2021.

Based on 99 forecasts by 37 forecasters:

Possible Answer	INFER % Chance 6/30	INFER % Chance 9/30
Less than 2,500	2%	1% (-1%)
More than or equal to 2,500 but less than 3,000	13%	13% (0%)
More than or equal to 3,000	85%	86% (+1%)

Summary of Forecaster Rationales [\(See Live Forecasts and Rationales\)](#)

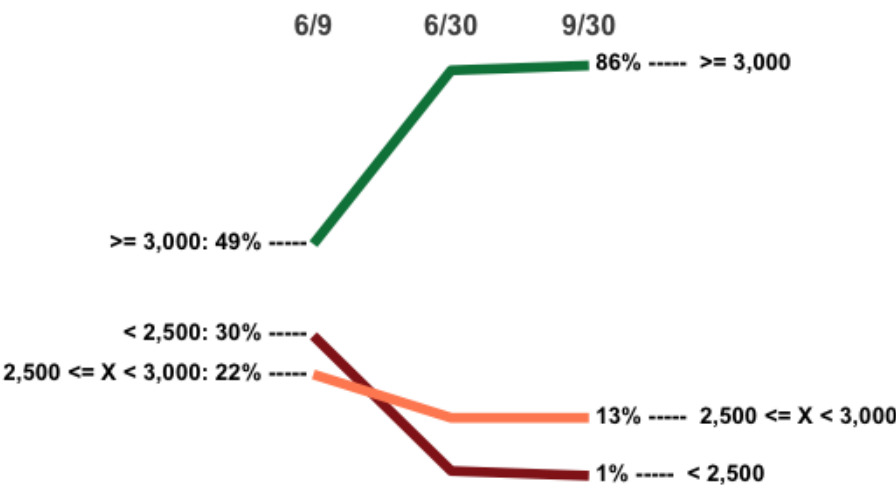
*** = Forecast Rationales made in the last 30 days**

Less than 3,000:	More than or equal to 3,000:
<ul style="list-style-type: none">▪ Artificial intelligence publications will surely increase, but they will not have a substantial increase without a specific strategy to promote it. (@BlancaElegaGG, 8/31/22)▪ There has yet to be a big hit due to COVID, which could have taken a year or two to materialize. (@btv, 6/11/22)▪ An average of the past seven years, accounting for reversion to the mean, signals that a jump into the 3,000 range is unlikely. (@2e10e122, 6/10/22)	<ul style="list-style-type: none">▪ Based on the Q1 and Q2 data, it looks very likely this will go over 3000 for the year. (@thsavage, 8/30/22)▪ Given that 2,068 publications have been reported for only the first half of the year, I don’t see how fewer than 3,000 publications can be reported for all of 2022. It’s likely that >3,000 publications will be reported through the end of Q3 alone. (@belikewater, 8/25/22)▪ Decreases are rare (2 times in 12 years), so there is no prevailing reason why there would be one this year. (@qassiovi, 6/27/22)

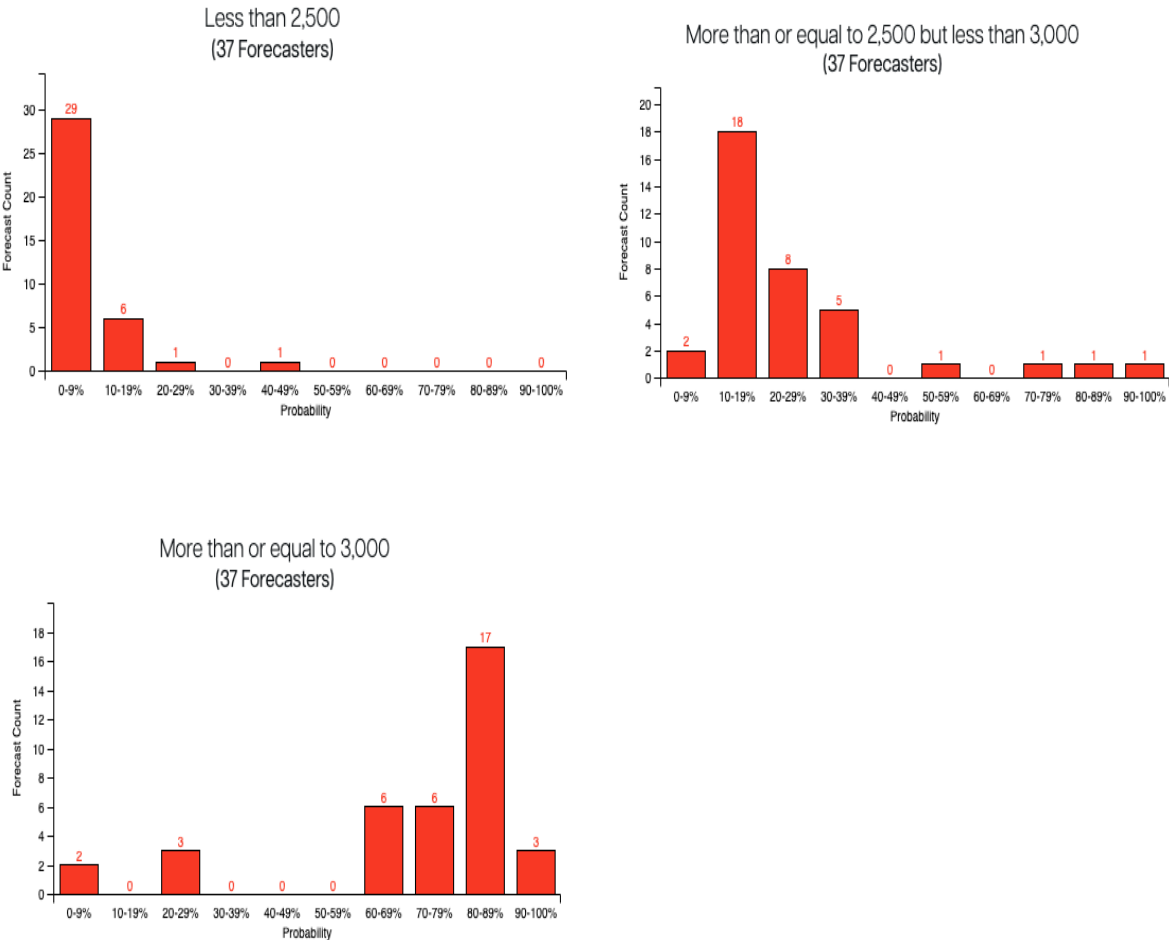
³ Galindo, L., K. Perset and F. Sheeka (2021), "An overview of national AI strategies and policies", Going Digital Toolkit Note, No. 14, [An overview of national AI strategies and policies](#).

How many AI scientific publications will be published by EU institutions in 2022?

Consensus Trend (See the latest consensus trend [here](#).)



Forecast Distributions (See the most up-to-date distributions [here](#).)



What percentage of the world's AI patents will be granted in China in 2022?

*This question opened 7 September 2022

Patents are a precursor to the commercialization of new technologies and play a key role in national strategies promoting technological competitiveness.⁴ The number of AI related patents published in China had been growing rapidly, peaking at almost 2,400 in 2019 before dropping slightly in 2020 and dropping again in 2021 to approximately 1,000.

Based on 27 forecasts by 22 forecasters:

Possible Answer	INFER % Chance on 9/30
Less than 5%	7%
More than or equal to 5% but less than 7%	78%
More than or equal to 7%	15%

Summary of Forecaster Rationales [\(See Live Forecasts and Rationales\)](#)

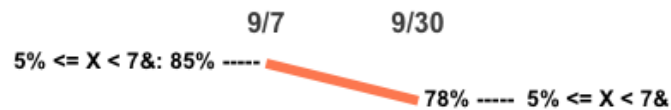
*** = Summary of forecast rationales made in the last 30 days**

More than or equal to 5% but less than 7%:	More than or equal to 7%:
<ul style="list-style-type: none">▪ China is now filing over half of the world's AI patents and being granted about 6%. It is likely that China maintains this high number of patent filings, which will increase the number of accepted patents. (@BlancaElenaGG, 9/25/22) *▪ There will be a drive to increase the number compared to last year, and there has been more time for recovery since the pandemic. (@HS21, 9/23/22) *▪ If their number of patents filed continues to grow at an extremely rapid pace, there's always a chance their number of patents granted will begin to catch up. (@MullenAustin, 9/8/22) *	<ul style="list-style-type: none">▪ Activities around AI patenting in China is growing faster than any other country, even with COVID. (@MiguelGM, 9/28/22) *▪ It seems more likely than not that China's Made in China 2025 initiative will focus on building more AI and that it's translated to Chinese innovation. (@bw601, 9/20/22) *

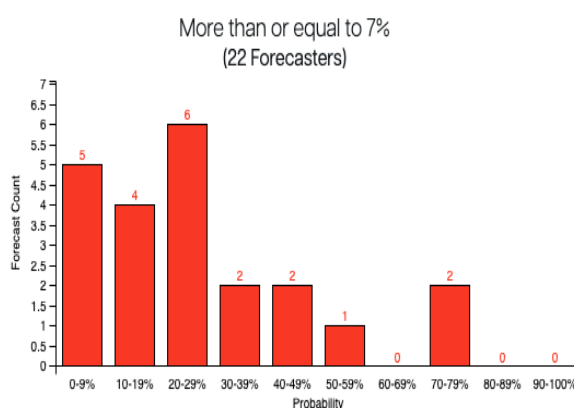
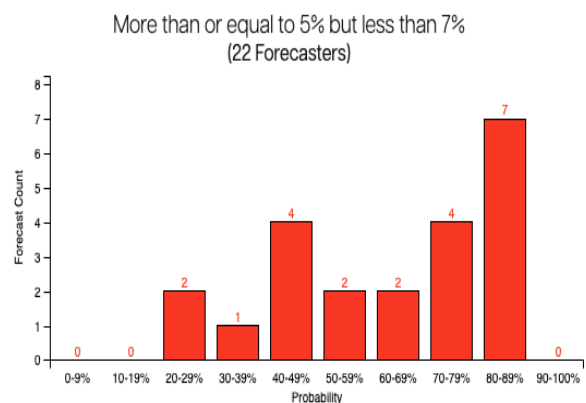
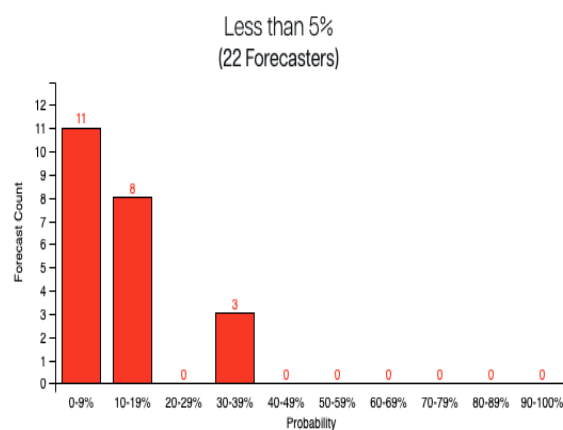
⁴ "Chapter 12: Intellectual Property," National Security Commission on Artificial Intelligence Final Report <https://reports.nscai.gov/final-report/chapter-12/>

What percentage of the world's AI patents will be granted in China in 2022?

Consensus Trend (See the latest consensus trend [here](#).)



Forecast Distributions (See the most up-to-date distributions [here](#).)



What percentage of the world’s AI patents will be granted in the European Union and United Kingdom in 2022?

*This question opened 7 September 2022

Patents are a precursor to the commercialization of new technologies and play a key role in national strategies promoting technological competitiveness.⁵ In recent years, the United States has published approximately 2.5x as many AI-related patents as its closest competitors.

Based on 16 forecasts by 14 forecasters:

Possible Answer	INFER % Chance on 9/30
Less than 7%	49%
More than or equal to 7% but less than 10%	43%
More than or equal to 10%	8%

Summary of Forecaster Rationales [\(See Live Forecasts and Rationales\)](#)

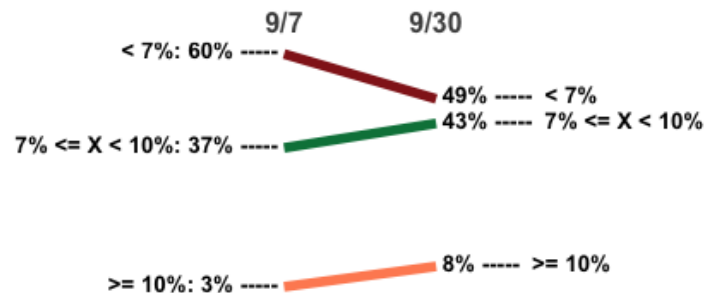
* = Summary of forecast rationales made in the last 30 days

Less than 7%	More than or equal to 7% but less than 10%:
<ul style="list-style-type: none">▪ If China’s growth continues, it could be enough to edge the EU out given their own comparatively lethargic growth. (@MullenAustin, 9/8/22) *▪ The base rate is just about 7%, but it could easily decrease due to the pandemic. (@mudiku, 9/26/22) *	<ul style="list-style-type: none">▪ The European Union and United Kingdom are filing over 4% of the world’s AI patents and being granted about 8%. Given that the trend does not show a substantial increase, it is very likely that its granting will continue. (@BlancaElenaGG, 9/25/22) *▪ It is most likely that the EU will stay in the same range it already is in. (@margaretelam, 9/27/22) *

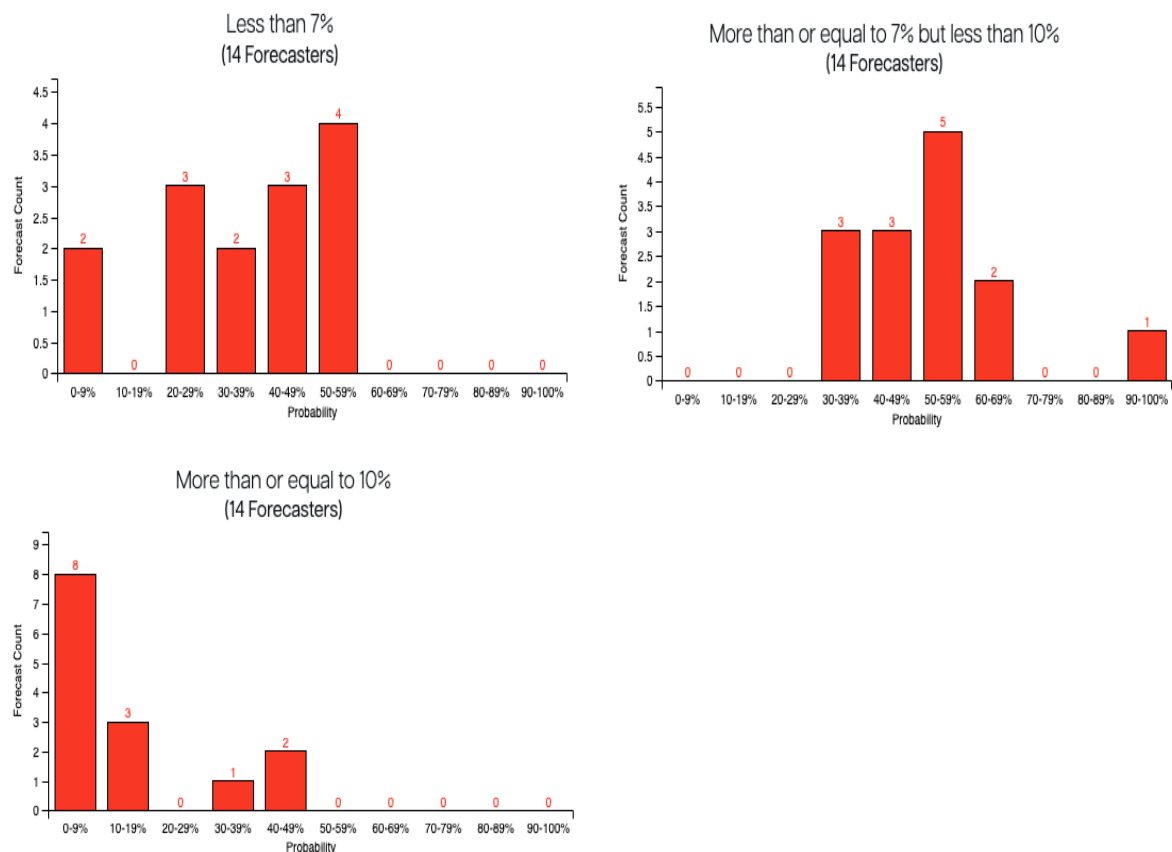
⁵ “Chapter 12: Intellectual Property,” National Security Commission on Artificial Intelligence Final Report <https://reports.nscai.gov/final-report/chapter-12/>

What percentage of the world's AI patents will be granted in the European Union and United Kingdom in 2022?

Consensus Trend (See the latest consensus trend [here](#).)



Forecast Distributions (See the most up-to-date distributions [here](#).)



In 2022, will a Chinese institution have the most “high impact” AI research publications?

*This question opened 7 September 2022

Enhancing national research and development capabilities is a key component of many national AI strategies,⁶ and the number of high quality publications is an important measure of an institution’s output. Historically, American universities have been the most prolific publishers of high quality research. However, in 2021, a Chinese organization, the Chinese Academy of Sciences, took the top spot for the first time.

Based on 21 forecasts by 16 forecasters:

Possible Answer	INFER % Chance on 9/30
Yes	62%
No	38%

Summary of Forecaster Rationales [\(See Live Forecasts and Rationales\)](#)

*** = Summary of forecast rationales made in the last 30 days**

Yes:	No:
<ul style="list-style-type: none">▪ In the past few years, Chinese institutions have been the sole leaders in AI research publications except for one. (@Mauricio_B, 9/24/22) *▪ Chinese institutions have received state funding and support to pursue AI research, and they are making some front-of-line research. (@rhuang, 9/20/22) *▪ Most Chinese Uni’s have had a very reliable uptrend, and the Indian uni’s exponential growth seems odd. (@Paul_Rowan, 9/8/22) *	<ul style="list-style-type: none">▪ The surge from Anna University in India in 2021 makes it difficult to definitively declare a Chinese institution to be a shoe-in. (@HS21l, 9/23/22) *▪ The question boils down to whether 2021 was a one-off for Anna or not, which it doesn’t appear to be so far. (@cassandra, 9/10/22) *

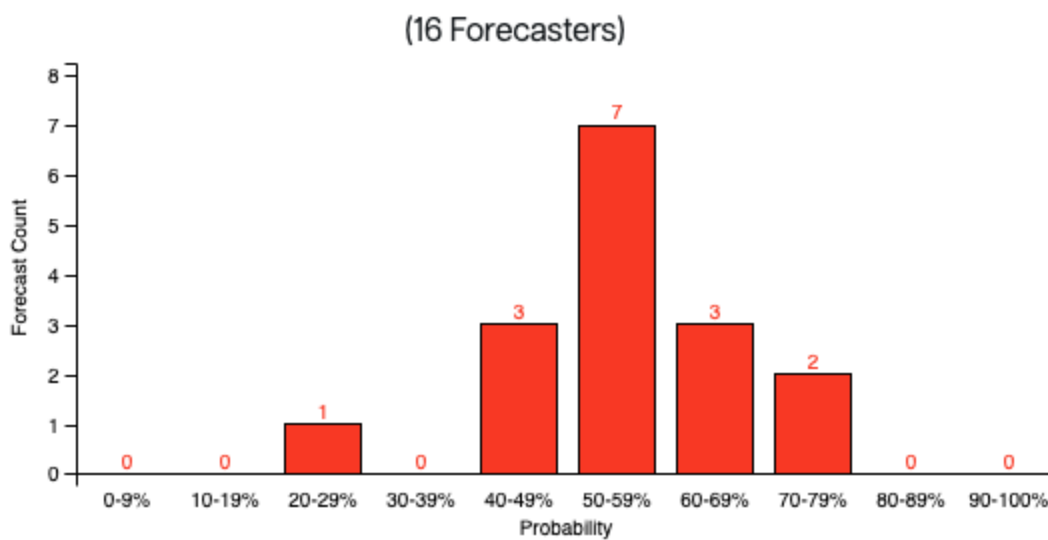
⁶ Galindo, L., K. Perset and F. Sheeka (2021), "An overview of national AI strategies and policies", Going Digital Toolkit Note, No. 14, [An overview of national AI strategies and policies](#).

In 2022, will a Chinese institution have the most “high impact” AI research publications?

Consensus Trend (See the latest consensus trend [here](#).)



Forecast Distributions (See the most up-to-date distributions [here](#).)



What percentage of the world’s AI patents will be granted in the United States in 2022?

*This question opened 7 September 2022

Patents are a precursor to the commercialization of new technologies and play a key role in national strategies promoting technological competitiveness.⁷ The number of AI patent publications in the U.S. has varied significantly in recent years. The number peaked at approximately 18,400 in 2013 before dropping below 11,000 in 2017, and then rising again to 17,500 in 2021.

Based on 18 forecasts by 15 forecasters:

Possible Answer	INFER % Chance on 9/30
Less than 40%	48%
More than or equal to 40% but less than 50%	41%
More than or equal to 50% but less than 60%	9%
More than or equal to 60%	2%

Summary of Forecaster Rationales [\(See Live Forecasts and Rationales\)](#)

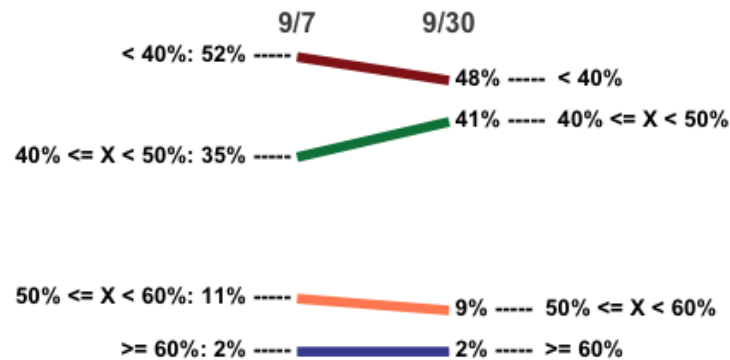
*** = Summary of forecast rationales made in the last 30 days**

Less than 40%	More than or equal to 40% but less than 50%
<ul style="list-style-type: none">▪ The boat won’t be rocked that much here from past years, where the US has been steadily decreasing in output. (@mudiku, 9/26/22) *▪ The United States has shown a downward trend in the granting of patents, a situation that is likely to continue, causing it to decline in the granting trends. (@BlanceElenaGG, 9/25/22) *	<ul style="list-style-type: none">▪ The steady increase of China and even EU approvals decreases the chance of the US turning the past few years’ trend, but patent filings have been relatively stable. (@Paul_Rowan, 9/8/22) *▪ Overcoming its sharp decline and rising back above 50% again is possible, but given the rapid rate of Chinese patent applications and historical U.S. performance, it’s unlikely to rebound that high. (@MullenAustin, 9/8/22) *

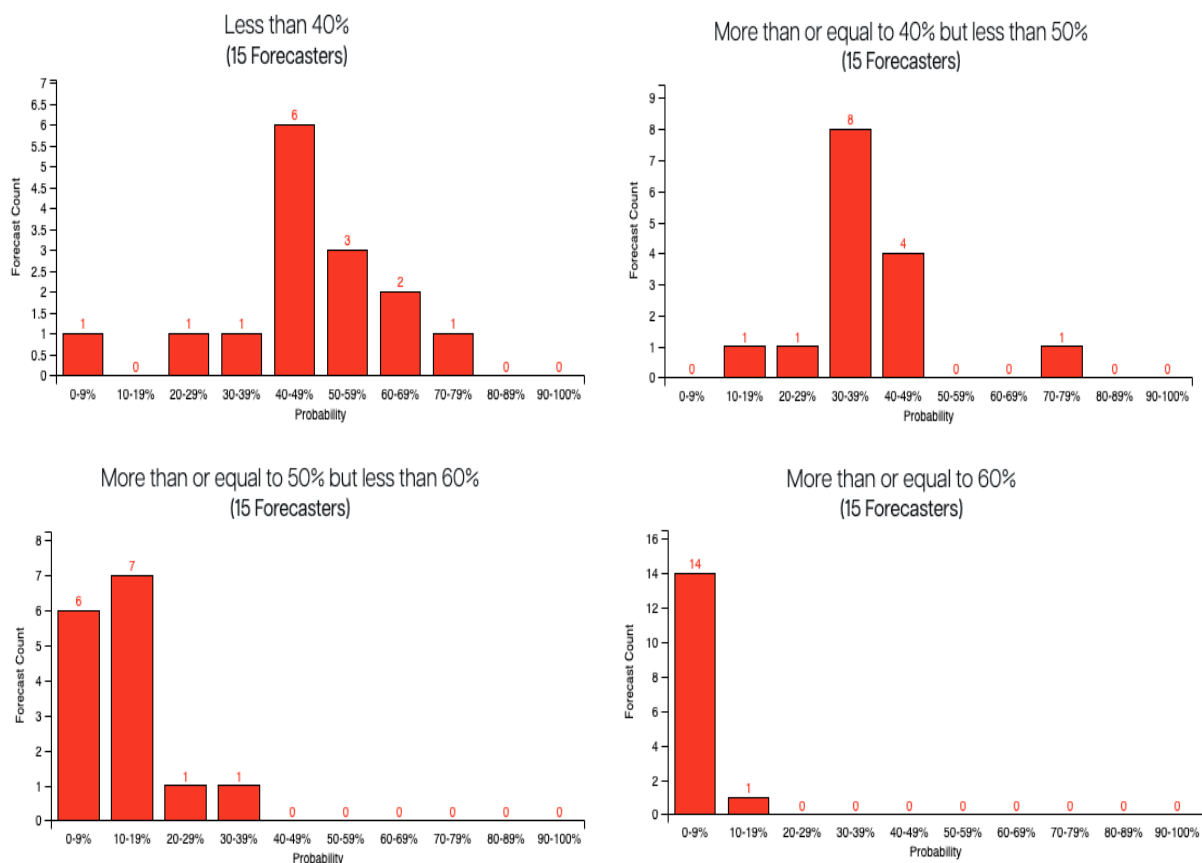
⁷ “Chapter 12: Intellectual Property,” National Security Commission on Artificial Intelligence Final Report <https://reports.nscai.gov/final-report/chapter-12/>

What percentage of the world's AI patents will be granted in the United States in 2022?

Consensus Trend (See the latest consensus trend [here](#).)



Forecast Distributions (See the most up-to-date distributions [here](#).)



Which country will have published the second most “high impact” journal articles on artificial intelligence in 2022?

*This question opened 7 September 2022

While the U.S. has consistently held a substantial lead in published articles, the race for second has gotten closer in recent years, with China surpassing the second-place EU for the first time in 2018. This comes as part of a broader trend of a rapidly rising number of articles from China amidst falling publication rates for the EU from a peak in 2013.

Based on 19 forecasts by 13 forecasters:

Possible Answer	INFER % Chance on 9/30
China	0%
EU	71%
United States	25%
India	4%
None of the above	0%

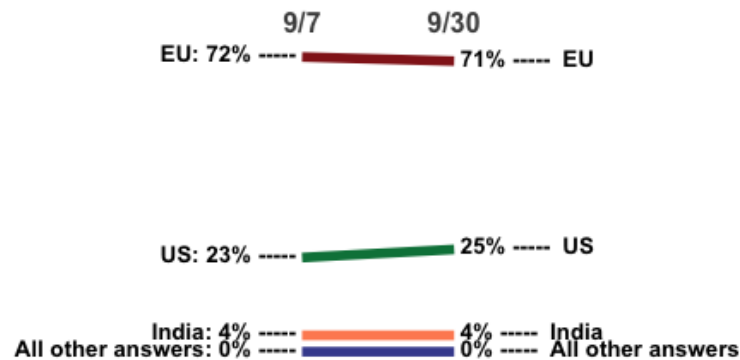
Summary of Forecaster Rationales [\(See Live Forecasts and Rationales\)](#)

*** = Summary of forecast rationales made in the last 30 days**

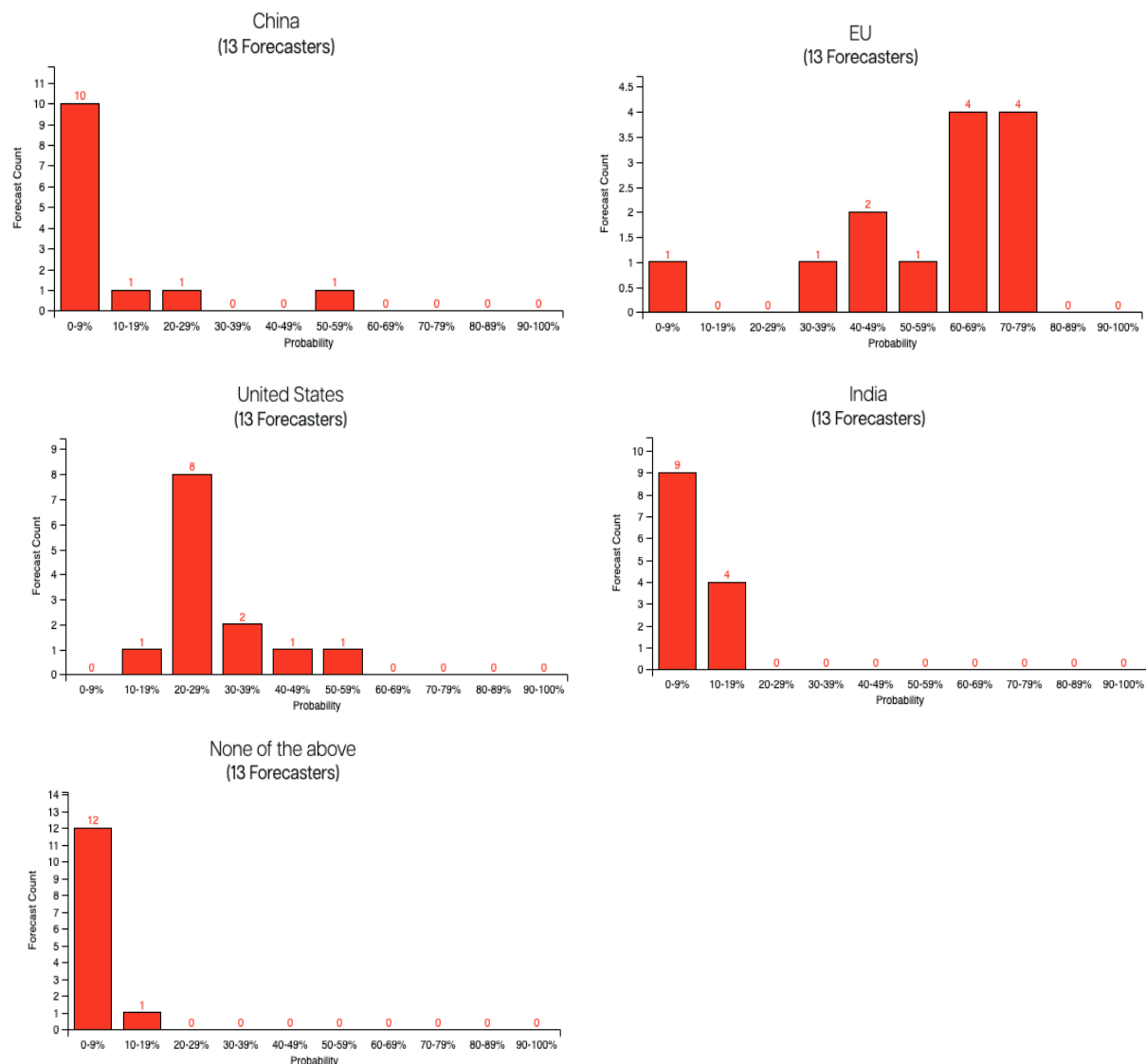
EU:	United States:
<ul style="list-style-type: none">▪ The EU has generally been leading this field in output, but they will not come close to output levels necessary to come first. (@margaretelam, 9/27/22) *▪ The EU seems to have had a much more stable output increase over the years, whereas US seems to be making an S-curve. (@Paul_Rowan, 9/8/22) *	<ul style="list-style-type: none">▪ The United States has had a historical lead over the EU. (@MullenAustin, 9/8/22) *▪ Current output levels are high for the US, making it possible that they will overcome the EU. (@2e10e122, 9/10/22) *

Which country will have published the second most “high impact” journal articles on artificial intelligence in 2022?

Consensus Trend (See the latest consensus trend [here](#).)



Forecast Distributions (See the most up-to-date distributions [here](#).)



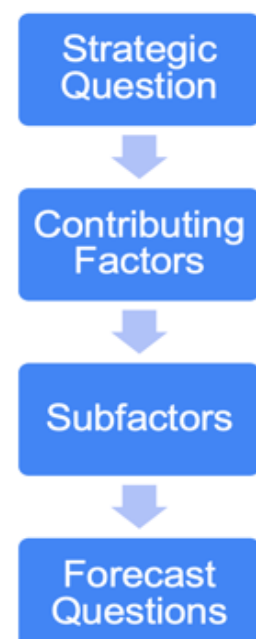
Appendix A - Methodology for Identifying Forecast Questions

INFER operates as a continuous, 4-step life-cycle between U.S. Government policymakers and a global community of forecasters who bring a diverse, informed perspective to their assessment of the future.

1. As initial input, policymakers work with INFER to identify *priority areas* (e.g. “AI competitiveness”) and *strategic questions* within those priority areas (e.g. “Will the U.S. regain its lead in microelectronics?”) where guidance, regulation, or clarification is needed to inform policy and strategy.
2. INFER draws on open source resources and subject matter experts to define what *contributing factors* will need to be understood to best inform the answer to the strategic question (e.g. “What will the future of domestic microelectronics manufacturing capabilities be?”). We call the process of identifying these pivotal factors “strategic question decomposition.”
3. Using factors identified in the decomposition, we define signals that we can use to assess the outcome of that factor. From those signals, we author *forecast questions* that appear on our public crowdsourced forecasting platform at inferpublic.com (e.g. “Will the U.S. Congress pass tax credits to incentivize semiconductor manufacturing and design in 2022?”).
4. Based on the forecasts the crowd generates, INFER creates curated reports and automated dashboards to share with policymakers. Unlike a one-time survey, individuals are encouraged to update their forecasts over time so INFER can always create near real-time assessments of what will happen in the future.

Here’s a model of that strategic question decomposition process and terms we use to describe it:

- **Strategic questions** represent the broad categories we want to learn more about. Breaking down a strategic question is the main focus of a decomposition.
- **Contributing factors** are the primary drivers of the strategic question. They directly influence the outcome in one direction or another.
- **Sub-factors** are the individual elements that make up and influence a contributing factor. Depending on the size and scope of the strategic question, it may be possible to identify signals directly from the contributing factors without the need for sub-factors.
- **Signals** are specific metrics or events that tell us how a factor or sub-factor is trending, and that ultimately used to create **forecast questions** we publish on INFER.



Once forecasts have been made, the decomposition model is used to synthesize and analyze data from individual forecasts and glean information about how a strategic question might trend. We call this **recomposition**—the process and product of combining forecasts together to provide insight into the strategic question. This final recomposition can take many forms, e.g., a dashboard, a summary report, or an index.

Decomposing our strategic question

Forecast questions are selected to provide coverage over the contributing factors and subfactors listed on page 3 , with an emphasis on questions that allow us to assess multiple factors or subfactors at once. The table below lists the forecast questions INFER has launched to assess our broader strategic question about which countries will lead in AI development.

Contributing Factor	Subfactor	Forecast Question
Research	Publications	Which country will have published the second most “high impact” journal articles on artificial intelligence in 2022? Which country or union will have the second most citations of “high impact” AI scientific publications in 2022?
	Institutions	How many AI scientific publications will be published by EU institutions in 2022? In 2022, will a Chinese institution have the most “high impact” AI research publications?
Human Capital	Migration	How many European Union countries will have an AI skill migration greater than 2 per 100,000 in 2022?
	Skill Penetration	How will the U.S. rank in AI skills penetration in 2022?
	Demand	Will U.S. domestic labor demand for artificial intelligence skills equal or exceed 3.2% for December 2022?
Technology	Patents	What percentage of the world’s AI patents will be granted in the European Union and United Kingdom in 2022? What percentage of the world’s AI patents will be granted in the United States in 2022? What percentage of the world’s AI patents will be granted in China in 2022?
	Software Development	What percentage of contributions to Github’s “very high impact” AI projects will be from China in 2022? What percentage of contributions to Github’s “very high impact” AI projects will be from the EU in 2022?

Appendix B - Current Forecaster Pool Profile

Attributes of the INFER forecaster pool:

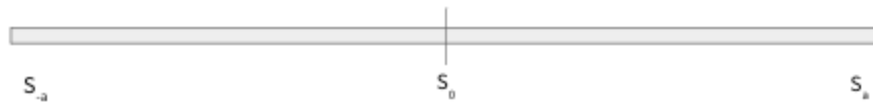
Gender	
Male	58%
Female	29%
Nonbinary, or prefer not to say	13%
Age	
18-24	35%
25-36	32%
37-48	13%
49-60	7%
61+	13%
Country	
United States	55%
Canada, UK, European Union, AUS	23%
South East Asia	8%
Central and South America	13%
Other	1%
Education	
Graduate education (completed or have some)	67%
Undergraduate education (completed or have some)	33%
Degree Fields - choose all that apply	
Science, Engineering, or Technology	34%
Political Science, International Relations, International Business	34%
Foreign Service, Security, or Government	20%
Public Policy	19%
Public Administration, Business Administration	8%
Other	21%
Experience in Relevant Topics 1-Not at all familiar to 5-Very Familiar	
Rated 4-5	
AI or machine learning	43%
U.S. policy on AI	22%
China policy on AI	16%
Advanced computing (supercomputers, quantum)	18%
Biotechnology	19%
Climate science	27%
Energy	27%
Forecasting and critical judgment	59%
Reasoning, decision making, and rationality	74%
Cognitive psychology	42%

Appendix C - Methodology for Slider Position

For each strategic question, three scenarios are defined:

- S_a : Scenario A
- S_{-a} : Scenario -A represents the opposite of Scenario A
- S_0 : Scenario 0 represents perpetuation of the status quo.

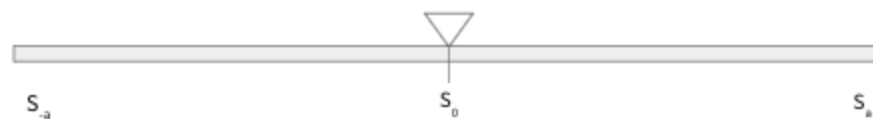
These three scenarios are represented on a horizontal axis, called the slider. This axis runs from -1 to 1, with 0 at the midpoint. The midpoint is labeled S_0 , the endpoint at -1 is labeled S_{-a} , and the endpoint at 1 is labeled S_a .



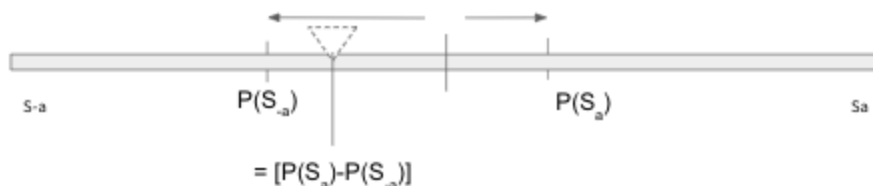
A set of forecasting questions is identified, and their answers are each associated with one of the scenarios S_a , S_{-a} , or S_0 . We define the probability of a scenario S_x as the average of the probabilities of the set of outcomes associated with S_x . More formally, for a set of outcomes, O_{xi} , $i=1, \dots, n$

$$P(S_x) = \frac{\sum_{i=1}^n P(O_{xi})}{n}$$

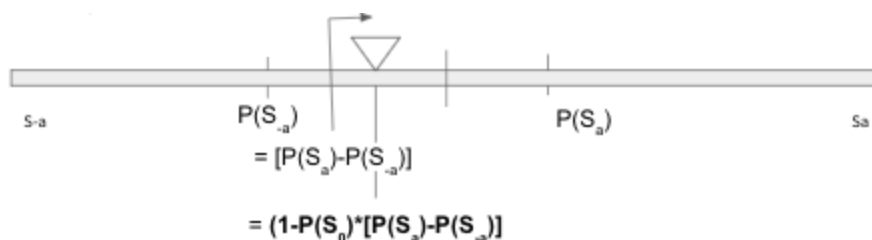
The ticker's position on the slider begins at the status quo, S_0 .



The probabilities of S_a and S_{-a} move the ticker toward their respective end points, resulting in a net movement probability of $P(S_a) - P(S_{-a})$.



The probability of the status quo scenario, S_0 , then moves the ticker back toward the status quo by multiplying the net movement probability by the probability that we depart from the status quo, $(1 - P(S_0))$.



The final position of the ticker is thus represented by the following equation:

$$= (1 - P(S_0)) \times [P(S_a) - P(S_{-a})]$$

For the purposes of this report the scenarios are defined as follows:

- S_a: The U.S. regains a two generation lead in microchip technologies.
- S_{-a}: The U.S. falls further behind in microchip technologies.
- S₀: Status quo

There are three sliders contained in this report (one each for the United States, the European Union, and China), and forecasted probabilities are only included in the calculation for the slider relevant to their associated scenario. The answers of the forecast questions included in this metric are assigned to the scenarios in the table below.

Question	Answers	Associated Scenario
What percentage of contributions to Github's "very high impact" AI projects will be from the EU in 2022?	Less than 10	EU decreases competitiveness
	10-15	EU status quo
	More than 15	EU increases competitiveness
Which country or union will have the second most citations of "high impact" AI scientific publications in 2022?	China	China decreases competitiveness
	US	US status quo
	EU	EU increases competitiveness
	India	India increases competitiveness
	Other	N/A
How will the U.S. rank in AI skills penetration in 2022?	1-2	US increases competitiveness
	3	US status quo
	4+	US decreases competitiveness
Will U.S. domestic labor demand for artificial intelligence skills equal or exceed 3.2% for December 2022?	Yes	US increases competitiveness
	No	US status quo
In 2022, will a Chinese institution have the most "high impact" AI research publications?	Yes	China status quo
	No	China decreases competitiveness
What percentage of the world's AI patents will be granted in the European Union and United Kingdom in 2022?	Less than 7	US increases competitiveness
	7-9	US status quo
	10+	US decreases competitiveness
What percentage of contributions to Github's "very high impact" AI projects will be from China in 2022?	Less than 22	China decreases competitiveness
	22-27	China status quo
	>27	China increases competitiveness
Which country will have	US	US decreases competitiveness

published the second most "high impact" journal articles on artificial intelligence in 2022?	EU	EU increases competitiveness
	China	China status quo
	Other	N/A
How many European Union countries will have an AI skill migration greater than 2 per 100,000 in 2022?	<6	EU decreases competitiveness
	6-7	EU status quo
	>7	EU increases competitiveness
What percentage of the world's AI patents will be granted in China in 2022?	<5	China decreases competitiveness
	5-6	China status quo
	7+	China increases competitiveness
What percentage of the world's AI patents will be granted in the United States in 2022?	<40	US decreases competitiveness
	40-49	US status quo
	50-59	US increases competitiveness
	60+	US significantly increases competitiveness
How many AI scientific publications will be published by EU institutions in 2022?	<2500	EU decreases competitiveness
	2500-3000	EU status quo
	>3000	EU increases competitiveness