U.S. Demand for AI Certifications

Promise or Hype?

CSET Issue Brief

AUTHORS
Diana Gehlhaus
Ines Pancorbo

Executive Summary

The promise of artificial intelligence and AI-related certifications has been widely touted as an alternative pathway to entering the AI workforce. Companies including Amazon, Google, and Microsoft have all created certification programs dedicated to AI and AI-related competencies, stating they would accept these credentials for their own positions.

Less clear, however, is whether the increased discussion about certifications as a workforce pathway is having a measurable impact. Data from related CSET research suggests the majority of AI workers have at least a four-year college degree. Moreover, little data is available on how many people complete these certifications and any associated labor market outcomes.

This brief explores the question of whether AI and related certifications create more promise or hype as a pathway to entry in the AI workforce. We address this question from the perspective of job postings, to explore if employers hiring for AI roles are asking for these certifications, particularly in lieu of college degrees.

We find that according to U.S. AI occupation job postings data over 2010–2020:

- There is little demand from employers for AI and AI-related certifications.

- Most AI or related certifications in demand are not explicitly AI, such as information technology (IT) certifications from Microsoft and state-mandated engineering licenses.

- Many "big tech" companies engaged in AI—several of whom market their own AI certifications—are largely not using these certifications to qualify potential applicants for AI jobs.

- Project management certifications offer an example of how certifications can be a more widely accepted entry-level credential for AI occupations.

The implication is that there is still a long road ahead to certifications becoming an accepted alternative pathway or entry point into AI jobs. This analysis suggests those obtaining AI and AI-related certifications are likely already employed in related jobs, and it is likely that the biggest value of these certifications is as a complement to a four-year degree and on-the-job work experience.

From this perspective, such certifications appear to be more hype than promise when it comes to being an alternative pathway to AI jobs. Creating industry-accepted standards or accrediting AI certification programs similar to colleges and university degree programs could be an important step forward in this regard.

Table of Contents

Introduction

There is considerable media attention being given to the potential of AI and AI-related certifications. Major AI development companies such as Amazon, Google, and Microsoft are touting their array of AI-related certifications as replacements for college credentials. The traditional online certification providers such as Coursera, EdX, Udacity, and Udemy all now offer a suite of AI-related certifications, sometimes in partnership with these companies.

Anecdotally, media reports suggest enrollment in these programs is booming.[1] However, little data is available on whether these certifications are actually in demand by employers, or the value of having such a certification for one's employment prospects. Many online providers for AI and AI-related courses and certifications do not publicly release this information.

"Little data is available on whether these certifications are actually in demand by employers, or the value of having such a certification for one's employment prospects."

This brief seeks to shed new insights on the prevalence of demand for AI and AI-adjacent certifications in today's job market. We consider employer demand for AI and related certifications when hiring for AI jobs as listed in U.S. job postings compiled by Burning Glass, a job posting aggregation database from over forty-five thousand job boards.[2] We define "AI jobs" according to previous CSET research,[3] and AI and AI-related certifications through selected keywords.

We acknowledge upfront this is not the complete set of data needed to comprehensively assess whether these certifications are more promise than hype. For that, data on completions and labor market outcomes (e.g., job transitions and wage premiums) would be needed. This issue brief analyzes the requirement for AI and AI-related certifications as a point of entry into AI jobs.

However, we believe this is an important data point in the discussion of certifications as an alternative pathway to AI jobs for those without a college degree. Given the large share of U.S. workers without a college credential,[4] and the rising importance of AI and related jobs, this analysis still provides meaningful insight.

Understanding Occupational Certifications

There are many types of certifications, certificates, and licenses related to jobs and occupations.[5] These credentials are generally occupation-based or competency-based, and can be government-mandated or voluntary. A range of providers issue these credentials, from state and local boards to postsecondary institutions, industry or trade associations, online course providers, and select employers.[6]

Voluntary certificates and certifications exist for just about everything, from learning a new software technique to yoga instruction to mastering an organizational management practice.[7] They can be a signal to employers of aptitude and interest, or they could be for pure self-interest. The number of such certificates and certifications offered is continuing to rise, as are the number of people who obtain these credentials.[8]

For some occupations, credentials or licenses are required by federal, state, or local authorities for employment. For example, the certified public accountant certification is required in all U.S. states for accountants who are filing audited or reviewed financial statements on behalf of a public company. Generally, occupations where certifications are required have requirements set at the state or local level, meaning certifications may not be valid across states. Other examples include certain types of engineers, dentists, food preparers, cosmetologists, and even certified pool/spa operators for commercial aquatic facilities.

Certification, certificate, and license requirements vary widely by type and level of certification. Generally, they include a number of hours of coursework, offered online or in-person, along with assignments followed by an exam. Once the individual passes the exam, and meets any other necessary criteria, they are conferred with the credential. Most of these expire after a set time period and individuals wishing to stay credentialed must renew them.

Recent years have seen a proliferation in certifications dedicated to signaling the mastery of a given technical skill, particularly skills related to AI and machine learning (ML). These include software

and advanced statistical techniques, such as cloud computing, database architecture, pandas, and python. Technical certifications are not new but the range of available certifications is. For example, in IT there has been a longstanding prevalence and acceptance of IT-related certifications (e.g., CompTIA). Such certifications are generally not required for any occupation, although there is frequent discussion as to their value—as an alternative to a college degree, as a career enhancement alongside a college degree, or for self-enrichment.

Defining AI Occupations and AI Job Postings

Consistent with previous CSET research, we define AI occupations as the set of occupations involved in the design, development, and deployment of AI capabilities and applications (details appear in our earlier report).[9] These categories are:

(1) Technical Team 1 (Tech 1): occupations that are or could be actively working in AI, needed to provide technical inputs into AI applications, or could laterally move into an AI development role.

(2) Technical Team 2 (Tech 2): occupations that have the related knowledge, skills, and abilities to perform technical roles on an AI team, either as is or with some minimal additional training.

(3) Product Team: occupations that complement AI technical occupations in product development (such as project or product managers and legal compliance officers).

(4) Commercial Team: occupations that provide support for the scaling, marketing, or acquisition of AI at the organizational level.

Our occupation set was derived using the federal standard occupation classification system, so that each occupation has an associated SOC code. Burning Glass automatically classifies each job posting in its database with an associated SOC code, enabling analysis of the database on an occupational basis.[10] For this analysis we consider all job postings over 2010–2010 that are classified by Burning Glass into a SOC occupation code that is an AI occupation using our list AI occupation codes as "AI jobs" or "AI job postings."

By analyzing AI job postings in these four categories, we can obtain a better understanding of trends across the different types of AI occupations. Across categories, the types of occupations and associated requirements are likely to vary.

Defining AI and AI-Related Certifications

To assess employer demand for AI and AI-related certifications when hiring for AI occupations, we first need to define what these certifications are. To do this, we created a list of keywords on which to search AI occupational job postings. To define the set of keywords, we extracted words of significance from AI-related certification course titles from major online providers. These include Amazon, Coursera, EdX, Microsoft, Udacity, and Udemy. This set of extracted words were then used as keywords to apply to Burning Glass data, which has a separate and searchable field for any certifications listed in job postings.

We made our list of AI keywords intentionally broad to include as many certifications as possible that could be related, since many certifications are related to processes, platforms, and applications and do not have "AI" or "ML" in the title. This intentionally makes all of our estimates an upper-bound on the number of AI job postings mentioning AI and AI-related certifications—the true number will certainly be less. Certifications that include one of the keywords provided in Table 1 are considered AI and AI-related certifications.

Table 1. AI and AI-Related Certification Keywords

Artificial Intelligence	Data Science/Scientist	Neural networks
Amazon	Database	Oracle
Automation	Deep learning	Programming
Autonomy	Developer	Python
AWS	Engineer	pyTorch
Azure	Google	Reinforcement learning
Big Data	keras	Software
Cloud	Machine Learning	Solutions architect
Computer	Microsoft	spark
Computer vision	Natural language	SQL
Data	processing	TensorFlow

Source: CSET compilation based on online certification offerings.

We acknowledge several limitations with this approach. First, we do not have complete data on certifications, certificates, and

licenses. Burning Glass includes certifications as listed in the hiring announcement, which have varying degrees of specificity.

Second, we are unable to separate out certifications, certificates, and licenses. All are included in Burning Glass' list of designated "certifications" without clear means of filtering out results. Ideally, we would like to analyze certifications that are not currently government-mandated. However, given our definition of AI occupations includes many types of engineers, known to have state-mandated requirements, including licenses is relevant and reasonable—and would be difficult to exclude for this analysis.

Finally, while a certification may not be a listed requirement in the posting, it could still act as an enhancement on an application or resume. While deciding between applicants, it is possible having a certification impacts the hiring decision even though it was not required. We are unable to address that in this analysis, except to state that requirements in a job announcement are the most basic indicator of entry criteria into an occupation or a company. Moreover, it is possible an individual already employed at a company could use a certification to laterally move into another position. Burning Glass data does not provide insight on lateral movement within a company, or on advancement opportunities within a company created by obtaining a certification.

Employer Demand for AI and Related Certifications

Few AI job postings asked for an AI or AI-related certification over 2010–2020. Looking at all AI job postings over this period, just 2.5 percent required an AI or AI-related certification. Moreover, the share of AI job postings requiring an AI or AI-related certification was little changed over 2010–2020. The implication is that for AI jobs, there does not appear to be much employer demand for AI or AI-related certifications.

Figure 1 shows the number of unique job postings for AI occupations demanding an AI or AI-related certification over 2010–2020. Over the course of 2010–2020, there were 1.39 million distinct AI job postings combined across the four categories asking for an AI or AI-related certification. This compares to over fifty-six million AI job postings in the U.S. over the same period. Detailed data for each year is provided in the Appendix.

Figure 1. AI Job Postings Including an AI or AI-Related Certification, 2010–2020
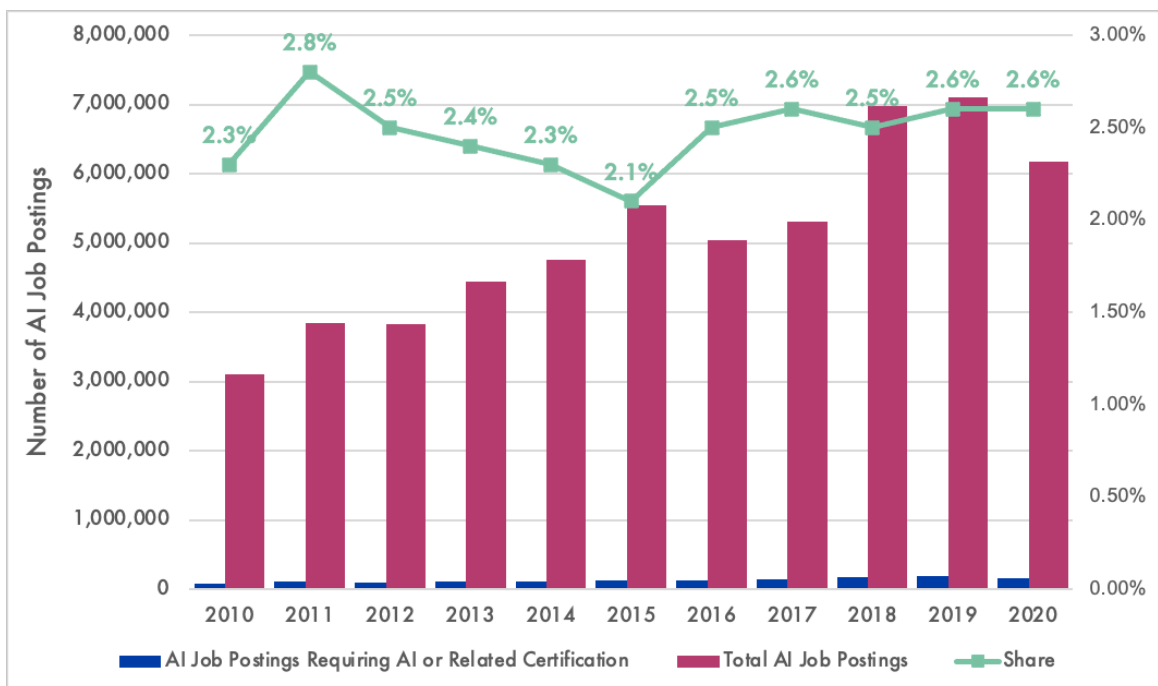
Source: Burning Glass, CSET calculations.

Table 2 shows the distribution of AI job postings requiring an AI or AI-related certification, aggregated over 2010–2020. Of the U.S. AI job postings including an AI or AI-related certification, Technical Team 1 occupations had the most, followed closely by Technical Team 2 occupations.

Table 2. Technical Team 1 Occupations Led the Number of AI Job Postings Including an AI or Related Certification over 2010–2020

	Number of AI Job Postings Including an AI or AI-Related Certification	Total Job Postings	Share
Technical Team 1	731,362	25,971,660	2.8%
Technical Team 2	533,333	9,725,780	5.5%
Product Team	93,792	14,578,472	0.6%
Commercial Team	29,042	5,826,077	0.5%
All AI Job Postings	1,387,529	56,101,989	2.5%

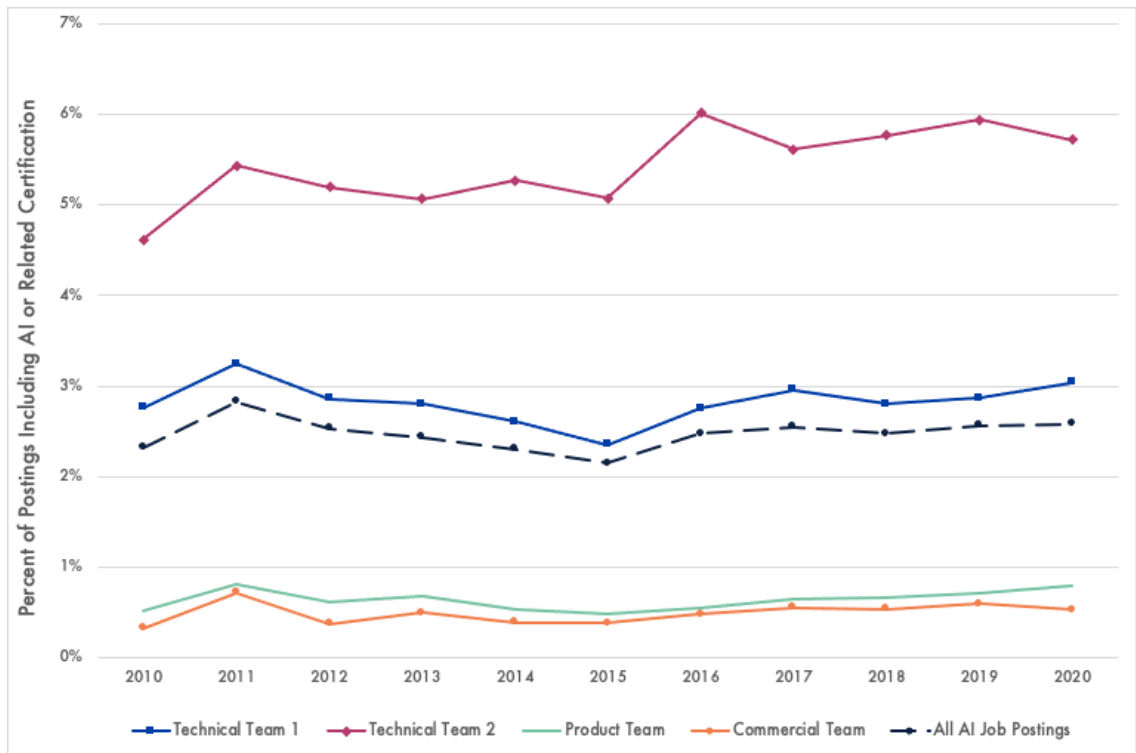Source: Burning Glass, CSET calculations.

While the large number of Technical Team 1 occupations could correspond to its overall share of AI job postings (almost half of total AI job postings), the large share of Technical Team 2 occupations that include AI and AI-related certifications is disproportionate in comparison. This suggests that there is another reason for the high number of Technical Team 2 job postings including an AI or related certification.

Similarly, the relative share of Product Team and Commercial Team job postings including an AI or AI-related certification is quite low. It is likely those low shares are due to the nontechnical nature of

these occupations given the more technical nature in which we defined AI and AI-related certifications.

Looking year over year, the share of AI job postings listing an AI or AI-related certification varied little over time from the fairly low average shares presented in Table 2. Figure 2 shows the share of job postings that include an AI or AI-related certification by category. We can see the shares across categories remained low and stable.

Figure 2. A Consistently Small Share of AI Job Postings Include an AI or AI-Related Certification, 2010–2020

Source: Burning Glass, CSET calculations.

Across all years the share of AI jobs requiring an AI or AI-related certification was largest for Technical Team 2 occupations, at ranging from about 5 to 6 percent. As the next section will show, this is likely due in large part to the presence of state-mandated engineering licenses. In contrast very few—less than 1 percent—of Commercial Team or Product Team jobs required these certifications.

Top AI and AI-Related Certifications for each AI Category

By far the AI and AI-related certifications in greatest demand were longstanding Microsoft certifications and state-mandated engineering licenses.[11] Many of the Microsoft Certified Professional (MCP) certifications have been around for several decades and are well established in the information technology sector. Engineering licenses appear to be heavily represented because of the mandated nature of these occupational licenses to practice certain types of engineering.

Table 3 shows the top AI and AI-related certifications for Technical Team 1 and Technical Team 2 occupations, along with the number of respective job postings mentioning the certification. We note these totals do not reflect the number of unique jobs requesting this certification, since one job posting could mention several certifications. In other words, Tables 3 and 4 report the unique mentions of certifications within job postings.

Table 3. Top AI- and AI-Related Certifications for Technical Team 1 and Technical Team 2 Occupations

Rank	Technical Team 1		Technical Team 2	
	Certification Title	Number of Mentions	Certification Title	Number of Mentions
1	Microsoft Certified Solutions Expert (MCSE)	169,198	American Board for Engineering and Technology (ABET) Accreditation	141,139
2	Microsoft Certified Solutions Associate (MCSA)	127,705	Licensed Professional Engineer	131,153
3	Microsoft Certified Professional (MCP)	84,246	Microsoft Certified Professional (MCP)	76,691
4	American Board for Engineering and Technology (ABET) Accreditation	54,304	Certified Quality Engineer (CQE)	59,017
5	Microsoft Certified Technology Specialist (MCTS)	51,330	Microsoft Certified Solutions Associate (MCSA)	41,580
6	Oracle Certification	49,058	Microsoft Certified Solutions Expert (MCSE)	40,196
7	Red Hat Certified Engineer (RHCE)	40,615	Engineer in Training Certification	29,691
8	Microsoft Certified Solutions Developer (MCSD)	36,421	Microsoft Certified Desktop Support Technician (Legacy)	17,364
9	Microsoft Certified Systems Engineer (Legacy)	32,071	Microsoft Certified Technology Specialist (MCTS)	17,064
10	Licensed Professional Engineer	21,272	Microsoft Certified Systems Engineer (Legacy)	7,605

Source: Burning Glass, CSET calculations.

It stands out that the AI and AI-related certifications in Table 3 are dominated by certifications which are more related than specific to AI or ML. A top certification in both groups, the Microsoft Certified Professional, is a gateway designation toward more specific certifications.[12] Interestingly, as of February 2020, Microsoft announced it was retiring all existing Microsoft Certified Solutions Developer (MCSD), Microsoft Certified Solutions Expert (MCSE) and Microsoft Certified Solutions Associate (MCSA) certifications.[13] These exams are being phased out as of January 2021 in a move to certifications based on Microsoft Azure (Cloud), Microsoft Dynamics 365 CRM (Customer Relationship Management), and Microsoft Office 365.

It is not until further down the list that we find certifications more closely connected to AI or ML (e.g., including training in cloud computing, software engineering, or automation,[14] although none are explicitly AI or ML).[15] For example, in Technical Team 1 occupations, the first certification related to cloud computing was for Amazon's Web Services Certified Solutions Architect (AWS-CSA),[16] coming in at number 13. Red Hat Certified Engineer (RHCE), related to fixed task process automation, comes in at number 7 but it is debatable if this type of automation is closely connected to AI.[17] Over 2010–2020, the AWS-CSA certification had just twelve thousand mentions, which is just 0.05 percent of all Technical Team 1 job postings.

Table 4 lists the top AI and AI-related certifications for Product and Commercial Team occupation job postings over 2010–2020. Similar to technical team occupations, many Microsoft and engineering related certifications are on the list.

Table 4. Top AI and AI-Related Certifications for Product Team and Commercial Team Occupations

Rank	Product Team		Commercial Team	
	Certification Title	Number of Mentions	Certification Title	Number of Mentions
1	Licensed Professional Engineer	35,156	Google AdWords Training	7,564
2	American Board for Engineering and Technology (ABET) Accreditation	10,931	Licensed Professional Engineer	3,321
3	Microsoft Certified Solutions Expert (MCSE)	6,799	Microsoft Certified Solutions Expert (MCSE)	3,164
4	Microsoft Certified Professional (MCP)	6,430	Microsoft Certified Professional (MCP)	2,265
5	Microsoft Certified Solutions Associate (MCSA)	4,680	American Board for Engineering and Technology (ABET) Accreditation	2,070
6	Certified Quality Engineer (CQE)	3,079	Microsoft Certified Solutions Associate (MCSA)	1,533
7	Civil Engineering Certificate	2,754	Marketing Automation Certification	1,399
8	Microsoft Certified Technology Specialist (MCTS)	2,732	Marketing Cloud Consultant	1,174
9	Computer Applications	2,548	Microsoft Certified Technology Specialist (MCTS)	804
10	Automation Certification	2,236	Certified Software Project Manager	546

Source: Burning Glass, CSET calculations.

Also similar to technical team occupations, very few job postings included certifications that were more closely connected to AI or ML (and none were explicitly AI or ML). The only specific mentions of cloud and software in the certification title are for Commercial Team occupations, although the number of mentions was quite low. Additionally, two certifications are related to automation, one for Product Team occupations and one for Commercial Team occupations—although again, total mentions were very small.

Top Occupations in Each AI Category

We next consider which occupations within each of our AI occupational categories have the most mentions of AI and AI-related certifications in their respective job postings.

Figure 3 lists the top five Technical Team 1 occupations whose job postings included an AI or AI-related certification over 2010–2020. The list is heavily computer oriented which is consistent with the occupations included in this group and with the heavy representation of Microsoft IT-related certifications. It is notable, for example, that network and computer systems administrators have a relatively higher share of postings mentioning a certification.

Figure 3. Top Technical Team 1 Occupations with an AI or AI-Related Certification Included in Job Postings, 2010–2020
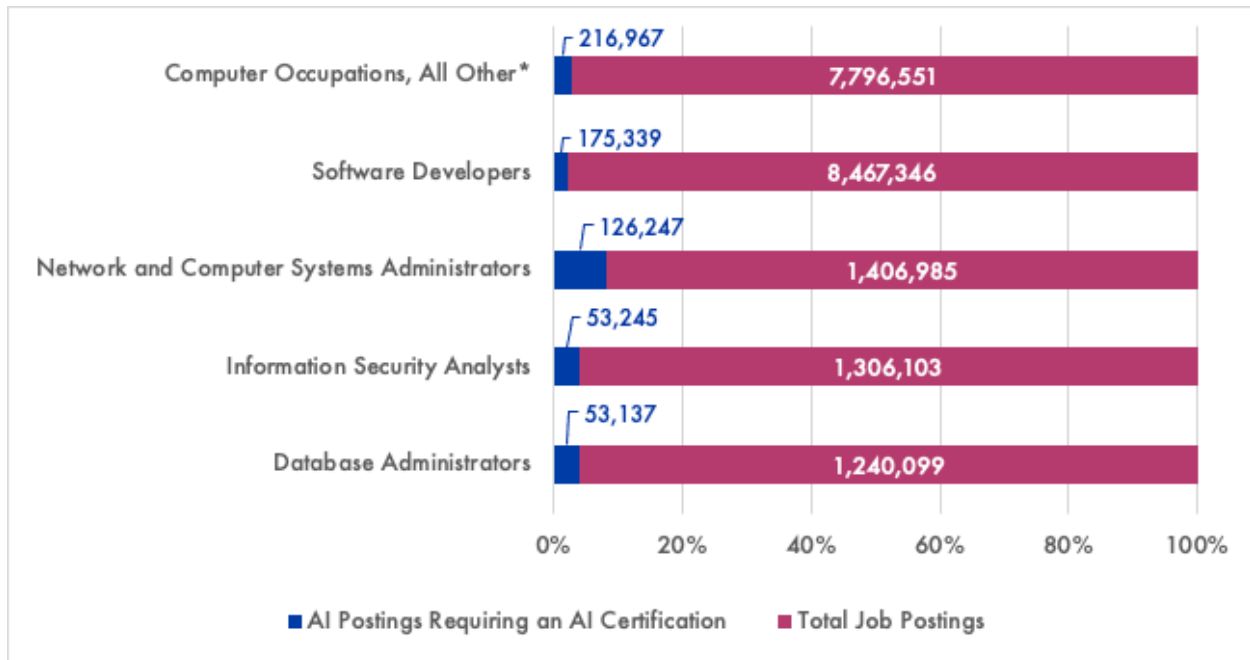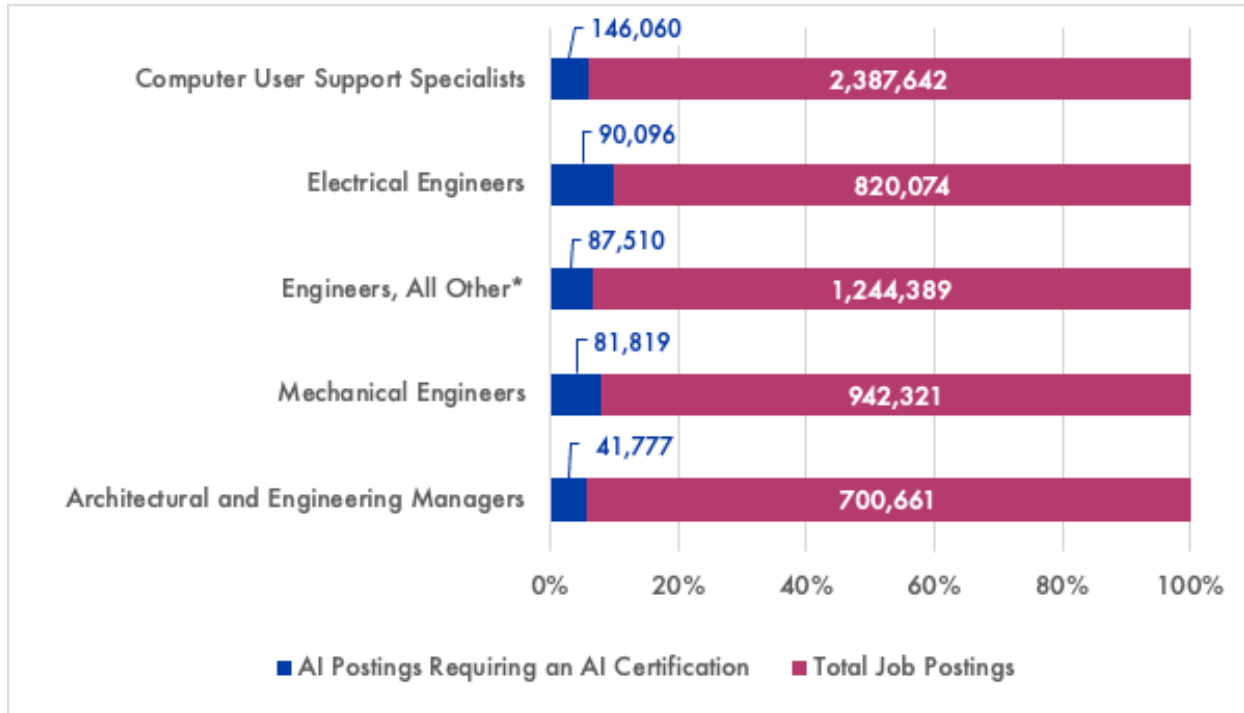

*Roughly 61 percent of jobs in "Computer Occupations, All Other" for this analysis were computer systems engineers/architects. We were able to obtain this more detailed breakout using O*NET codes, which are similar to but include more detail than the Standard Occupation Classification (SOC) codes this analysis is based on.

Source: Burning Glass, CSET calculations.

Figure 4 lists the top five Technical Team 2 occupations whose job postings included an AI or related certification. Computer user support specialists (commonly referred to as IT specialists) top the list, likely due to the high prevalence of Microsoft's IT-related certifications in this career field. The remaining occupations are in line with state-mandated licensure requirements for engineers.

Figure 4. Top Technical Team 2 Occupations with an AI or Related Certification Included in Job Postings, 2010–2020
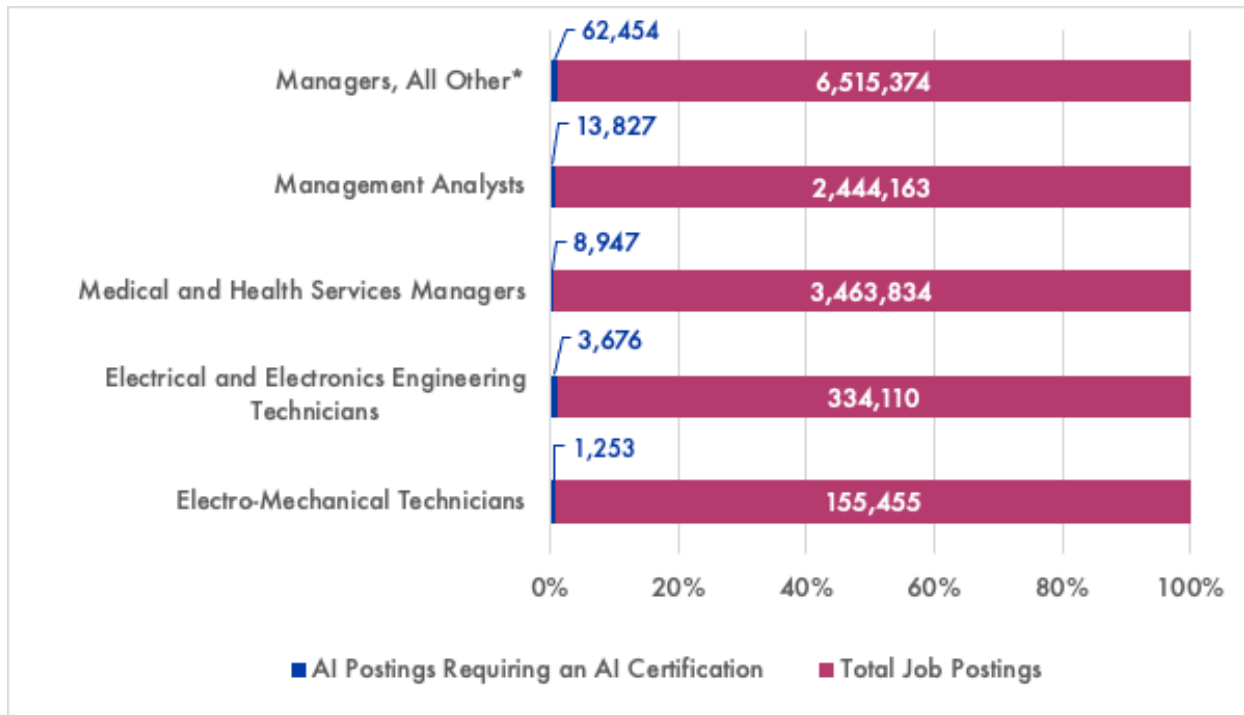

*Roughly 47 percent of jobs in "Engineers, All Other" for this analysis were validation engineers. We were able to obtain this more detailed breakout using O*NET codes, which are similar to but include more detail than the Standard Occupation Classification (SOC) codes this analysis is based on.

Source: Burning Glass, CSET calculations.

Figure 5 lists the top five Product Team occupations whose job postings included an AI or related certification. "Managers, All Other" tops the list; however, many of these managers are actually Project Management Specialists.[18]

Figure 5. Top Product Team Occupations with an AI or Related Certification Included in Job Postings, 2010–2020

*Even after looking at a more disaggregated breakdown, roughly 94 percent of jobs in "Managers, All Other" for this analysis were still classified as "Managers, All Other."

Source: Burning Glass, CSET calculations.

Importantly, although not an AI or AI-related certification, there is one type of certification that is quite prevalent in Product Team job postings (specifically, project management specialists). Over 10 percent of all Product Team job postings over 2010–2020 included at least one "project management certification." The most common of those certifications, the Project Management Professional (PMP) designation, was mentioned in 6.3 percent of all Product team job postings over 2010–2020. For context, the top AI certification in Technical Team 1 occupations, Microsoft's Certified Solutions Expert (MCSE), was mentioned 169,189 times over 2010–2020. This amounts to just 0.7 percent—less than 1 percent—of all Technical Team 1 job postings over this time.

The prevalence and wider acceptance of the PMP—one of the most recognized certifications—suggests it is possible for

occupations to have a certification as a pathway to jobs in lieu of a college degree. The PMP does not require a four-year degree for eligibility; rather, it is possible to sit for the PMP exam based on experience.[19]

Finally, Figure 6 lists the top five Commercial Team occupations whose job postings included an AI or related certification. Although few job postings in this category had such a certification listed, the ones that did were predominately for marketing occupations.

Figure 6. Top Commercial Team Occupations with an AI or Related Certification Included in Job Postings, 2010–2020
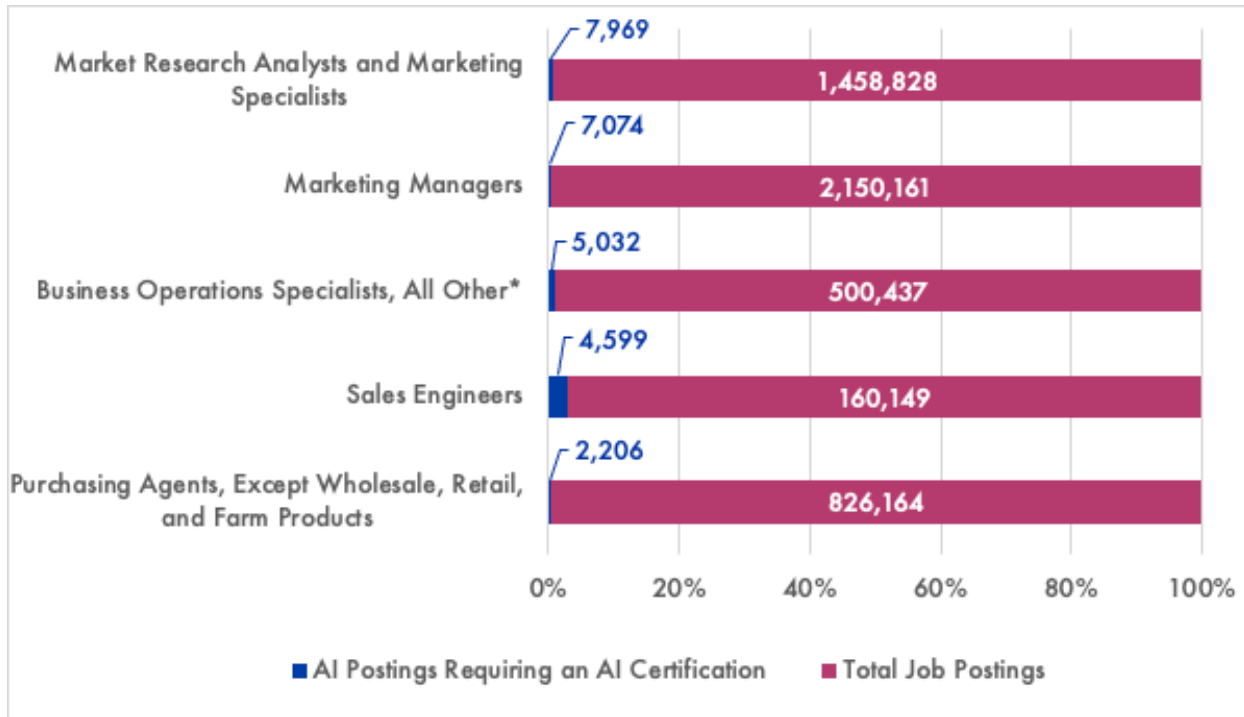
*Roughly 35 percent and 26 percent of jobs in "Business Operations Specialists, All Other" are security management specialists and energy auditors, respectively. We obtained this more detailed breakout using O*NET codes, which are similar to but include more detail than the Standard Occupation Classification (SOC) codes this analysis is based on.

Source: Burning Glass, CSET calculations.

## FAANG + Microsoft Demand for AI Certifications

Over the last year, Amazon, Google, and Microsoft have all launched large global initiatives aimed at certifying more AI-able professionals with their certifications.[20] These companies are lauding these certifications as a true alternative pathway into AI and AI-adjacent jobs in lieu of a traditional four-year college degree. In early 2021 Google took this a step further, announcing that a consortium of over 130 companies will accept Google's certifications as an entry point for select positions.[21]

As a final analysis, we assessed whether the main large players engaged in AI ("big tech") were including AI or AI-related certifications in their AI job postings, which by our definition includes their own certifications. We analyzed the number of unique job postings at Facebook, Amazon, Apple, Netflix, Google, and Microsoft ("FAANG+M") that include at least one AI or AI-related certification. In this analysis we also included relevant subsidiaries of these companies, such as LinkedIn for Microsoft and Whole Foods Market for Amazon.

Figure 7 shows these employers are not asking for AI and AI-related certifications in their AI job postings. In fact, the number of AI job postings from FAANG+M companies mentioning an AI or AI-related certification is surprisingly low. In each year over 2010–2020, 2 percent or less of all U.S. AI job postings from these companies required an AI or AI-related certification. Instead, most AI job postings from these companies listing a minimum requirement continue to require a four-year college degree. The corresponding data is provided in Table A2 in the Appendix.

Figure 7. A Small Share of FAANG+M AI Job Postings Include an AI or AI-Related Certification over 2010–2020
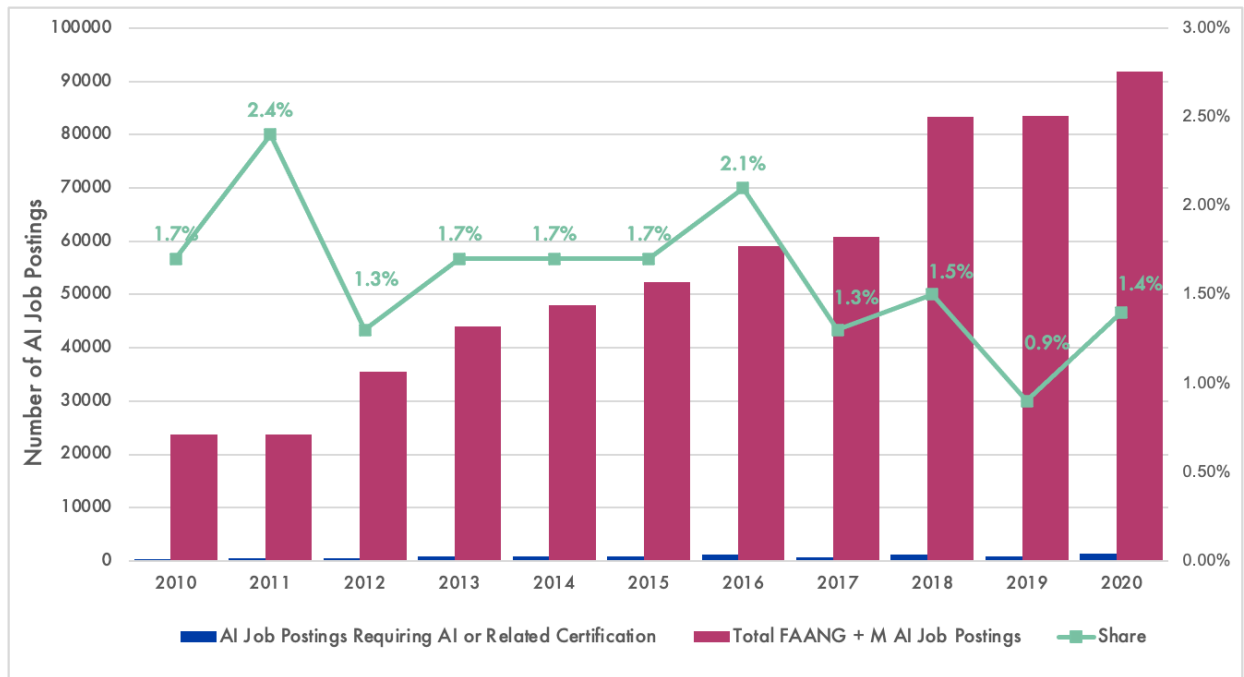
Note: FAANG+M represents Facebook, Amazon, Apple, Netflix, Google, and Microsoft. CSET resolved each entity for potential duplicate names and subsidiaries.

Source: Burning Glass, CSET calculations.

Interestingly, while the number of AI job postings at these companies, and the number of AI job postings requiring an AI or related certification increased over 2010–2020, the share of AI jobs requiring an AI or AI-related certification did not. That is, even as these companies and their AI capabilities expanded, and as their AI-related certification offerings expanded, the share of postings mentioning these certifications did not grow alongside.

Table 5 breaks down the certifications listed by FAANG+M AI job postings that mention an AI or AI-related certification. The list looks identical to the list for all Technical Team 1 occupations listing an AI or AI-related certification, dominated by Microsoft certifications. This is not a huge surprise, since Technical Team 1 occupations reflect the many of the technical AI skills known to be the focus of FAANG+M AI hiring.

Table 5: Top AI and AI-Related Certifications Demanded by
FAANG+M Employers, 2010–2020

Certification	Number of FAANG+M AI Job Postings
Microsoft Certified Solutions Expert (MCSE)	3,770
Microsoft Certified Solutions Developer (MCSD)	1,102
Licensed Professional Engineer	806
Microsoft Certified Solutions Associate (MCSA)	705
Microsoft Certified Technology Specialist (MCTS)	617

Note: FAANG+M represents Facebook, Amazon, Apple, Netflix, Google, and Microsoft. CSET resolved each entity for potential duplicate names and subsidiaries. Since one job posting can list multiple certifications, we do not estimate shares here. Totals would not add to 100 percent.

Source: Burning Glass, CSET calculations.

Conclusion

Recent media and other public reports from large technology companies have elevated the possible role of certifications as an alternative pathway into the AI workforce. The global COVID-19 pandemic has only accelerated the promise of AI-related certifications, as more companies adopt AI-enabled technologies and look to hire more workers with AI and AI-related skills.

However, little data is available on whether the promise of AI and AI-related certifications as a pathway into AI jobs holds in reality. Most online certification providers do not publicly release statistics on completions, or on the educational or career backgrounds of individuals enrolled in these programs or courses.

This brief provides a preliminary assessment of whether the reported promise of AI and AI-related certifications are promise or hype. We address this question from the perspective of employer hiring demands, looking at U.S. job postings as aggregated by Burning Glass for AI occupations over 2010–2020.

We find that in spite of the reporting to date, AI and AI-related certifications are not yet perceived by employers as an alternative pathway to bachelor's degrees into many AI jobs. Our analysis shows very few AI job postings are asking for AI or AI-related certifications. More likely, the main beneficiaries of these certifications are those either already in the field and looking to advance or those with a bachelor's degree looking for a lateral career transition.

Our finding of limited opportunity for these certifications as a pathway into AI jobs include the "big tech" firms that are launching global efforts to make their own certifications more accessible. In fact, our analysis of Facebook, Apple, Amazon, Netflix, Google, and Microsoft revealed that over the last decade very few of their job AI job postings demanded an AI or AI-related certification, including their own certifications. If these companies are serious about global efforts to move toward certifications as an alternative pathway, it was not evident in their AI job postings.

However, we also find some evidence to suggest that AI and AI-related certifications *could* have the potential to become an alternative pathway for AI jobs. The prevalence of project management certifications, now well established in the project management profession, suggests that it is possible for a certification that does not require a college degree to be an accepted pathway. That said, these certifications do generally require some relevant professional experience in lieu of college degrees. This means that for a certification to truly be a gateway credential into a profession traditionally reserved for four-year college degrees, and without years of relevant experience, it would likely need to be awarded based on an agreed upon standard of knowledge, skills, and abilities (e.g., competencies).

We note the policy implications for education and workforce development could be significant, but that the available data on certifications is incomplete. Even this analysis has limitations in how certifications are listed and defined. Moreover, there is uncertainty in how strictly employers hold to the listed requirements in cases where an automated filter based on those requirements is not initially used to sort out applicants. This limits the potential power of elevating certifications as an alternative pathway until better data is available.

In addition, more data is needed on the return to investment for AI and AI-related certifications—associated wage premiums and advancement in workforce outcomes. More data is also needed on completion rates, along with demographic and educational attainment indicators of who is completing these certifications. Some efforts are underway to address this gap in data, for example, pilots from the National Student Clearinghouse and the National Center for Science and Engineering Statistics. However, this data is far from being complete.

Still, the analysis provided here suggests AI and AI-related certifications are not used by employers as an alternative pathway to AI jobs. To elevate their recognition by industry, it seems more coordinated effort is required at the national level between government, certification providers, and employers. This includes not only a concerted effort by industry to accept agreed upon AI

certifications as a pathway into AI jobs, but for the creation of industry-accepted national standards related to the quality of such certifications. If AI certification programs were accredited in the way colleges and universities are, it could also be an important step forward in this regard.

Authors

Diana Gehlhaus is a research fellow at CSET where Ines Pancorbo was formerly a student research assistant.

Appendix

This appendix provides detailed data for Figure 1 and Figure 7 in the main body of this report.

Table A1. AI Job Postings including an AI or Related Certification, 2010–2020

Year	Number of AI Job Postings Requiring AI or Related Certification	Total AI Job Postings	Share
2010	71,732	3,098,950	2.3%
2011	108,365	3,836,843	2.8%
2012	96,777	3,821,824	2.5%
2013	107,903	4,437,730	2.4%
2014	109,607	4,757,396	2.3%
2015	118,843	5,547,568	2.1%
2016	124,579	5,033,800	2.5%
2017	135,470	5,312,515	2.6%
2018	172,597	6,969,951	2.5%
2019	182,264	7,105,524	2.6%
2020	159,392	6,179,888	2.6%
Total 2010–2020	1,387,529	56,101,989	2.5%

Source: Burning Glass, CSET calculations.

Table A2. A Small Share of FAANG+M AI Job Postings Include an AI or AI-related Certification over 2010–2020

Year	AI Job Postings Requiring AI or Related Certification	Total FAANG+M AI Job Postings	Share of FAANG+M AI Job Postings
2010	398	23,765	1.7%
2011	579	23,817	2.4%
2012	471	35,526	1.3%
2013	769	44,015	1.7%
2014	806	47,977	1.7%
2015	911	52,287	1.7%
2016	1,211	59,007	2.1%
2017	764	60,787	1.3%
2018	1,210	83,433	1.5%
2019	766	83,472	0.9%
2020	1,305	91,846	1.4%
Total, 2010–2020	9,190	605,932	1.5%

Note: FAANG+M represents Facebook, Amazon, Apple, Netflix, Google, and Microsoft. CSET resolved each entity for potential duplicate names and subsidiaries.

Source: Burning Glass, CSET calculations.

Endnotes

[1] Steve Lohr, "Remember the MOOCs? After Near-Death, They're Booming," *The New York Times*, May 26, 2020, https://www.nytimes.com/2020/05/26/technology/moocs-online-learning.html.

[2] See Burning Glass Technologies: https://www.burning-glass.com/.

[3] Diana Gehlhaus and Santiago Mutis, "The U.S. AI Workforce: Understanding the Supply of AI Talent" (Center for Security and Emerging Technology, January 2021), https://cset.georgetown.edu/wp-content/uploads/US-AI-Workforce_Brief-2.pdf.

[4] Diana Gehlhaus and Ilya Rahkovsky, "The U.S. AI Workforce: Labor Market Dynamics" (Center for Security and Emerging Technology, April 2021), https://cset.georgetown.edu/publication/u-s-ai-workforce/.

[5] Although this brief uses the term "certifications" throughout to refer to certifications, certificates, and licenses, we note certificates and licenses are technically distinct from certifications. Licenses are government-mandated and issued by the state. In contrast, only some certifications are mandated; most certifications are voluntary. Certificates have the broadest interpretation, although generally are focused on individual skills or competencies and issued by employers, industry or trade associations, and postsecondary institutions.

[6] John P. Pallasch, *Understanding Postsecondary Credentials in the Public Workforce System* (Washington, D.C.: U.S. Department of Labor, June 8, 2020), https://wdr.doleta.gov/directives/attach/TEN/TEN_25-19.pdf.

[7] See "Certification Finder" as maintained by CareerOneStop, which also denotes whether certifications are in demand, industry-endorsed, or accredited by the American National Standards Institute (ANSI) or National Commission for Certifying Agencies (NCCA): https://www.careeronestop.org/Toolkit/Training/find-certifications-help.aspx.

[8] Paul Fain, "Alternative Credentials on the Rise," *Inside Higher Ed*, August 27, 2020, https://www.insidehighered.com/news/2020/08/27/interest-spikes-short-term-online-credentials-will-it-be-sustained.

[9] Gehlhaus and Mutis, "The U.S. AI Workforce."

[10] Burning Glass methodology document provided to CSET, "Representativeness Analysis of the Burning Glass Job Posting Data—U.S."

[11] Every U.S. state has licensure requirements to practice certain types of engineering. According to the National Society of Professional Engineers, "Only a licensed engineer may prepare, sign and seal, and submit engineering plans and drawings to a public authority for approval, or seal engineering work for public

and private clients." See "What is a PE?," National Society of Professional Engineers, https://www.nspe.org/resources/licensure/what-pe

[12] See the full description of Microsoft certification pathways here: Ed Tittel and Mary Kyle, "Microsoft Certification Guide: Overview and Career Paths," *Business News Daily*, January 24, 2019, https://www.businessnewsdaily.com/10736-microsoft-certification-guide.html. See current Microsoft product offerings here: "Microsoft Certifications," Microsoft, https://docs.microsoft.com/en-us/learn/certifications/.

[13] See Microsoft's announcement for more: "MCSA, MCSD, MCSE certifications retire; with continued investment to role-based certifications," Microsoft, February 28, 2020, https://docs.microsoft.com/en-us/learn/certifications/posts/mcsa-mcsd-mcse-certifications-retire-with-continued-investment-to-role-based-certifications.

[14] Flexible automation most closely connected to AI, as it switches tasks without human intervention. See for more: Bally Kehal, "A Look into Automation & its Different Types," *Medium*, August 2, 2019, https://medium.com/aiautomation/a-look-into-automation-its-different-types-f4266049f54d.

[15] By "explicitly AI or ML" we mean certifications in areas such as machine learning, deep learning, reinforcement learning, neural networks, computer vision, natural language processing, data architecture, and autonomy. For example, Amazon offers a specialty certification in machine learning as an enhancement to foundational, associate, and professional certifications. Another explicitly ML example is the TensorFlow Developer certification. However, our review of certification titles found most online offerings in this regard were courses or guided projects.

[16] See for more: "AWS Certified Solutions Architect – Associate," Amazon, https://aws.amazon.com/certification/certified-solutions-architect-associate/.

[17] See RHCE: "Red Hat Certified Engineer," Red Hat, https://www.redhat.com/en/services/certification/rhce.

[18] Project management specialists were not formally created as a standalone occupation by the U.S. government occupational classification system until 2018. Before 2018, this occupation was split across Managers, All Other; Computer Occupations, All Other; and Business Occupations, All Other.

[19] See PMP certification requirements: "Project Management Professional (PMP)," Project Management Institute, https://www.pmi.org/certifications/project-management-pmp.

[20] See, for example, Microsoft: Brad Smith, "Microsoft launches initiative to help 25 million people worldwide acquire the digital skills needed in a COVID-19 economy," Microsoft, June 30, 2020,

https://blogs.microsoft.com/blog/2020/06/30/microsoft-launches-initiative-to-help-25-million-people-worldwide-acquire-the-digital-skills-needed-in-a-covid-19-economy/.

21 In IT support, data analytics, project management, user experience (UX) design, and Android development. See for more: "Google Career Certificates," Google, https://grow.google/certificates.