LABOR MARKET ANALYSIS

FOR PROGRAM RECOMMENDATION

C·O·E

CENTERS OF EXCELLENCE
FOR LABOR MARKET RESEARCH

DATA SCIENCE
IN THE GREATER SACRAMENTO REGION

North (Greater Sacramento)
Center of Excellence

DECEMBER 2022

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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 analysis due to the lessened barriers for entry-level work, such as no formal education and on-the-job training requirements.

Key findings include:

- Over the next five years, data science jobs are projected to have 827 annual openings in the North (Greater Sacramento) subregion.
- Analysis of wage data shows that data science occupations earn $16 to $48 above the single adult living wage of $14.53 per hour.
- Between December 1, 2021, and November 30, 2022, there were 1,627 job postings for data scientists, representing about 35% of job postings.
- Across California, incumbent workers in the studied data science occupations tend to hold a bachelor's degree or higher.
- While most local community colleges offer programs in fields of study related to data science, there seems to be only one program devoted explicitly to data science in the Greater Sacramento area.

Recommendations include:

- The North (Greater Sacramento) Center of Excellence recommends moving forward with new program development in the field of data science.
- Given that the typical entry-level education for data science occupations is a bachelor's degree and a significant proportion of incumbent workers hold at least a bachelor's degree, the COE recommends community colleges develop transfer pathways for any new data science program.

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:

- Data Scientists (15-2051)
    - Includes the emerging occupation of Business Intelligence Analysts (15-2051.01)
- Computer Systems Analysts (15-1211)
- Computer Programmers (15-2051)
- Computer and Information Systems Managers (11-3021)

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

- Computer Information Systems (0702.00)
- Computer Software Development (0707.00)
- Computer Programming (0707.10)

The corresponding Classification of Instructional Program (CIP) title(s) and code(s) are:

- Information Technology (11.0103)
- Data Science, General (30.7001)
- Computer Science (11.0701)

OCCUPATIONAL DEMAND

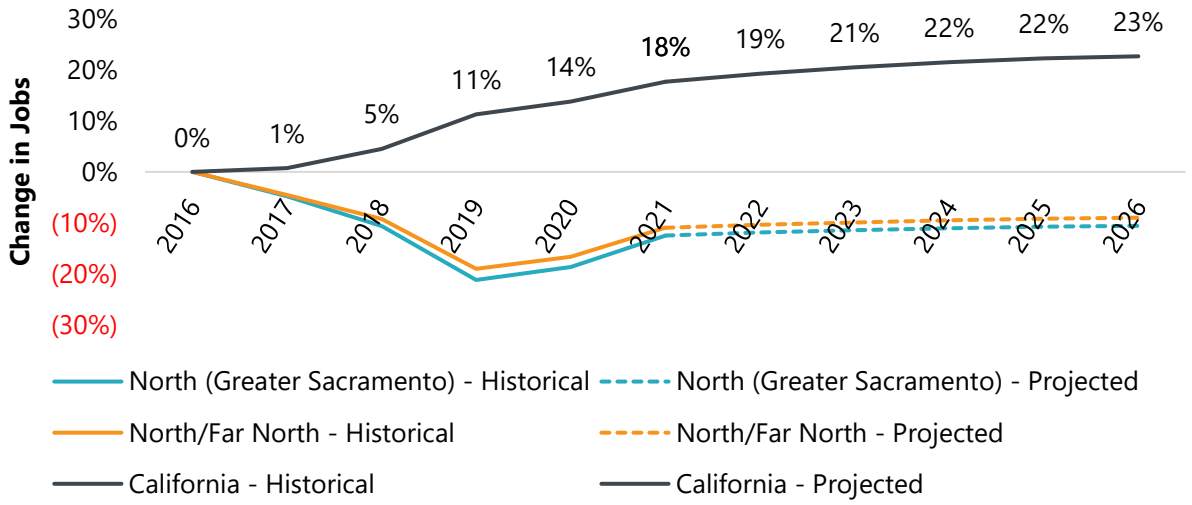
Exhibit 1 summarizes the five-year projected job growth for middle-skill and high-skill occupations in the North, North/Far North, and California.

Exhibit 1. Employment and projected demand, 2021-2026

Occupation	2021 Jobs	2026 Jobs	2021-2026 Change	2021-2026 % Change	2021-2026 Annual Openings
Computer and Information Systems Managers	4,044	4,158	114	3%	322
Computer Systems Analysts	3,083	3,157	74	2%	231
Computer Programmers	1,809	1,681	(129)	(7%)	116
Data Scientists	1,678	1,848	170	10%	157
North (Greater Sacramento)	**10,613**	**10,844**	**230**	**2%**	**827**
Computer and Information Systems Managers	4,428	4,560	133	3%	355
Computer Systems Analysts	3,493	3,582	88	3%	263
Computer Programmers	1,910	1,768	(142)	(7%)	123
Data Scientists	1,778	1,955	178	10%	166
North/Far North	**11,609**	**11,866**	**257**	**2%**	**907**
Computer and Information Systems Managers	91,547	95,407	3,859	4%	7,640
Computer Systems Analysts	59,606	62,285	2,679	4%	4,792
Computer Programmers	26,171	25,429	(741)	(3%)	1,811
Data Scientists	17,337	19,795	2,458	14%	1,784
California	**194,661**	**202,915**	**8,255**	**4%**	**16,026**

Exhibit 2 compares the percent change in jobs between 2016 through 2021 and the projected changes through 2026. The rate of change is indexed to the total number of jobs in 2016.

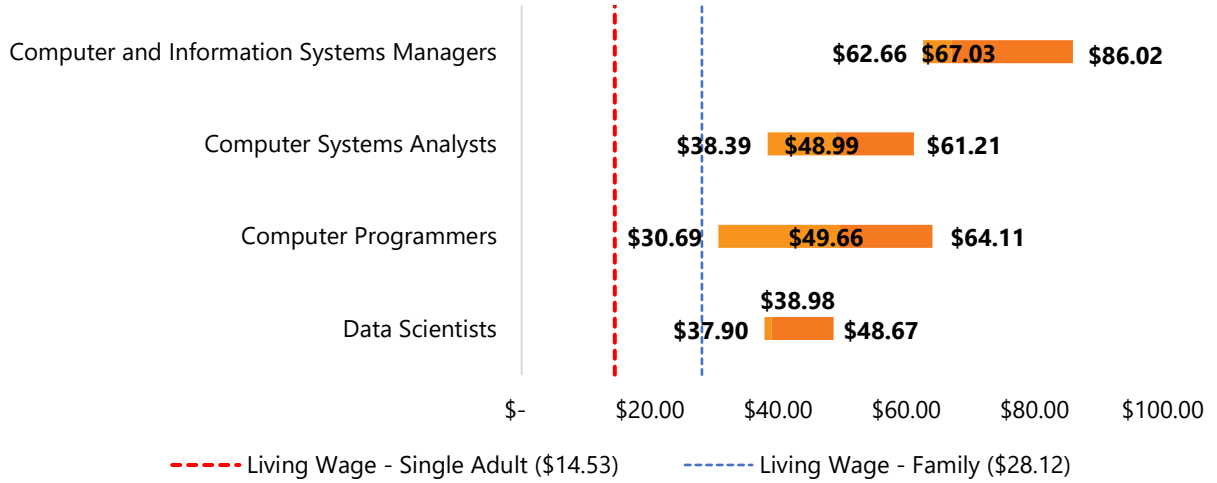
Exhibit 2. Changes in employment, 2016-2026



WAGES

Exhibit 3 compares the entry-level, median, and experienced wages for the selected occupations to the North (Greater Sacramento) living wage[1] for a single adult ($14.53 per hour) and a small family[2] ($28.12 per hour).

Exhibit 3. Comparison of wages by occupation, 2021



[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. Please note that the 25th-percentile and 75th-percentile hourly wages are used as proxy for entry-level and experienced-level wages.
[2] A small family is defined as a single adult and one school aged child (between the ages of 5 and 12 years).

JOB POSTINGS

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

The North COE identified 4,582 online postings for data science-related jobs in the Greater Sacramento subregion. Job posting data comes from Lightcast (formerly Emsi Burning Glass Labor) and represents new listings posted online within the last year, from December 1, 2021, to November 30, 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
Computer Systems Analysts	2,067	45%
Data Scientists (overall)	1,627	35%
Business Intelligence Analysts	*1,239*	--
Data Scientists	*301*	--
Other	*87*	--
Computer Programmers	583	13%
Computer and Information Systems Managers	305	7%
Total Job Postings	**4,582**	**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
Business Systems Analysts	263	6%
Data Analysts	190	4%

Job Title	Job Postings	Share of Job Postings
Data Scientists	144	3%
Business Intelligence Analysts	87	2%
Systems Analysts	73	2%
Business Solutions Analysts	63	1%
Research Data Analysts	57	1%
IT Business Analysts	38	1%
Systems Specialists	38	1%
Data Science Managers	35	1%

Employers

Exhibit 6 shows the top 10 employers with the most job postings for the selected occupations.

Exhibit 6. Employers with the most job postings

Employer	Job Postings	Share of Job Postings
Deloitte	257	6%
University of California, Davis	177	4%
Accenture	160	3%
Elevance Health	105	2%
Blue-Shield	82	2%
Intel	82	2%
UC Davis Health	63	1%
Centene	49	1%
PricewaterhouseCoopers	34	1%
PG&E	34	1%

Certifications, Skills, and Experience

Exhibit 7 shows the most relevant certifications requested by employers for the selected occupations.

Exhibit 7. Most in-demand certifications

Certification	Job Postings	Share of Job Postings
Project Management Professional Certification	82	2%
Top Secret-Sensitive Compartmented Information (TS/SCI Clearance) OR Security Clearance	79	2%
Certified Business Analysis Professional	36	1%
CompTIA Security+	32	1%
Microsoft Certified Professional	30	1%
Certified Information Systems Security Professional	26	1%

Exhibit 8 shows the studied occupations' top 10 specialized, employability, and technical skills.

Exhibit 8. Most in-demand specialized skills

Top 10 Specialized Skills	Top 10 Employability Skills	Top 10 Technical Skills
Data Analysis	Communications	SQL (Programming Language)
Computer Science	Management	Microsoft Excel
SQL (Programming Language)	Leadership	Python (Programming Language)
Business Process	Problem Solving	Microsoft Office
Agile Methodology	Operations	Tableau (Business Intelligence Software)
Python (Programming Language)	Writing	Microsoft PowerPoint

Top 10 Specialized Skills	Top 10 Employability Skills	Top 10 Technical Skills
Project Management	Planning	R (Programming Language)
Business Requirements	Research	SAP Applications
Workflow Management	Customer Service	Operating Systems
Information Systems	Microsoft Excel	Microsoft Access

Exhibit 9 shows employers' minimum level of education for job postings for the selected occupations.

Exhibit 9. Employer-preferred minimum education levels

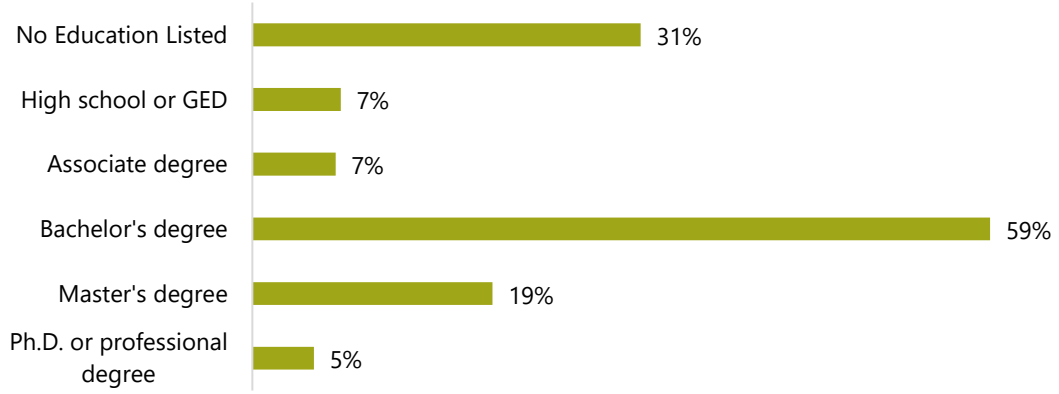
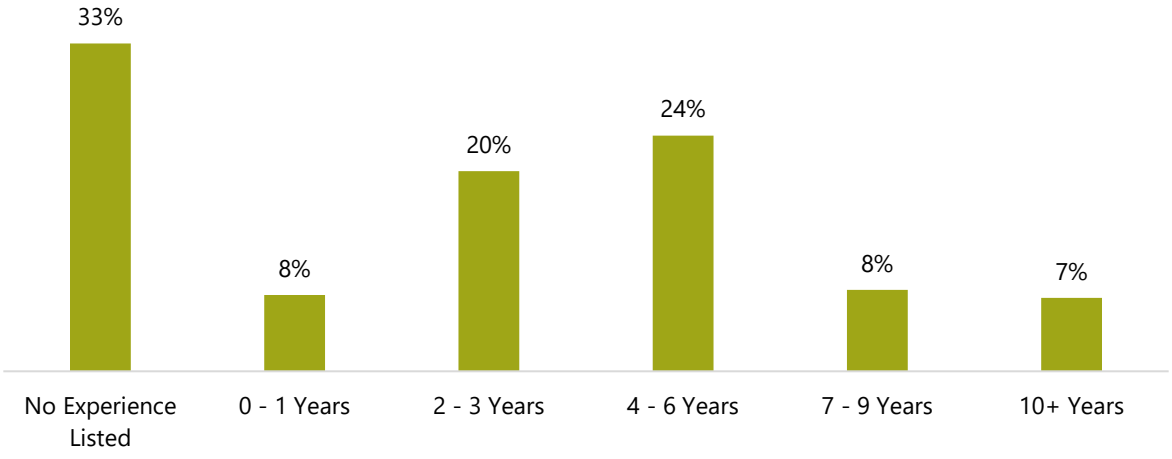


Exhibit 10 shows the experience levels required by employers for job postings for the selected occupations.

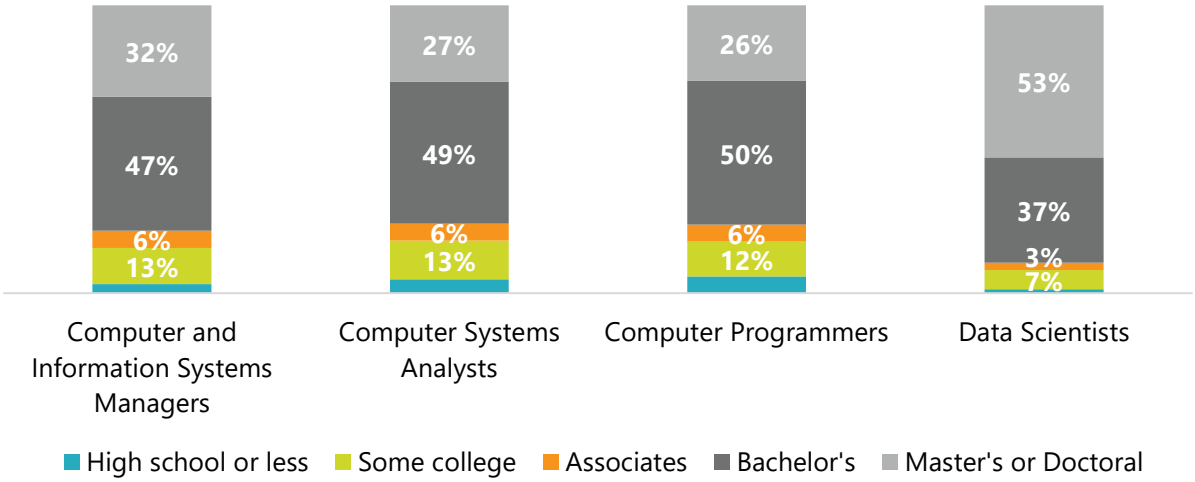
Exhibit 10. Employer-preferred experience levels



EDUCATION AND TRAINING

The U.S. Census Bureau collects education data from workers employed in occupations. Exhibit 11 shows the state-level educational attainment of the current workforce in the selected occupations.

Exhibit 11. California worker educational attainment for selected occupations, 2019



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 12 shows the selected occupations' entry-level job requirements.

Exhibit 12. Typical education, work experience, and on-the-job training requirements

Occupation	Typical Entry-level Education	Work Experience Required	On-the-job Training Required
Computer and Information Systems Managers	Bachelor's degree	Five years or more	None
Computer Systems Analysts	Bachelor's degree	None	None
Computer Programmers	Bachelor's degree	None	None
Data Scientists	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 13 shows the TOP and CIP codes for educational programs related to the selected occupations.

Exhibit 13. TOP and CIP codes for training programs related to the selected occupations

TOP Programs and Codes	Aligned CIP Programs and Codes
Computer Information Systems (0702.00)	Information Technology (11.0103)
Computer Software Development (0707.00)	Data Science, General (30.7001)
Computer Programming (0707.10)	Computer Science (11.0701)

Community College Supply

Exhibits 14 and 15 compare the average number of certificates and degrees from selected community college programs over the last three academic years.

Exhibit 14. Annual average community college awards by program

Program - TOP Code	College	Annual Awards 2019-20	Annual Awards 2020-21	Annual Awards 2021-22	3-Yr Annual Awards Average
Computer Information Systems (0702.00)	Cosumnes River	9	9	9	9
	Sacramento City	12	13	14	13
	Sierra	6	4	2	4
	Subtotal	**27**	**26**	**25**	**26**
Computer Programming (0707.10)	American River	21	27	29	26
	Cosumnes River	12	15	18	15
	Folsom Lake	0	11	19	15
	Sacramento City	5	14	9	9
	Sierra	34	33	26	31

Program - TOP Code	College	Annual Awards 2019-20	Annual Awards 2020-21	Annual Awards 2021-22	3-Yr Annual Awards Average
	Yuba	9	3	25	12
	Subtotal	**81**	**103**	**126**	**103**
Computer Software Development (0707.00)	Cosumnes River	0	2	2	1
	Folsom Lake	--	--	1	1
	Sacramento City	13	26	11	16
	Subtotal	**13**	**28**	**14**	**18**
	Grand Total	**121**	**157**	**165**	**148**

Exhibit 15. Annual average community college awards by type

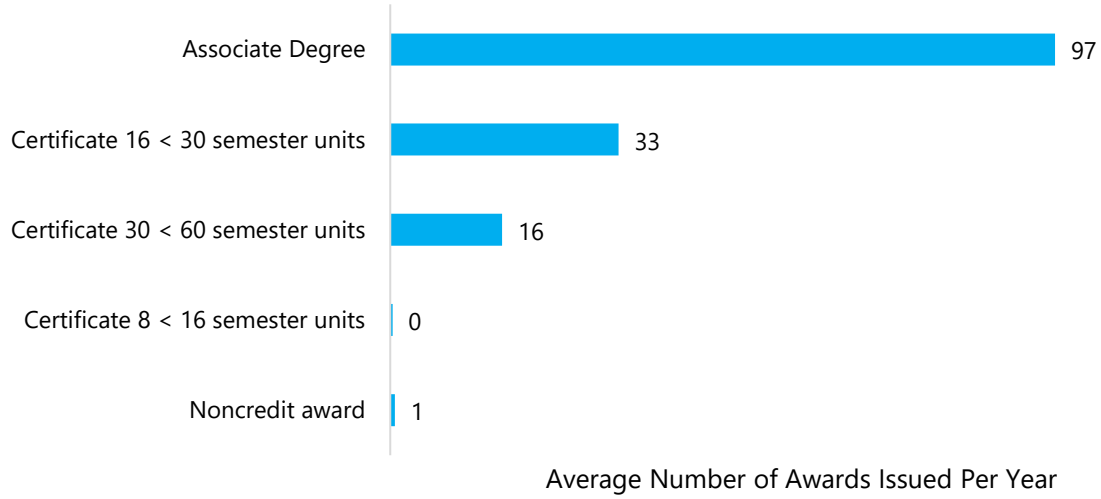


Exhibit 16 lists the programs from Greater Sacramento's community colleges by TOP code. This list comes from The Chancellor's Office Curriculum Inventory System (COCI 2.0).

Exhibit 16. California Community College Programs by TOP Code

TOP Code	College	Program	Award
Computer Information Systems (0702.00)	Cosumnes River	Management Information Systems	Associate Degree
	Sacramento City	Data Science	Certificate
	Sacramento City	Information Processing	Associate Degree
	Sacramento City	Management Information Science	Certificate Associate Degree
	Sierra	Computer Science: Management Information Systems	Associate Degree
Computer Programming (0707.10)	American River	CIS: Computer Programming	Certificate Associate Degree
	Cosumnes River	CIS: Computer Programmer – SQL	Certificate
	Cosumnes River	CIS: Computer Programming (workforce entry)	Associate Degree
	Cosumnes River	CIS: Programming in C/C++	Certificate
	Cosumnes River	CIS – Web Programming	Certificate
	Cosumnes River	Computer Science	Certificate
	Folsom Lake	Computer Programming	Certificate
	Sacramento City	Programming	Certificate
	Sacramento City	Web Developer	Certificate Associate Degree
	Sacramento City	Front-end Web Developer	Certificate

TOP Code	College	Program	Award
	Sierra	Computer Science: Computer Science	Associate Degree
	Sierra	Computer Science – Web Programming	Certificate
	Yuba	Computer Science	Certificate Associate Degree
Computer Software Development (0707.00)	Cosumnes River	CIS-Object Oriented Software Development	Certificate
	Sacramento City	Computer Science	Certificate Associate Degree
	Sacramento City	iOS App Developer	Certificate

Other Postsecondary Supply

Exhibit 17 compares the average number of degrees that 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 17. Other postsecondary awards by program

Program - CIP Code	College	Annual Awards 2018-19	Annual Awards 2019-20	Annual Awards 2020-21	3-Yr Annual Awards Average
Computer Science (11.0701)	UC Davis (Bachelor's Degree)	301	321	360	327
	CSU Sacramento (Bachelor's Degree)	236	239	260	245
	William Jessup (Bachelor's Degree)	4	5	4	4
	Grand Total	**541**	**565**	**624**	**576**

FINDINGS

- This report focuses on four occupations in the data science career pathway: data scientists (which includes the emerging occupation of business intelligence analysts), computer systems analysts, computer programmers, and computer and information systems managers.
- The North (Greater Sacramento) subregion held 10,613 data science jobs in 2021. These jobs are projected to increase by 2% over the next five years, adding 230 new jobs to the subregion by 2026.
    - The slower-than-average growth for data science jobs is due to the projected loss of jobs for programmers in the Greater Sacramento area. Computer programmer jobs are projected to decline by 7% over the next five years, losing 129 jobs by 2026.
- Data science jobs are projected to grow slower in the North (Greater Sacramento) subregion than in California.
- Over the next five years, data science jobs are projected to have 827 annual openings in the North (Greater Sacramento) subregion.
    - Most of these job openings will be for computer and information systems managers, with 322 annual openings between 2021 and 2026. Jobs for data scientists are projected to have 157 openings each year between 2021 and 2026.
- Analysis of wage data shows that data science occupations earn $16 to $48 above the single adult living wage of $14.53 per hour.
- According to real-time labor market information, there were about 4,582 online job postings for data science occupations between December 1, 2021, and November 30, 2022.
    - Forty-five percent of job postings were for computer systems analysts (n = 2,067).
    - Overall, there were 1,627 job postings for data scientists, which represented about 35% of all data science job postings. Among the job postings for data scientists, more than three-quarters were for business intelligence analysts (n = 1,239).
- Across California, current workers in the studied data science occupations tend to hold a bachelor's degree or higher. Thirty-seven percent to 50% of these workers hold a bachelor's degree, while another 26% to 53% have a master's or doctorate.

    - Between 10% and 19% of incumbent workers in data science occupations in California have educational attainment levels consistent with community college offerings (some college or an associate degree).
- Six North (Greater Sacramento) community colleges offer degrees and certificates in programs related to data science occupations. Together, these programs conferred an average of 148 awards (certificates and associate degrees) over the last three academic years (2019-20 through 2021-22).
    - While most local community colleges offer programs in fields of study related to data science, there seems to be only one program devoted explicitly to data science: the data science certificate offered at Sacramento City College.
- Local four-year universities also offer training in fields of study related to data science. Between 2018-19 and 2020-21, non-community college training providers conferred an average of 576 awards in related programs over the last three years. Please note that non-community college awards data often lags by one year.

RECOMMENDATIONS

- Analysis of the supply gap shows that the region seems to have room for additional training related to data science occupations.
    - Community colleges and four-year universities issued an average of 724 awards over the last three years.
    - There are 827 projected annual openings for data science jobs.
- The North (Greater Sacramento) Center of Excellence recommends moving forward with the program.
- Given that the typical entry-level education for data science occupations is a bachelor's degree and a significant proportion of incumbent workers hold at least a bachelor's degree, the COE recommends community colleges develop transfer pathways for any new data science program.

New Program Recommendation		
Move forward with the new program	**Proceed with caution**	**A new 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.

Lightcast (Formerly EMSI/Burning Glass) 2022.3; QCEW Employees, Non-QCEW Employees, and Self-Employed. https://www.economicmodeling.com/. *Note: 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).*

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

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/.

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

Public Use Microdata Sample (PUMS). U.S. Census Bureau American Community Survey (ACS). https://www.census.gov/programs-surveys/acs/microdata.html

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-Us/Divisions/Educational-Services-and-Support/Academic-Affairs/What-we-do/Curriculum-and-Instruction-Unit/Files/TOPmanual6200909corrected12513pdf.ashx

"TOP-CIP-SOC Crosswalk." Centers of Excellence for Labor Market Research. June 2021 Edition. http://coeccc.net/

APPENDIX B. GLOSSARY OF KEY TERMS

Key Terms	Definition
Occupation	Occupation refers to professions, or careers, in the workforce. Occupations differ from jobs in that jobs show the number of positions held in a given occupation.
Jobs	A job is any position where a worker provides labor for monetary compensation. Job numbers include employees (those who work for businesses) and proprietors (those who work for themselves). Full- and part-time jobs are included and counted equally (i.e., not adjusted to full-time equivalents). Data for jobs, or employment, are annual averages.
Job Change	Job change is the net increase or decrease of jobs over a given timeframe.
Job Openings	Job openings are the projected number of positions available for workers entering an occupation. Openings include growth and replacement jobs. Growth jobs are the positive change in the total number of workers employed. Replacement jobs are the estimates of new workers needed to replace workers permanently leaving the occupation.
Wages	Wages, or compensation, show workers' percentile and average earnings in a given occupation. The 25th-percentile and 75th-percentile hourly wages are used as a proxy for entry-level and experienced-level wages.
Living Wage	The living wage is the level of income a single adult with no children must earn to meet basic needs. The living wage is calculated using basic levels of allowances for food, housing, transportation, healthcare, taxes, and other miscellaneous basic needs.
Educational Attainment	Educational attainment is the level of education achieved by workers in a given occupation. The data includes workers aged 25 years and older.
Typical Entry-level Education	The education level generally required for employment in an occupation. It may differ from the actual educational levels attained by workers in any given occupation.
Work Experience Required	The level of prior experience a worker needs to enter a job in a given occupation.
On-the-job Training Required	The level of on-the-job training a worker needs to obtain competency in a given occupation.
Awards	Awards are the number of certificates and degrees conferred for a specific course of study in a given year. Awards counts "papers" and, as a result, may be greater than the actual number of students who complete a program.

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.

Important Disclaimer: All representations included in this report have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. Efforts have been made to qualify and validate the accuracy of the data and the reported findings; however, neither the Centers of Excellence, COE host District, nor California Community Colleges Chancellor's Office are responsible for applications or decisions made by recipient community colleges or their representatives based upon components or recommendations contained in this study.

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FOR LABOR MARKET RESEARCH

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