LABOR MARKET ANALYSIS

FOR PROGRAM RECOMMENDATION

ARTIFICIAL INTELLIGENCE
IN THE GREATER SACRAMENTO REGION

North (Greater Sacramento)
Center of Excellence

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SUMMARY

The North (Greater Sacramento) of Excellence for Labor Market Research prepared this report to provide a labor market analysis of educational supply and occupational demand for middle-skilled career pathways in the North (Greater Sacramento) subregion. This report aims to determine if demand in the local labor market is unmet by the supply from existing community college programs and other postsecondary training providers.

This report primarily focuses on training that leads to jobs in middle-skilled occupations - jobs that typically require education beyond a high school diploma but less than a Bachelor's degree - but may include higher-skilled occupations for training pathways that lead to a bachelor's degree. Lowered skilled occupations are rarely considered in this type of analysis due to the lessened barriers for entry-level work, such as no formal education and on-the-job training requirements.

Key findings include:

- Artificial intelligence is an emerging area in which there is not a well-defined occupation. Software developers and data scientists are closely related to artificial intelligence.

- The North (Greater Sacramento) subregion held 9,349 software development and data science jobs in 2020. Software development and data science jobs are projected to increase by 12% over the next five years, adding 1,155 new jobs to the subregion by 2025.

- Over the next five years, software development and data science jobs are projected to have 965 annual openings in the North (Greater Sacramento) subregion.

- Wage data shows that software development and data science occupations earn at least $20 to $30 above the subregion's living wage of $14.53 per hour.

- Awards data analysis shows that North (Greater Sacramento) training providers conferred 803 annual awards (certificates, Associate degrees, and Bachelor's degrees) in relevant software development and data science programs over the last three academic years.

Recommendations include:

- The North (Greater Sacramento) Center of Excellence recommends community college work with employers to better tailor artificial intelligence program offerings to local workforce needs.

- The North (Greater Sacramento) Center of Excellence recommends community colleges align artificial intelligence programs with transfer-oriented pathways to ensure students meet local employer expectations of job candidates holding Bachelor's degrees.

- The North (Greater Sacramento) Center of Excellence recommends exercising caution in developing artificial intelligence training programs.

INTRODUCTION

The North (Greater Sacramento) Center of Excellence (COE) was asked to provide labor market information for a proposed program at a regional community college. This report focuses on the following Standard Occupational Classification (SOC) occupations and codes:

- Artificial intelligence is an emerging area where the Bureau of Labor Statistics does not have well-defined occupations. However, the following occupations are closely related to artificial intelligence. Should a student transfer from a community college to a four-year institution and earn a four-year degree, they may be qualified to pursue the following high-skill occupations:

    o Software Developers and Software Quality Assurance Analysts and Testers (15-1256)

    o Data Scientists and Mathematical Science Occupations, All Other (15-2098)

A review of related programs revealed the following Taxonomy of Programs (TOP) title(s) and code(s) are appropriate for inclusion in this report:

- Information Technology, General (0701.00)

- Computer Information Systems (0702.00)

- Computer Science (Transfer) (0706.00)

- Computer Software Development (0707.00)

- Computer Programming (0707.10)

- Database Design and Administration (0707.20)

Computer Systems Analysis (0707.30)The corresponding Classification of Instructional Program (CIP) title(s) and code(s) are:

- Computer and Information Sciences, General. (11.0101)

- Computer Programming/Programmer, General. (11.0201)

- Information Technology. (11.0103)

- Computer Systems Analysis/Analyst. (11.0501)

- Computer/Computer Systems Technology/Technician. (15.1202)

- Data Science, General. (30.7001)

- Data Analytics, General. (30.7101)

- Computer Science. (11.0701)

- Computational Science (30.3001)

- Computer Programming, Specific Applications. (11.0202)

- Computer Programming, Vendor/Product Certification. (11.0203)

- Computer Game Programming. (11.0204)

- Computer Programming, Specific Platforms. (11.0205)

- Data Analytics (30.7101)

- Data Modeling/Warehousing and Database Administration. (11.0802)

OCCUPATIONAL DEMAND

Exhibit 1 summarizes the five-year projected job growth for middle-skill and high-skill occupations in the North, North/Far North, and California.

Exhibit 1. Employment and projected demand, 2020-2025

Occupation	2020 Jobs	2025 Jobs	2020-2025 Change	2020-2025 % Change	2020-2025 Annual Openings
Software Developers and Software Quality Assurance Analysts and Testers	8,090	9,093	1,003	12%	787
Data Scientists and Mathematical Science Occupations, All Other	1,259	1,412	153	12%	179
North (Greater Sacramento)	**9,349**	**10,505**	**1,155**	**12%**	**965**
Software Developers and Software Quality Assurance Analysts and Testers	8,757	9,889	1,132	13%	869
Data Scientists and Mathematical Science Occupations, All Other	1,296	1,458	161	12%	186
North/Far North	**10,054**	**11,347**	**1,293**	**13%**	**1,054**
Software Developers and Software Quality Assurance Analysts and Testers	243,173	277,523	34,350	14%	25,029
Data Scientists and Mathematical Science Occupations, All Other	9,292	10,808	1,516	16%	1,317
California	**252,465**	**288,331**	**35,866**	**14%**	**26,345**

Exhibit 2 compares the percent change in jobs between 2015 through 2020 and the projected changes through 2025. The rate of change is indexed to the total number of jobs in 2015.

Exhibit 2. Changes in employment, 2015-2025
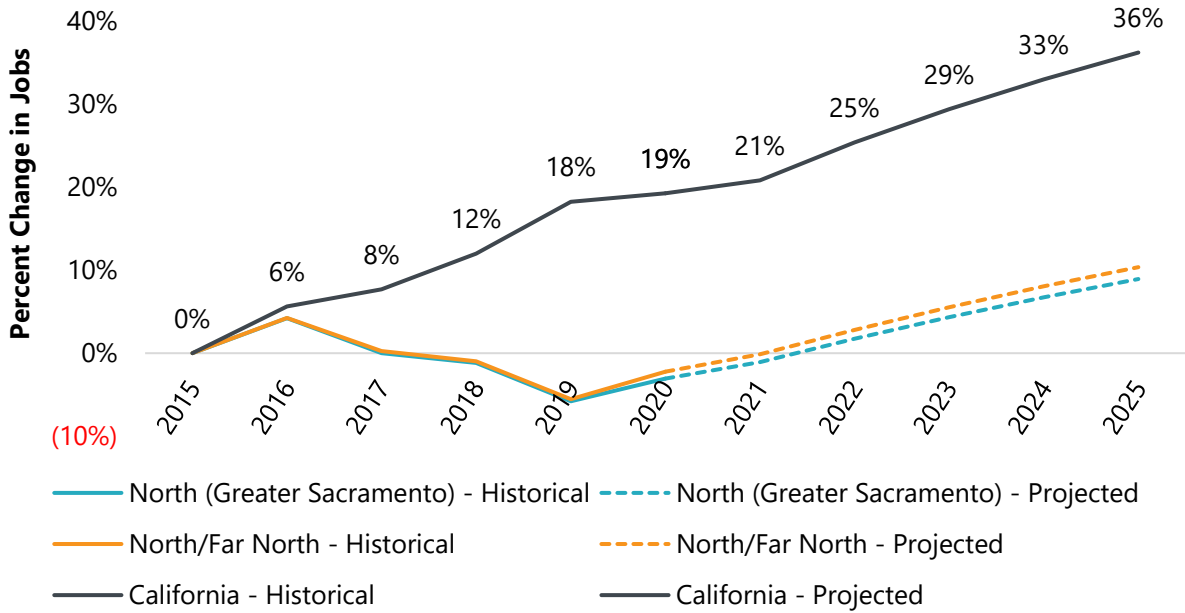
WAGES

Exhibit 3 compares the entry-level, median, and experienced wages for the selected occupations to the North (Greater Sacramento) living wage for a single adult - $14.53 per hour.[1]

Exhibit 3. Comparison of wages by occupation, 2020

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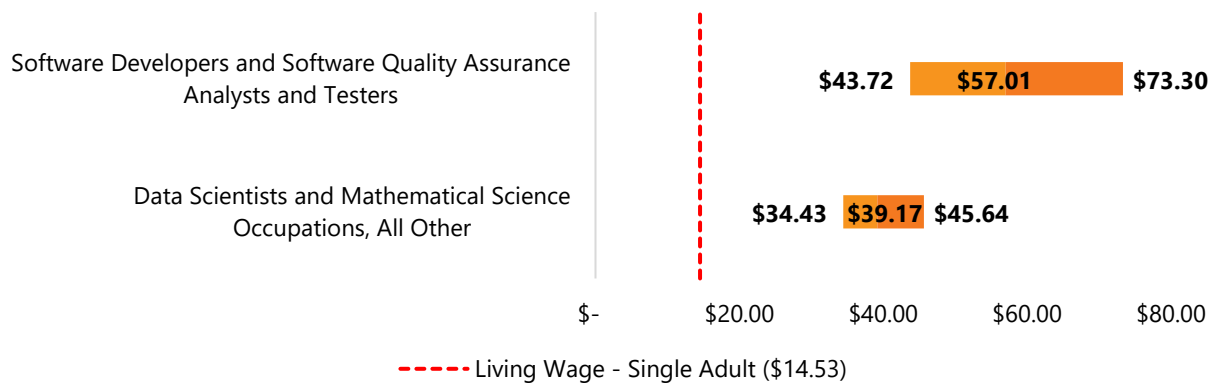
[1] Living wage is defined as the level of income a single adult with no children must earn to meet basic needs, including food, housing, transportation, healthcare, taxes, and other miscellaneous basic needs. The 25th-percentile and 75th-percentile hourly wages are used as proxy for entry-level and experienced-level wages.

JOB POSTINGS

This section analyzes recent data from online job postings (real-time LMI) for the specified occupations in this report. Online job postings may provide additional insight into recent changes in the labor market that are not captured by historical trends.

The North (Greater Sacramento) COE identified 6,292 online job postings for the selected occupations in the Greater Sacramento subregion. Job postings data comes from Burning Glass Labor Insights and represents new listings posted online within the last year, from April 1, 2021, through March 31, 2022.

Occupations and Job Titles

Exhibit 4 details the number of online job postings for the selected occupations.

Exhibit 4. Number of job postings by occupation

Occupation	Job Postings	Share of Job Postings
Software Developers and Software Quality Assurance Analysts and Testers	6,287	100%
Data Scientists and Mathematical Science Occupations, All Other	5	0%
Total Job Postings	**6,292**	**100%**

Exhibit 5 shows the top 10 job titles with the most job postings and the share. All job postings included a job title.

Exhibit 5. Top jobs titles

Job Title	Job Postings	Share of Job Postings
Software Engineer	209	3%
Senior Software Engineer	147	2%
.Net Developer	93	1%
Java Developer	91	1%
DevOps Engineer	80	1%
Software Developer	78	1%

Job Title	Job Postings	Share of Job Postings
Full Stack Developer	56	1%
Software Engineer - Remote	47	1%
Salesforce Developer	37	1%
Application Developer	35	1%

Employers

Exhibit 6 shows the top 10 employers with the most job postings for the selected occupations. Twenty-seven percent (n = 1,676) of job postings did not include an employer.

Exhibit 6. Employers with the most job postings

Employer	Job Postings	Share of Job Postings
Intel Corporation	315	5%
Deloitte	251	4%
Accenture	127	2%
Travelers	98	2%
Anthem Blue Cross	85	1%
Pearson	68	1%
TCS North America	64	1%
Lumen	45	1%
Guidehouse	45	1%
Pacific Gas and Electric Company	40	1%

Certifications, Skills, and Experience

Exhibit 7 shows the most relevant certifications requested by employers for the selected occupations. Eighty-seven percent (n = 5,490) of job postings did not include certification information.

Exhibit 7. Most in-demand certifications

Certification	Job Postings	Share of Job Postings
Security Clearance	143	2%
IT Infrastructure Library (ITIL) Certification	112	2%
CompTIA Security+	53	1%
Cisco Certified Network Associate (CCNA)	52	1%
Certified Information Systems Security Professional (CISSP)	52	1%
Cisco Certified Network Professional (CCNP)	43	1%
Certified Salesforce Platform Developer	38	1%

Exhibit 8 shows the top 10 skills across three categories for the studied occupations: specialized, human-centered, and technical skills. Please note that in this report, the specialized skills are the same as the technical skills, and more than half of the specialized and technical skills are centered around software development.

Exhibit 8. Most in-demand skills

Top 10 Specialized Skills	Top 10 Human-Centered Skills	Top 10 Technical Skills
SQL	Communication Skills	SQL
Software Engineering	Teamwork / Collaboration	Software Engineering
Software Development	Problem Solving	Software Development
Java	Troubleshooting	Java
JavaScript	Writing	JavaScript
Python	Planning	Python

Top 10 Specialized Skills	Top 10 Human-Centered Skills	Top 10 Technical Skills
Git	Research	Git
Microsoft C#	Creativity	Microsoft C#
.NET	Written Communication	.NET
DevOps	Detail-Oriented	Debugging

Exhibit 9 shows employers' minimum level of education for job postings for the selected occupations. Thirty-six percent (n = 2,292) of job postings did not include a preferred education level.

Exhibit 9. Employer-preferred minimum education levels

High school or vocational training — 3%
Associate's degree — 2%
Bachelor's degree — 57%
Master's degree — 2%
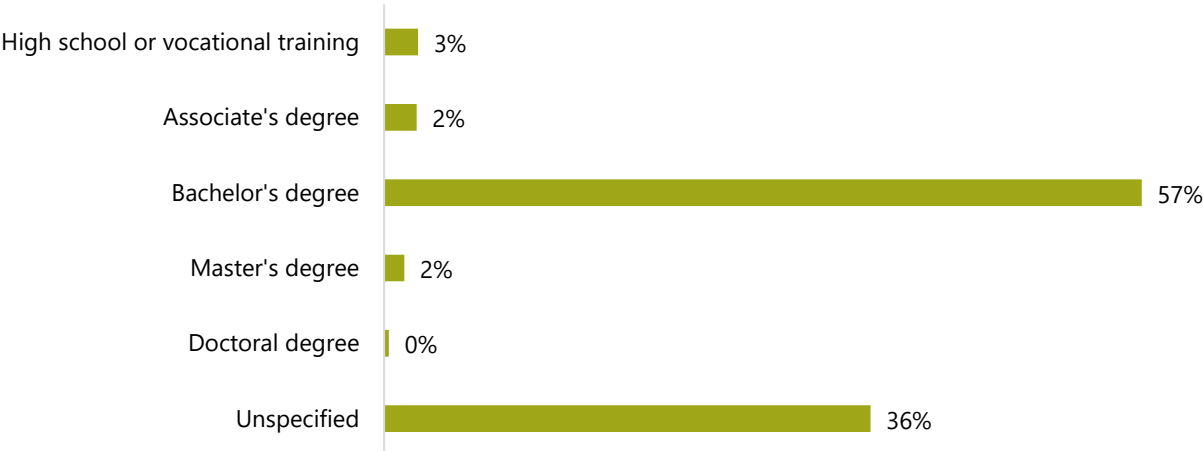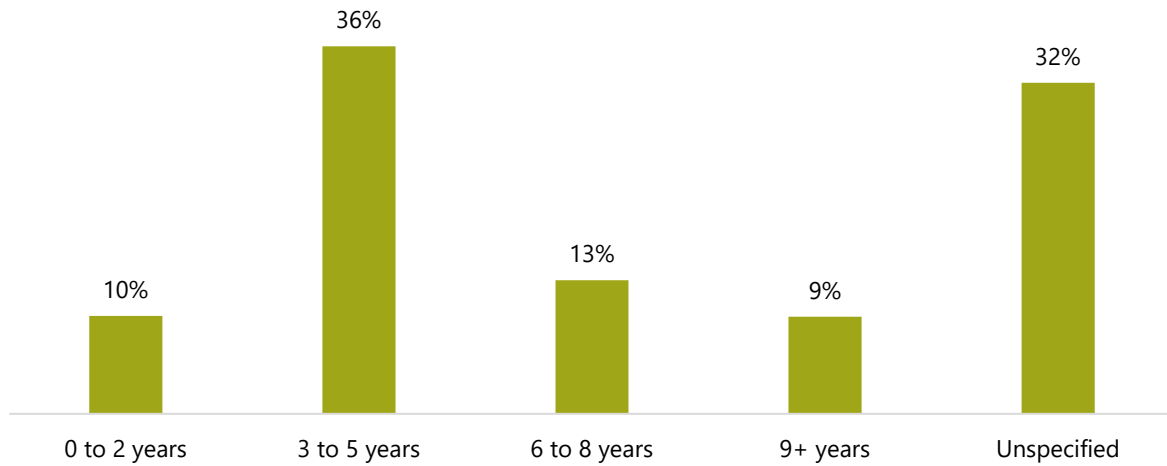Doctoral degree — 0%
Unspecified — 36%

Exhibit 10 shows the experience levels required by employers for job postings for the selected occupations. Thirty-two percent (n = 2,028) of job postings did not include a preferred experience level.

Exhibit 10. Employer-preferred experience levels

ARTIFICIAL INTELLIGENCE SKILLS ANALYSIS

This section of the report examines the level of demand for a workforce with artificial intelligence skillsets. By searching for job postings containing skills related to artificial intelligence, we can map to jobs that require the skill and employers looking for job candidates with these skills.

Skills Analysis is a report from Burning Glass, which uses online job postings to analyze the demand for skills. The North (Greater Sacramento) COE identified 716 distinct online job postings for the artificial intelligence skill sets in the Greater Sacramento subregion. Job postings data comes from Burning Glass Labor Insights and represents new listings posted online within the last year, from April 1, 2021, through March 31, 2022.

Exhibit 11. Burning Glass Skill Taxonomy for Artificial Intelligence

Skill Cluster	Skill Family	Individual Skills (found in job postings)
Information Technology	Artificial Intelligence	AI ChatBot
		AI KIBIT
		Artificial Intelligence
		IBM Watson

Top Occupations for A.I.

Exhibit 12 shows the number of online job postings requesting artificial intelligence skills by occupation.

Exhibit 12. Greater Sacramento occupations needing Artificial Intelligence skills

Occupation (2010 SOC Titles)	Total Job Postings	Job Postings Requesting Skills	Share of Job Postings Requesting Skills	Typical Entry-Level Education
Software Developers, Applications	6,339	110	**1.7%**	Bachelor's degree
Computer Systems Engineers/Architects	1,603	57	**3.6%**	Bachelor's degree
Computer and Information Research Scientists	275	45	**16.4%**	Master's degree
Managers, All Other	8,441	27	**0.3%**	Bachelor's degree
Business Intelligence Analysts	1,260	23	**1.8%**	Bachelor's degree
Database Administrators	959	18	**1.9%**	Bachelor's degree
Web Developers	1,170	17	**1.5%**	Associate's degree
Management Analysts	2,634	15	**0.6%**	Bachelor's degree
Intelligence Analysts	86	15	**17.4%**	Bachelor's degree
Sales Representatives, Wholesale and	9,786	13	**0.1%**	High school diploma or

Manufacturing, Except Technical and Scientific Products				equivalent

Top Employers for A.I.

Exhibit 13 shows the employers with the most online job postings requesting artificial intelligence skills.

Exhibit 13. **Greater Sacramento employers needing Artificial Intelligence skills**

Employer	A.I. Job Postings	Share of A.I. Job Postings
Deloitte	92	5%
Intel Corporation	62	4%
Accenture	41	2%
Anthem Blue Cross	40	2%
Travelers	24	1%
Blue Cross Blue Shield of California	19	1%
General Motors	15	1%
Guidehouse	14	1%
Nvidia Corporation	13	1%
University Of California	13	1%

Top Co-Occurring Skills for A.I.

Exhibit 14 shows the top 10 co-occurring artificial intelligence skills across three categories: specialized, human-centered, and technical skills.

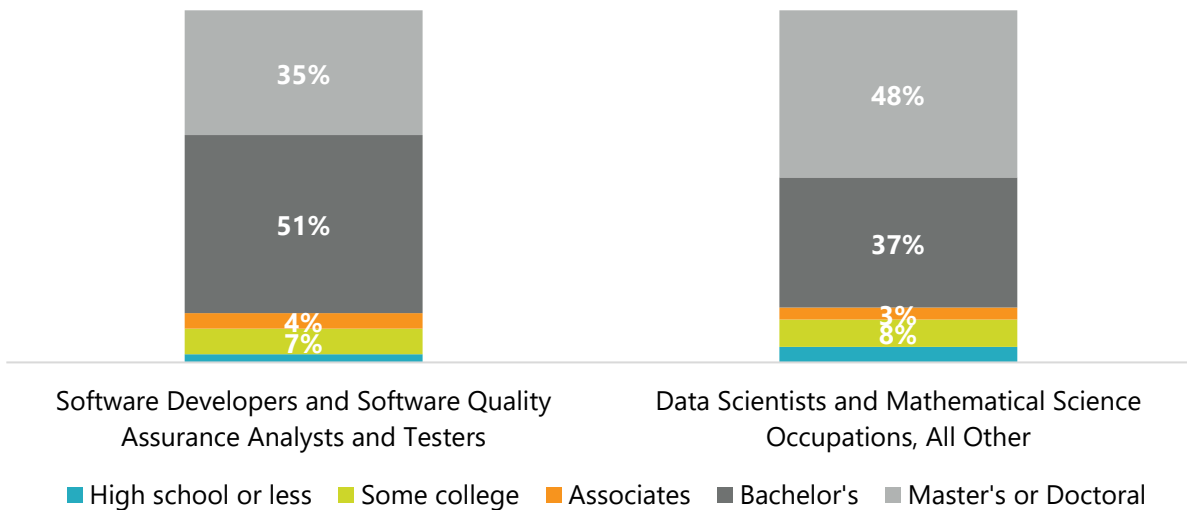**Exhibit 14.** **Skills Co-Occurring with A.I. in Greater Sacramento**

Top 10 Specialized Skills	Top 10 Human-Centered Skills	Top 10 Technical Skills
Artificial Intelligence	Communication Skills	Python

Top 10 Specialized Skills	Top 10 Human-Centered Skills	Top 10 Technical Skills
Machine Learning	Teamwork / Collaboration	SQL
Python	Problem Solving	Java
Data Science	Research	Software Development
SQL	Creativity	Software Engineering
Java	Planning	C++
Software Development	Writing	Microsoft Excel
Big Data	Written Communication	Linux
Software Engineering	Troubleshooting	Apache Hadoop
Project Management	Organizational Skills	Computer Engineering

EDUCATION AND TRAINING

The U.S. Census Bureau and Bureau of Labor Statistics collected data on education achieved by workers employed in occupations. Exhibit 15 shows the national-level educational attainment of the current workforce in the selected occupations.

Exhibit 15. National worker educational attainment for selected occupations, 2019

Software Developers and Software Quality Assurance Analysts and Testers: High school or less, Some college 7%, Associates 4%, Bachelor's 51%, Master's or Doctoral 35%

Data Scientists and Mathematical Science Occupations, All Other: High school or less, Some college 8%, Associates 3%, Bachelor's 37%, Master's or Doctoral 48%

■ High school or less ■ Some college ■ Associates ■ Bachelor's ■ Master's or Doctoral

The Bureau of Labor Statistics (BLS) uses a system to assign categories for entry-level education, work experience in a related occupation, and typical on-the-job training to each occupation for which the BLS publishes projections data. Exhibit 16 shows the skill level and entry-level job requirements for the selected occupations.

Exhibit 16. Typical education, work experience, and on-the-job training requirements

Occupation	Typical Entry-level Education	Work Experience Required	On-the-job Training Required
Software Developers and Software Quality Assurance Analysts and Testers	Bachelor's degree	None	None
Data Scientists and Mathematical Science Occupations, All Other	Bachelor's degree	None	None

EDUCATIONAL SUPPLY

Educational supply for an occupation can be estimated by analyzing the number of awards issued in related Taxonomy of Programs (TOP) or Classification of Instructional Programs (CIP) codes. Exhibit 17 shows the TOP and CIP codes for educational programs related to the selected occupations.

Exhibit 17. TOP and CIP codes for training programs related to the selected occupations

TOP Programs and Codes	Aligned CIP Programs and Codes
Information Technology, General (0701.00)	Computer and Information Sciences, General. (11.0101) Computer Programming/Programmer, General. (11.0201)
Computer Information Systems (0702.00)	Computer and Information Sciences, General. (11.0101) Information Technology. (11.0103) Computer Systems Analysis/Analyst. (11.0501) Computer/Computer Systems Technology/Technician. (15.1202) Data Science, General. (30.7001)

	Data Analytics, General. (30.7101)
Computer Science (Transfer) (0706.00)	Computer and Information Sciences, General (11.0101)
	Computer Science (11.0701)
	Computational Science (30.3001)
	Data Science, General. (30.7001)
Computer Software Development (0707.00)	Computer Programming/Programmer, General. (11.0201)
	Data Science, General. (30.7001)
	Data Analytics, General. (30.7101)
Computer Programming (0707.10)	Computer Programming/Programmer, General. (11.0201)
	Computer Programming, Specific Applications. (11.0202)
	Computer Programming, Vendor/Product Certification. (11.0203)
	Computer Game Programming. (11.0204)
	Computer Programming, Specific Platforms. (11.0205)
	Computer Systems Analysis/Analyst. (11.0501)
	Computer Science. (11.0701)
	Data Science, General. (30.7001)
	Data Analytics (30.7101)
Database Design and Administration (0707.20)	Data Modeling/Warehousing and Database Administration. (11.0802)
	Data Science, General. (30.7001)
	Data Analytics (30.7101)
Computer Systems Analysis (0707.30)	Computer Systems Analysis/Analyst. (11.0501)

Community College Supply

Exhibits 18 and 19 compare the average number of certificates and degrees conferred in selected community college programs over the last three academic years.
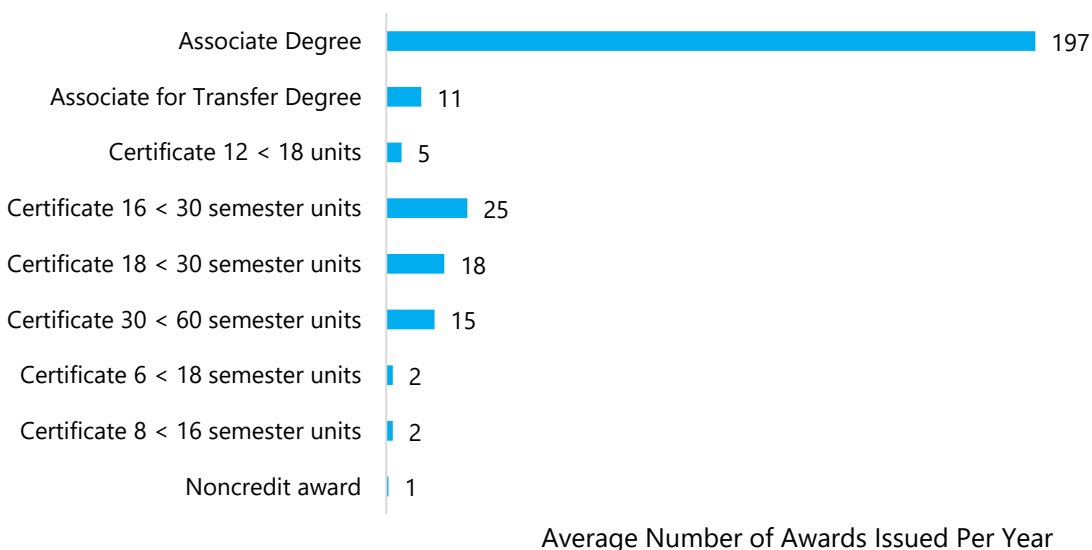
Exhibit 18. Annual average community college awards by program, 2018-19 through 2020-21

Program - TOP Code	College	Annual Awards 2018-19	Annual Awards 2019-20	Annual Awards 2020-21	3-Yr Annual Awards Average
Information Technology (0701.00)	Cosumnes River	8	12	18	13
	Folsom Lake	--	3	5	3
	Subtotal	**8**	**15**	**23**	**16**
Computer Information Systems (0702.00)	Cosumnes River	13	9	9	10
	Sacramento City	6	13	13	11
	Sierra	5	6	4	5
	Subtotal	**24**	**28**	**26**	**26**
Computer Science (Transfer) (0706.00)	American River	29	36	43	36
	Cosumnes River	7	17	19	14
	Folsom Lake	28	26	24	26
	Sierra	11	12	7	10
	Yuba	--	1	1	1
	Subtotal	**75**	**92**	**94**	**87**
Computer Software Development (0707.00)	Cosumnes River	1	0	2	1
	Sacramento City	13	13	26	17
	Subtotal	**14**	**13**	**28**	**18**
Computer Programming (0707.10)	American River	42	21	27	30
	Cosumnes River	9	12	15	12

Program - TOP Code	College	Annual Awards 2018-19	Annual Awards 2019-20	Annual Awards 2020-21	3-Yr Annual Awards Average
	Folsom Lake	16	0	11	9
	Sacramento City	10	5	14	10
	Sierra	35	34	33	34
	Yuba	15	9	3	9
	Subtotal	**127**	**81**	**103**	**104**
Database Design and Administration (0707.20)	American River	5	4	4	4
	Cosumnes River	23	11	19	18
	Folsom Lake	3	0	2	2
	Subtotal	**31**	**15**	**25**	**24**
Computer Systems Analysis (0707.30)	Sierra	--	--	1	1
	Subtotal	**--**	**--**	**1**	**1**
	Grand Total	**279**	**244**	**300**	**274**

Please note that values may not sum due to rounding.

Exhibit 19. Annual average community college awards by type, 2018-19 through 2020-21

Award Type	Average Number of Awards Issued Per Year
Associate Degree	197
Associate for Transfer Degree	11
Certificate 12 < 18 units	5
Certificate 16 < 30 semester units	25
Certificate 18 < 30 semester units	18
Certificate 30 < 60 semester units	15
Certificate 6 < 18 semester units	2
Certificate 8 < 16 semester units	2
Noncredit award	1

Average Number of Awards Issued Per Year

Other Postsecondary Supply

Exhibit 20 compares the average number of degrees non-community college training providers conferred in the North (Greater Sacramento) subregion over the last three academic years. Please note that non-community college data lags by one year.

Exhibit 20. Other postsecondary awards by program, 2017-18 through 2019-20

Program - CIP Code	College	Annual Awards 2017-18	Annual Awards 2018-19	Annual Awards 2019-20	3-Yr Annual Awards Average
Computer Science (11.0701)	UC Davis (Bachelor's Degree)	326	301	321	316
	CSU Sacramento (Bachelor's Degree)	156	236	239	210
	William Jessup (Bachelor's Degree)	--	4	5	3
	Grand Total	**482**	**537**	**560**	**529**

FINDINGS

- This report focuses on two occupations in the Artificial Intelligence training pathway, including Software Developers and Software Quality Assurance Analysts and Testers and Data Scientists and Mathematical Science Occupations, All Other.

    o Both Software Developers and Software Quality Assurance Analysts and Testers and Data Scientists and Mathematical Science Occupations, All Other are considered high-skill occupations. High-skill occupations typically require a minimum of a bachelor's degree for entry-level work.

    o A third occupation - Computer and Information Research Scientists - was considered for inclusion in this report. However, the typical entry-level education for workers in this occupation is a Master's degree, with nearly 60% of the nation's incumbent workforce holding a Master's or Doctoral degree.[2] Due to the higher level of education needed by workers in this occupation, it was excluded from this report.

- The North (Greater Sacramento) subregion held 9,349 software development and data science jobs in 2020. Software development and data science jobs are projected to increase by 12% over the next five years, adding 1,155 new jobs to the subregion by 2025.

    o Software developers and software quality assurance analysts and testers held slightly more than 85% of these jobs in Greater Sacramento in 2020. Jobs for software developers and software quality assurance analysts and testers are projected to remain concentrated at this level through 2025.

- Software development and data science jobs are projected to grow slightly slower in the North (Greater Sacramento) subregion than in California.

    o Historical job growth for software development and data science occupations in Greater Sacramento was negative until 2019. Although software development and data science jobs are growing in numbers in the Greater Sacramento region, job growth still lags significantly behind what's occurring across the state (which has trended positively since 2015).

- Over the next five years, software development and data science jobs are projected to have 965 annual openings in the North (Greater Sacramento) subregion.

    o Eighty percent, or 787, of these annual openings will be for software developers and software quality assurance analysts and testers.

- Wage data shows that software development and data science occupations earn at least $20 to $30 above the subregion's living wage of $14.53 per hour.

- According to real-time labor market information, there were about 6,292 online job postings for software development and data science occupations between April 1, 2021, and March 31, 2022. All but five of the job postings were for software developers and software quality assurance analysts and testers.

- The most in-demand specialized skills included SQL, software engineering, software development, Java, and JavaScript.

- Of the job postings that included minimum educational qualifications, 57% of employers were looking for job candidates with a bachelor's degree. Another 36% of employers requested job candidates with three to five years of relevant work experience.

- Analysis of the Artificial Intelligence skill cluster revealed the following:

  - During the last 12 months, 716 online job postings mentioned or required job candidates to possess artificial intelligence skills.

  - Of the more than 6,000 job postings for software developers, only 110 (less than 2%) required artificial intelligence skills.

  - The occupation with the largest share of job postings requesting artificial intelligence skills was Intelligence Analysts[3] (17.4%, n = 15) and Computer and Information Research Scientists (16.4%, n = 45).

  - The company Deloitte led the top employer's group with the most number of job postings requesting artificial intelligence skills.

- Between 37% and 51% of incumbent software development and data science workers hold a bachelor's degree, while another 35% to 48% hold a Master's or Doctoral degree.

  - Approximately 11% of incumbent software development and data science workers have educational attainment levels consistent with community college offerings (some college or associate degrees)

- Six North (Greater Sacramento) community colleges offer degrees and certificates in software development and data science programs. Together, these programs conferred an average of 274 awards (certificates and associate degrees) in software development and data science programs over the last three academic years (2018-19 through 2020-21).

- Local four-year colleges and universities also offer training related to software development and data science. Between 2017-18 and 2019-20, four-year colleges and universities conferred an average of 529 bachelor's degrees in software development

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[3] Intelligence Analysts are a sub-occupation of Detectives and Criminal Investigtors (SOC 33-1021)

and data science programs over the last three years. Please note that non-community college awards data lags by one year.

RECOMMENDATIONS

- Based on occupational demand and educational supply in the North (Greater Sacramento) subregion, there appears to be a supply gap for Software Developers and Software Quality Assurance Analysts and Testers and Data Scientists and Mathematical Science Occupations, All Other. The typical entry-level wages far exceed the living wage for the Greater Sacramento region. However, these occupations typically require a Bachelor's degree, and analysis of job posting data suggests that local employers prefer these workers to have a minimum of a bachelor's degree.

- Furthermore, a detailed analysis of the demand for artificial intelligence skills in the Greater Sacrament subregion revealed low demand for workers with these skill sets. In the last 12 months, 716 online job postings requested artificial intelligence sets. And these job postings were concentrated in occupations that typically required a bachelor's degree or higher.

- The North (Greater Sacramento) Center of Excellence recommends community colleges work with employers to better tailor artificial intelligence program offerings to local workforce needs.

- The North (Greater Sacramento) Center of Excellence recommends community colleges align artificial intelligence programs with transfer-oriented pathways to ensure students meet local employer expectations of job candidates holding Bachelor's degrees.

- The North (Greater Sacramento) Center of Excellence recommends exercising caution in developing artificial intelligence training programs.

COE Recommendation		
Move forward with the program	**Proceed with caution**	**Program is not recommended**
☐	☒	☐

APPENDIX A. METHODOLOGY AND SOURCES

This report identified Occupations using the Center of Excellence TOP-to-CIP-to-SOC crosswalk and O*Net OnLine. This report's findings were determined using labor market data from the Bureau of Labor Statistics (BLS), U.S. Census Bureau data from Emsi, and jobs posting data from Burning Glass.

Cal-PASS Plus LaunchBoard. California Community Colleges Chancellor's Office. https://www.calpassplus.org/LaunchBoard/Home.aspx.

Emsi 2022.1; QCEW Employees, Non-QCEW Employees, and Self-Employed. https://www.economicmodeling.com/. EMSI occupational employment data are based on final EMSI industry data and final EMSI staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors).

Educational Attainment for Workers 25 Years and Older by Detailed Occupation, 2016-2017. Bureau of Labor Statistics. https://www.bls.gov/emp/tables/educational-attainment.htm#.

Integrated Postsecondary Education Data System (IPEDS). National Center for Education Statistics. U.S. Department of Education. https://nces.ed.gov/ipeds/.

"Labor Insight Real-Time Labor Market Information Tool." Burning Glass Technologies. http://www.burning-glass.com.

Labor Market Information Division. California Employment Development Department. https://labormarketinfo.edd.ca.gov/.

Management Information Systems (MIS) Data Mart. California Community Colleges Chancellor's Office. https://datamart.cccco.edu/.

Occupational Employment Statistics (OES). Bureau of Labor Statistics. https://www.bls.gov/oes/home.htm.

O*NET OnLine. U.S. Department of Labor/Employment and Training Administration (DOL ETA). https://www.onetonline.org/.

Self-Sufficiency Standard Tool for California. The University of Washington. http://www.selfsufficiencystandard.org/

"Taxonomy of Programs." California Community Colleges Chancellor's Office. June 2012, 6th Edition. https://www.cccco.edu/-/media/CCCCO-Website/About-

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COVID-19 Statement: This report includes employment projection data by EMSI. EMSI's projections are modeled on recorded (historical) employment figures and incorporate several underlying assumptions, including the assumption that the economy during the projection period will be at approximately full employment or potential output. To the extent that a recession or labor shock, such as the economic effects of COVID-19, can cause long-term structural change, they may impact the projections. At this time, it is not possible to quantify the impact of COVID-19 on projections of industry and occupational employment. Other measures such as unemployment rates and monthly industry employment estimates will reflect the most recent information on employment and jobs in the state and, in combination with input from local employers, may help validate current and future employment needs as depicted here.

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