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# MassVision2050

Artificial Intelligence

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MASSACHUSETTS  
**HIGHTECHNOLOGYCOUNCIL**

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## Definition of AI

The science and engineering of making intelligent machines used to perform cognitive functions associated with human minds, including perception, learning, pattern recognition and problem solving. This capability is either the core business of a dedicated AI company or represents a supporting function within a broader business.

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### Approach to quantifying market share and economic competitiveness:

- Analyze locations of companies with significant investments in AI
- Investigate patents held on AI topics and where the owners of those patents are located
- Aggregate job postings and professional profiles that use keywords related to AI:
  - Artificial intelligence, machine learning, neural network, language processing, deep learning, generative AI, prompt engineering, data building, large language models, behavior-based robotics
- Review VC investment in AI across MA and the rest of the US
- Identify notable startups and exits in the space

# Executive Summary: Artificial Intelligence

Preliminary

## Macro trends

- The AI market is estimated to have a 25.6 trillion-dollar impact on the global economy, generative AI has the potential to significantly enhance AI's value proposition, adding up to \$4.4T in value
- MA ranks 6<sup>th</sup> among states for new AI related jobs in the US since 2021, making up ~4% of the US total, a ~2% decrease in share since 2023
- California, New York, and Washington are the clear national leaders as hubs for AI leading companies and intellectual property, with MA being ranked 4<sup>th</sup> in terms of AI patent ownership since 2017

## Talent Supply and Demand

- The demand for AI-related roles has grown substantially in MA and the US (93% and 146%, respectively), with the number of employers competing for talent nearly doubling since the first half of 2021
- The demand for hard skills in the AI sector is evolving, with demand for skills such as robotics and generative AI appearing in the years since 2021
- Supply of AI talent in MA ranks 5<sup>th</sup> in the US: an estimated 68K MA-based workers have AI related roles or skills, making up 5% of total online AI profiles (an outsized share for the state, MA accounts for less than 2% of all profiles nationally)
- Although MA is producing enough graduates to fill open roles in most tech occupations, local employers must compete on a national scale and MA universities retain ~40% of graduates in-state

## Startup and Investment Landscape

- MA ranks 3<sup>rd</sup> nationally in attracting AI venture capital investment since 2020 (\$22.2B) - trailing New York (\$38.5B) and California (\$227.8B) - and AI ranks 3<sup>rd</sup> among verticals for VC investment within MA over the same period, producing 1 unicorn IPO in the past five years and 77 mergers
- MIT, Northeastern and Harvard lead MA's AI-related academic R&D, the state currently has nearly \$200M in active NSF awards for AI R&D, up from \$150 in 2023

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# Objectives for today

- **Macro trends and dynamics**
  - Talent supply and demand
  - Startup and investment landscape

# Artificial intelligence has seen rapid progress in recent years with new Generative AI tools showcasing the latest developments



**Artificial Intelligence**, the science and engineering of making intelligent machines >



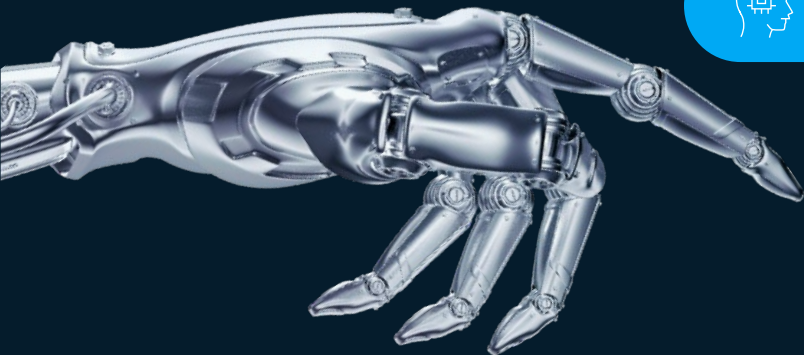
**Machine Learning**, a major approach to realize AI >



**Deep Learning** >



**Generative AI** >



1950's

1960's

1970's

1980's

1990's

2000's

2010's

2020's

## Artificial Intelligence

Is the broad field of developing machines that can replicate human behavior, including all aspects of **perceiving, reasoning, learning, and problem solving**

## Machine Learning

Is a major approach to **achieve AI by teaching machines to learn relationships hidden in data, and build approximate models of real systems**

## Deep Learning

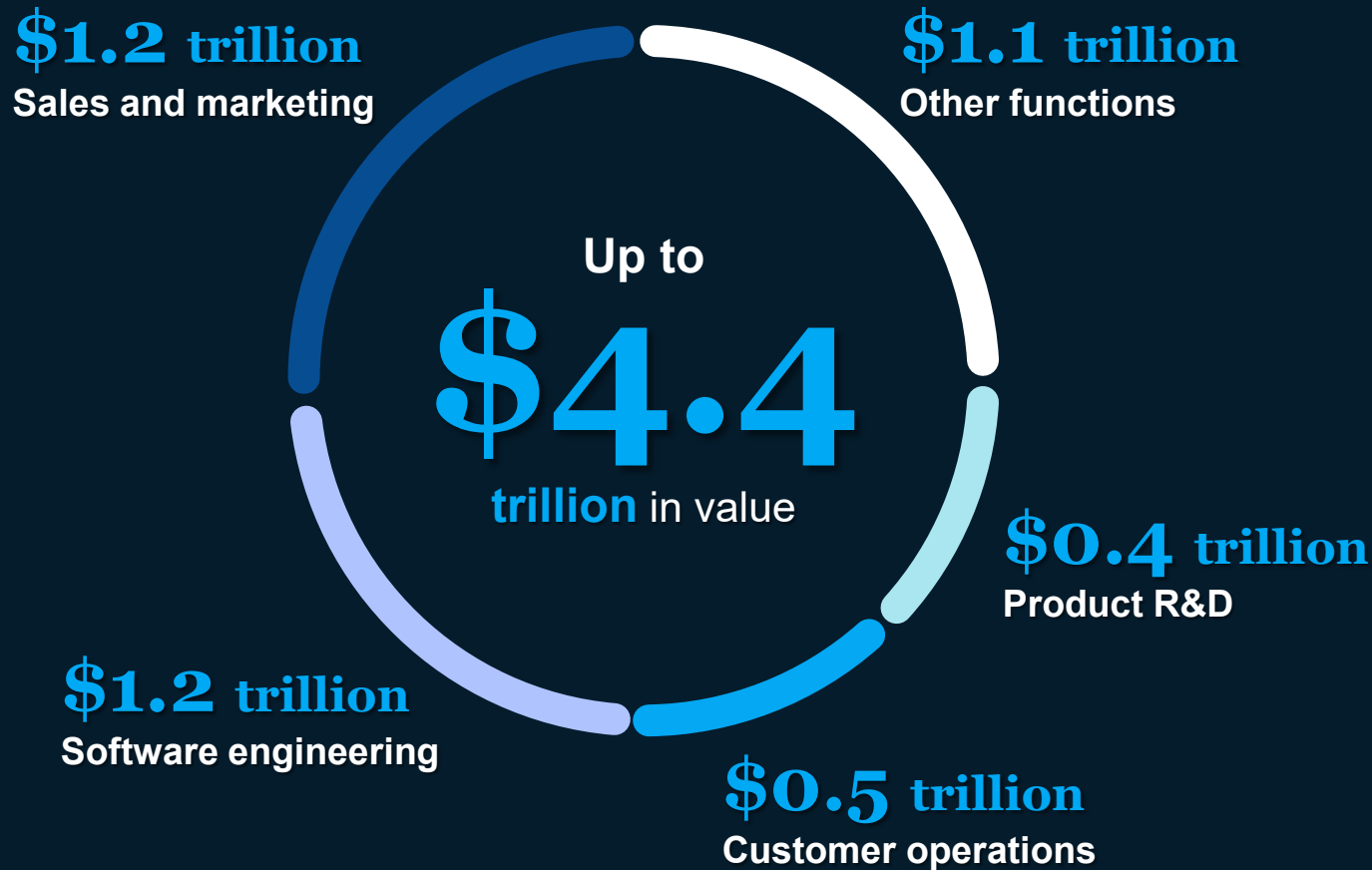
is a **branch of Machine Learning** that uses 'neural networks' to **model real systems** by mimicking how the human brain works, utilizing millions of computational 'neurons'

## Generative AI

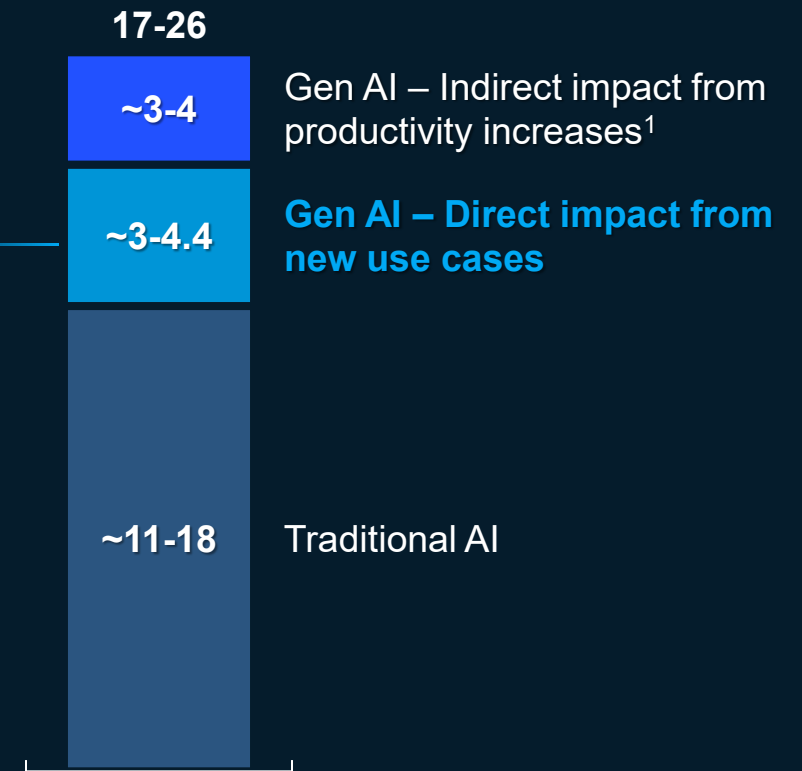
are a **branch of Deep Learning** that uses exceptionally large neural nets called **Large Language Models** ( with 100's of billions of neurons) that can learn especially abstract patterns

Applying these language models to interpret and create text, images, video, and data has become known as **Generative AI**

# Gen AI has the potential to significantly enhance AI's value proposition by enabling new use cases across all functions



## AI's potential impact on global economy \$ Trillion

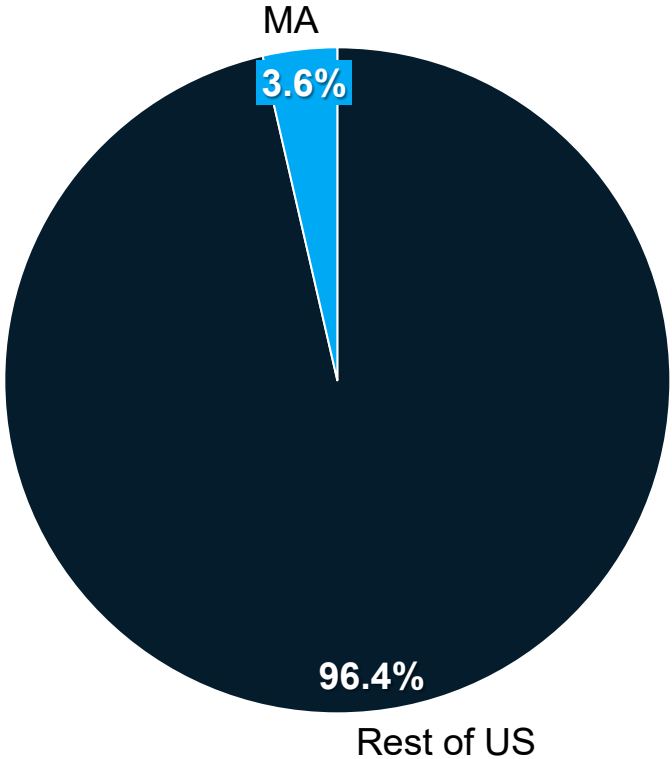


1. Details: Gen AI – Indirect impact from other productivity increases across industries (e.g., automation, efficiency improvements)

# MA has been responsible for 3.6% of the AI related jobs posted in 2025, ranked 6<sup>th</sup> in the US

Preliminary

Share of AI job postings, %, 2021-2025



Rank	State	% of AI postings nationally, 2025	Posting LQ, 2025
1	California	16.3%	1.64
2	Texas	12.6%	1.45
3	New York	6.8%	1.33
4	Virginia	5.1%	1.62
5	Illinois	4.0%	1.06
6	<b>Massachusetts</b>	<b>3.6%</b>	<b>1.30</b>
7	Washington	3.5%	1.47
8	Florida	3.5%	0.54
9	Georgia	3.3%	1.07
10	New Jersey	3.2%	1.25

MA's share of postings decreased from 5.7% in 2023

# MA has seen significant growth in Artificial Intelligence & Machine Learning patenting and is comparable to TX, MI in patent volume

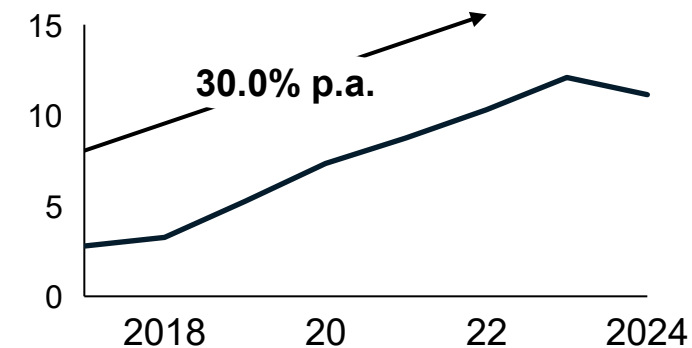
US utility patent grants on Artificial Intelligence & Machine Learning (2017 – 2024<sup>1</sup>)

## Top patent holders in MA

Nuance Communications, Inc.	455
iRobot Corporation	311
EMC IP Holding Company LLC	195
Mitsubishi Electric Research Laboratories, Inc.	170
Motional AD LLC	147
Massachusetts Institute of Technology	100
Raytheon Company	100
Bose Corporation	66
Boston Dynamics, Inc.	58
FMR LLC	41

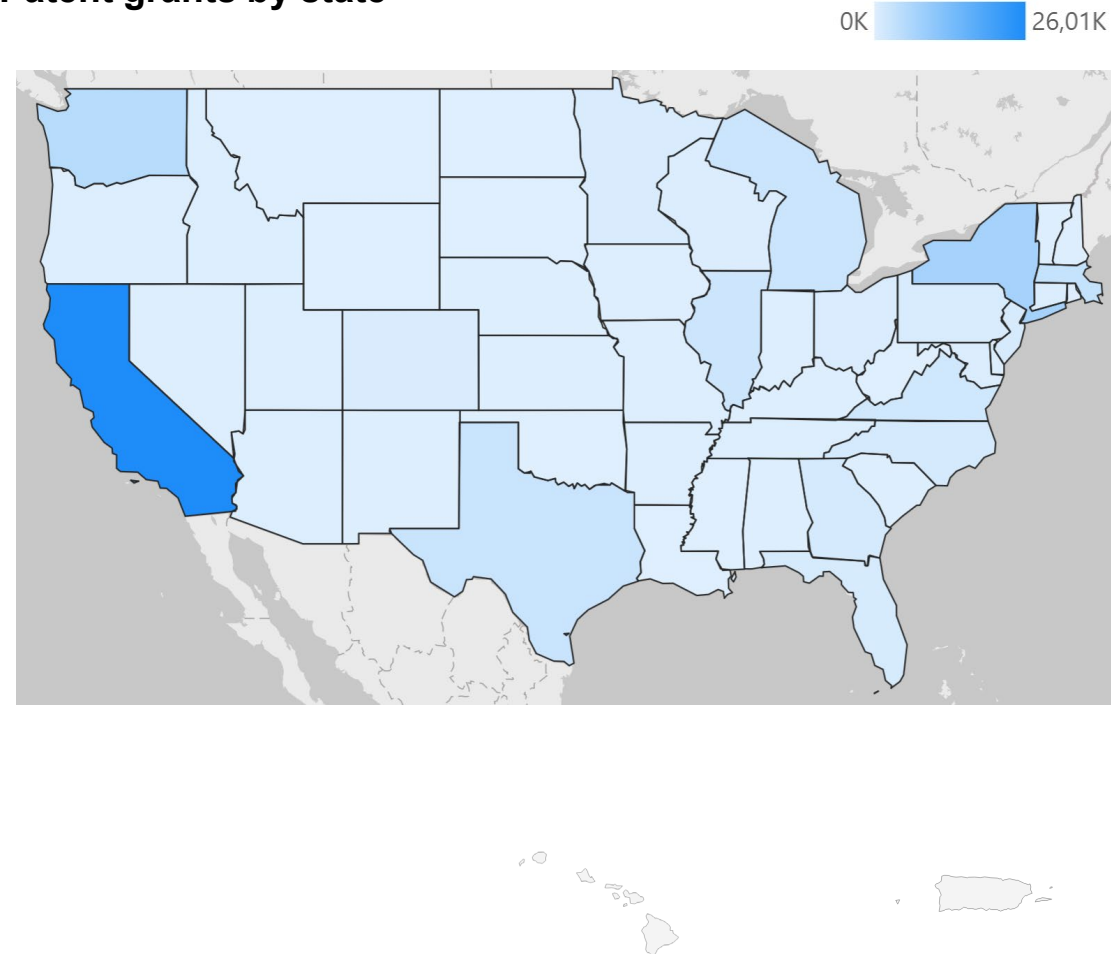
## Patents issued in US (thousands)

5 yr. CAGR



1. 2024 data only available through Q2

## Patent grants by state



## MA AI facts

**4<sup>th</sup>**  
in patents granted

**30%**  
CAGR (2017-2022)

**3 companies**  
among the **top 50**  
US patent holders  
assign IP in MA

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# Objectives for today

- Macro trends and dynamics
- **Talent supply and demand**
- Startup and investment landscape

# ~5% of job postings in MA include AI-related keywords; AI-related postings increased significantly in MA and the US while total job postings declined

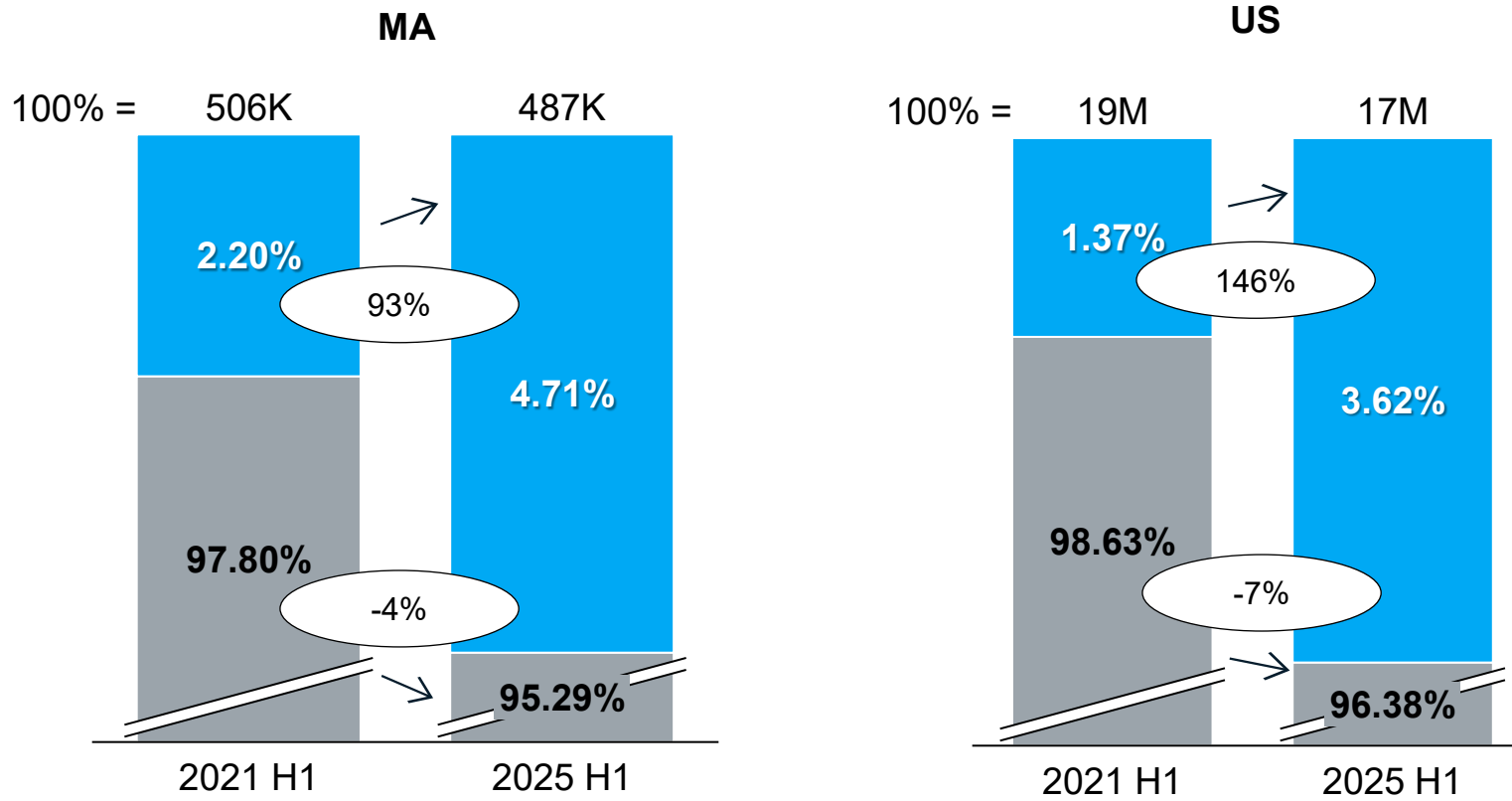
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## Share of total postings<sup>1</sup>, %

Postings that include keywords: Artificial intelligence, machine learning, neural network, language processing, deep learning, generative AI, prompt engineering, data building, large language models, behavior-based robotics

■ AI postings ■ Rest of postings

○ % change in postings, 2021H1 to 2025H1



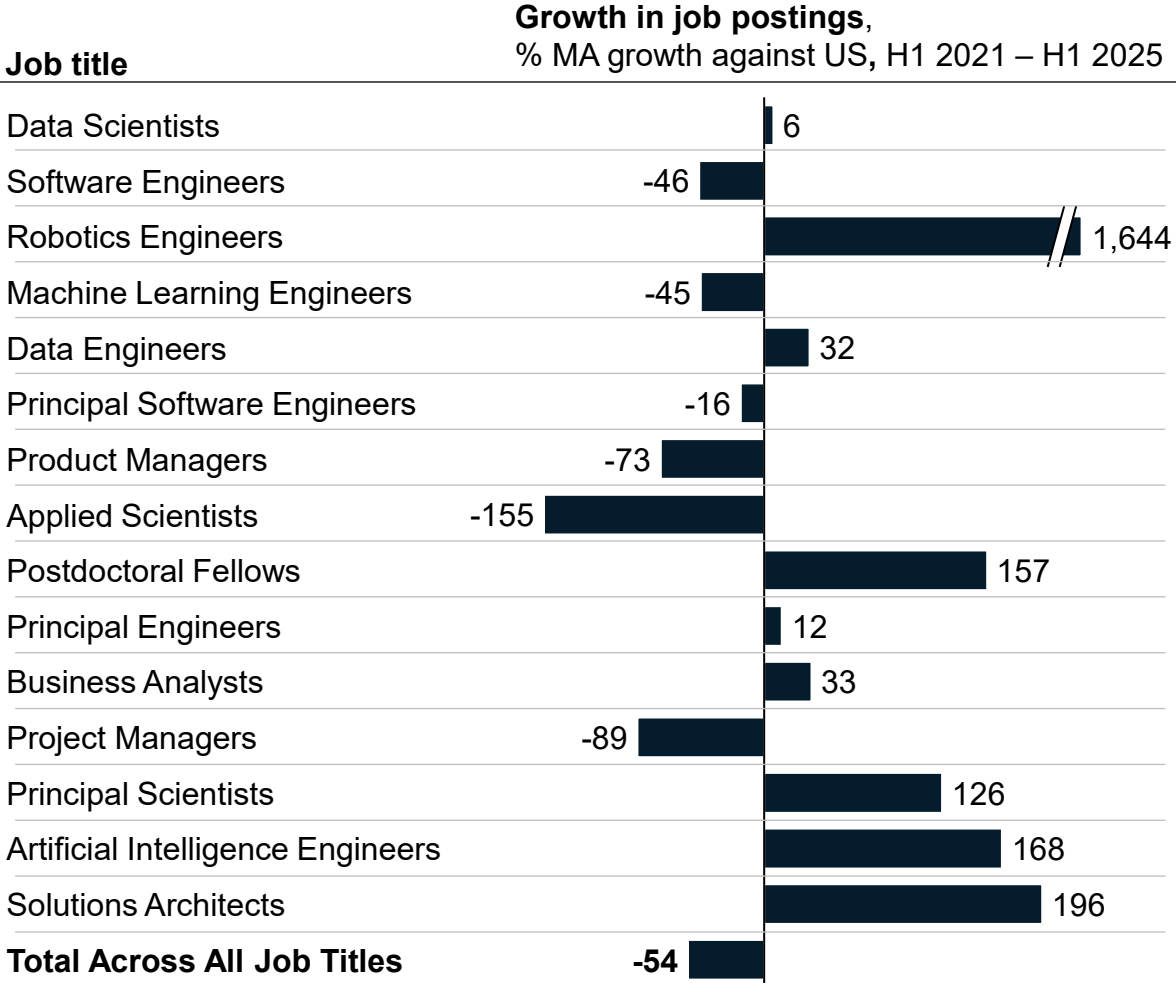
- Since 2021, the number of **AI-related job postings has grown significantly**, increasing by **93% in MA and 146% across the US**
- MA employers are more likely to be looking for AI talent than the US overall: **4.7% of MA job postings in H1 2025 included AI keywords**, compared to 3.6% in the US
- The number of **total job postings has decreased** between 2021 and 2025, declining 4% in MA and 7% in the US

1. De-duplicated job postings, or online vacancies, scraped from over 45,000 websites, including company career sites, national and local job boards, and job posting aggregators

# AI job postings have grown faster in the US overall than in MA for most top roles, but change in number of postings varies widely

MA top 15 roles by number of postings that include keywords<sup>1</sup>

Preliminary



Change in demand for AI roles has differed in MA compared to the US overall:

- Demand for robotics engineers, solutions architects, artificial intelligence engineers, and postdoctoral fellows grew substantially more in MA than the US overall
- Demand for applied scientists, project managers, and product managers grew less in MA than the US as a whole; total AI-related postings also grew less in MA than the US

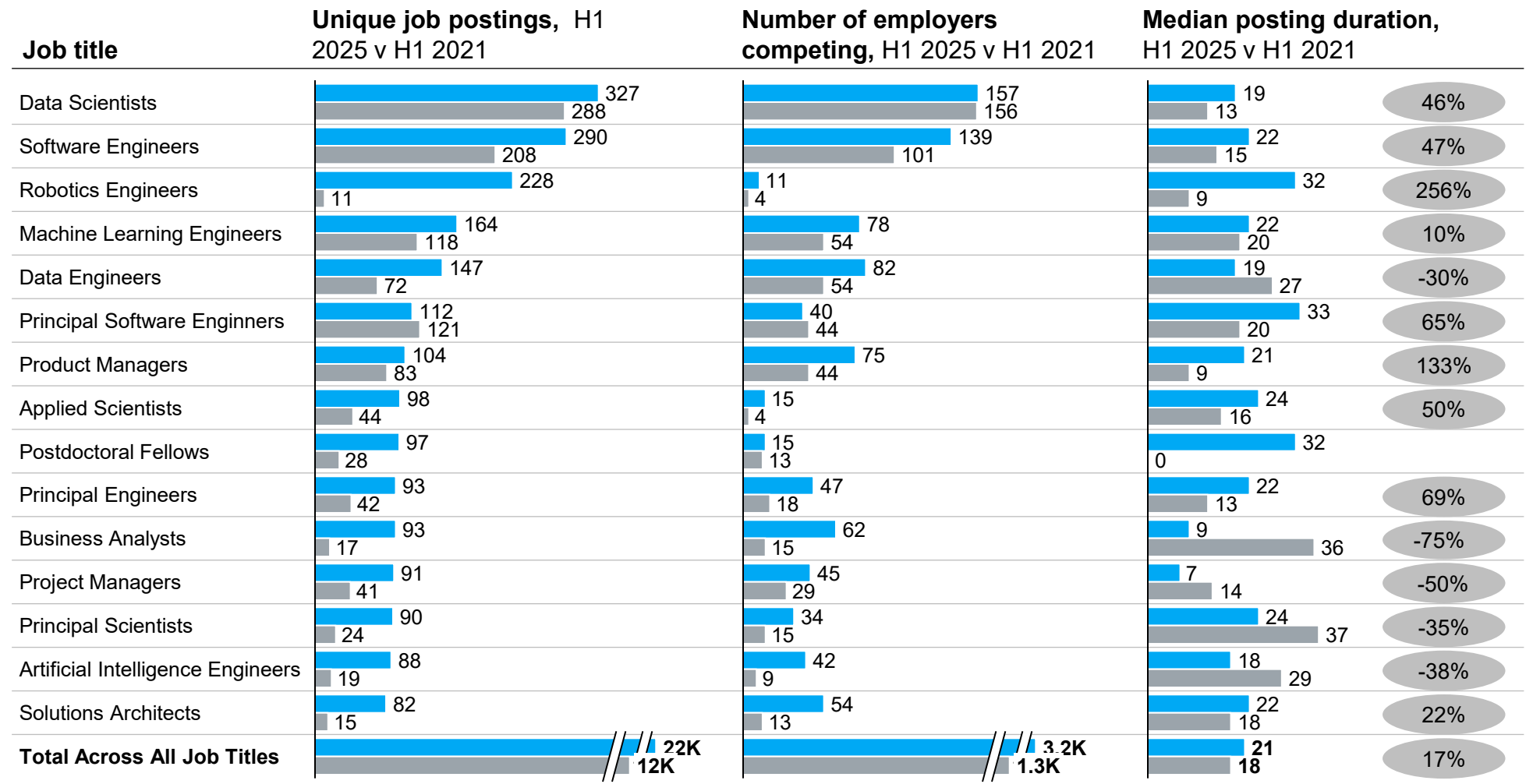
1. Excludes roles that mention AI but do not typically require AI skills or functionalities, e.g., food services, hospitality

# Job postings for AI-related roles in MA grew significantly, as did the number of employers competing and time to fill roles, indicating increased competition for AI talent

MA top 15 roles by number of postings that include keywords

**Preliminary**

■ H1 2025 ■ H1 2021  
○ % change



- Job postings including AI keywords totaled around 12K in H1 2021 but grew to 22K in H1 2025
- The number of employers competing for AI talent has increased from 1.3K in H1 2021 to 3.2K in H1 2025
- Roles are slightly hard for employers to fill: median posting duration is 21 days (compared to 18 in 2021)

# Based on online profile data, ~68K MA-based workers work in AI related roles or have AI skills

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## Top 15 states ranked by number of AI-related profiles<sup>1</sup>

State	Online profiles, K	% of region's profiles	% of AI profiles nationally
California	363.0	2.0%	25.1%
New York	171.6	1.6%	11.9%
Texas	123.2	1.0%	8.5%
Washington	92.3	2.5%	6.4%
<b>Massachusetts</b>	<b>68.1</b>	<b>1.8%</b>	<b>4.7%</b>
Florida	59.7	0.6%	4.1%
Illinois	56.2	1.0%	3.9%
Georgia	43.7	0.8%	3.0%
Pennsylvania	39.8	0.7%	2.7%
North Carolina	37.5	0.8%	2.6%
Virginia	35.3	0.9%	2.4%
Colorado	33.6	1.0%	2.3%
New Jersey	30.6	0.9%	2.1%
District of Columbia	27.2	2.2%	1.9%
Ohio	23.3	0.5%	1.6%
<b>US total</b>	<b>1,446.3</b>		

- Washington and the District of Columbia have the largest concentration of profiles with AI related skills or occupations (2.5% and 2.2%)
- Massachusetts has an **outsized share of AI talent**: the state accounts for **1.8% of profiles nationally, but 4.7% of total AI profiles**

1. Data scraped from individual profiles of over 144M workers in the US, sources are proprietary to Lightcast

# Massachusetts ranks 6<sup>th</sup> among states for AI-related postings however, it is experiencing slower growth than its peers

Top 15 states ranked by number of AI-related postings

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State	Postings, K, 2025 H1	% of region's postings	Growth, 2021H1-2025H1
California	102.7	5.9%	101%
Texas	79.2	5.3%	240%
New York	42.8	4.8%	168%
Virginia	31.9	5.9%	210%
Illinois	25.3	3.9%	145%
<b>Massachusetts</b>	<b>22.9</b>	<b>4.7%</b>	<b>93%</b>
Washington	21.9	5.3%	97%
Florida	21.7	1.9%	166%
Georgia	20.9	3.9%	134%
New Jersey	20.0	4.5%	216%
North Carolina	17.9	3.0%	109%
Ohio	15.5	2.4%	196%
Pennsylvania	14.9	2.2%	114%
Colorado	14.3	3.4%	107%
Maryland	14.0	4.7%	228%
US total	628.7	3.6%	146%

- MA had the 6<sup>th</sup> highest number of AI postings in the first half of 2025
- However, growth in postings lags behind the overall US and peers – AI postings grew 93% since 2021 in MA, but TX, MD, NJ, and over 200% growth in AI postings comparatively

# The top 15 Massachusetts universities produced ~6K AI related graduates in 2023, but had a state-wide average retention of 26%

## Completions in AI and related programs<sup>1</sup>, 2023

Top 15 MA universities, by number of completions

		% of total completions	Growth, 2018-2023 CAGR	Retention rate <sup>2</sup>
Northeastern University	1,430	15%	30%	41.4%
University of Massachusetts-Amherst	867	9%	19%	39.7%
Massachusetts Institute of Technology	749	18%	3%	19.1%
Boston University	643	5%	15%	32.7%
Tufts University	433	9%	14%	33.1%
Harvard University	383	4%	-4%	18.9%
Worcester Polytechnic Institute	333	16%	8%	42.5%
University of Massachusetts-Lowell	288	6%	10%	47.2%
Brandeis University	155	7%	-1%	31.4%
University of Massachusetts-Boston	149	4%	7%	48.6%
Boston College	144	3%	16%	30.0%
Fitchburg State University	120	7%	23%	40.9%
Wentworth Institute of Technology	106	11%	6%	45.1%
Clark University	100	7%	34%	39.5%
Bentley University	98	6%	2%	39.8%
<b>Total</b>	<b>7,041</b>	<b>5%</b>	<b>9%</b>	<b>39.9%</b>

- Specialized AI degree areas include: AI, Informatics, Modeling, virtual environments and simulation, Computational science, and Human computer integration
- AI-related completions account for 5% of total completions in the state (all degree levels), and account for 8% of completions in the top 15 schools
- Graduate retention rate has declined further among many of the top graduating AI-related universities in MA since the previous year

1. CIP codes: Computer Science (11.0701), Computer and Information Sciences, General (11.0101), Artificial Intelligence (11.0102), Informatics (11.0104), Modeling, Virtual Environments and Simulation (11.0804), Computational Science (30.3001), Human Computer Interaction (30.3101), Statistics, General (27.0501)e  
 2. Overall university retention rate, not program specific

# MA is producing enough graduates to fill open roles in ~60% of the top tech occupations

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## Top in-demand occupations within the AI sector in MA

■ <50% Completions relative to Openings
 ■ 51% - 75% Completions relative to Openings
 ■ 75%+ Completions relative to Openings

Occupations	All MA job postings, Thousands, 2025	Completions <sup>1</sup> , 2024	Typical entry level education
Software Developers	2.7	4576	Bachelor's degree
Data Scientists	1.5	716	Bachelor's degree
Computer Occupations, All Other	1.4	2020	Bachelor's degree
Computer and Information Research Scientists	1.0	134	Master's degree
Marketing Managers	0.9	1013	Bachelor's degree
Database Architects	0.4	185	Bachelor's degree
General and Operations Managers	0.4	9003	Bachelor's degree
Engineers, All Other	0.4	1143	Bachelor's degree
Project Management Specialists	0.4	1895	Bachelor's degree
Managers, All Other	0.4	13386	Bachelor's degree
Management Analysts	0.4	1750	Bachelor's degree
Database Administrators	0.3	223	Bachelor's degree
Market Research Analysts and Marketing Specialists	0.3	3874	Bachelor's degree
Sales Managers	0.3	776	Bachelor's degree
Financial Managers	0.3	1828	Bachelor's degree
Financial Risk Specialists	0.3	56	Bachelor's degree

- Software developers are in highest demand in MA, with graduates filling >75% of the needed openings
- All but one tech occupation require a bachelor's degree, with computer and information research scientists requiring a master's

1. Completions in 2024 (the most recent data available) are used as a proxy for the level of 2025 graduates (as 2025 are not yet released). To adjust for duplication, the number of completions within each degree program (CIP) was distributed to each corresponding occupation (SOC) typically requiring a four-year degree or higher by way of a weighted average based on current employment within occupations

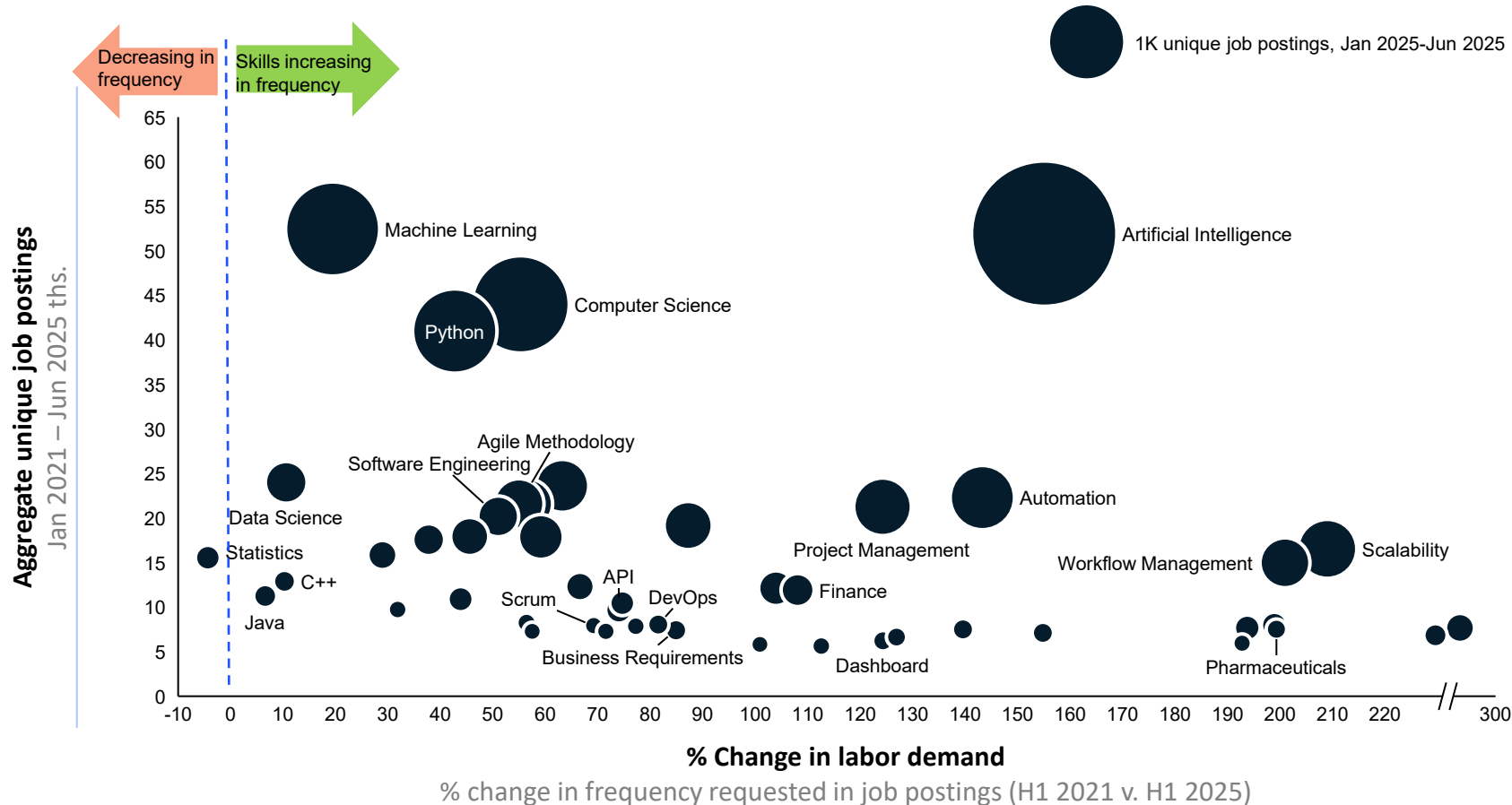
\*Except technical and scientific products

# Top hard skills requested in AI jobs are AI, machine learning and computer science, while newly demanded skills include robotics and generative AI

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## Top 50 in-demand hard-skills<sup>1</sup> for MA employers in the AI sector

Jan 2021 – Jun 2025



- Artificial Intelligence, machine learning, and computer science have been the top in-demand skills over the past 5 years
- Demand for hard coding skills, such as java, C++, data science, and statistics, are experiencing little to no growth, comparatively
- Across the top 50 hard skills for AI in MA, most have seen dramatic growth through an increase in frequency

1. Based on job postings filtered by AI keywords (AI, ML, neural network, language processing, etc.) in MA. Specialized, software, and certificate skills only (excludes common skills)

# Amazon, Symbiotic, and State Street Corporation are seeking the most workers to fill AI-related roles

**Preliminary**

MA companies	MA job postings, Unique postings Jan 2025-Jun 2025	% of postings
Amazon	698	3.1%
Symbiotic	591	2.6%
State Street Corporation	405	1.8%
Medtronic	284	1.3%
UKG	284	1.3%
Sanofi	264	1.2%
Takeda Pharmaceutical Company	245	1.1%
Accenture	238	1.1%
Harvard University	223	1.0%
Compass Group	213	0.9%
Anduril Industries	210	0.9%
Oracle	207	0.9%
Meta	202	0.9%
Point32Health	194	0.9%
CVS Health	179	0.8%
Total Across All Companies	22,559	

- Amazon, Symbiotic, and State Street Corporations have driven the highest volume of postings in MA, with ~700, ~600, and ~400 roles respectively
- The share of Symbiotic AI job postings has significantly declined, dropping from 9% in 2023 to just 2.6% in 2025

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# Objectives for today

- Macro trends and dynamics
- Talent supply and demand
- **Startup and investment landscape**

# AI & Machine Learning has the 3rd highest vertical by VC investment in MA, despite having only a 6% share of total VC in the US

**Preliminary**

Top 20 verticals by venture capital investment, in Massachusetts, 2020-24,<sup>1</sup> \$B

Vertical	Investment (\$B)	% of total VC in US
Life Sciences	52.6	29%
HealthTech	23.2	15%
<b>AI &amp; Machine Learning</b>	<b>22.2</b>	<b>6%</b>
Oncology	18.4	27%
SaaS	17.4	4%
Climate Tech	11.6	12%
TMT	11.4	6%
CleanTech	11.0	13%
Big Data	8.3	5%
LOHAS & Wellness	7.6	9%
Digital Health	5.7	11%
Cybersecurity	4.8	9%
Mobile	4.8	3%
FinTech	4.7	3%
Advanced Manufacturing	3.7	12%
AgTech	3.0	17%
Mobility Tech	3.0	5%
CloudTech & DevOps	2.3	5%
Supply Chain Tech	2.3	6%
Marketing Tech	2.3	6%

Higher than average share of investment (MA receives 8% of total US VC)

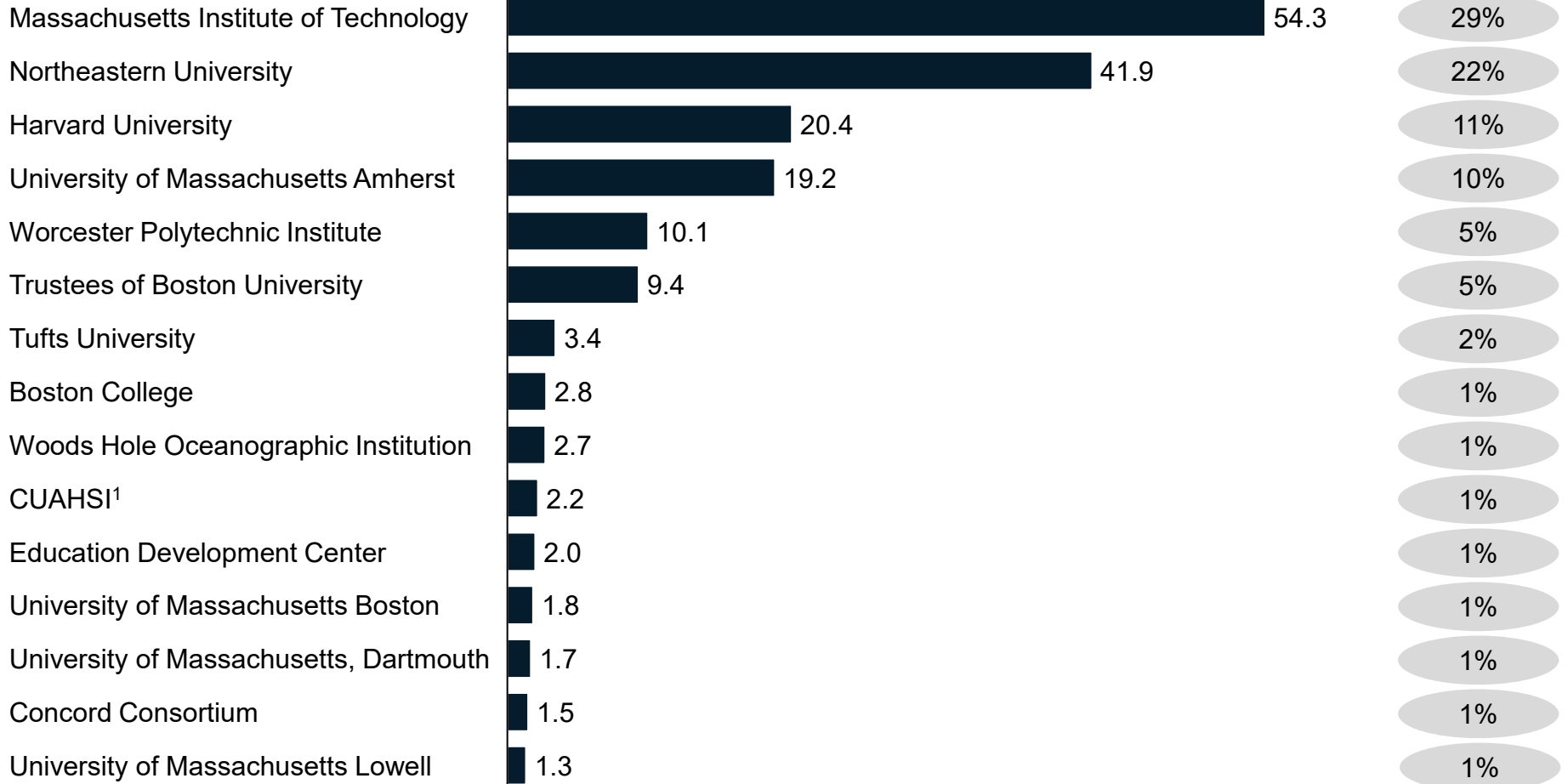
- AI & Machine Learning has the 3<sup>rd</sup> highest vertical by venture capital investment in MA, after life sciences and HealthTech
- MA is underperforming in attracting venture capital investment in AI startups: with 8% of total US VC but only 6% of AI VC

1. Figures will not sum up to total as multiple tech verticals can be applied to one deal; removed high-level verticals that include other verticals such as "Manufacturing" and "Industrials"

# MIT, Northeastern, and Harvard lead the state's AI related R&D funded by the NSF, NSF funding for AI has grown considerably since 2023

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AI-related R&D funding from NSF, top 15 institutions, Active awards as of August 2025, \$M

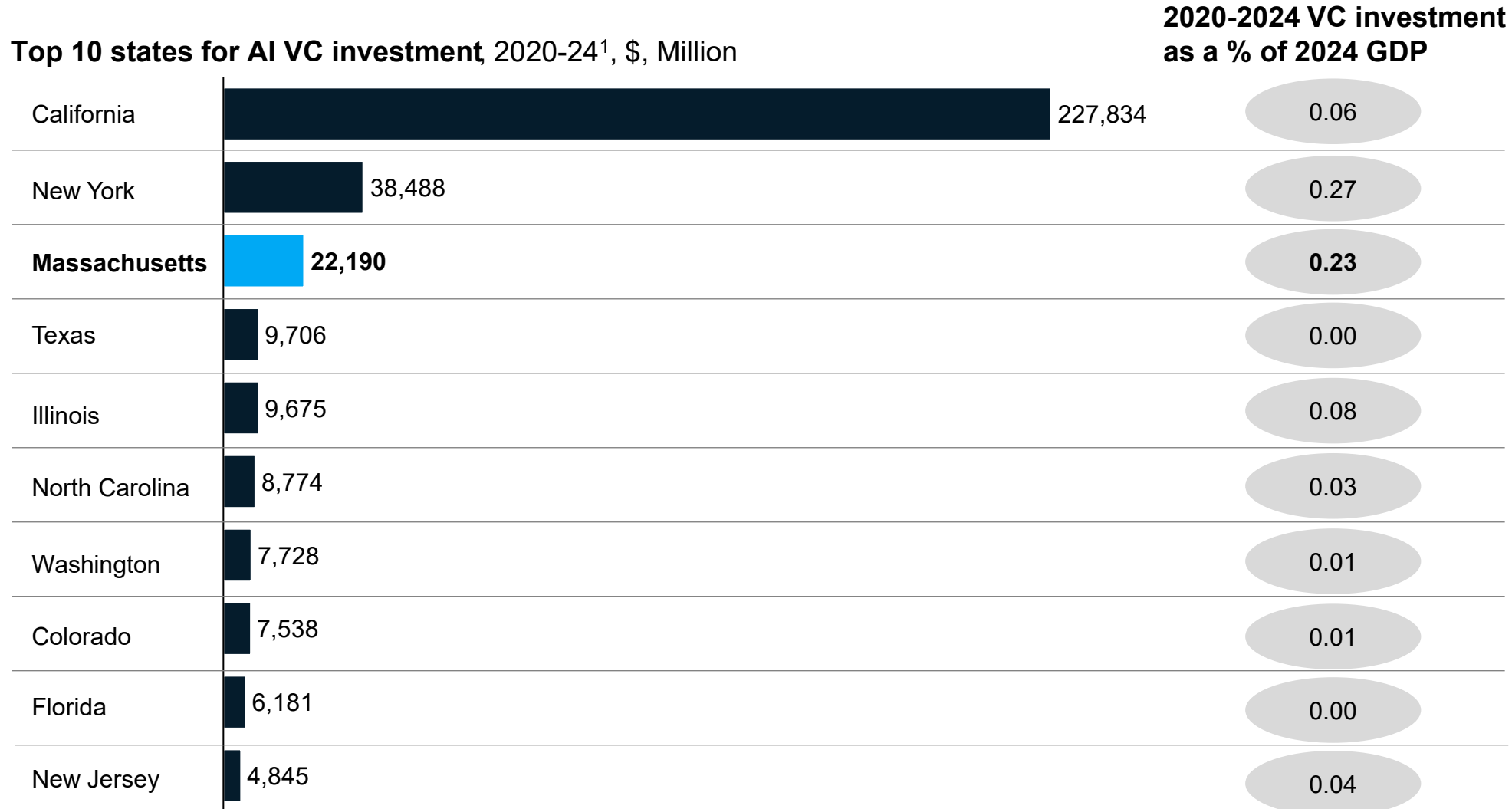


- 37 MA institutions and research organizations have active NSF grants for AI R&D, totaling nearly \$200M (up from \$150M in 2023)
- MIT, Northeastern and Harvard receive 60% of the state's NSF funding for AI
- Nationally, there are nearly 4.5K active NSF awards focused on AI research

1. Consortium of Universities for the Advancement of Hydrolic Science, Inc.

# California leads states in AI & Machine Learning VC investment by a wide margin; MA attracts the 3<sup>rd</sup> most AI VC nationally

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- California leads in AI VC investment nationally, attracting nearly 5x the investment of the next highest state
- Normalized for GDP size, MA ranks just behind NY for VC investment as a % of 2024 GDP

# There have been 4 AI startups valued over \$1B in the past 5 years

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~76

AI early-stage startups active<sup>1</sup> in MA

1

IPO in the past 5 years

77

M&A exits in the past 5 years

1. Active startups defined as: Privately held, PE, VC, or accelerator/incubator, or angel backed with business status product development or startup

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## Top 10 transactions by deal size, AI startups, 2020-2024

Company	Exit type	Exit date	Approx. valuation, \$M
Nuance Communications	M&A	2022	18,767
Thrive Earlier Detection	M&A	2021	2,190
Turbonomic	M&A	2021	1,834
Biofourmis	M&A	2022	1,320
Berkshire Grey	M&A	2023	522
Vertica Systems	M&A	2020	400
Syniti	M&A	2024	340
CAMP4 (NAS: CAMP)	IPO	2024	215
Kuebix	M&A	2020	201
ZebiAI	M&A	2021	170