Transforming CRE:

Commercial real estate demand drivers for AI and their footprint

October 2024 Report

Northern California Research

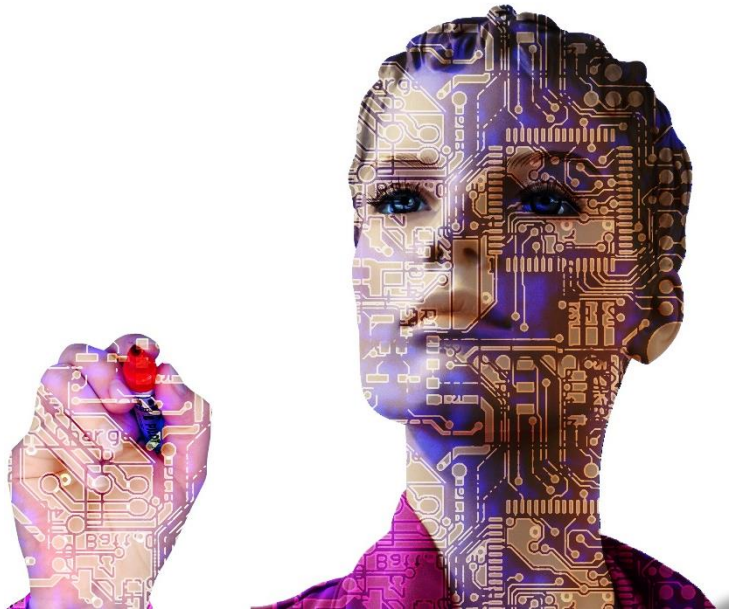
JLL SEE A BRIGHTER WAY

“

(AI) as the most profound technology humanity is working on. More profound than fire, electricity, or anything that we have done in the past."

Sundar Pichai – CEO of Google

Artificial Intelligence's Potential Impact By 2030



$15.7 Trillion

AI's potential contribution to the world economy in 2030 according to PwC, with the greatest gains coming from labor productivity

Generative AI

Could potentially raise global GPD by 7%, or $7 trillion according to Goldman Sachs by increasing productivity by 1.5 percentage points over 10 years

Life Sciences

AI is projected to reach a $194.4 billion value in the healthcare department by 2030, according to Allied Market Research

Robotics

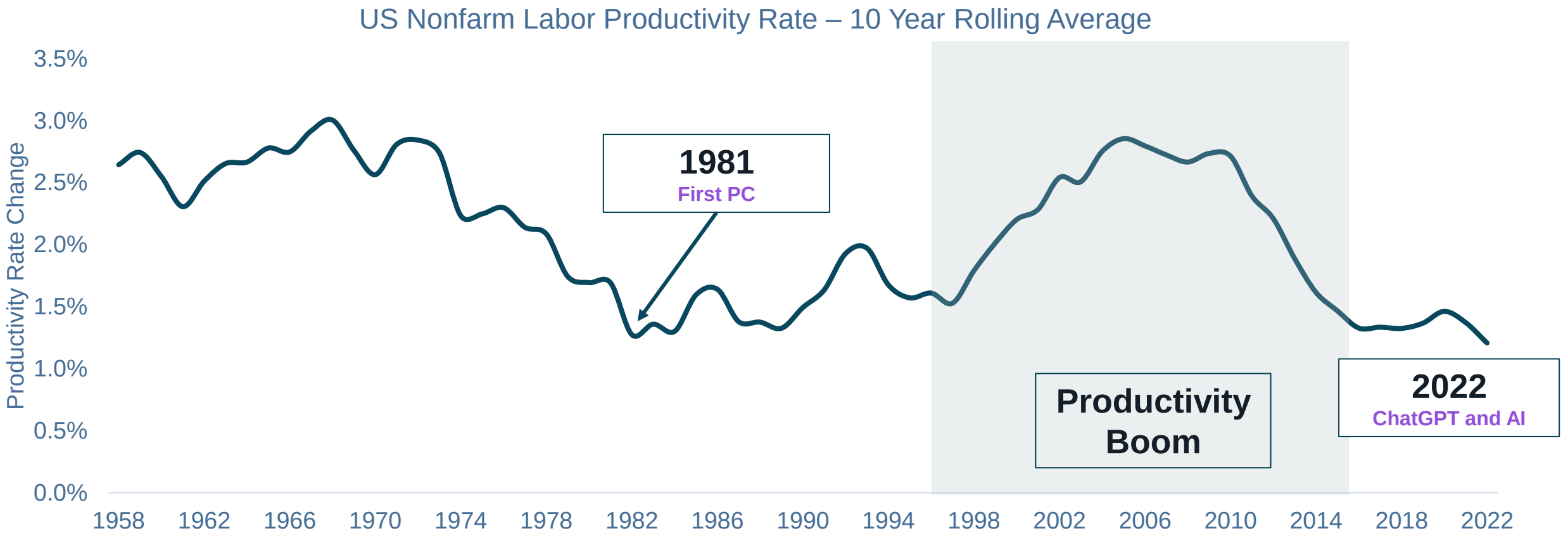
Oxford economics projects robots could boost Global GDP as much as 5.3%, or $4.9 trillion to the global economy if robotics adoption quickens

Aerospace and Defense

The Pentagon is planning to spend $1.8 billion in 2024 on AI and Machine Learning, with AI projected to reach a valuation of $14.4 billion globally in 2030.

AI Could Boost Labor Productivity

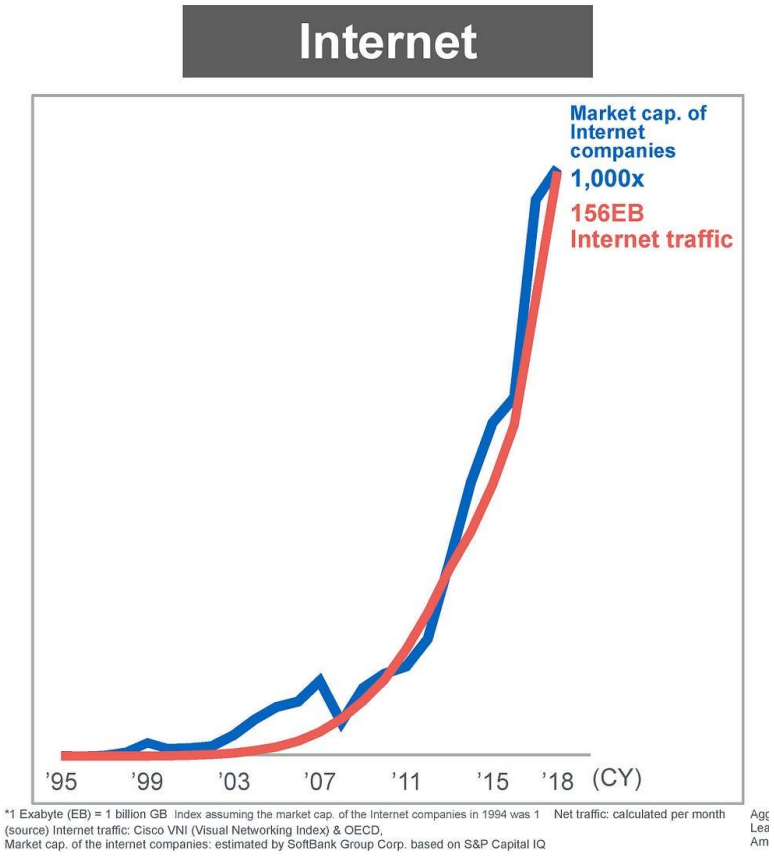
Technological milestones have resulted in a labor productivity boom roughly 20 years after invention, with the electric motor in 1890 leading to a production boom around 1910 per Goldman Sachs. AI could be the next milestone in labor productivity

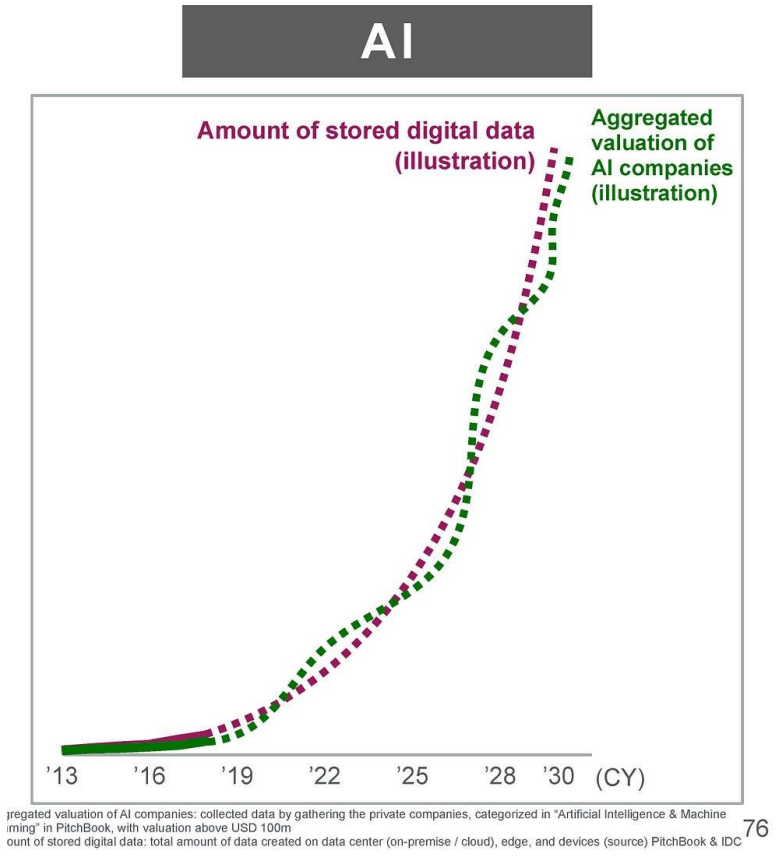


Source: JLL, 2024, Data released May 4, 2023; Bureau of Labor Statistics, Office of Productivity and Technology, Goldman Sachs

AI Could Be The Next Dot Com

The internet changed our behavior and brought about many companies who are highly influential, just not as fast as we thought. The speed of which AI is adopted is most important, the challenge lies in the timing of investments and if AI will be profitable.





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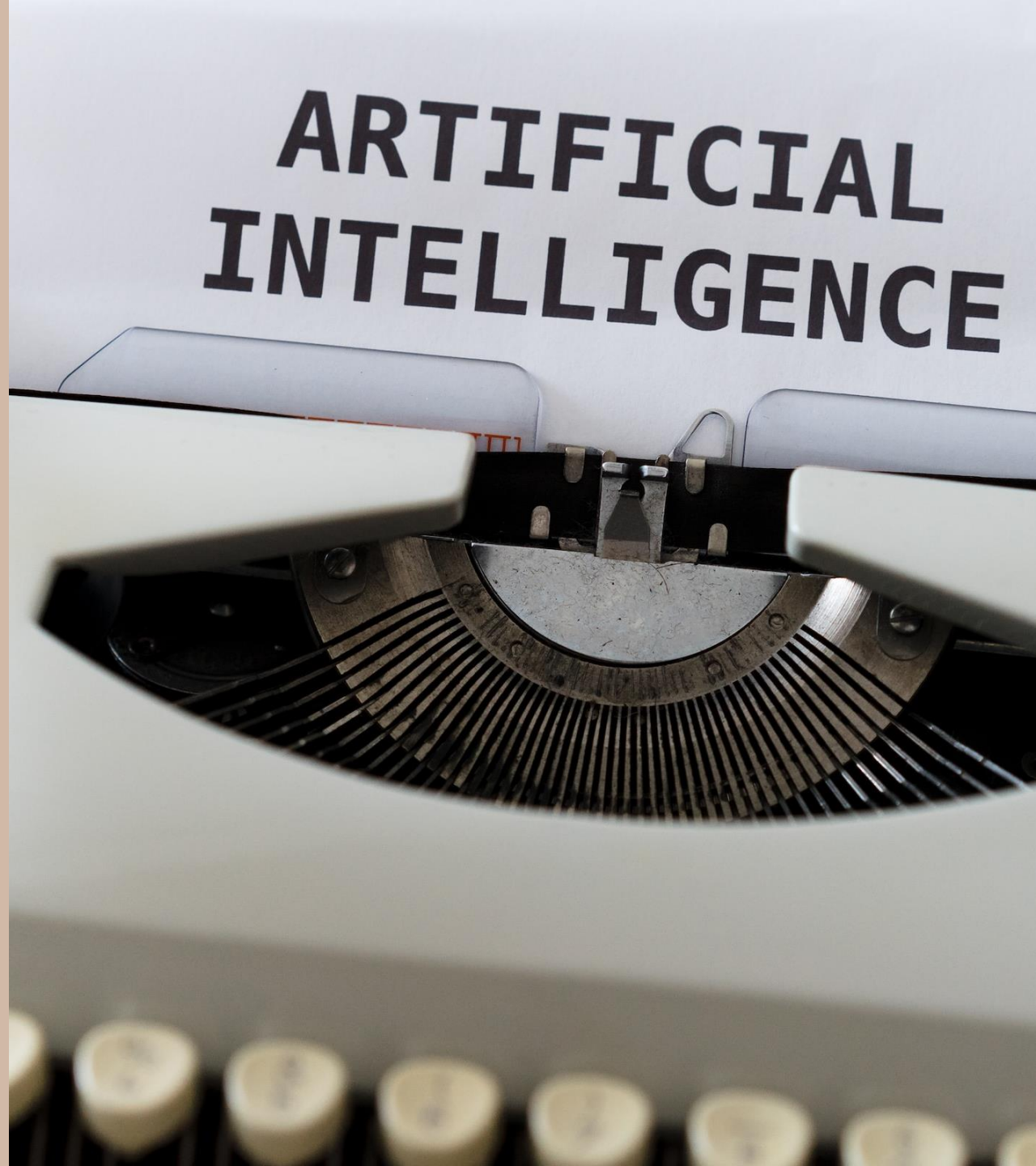
Source: Softbank 2018, https://medium.com/swlh/why-softbank-bets-big-on-ai-def77720e483

Factors Driving AI Growth



Factors promoting the growth of AI

VC funding is needed to sustain the growth of AI companies, most of which are still in the early stage

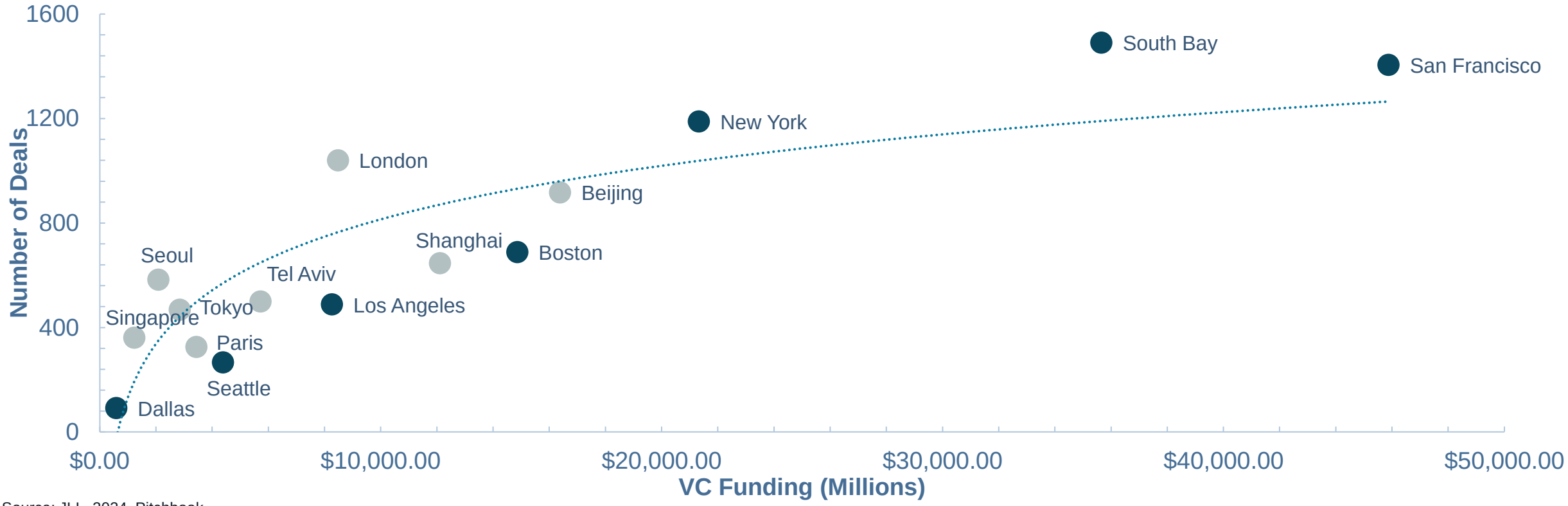
Proximity and investment from Big Tech companies, particularly Google and Microsoft has fuelled the growth of AI companies

Proximity to major AI institutions and international talent inflow to certain cities has driven most of the early AI growth.

Business connections, networking, and clustering of AI companies are also key in where AI companies choose to start.

San Francisco, Silicon Valley, and New York have led the world in VC funding for AI companies

VC Funding By City Since 2020 (Cumulative)

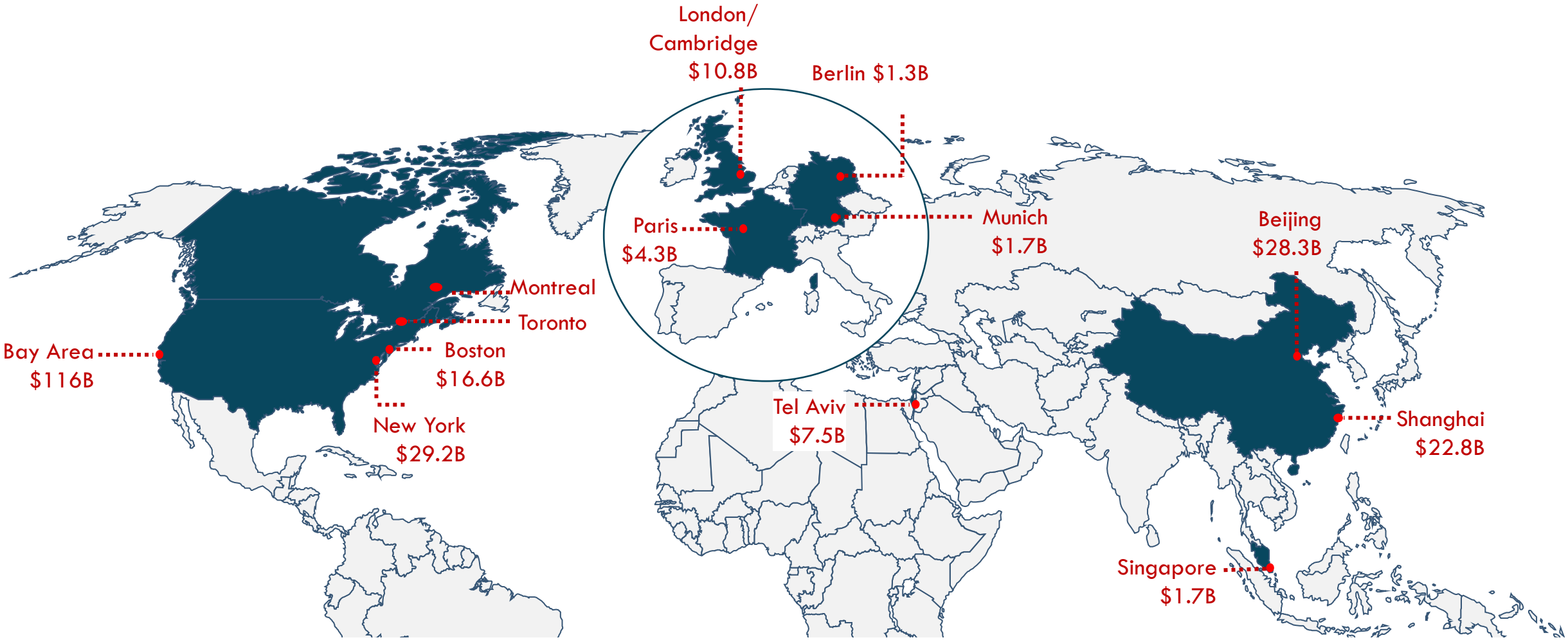


Source: JLL, 2024, Pitchbook

The Global Race for AI

Global AI-Hubs and Cumulative AI Investment Since 2014

European Cities with Big Tech AI Institutions such as Google Brain will benefit as companies such as Mistral AI had cofounders who worked there. AI is also becoming a national priority for major European countries.



Source: JLL, 2024, Pitchbook, based on AI investment and existing AI institutions and AI VC funding

Big Tech’s Race for AI

Microsoft is using AI to focus on enterprise needs, with their Microsoft Copilot designed to be a tool in Office 365, aimed to boost employee productivity by generating ideas and creating.

Companies Invested: OpenAI, Databricks, Humane, Typeface, AiFlux, Follo, Docbot, Bright Box

Google has been building up for the release of their counterpart to ChatGPT in Gemini. Google also has major research labs and has been heavily involved in AI research.

Companies Invested: Waymo, Anthropic, Releva, InnoBrain, Mobovi

Meta just built DINOv2, a self-supervised learning model that trains computer models by accurately identifying individual objects within images and video frames. In addition, Meta has been training Llama, an AI model to challenge GPT.

Companies Invested: Gus, Gofind

Amazon has been quiet about their generative AI; however, they have many chips to help with AI models such as AWS Inferentia2, a machine learning chip that can help with AI as well as Trainium chips.

Companies Invested: AI21 Labs, and Stability AI

While Apple has not been in the headlines regarding AI developments, they have quietly been hiring and spending millions of dollar a day into Siri improvements with generative AI.

The biggest beneficiary of AI’s growth, NVIDIA’s market cap has grown rapidly in the past several months. NVIDIA has also developed BioNeMo, a generative AI mode for life sciences.

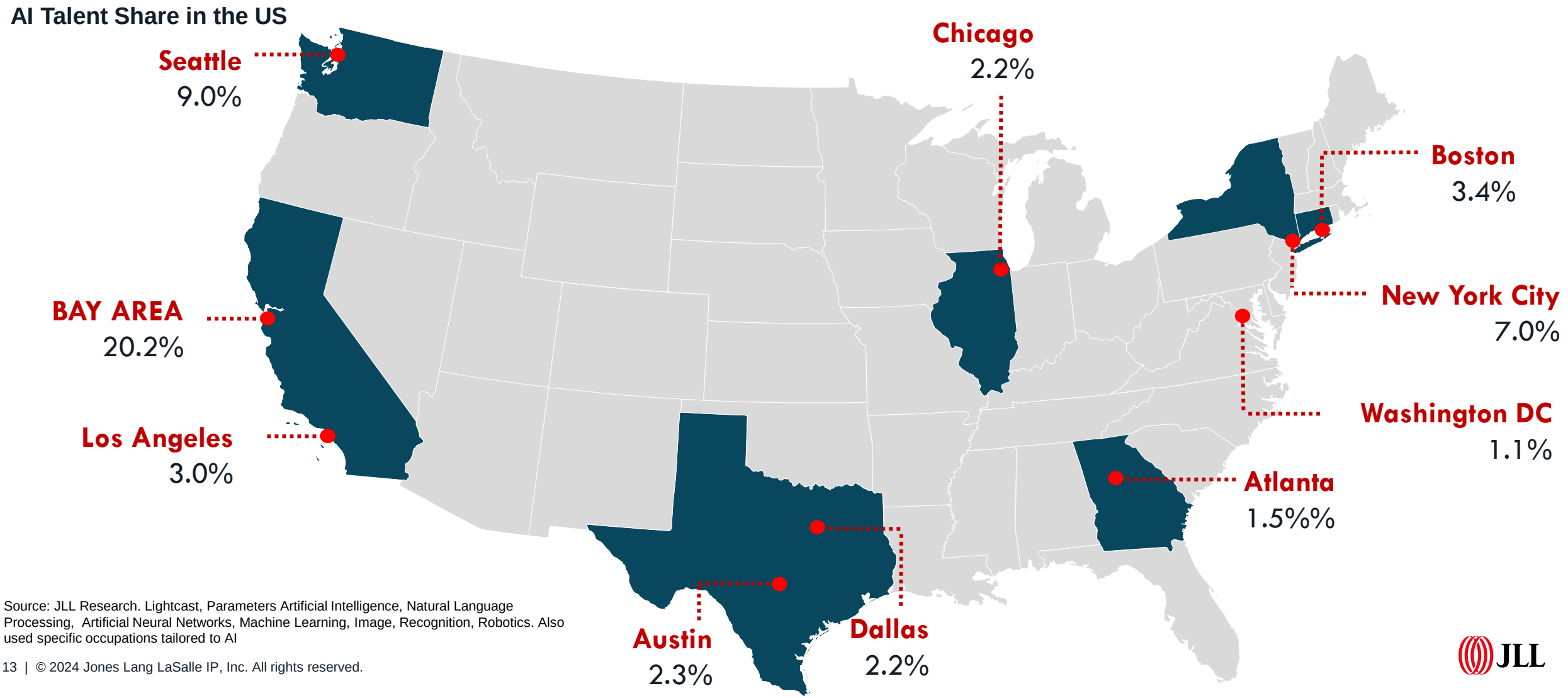
Companies Invested: Recursion Pharmaceuticals, Inflection AI, Hugging Face

Tesla has been using AI in its cars, as well as developing a humanoid robot (Tesla Bot) which was announced in 2021. The aim of Tesla Bot is to help perform repetitive tasks.

Adobe has quietly been launching several generative AI tools in its existing platform to help artists and creators. Their tool, Firefly, has caused several investors to call Adobe a primary AI player.

AI’s Talent Geography

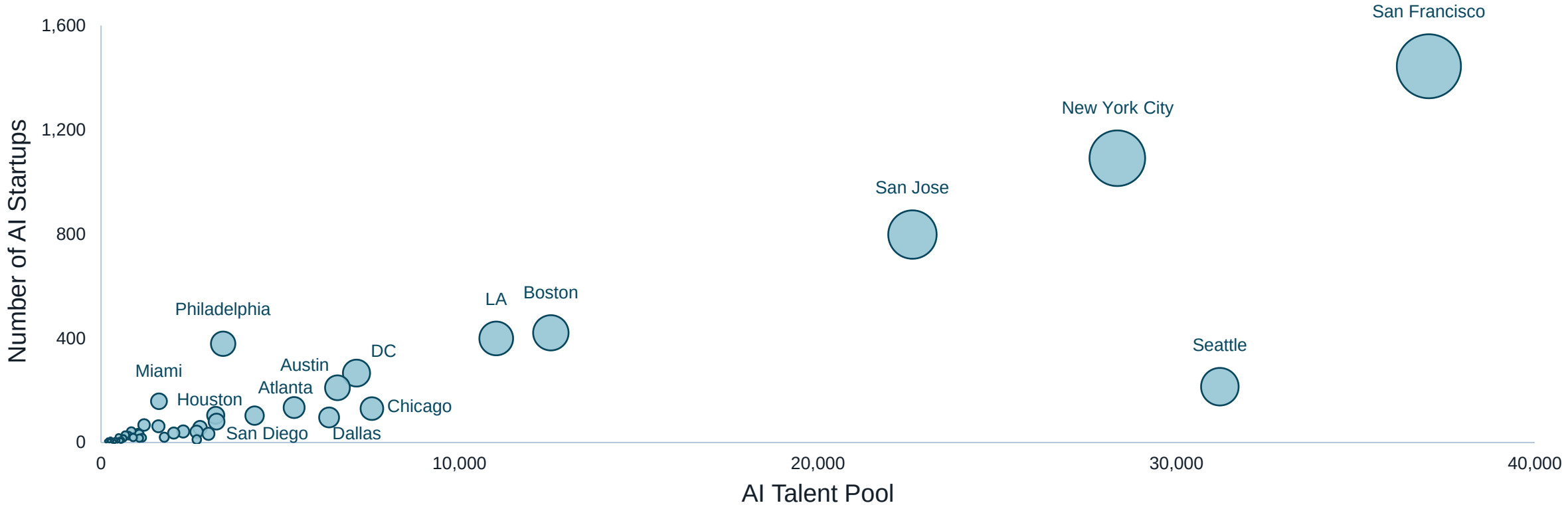
AI talent is primarily concentrated on coastal markets, with the Bay Area, Seattle, and New York being the top three



Source: JLL Research. Lightcast, Parameters Artificial Intelligence, Natural Language Processing, Artificial Neural Networks, Machine Learning, Image, Recognition, Robotics. Also used specific occupations tailored to AI

San Francisco, New York, Silicon Valley, and Seattle are major AI Innovation hubs

AI Hubs: Startups vs. Talent Pool Across The U.S (2024)



Source: JLL Research. Lightcast, Pitchbook

Footprint of US AI Companies

“

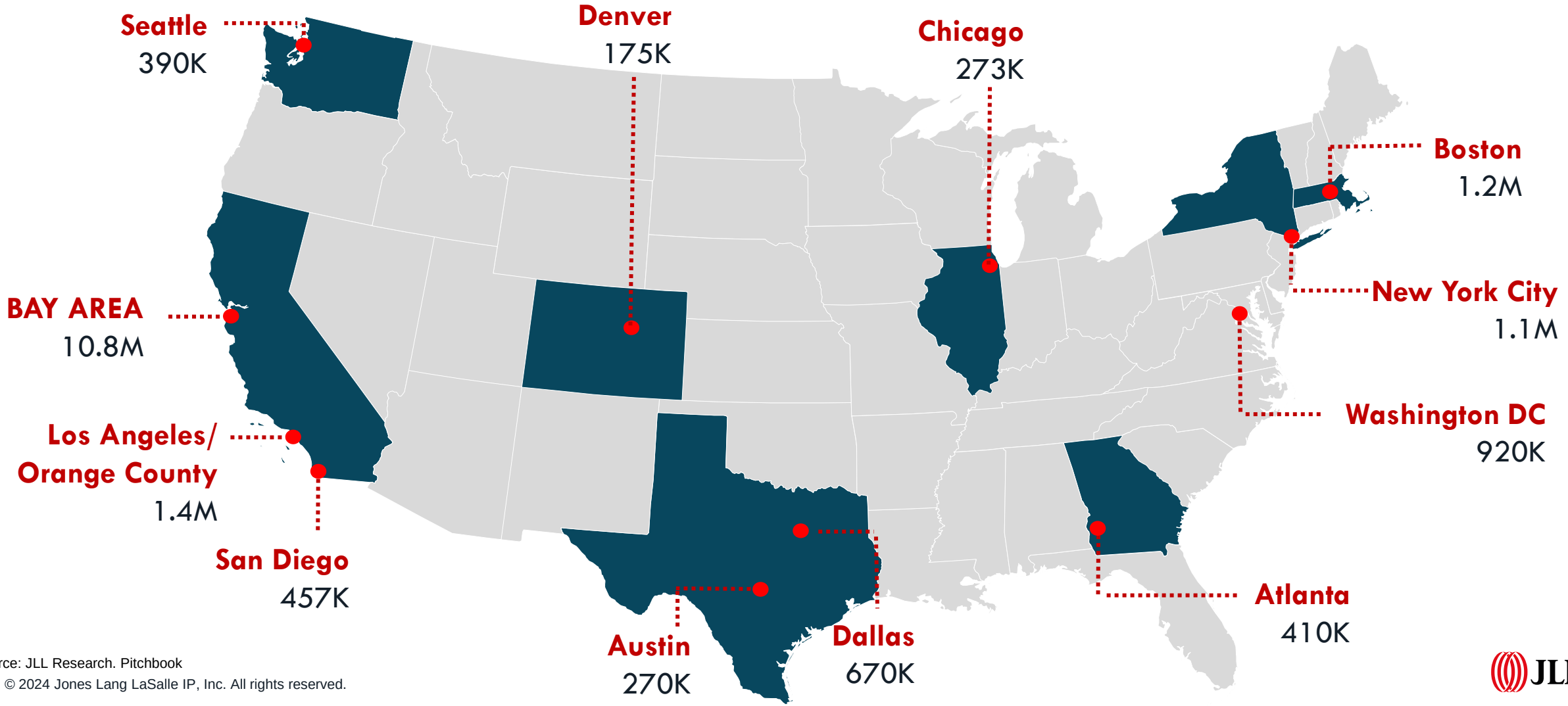
I think …one of the tech industry’s worst mistakes …was that everybody could go full remote forever, and…there was going to be no loss of creativity

Sam Altman

CEO of OpenAI

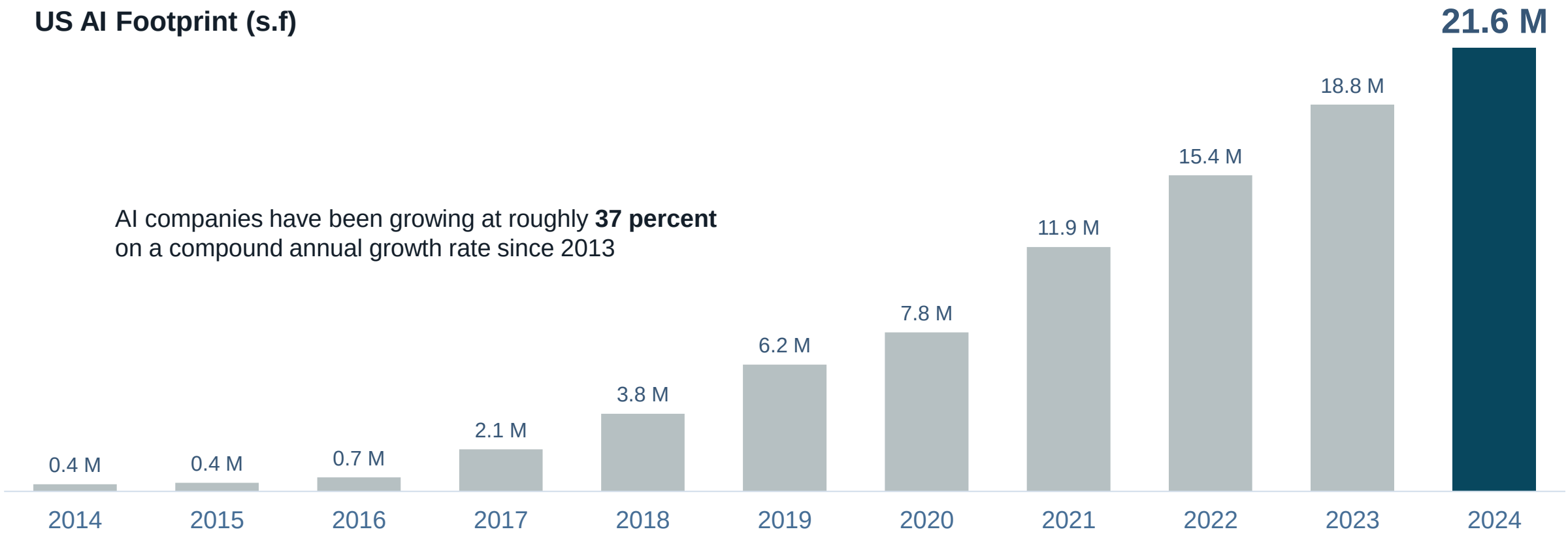
AI companies are highly concentrated in gateway cities

AI Footprint (square footage leased)



Source: JLL Research. Pitchbook

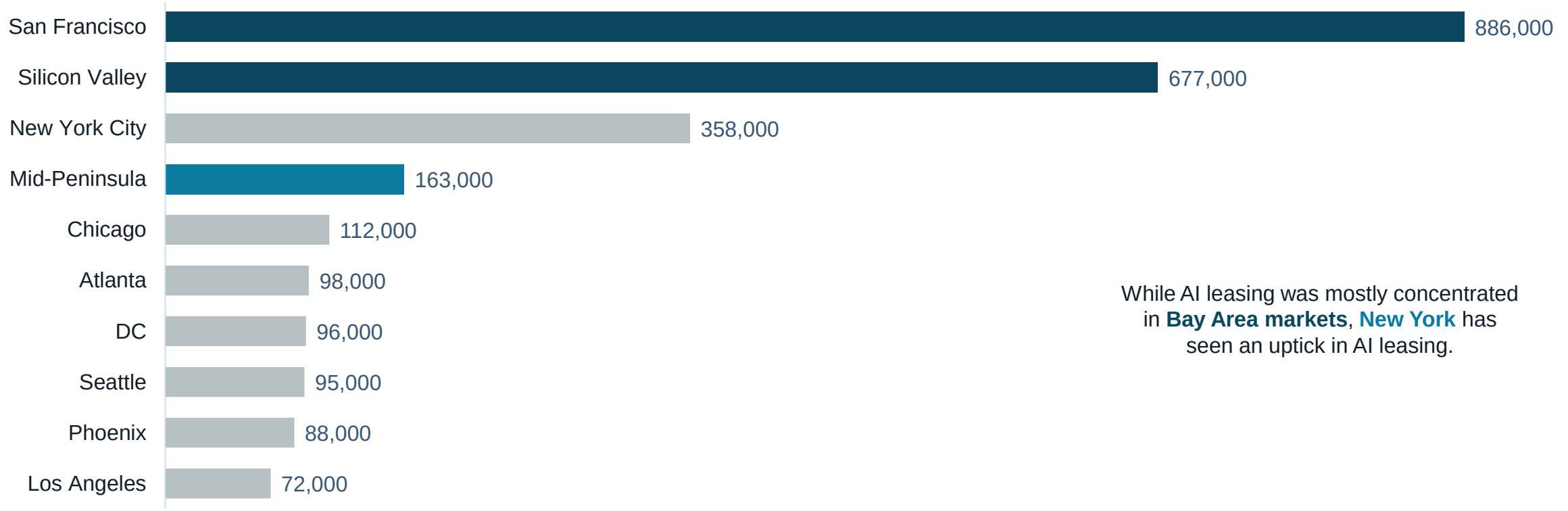
AI companies have more than doubled their footprint since the end of 2020 with the rapid growth of autonomous vehicles and generative AI.



Source: JLL, 2024 Pitchbook and JLL Research, PwC, sizing the Prize (2017)

The Bay Area saw most AI leasing YTD, followed by Silicon Valley. New York's presence is expanding considerably since 2023.

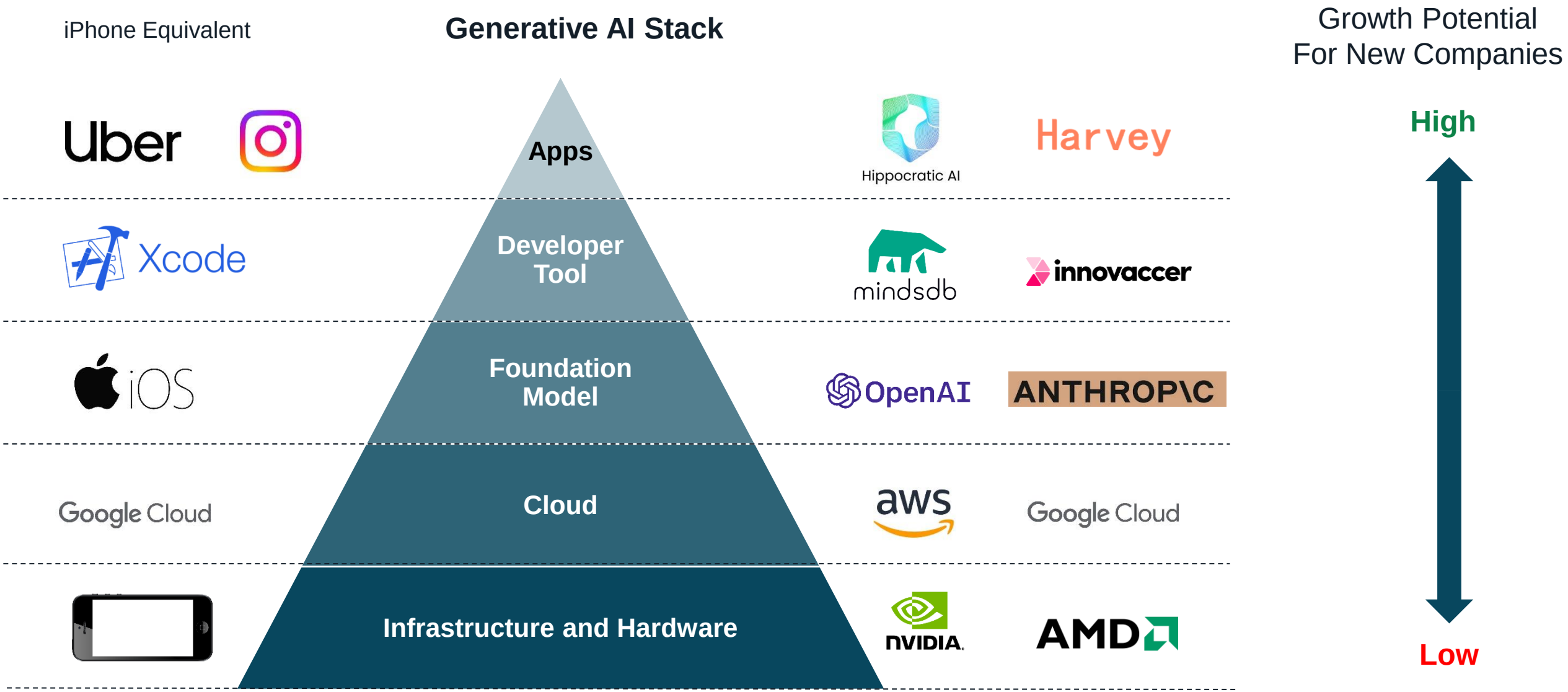
Top Ten Markets for AI Leasing – 2024 YTD (s.f.)



While AI leasing was mostly concentrated in **Bay Area markets**, **New York** has seen an uptick in AI leasing.

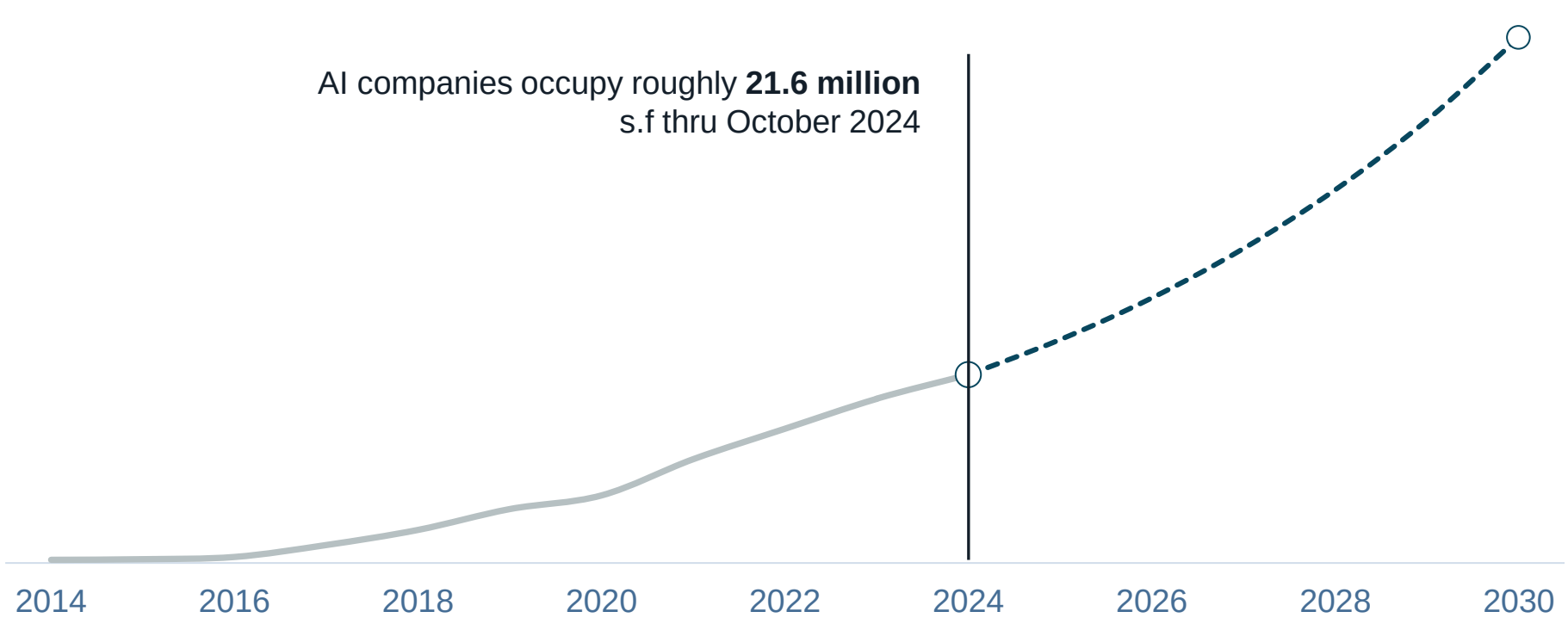
Source: JLL, 2024 Pitchbook and JLL Research

Future office demand will come from apps/developer tool companies where the growth potential for new AI companies is high.



Assuming a rough estimate of PwC's forecasted GDP growth for AI, AI firms could **grow roughly 47 million s.f. this decade**.

US AI Footprint



60.3M s.f forecasted AI footprint assuming AI's CRE footprint grows with PwC's forecasted 18.6% CAGR for AI's GDP thru 2030

Source: JLL, 2024 Pitchbook and JLL Research, PwC, sizing the Prize (2017)

Implications on the labor force and CRE

AIs Potential To Create New Jobs

It will affect some jobs but also create jobs down the line, if history repeats itself

	Telephone	Automobile	Computer	Internet	AI
	“They took my job” 	“They took my job” 	“They took my job” 	“They took my job” 	
Jobs Created	Telephone operators Salespeople Customer service Copywriter	Car mechanic Assembly line workers Parts suppliers Car Dealers	Computer Engineers Software Engineers Programmers Graphic Designers Game Designers	Website designers Social Media jobs SEO consultants App developers	AI Engineers AI Auditors AI Ethics/Compliance Machine Learning Engineers

Generative AI Is Already Having a Massive Impact

How will it impact the US Workforce?

Research from the University of Pennsylvania found that at least 80% of the workforce could have at least 10% of their tasks affected by Large Learning Models (LLM). Furthermore, **15% of all workers' tasks** in the US could be completed faster when incorporating LLMs, and when incorporating software with these LLMs, **could increase to 50% of all tasks**

Contribution to GDP

Generative AI's Potential by 2030
7.0%

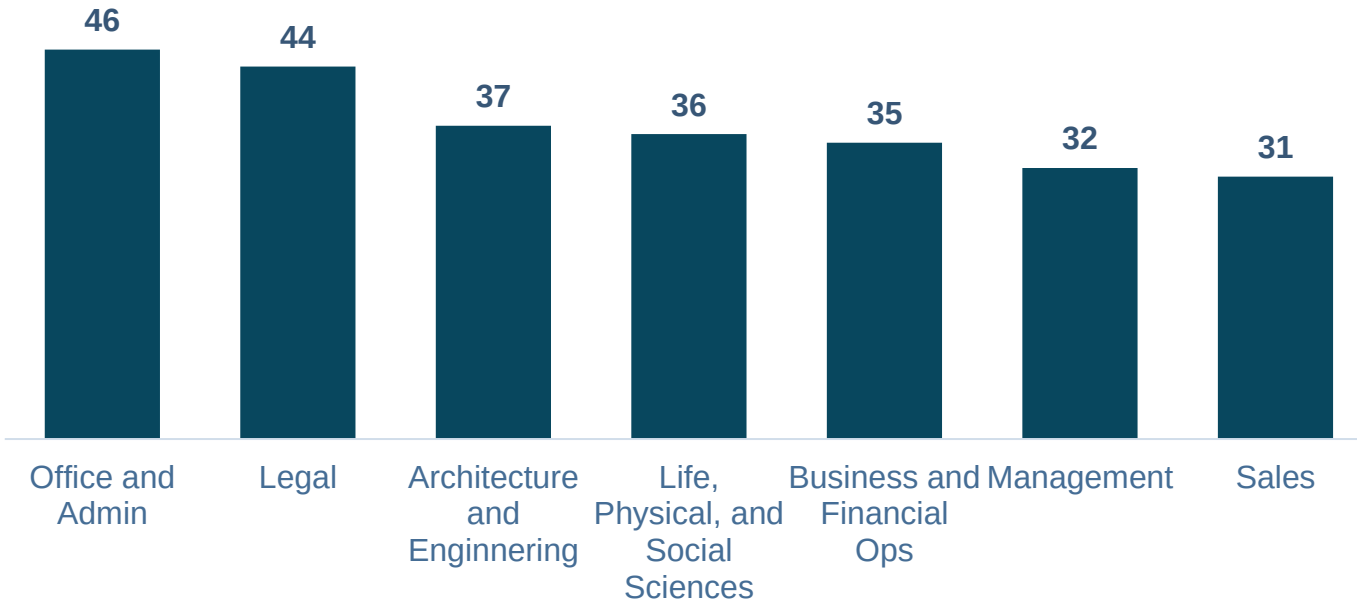
Machine Learning's Potential
1.5-2.9%

Real GDP Growth (Q4 2022)
2.6%

Professional Services (Q4 2022 contribution)
0.62%

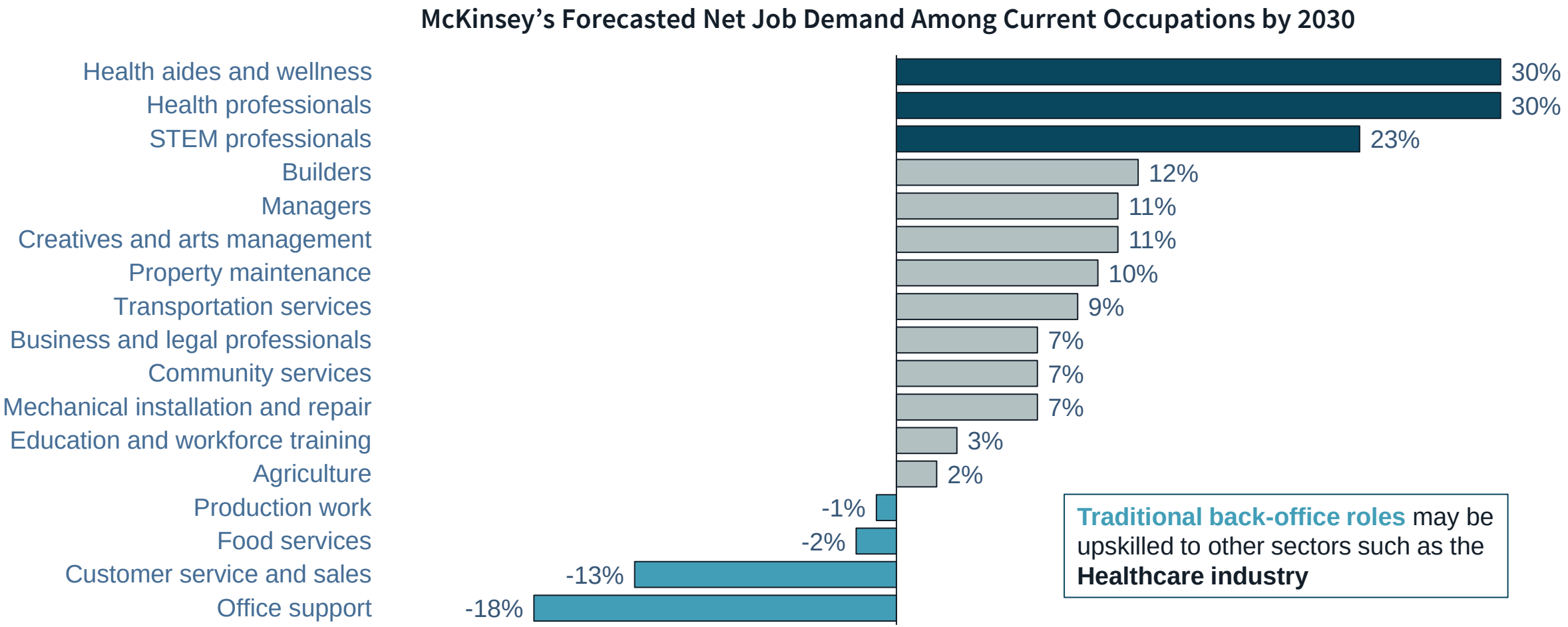
Employment Percentage Exposed to Automation by AI In the US

The chart below does not equate to jobs lost



Source: JLL, 2024, Goldman Sachs Research, Tomasz of Theory Ventures, University of Pennsylvania – "An Early look at the Labor Market Potential of Large Language Models"

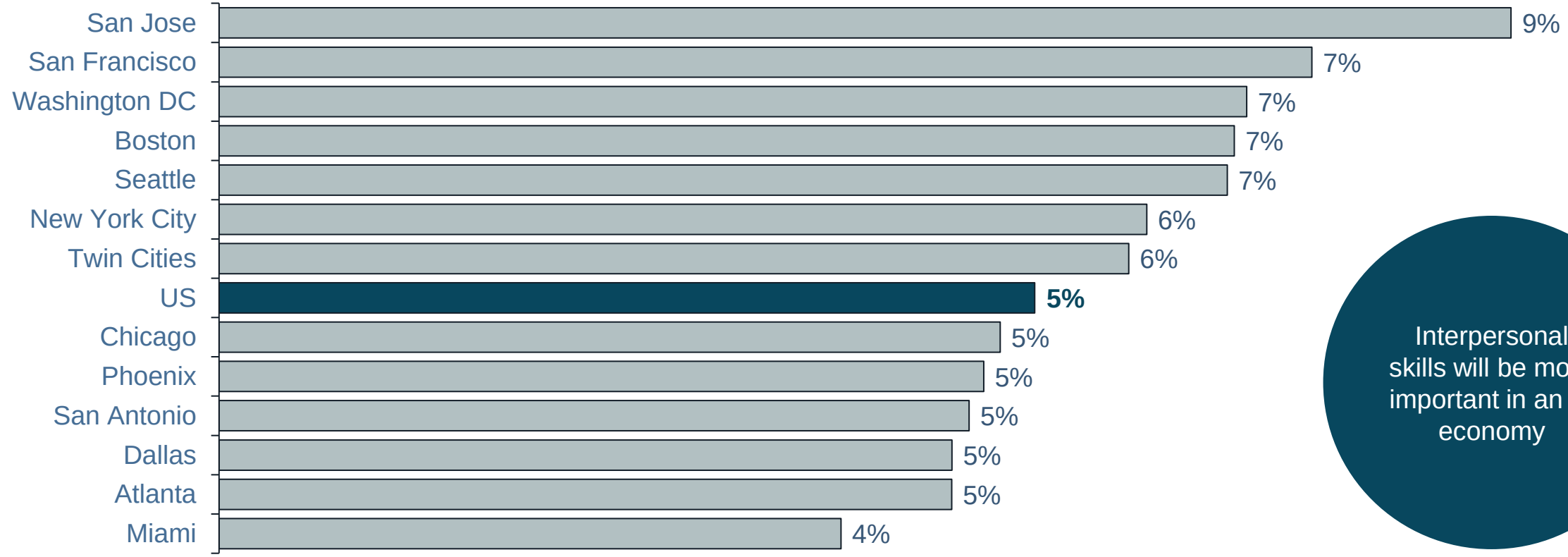
AI Could Drive Demand Among Most Current Occupations; however, upskilling will need to happen across all occupations



Source: McKinsey 2023 Generative AI Impact on Jobs

Using McKinsey's forecast, there could be more job demand across all occupations in an AI economy

McKinsey's Forecasted Net Job Demand Among Current Occupations by 2030 (MSA)



Interpersonal skills will be more important in an AI economy

Source: McKinsey, BLS May 2022 data

Thank you

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Appendix

Definitions of Standard Terms

- **LLM** Large Language Model
- **MANGMA** Microsoft, Amazon, Nvidia, Google, Meta, Apple
- **GPU** Graphics Processing Unit
- **ML/AI** Machine Learning/ Artificial Intelligence
- **Chat-GPT 3.5** The version of ChatGPT that released in November of 2022

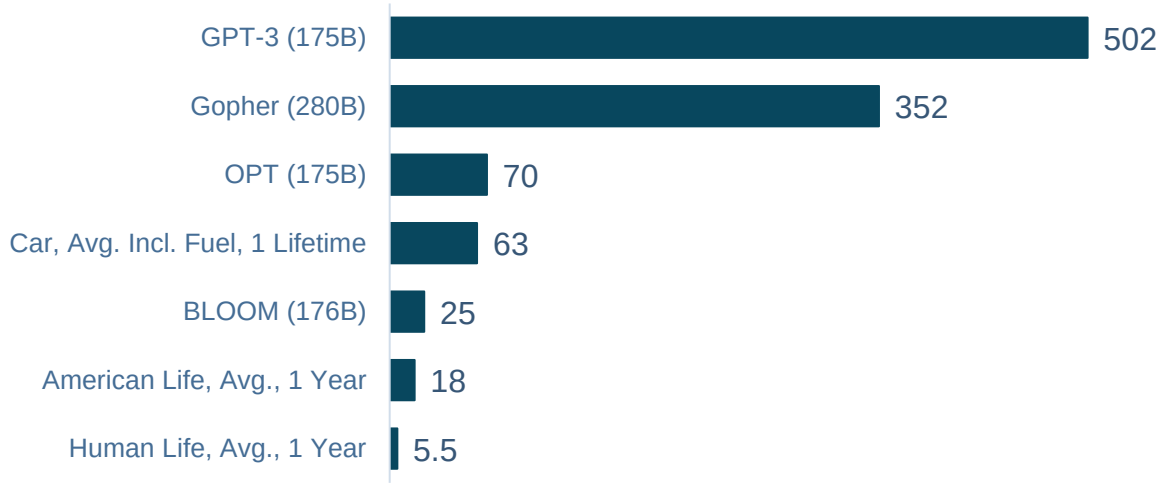
Environmental Impact of Large Language Models

AI's recent growth and potential is high; however, the **environmental impact of machine learning is high**, with generative AI **consuming large amounts of energy and power**. Furthermore, companies such as Samsung have banned the use of GPT due to **data concerns**, and HIPAA compliance remains a priority for healthcare companies. Additionally, countries and regions such as China and the European Union have taken steps to **regulate AI**, this could help against the misuse of data.

Impact of Machine Learning Models

Model	Datacenter PUE (power usage effectiveness)	Grid Carbon Intensity (gCO2eq/KwH)	Power Consumption MWh	CO2 Emissions (tonnes)
Gopher	1.08	330	1,066	352
Bloom	1.20	57	433	25
GPT-3	**1.10**	**429**	**1,287**	**502**
OPT	1.09	231	324	70

CO2 Equivalent Emissions (Tonnes)

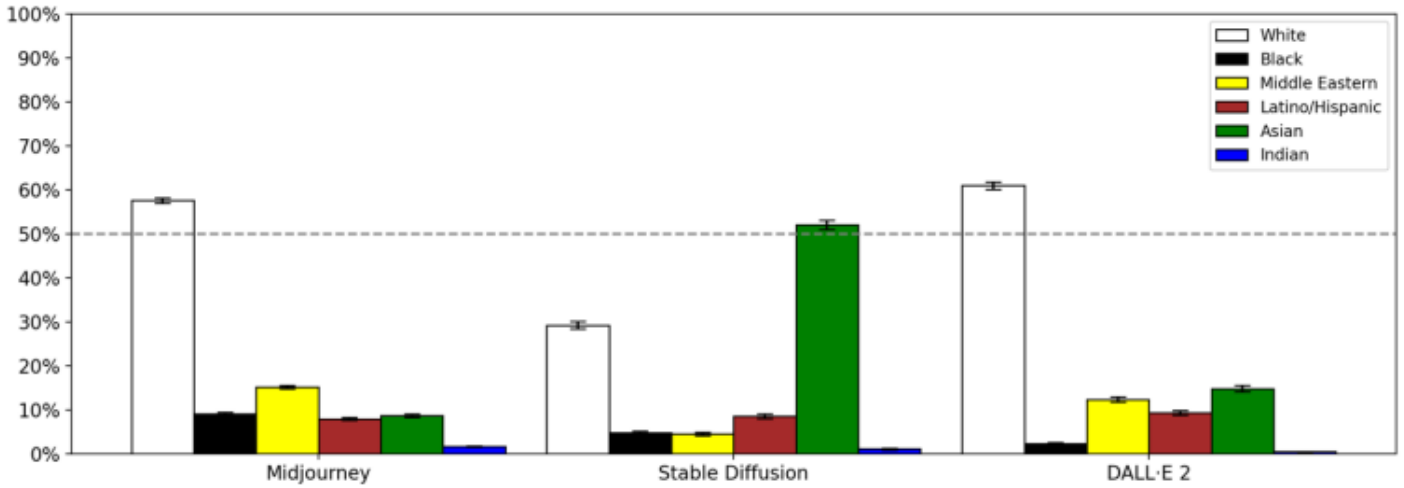


Source: JLL, 2024, Luccioni et al., 2022, Stanford Index Report

AI Bias

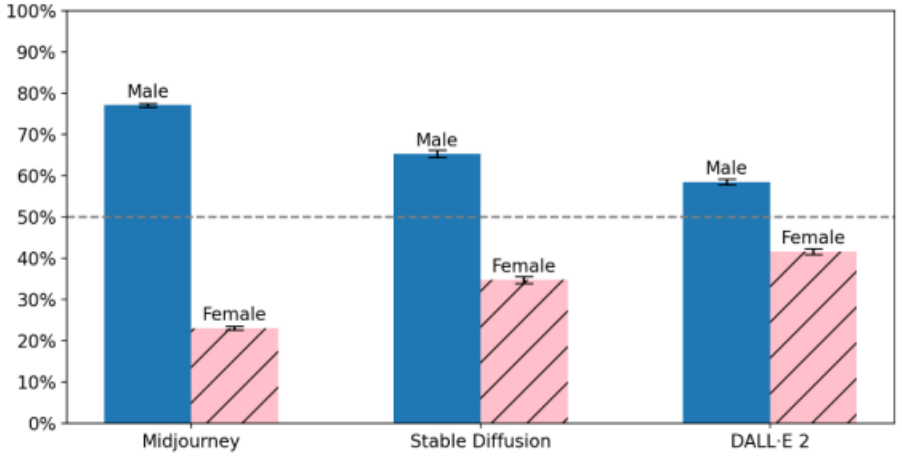
Multiple studies have been done to show that generative AI could potentially perpetuate stereotypes through enforcing gender portrayals while underrepresenting women and African Americans in AI generated images. As AI models are primarily trained in developed countries with datasets from Google, Meta, Microsoft, Amazon, Tencent, Alibaba, and Baidu, developing countries may struggle to use AI models that cater to developed countries.

Racial Distribution in AI Image Generators



Source: JLL, 2024, “Bias In Generative AI –Carnegie Mellon”

Gender Portal in AI Generators



Source: “Bias In Generative AI –Carnegie Mellon”

