



# Labor Market Analysis for Program Recommendation Machine Learning, Deep Learning, and Programming (Artificial Intelligence) Occupations Silicon Valley Subregion

Prepared by the Bay Region Center of Excellence for Labor Market Research

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## Recommendation

Based on all available data, there appears to be an “undersupply” of Machine Learning, Deep Learning, and Programming (Artificial Intelligence) workers compared to the demand for this cluster of occupations in the Bay Region and in the Silicon Valley Subregion (Santa Clara County). There is a projected annual gap of about 2,458 students in the Bay Region and 1,021 students in the Silicon Valley Subregion. However, these occupations are above middle-skill meaning they require a bachelor’s degree or higher.

## Introduction

This report provides student outcomes data on employment and earnings for TOP 0799.00 - Other Information Technology programs in the state and region. It is recommended that these data be reviewed to better understand how outcomes for students taking courses on this TOP code compare to potentially similar programs at subregion in the state and region.

This report profiles Machine Learning, Deep Learning, and Programming (Artificial Intelligence) Occupations in the 12 county Bay Region and in the Silicon Valley Subregion. This report includes above middle-skill occupations that require a bachelor’s degree or higher.

- **Information Security Analysts (15-1212):** Plan, implement, upgrade, or monitor security measures for the protection of computer networks and information. Assess system vulnerabilities for security risks and propose and implement risk mitigation strategies. May ensure appropriate security controls are in place that will safeguard digital files and vital electronic infrastructure. May respond to computer security breaches and viruses.  
Typical Entry-Level Educational: Bachelor’s degree  
Skill Level: Above Middle-Skill  
Work Experience Required: Less than 5 years  
Percentage of individuals 25+ with an associate degree, certificate, or some postsecondary coursework as their highest level of education attainment: 24%
- **Data Scientists (15-2051):** Develop and implement a set of techniques or analytics applications to transform raw data into meaningful information using data-oriented programming languages and visualization software. Apply data mining, data modeling, natural language processing, and machine learning to extract and analyze information from large structured and unstructured datasets. Visualize, interpret, and report data findings. May create dynamic data reports.  
Typical Entry-Level Educational: Bachelor’s degree  
Skill Level: Above Middle-Skill

Work Experience Required: None

Percentage of individuals 25+ with an associate degree, certificate, or some postsecondary coursework as their highest level of education attainment: 10%

## Occupational Demand

**Table 1. Employment Outlook for Machine Learning, Deep Learning, and Programming (Artificial Intelligence) Occupations in the Bay Region**

Occupation	2023 Jobs	2028 Jobs	5-yr Change	5-yr % Change	5-yr Total Openings	Annual Openings	25% Hourly Wage	Median Hourly Wage
Information Security Analysts	7,245	8,224	979	14%	3,223	645	\$61	\$80
Data Scientists	14,104	18,532	4,427	31%	9,064	1,813	\$63	\$80
<b>Total</b>	<b>21,349</b>	<b>26,756</b>	<b>5,407</b>	<b>25%</b>	<b>12,287</b>	<b>2,458</b>	<b>\$62</b>	<b>\$80</b>

Source: Lightcast 2025.3

The Bay Region includes: Alameda, Contra Costa, Marin, Monterey, Napa, San Benito, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano and Sonoma Counties

**Table 2. Employment Outlook for Machine Learning, Deep Learning, and Programming (Artificial Intelligence) Occupations in the Silicon Valley Subregion**

Occupation	2023 Jobs	2028 Jobs	5-yr Change	5-yr % Change	5-yr Total Openings	Annual Openings	25% Hourly Wage	Median Hourly Wage
Information Security Analysts	2,589	3,039	450	17%	1,202	240	\$63	\$84
Data Scientists	5,366	7,433	2,067	39%	3,904	781	\$70	\$83
<b>Total</b>	<b>7,955</b>	<b>10,472</b>	<b>2,517</b>	<b>32%</b>	<b>5,106</b>	<b>1,021</b>	<b>\$68</b>	<b>\$83</b>

Source: Lightcast 2025.3

Silicon Valley Subregion includes: Santa Clara County

## Job Postings in the Bay Region and Silicon Valley Subregion

**Table 3. Number of Job Postings by Occupation for the latest 12 months**

Occupation	Bay Region	Silicon Valley
Data Scientists	14,466	6,288
Information Security Analysts	548	214

Source: Lightcast 2025.3; "Job Posting Analytics." Dec. 2024 - Nov. 2025

**Table 4a. Top Job Titles in Job Postings for Machine Learning, Deep Learning, and Programming (Artificial Intelligence) Occupations in the Bay Region**

Title	Bay	Title	Bay
Data Scientists	1,647	Applied Scientists	152
Data Analysts	919	SAP Consultants	127
Chief Data Scientists	260	Data Analytics Scientists	123

Title	Bay	Title	Bay
Data Science Managers	251	Data Analytics Engineers	100
Directors of Data Science	208	Principal Engineers	95
Business Intelligence Analysts	194	Data Science Interns	90
Enterprise Architects	183	Lead Data Scientists	90
Principal Data Scientists	174	SAP SD Consultants	86
Machine Learning Engineers	168	Marketing Data Scientists	84

Source: Lightcast 2025.3; "Job Posting Analytics." Dec. 2024 - Nov. 2025

**Table 4b. Top Job Titles in Job Posting for Machine Learning, Deep Learning, and Programming (Artificial Intelligence) Occupations in the Silicon Valley Subregion**

Title	Silicon Valley	Title	Silicon Valley
Data Scientists	718	Principal Data Scientists	66
Data Analysts	408	Enterprise Architects	63
Data Science Managers	142	Machine Learning Researchers	58
Chief Data Scientists	114	Principal Engineers	57
Applied Scientists	107	SAP Consultants	56
Business Intelligence Analysts	90	SAP GTS Consultants	56
Machine Learning Engineers	86	Data Science Interns	54
Directors of Data Science	72	Data Analytics Engineers	50
Modeling Engineers	72	SAP SD Consultants	47

Source: Lightcast 2025.3; "Job Posting Analytics." Dec. 2024 - Nov. 2025

## Industry Concentration

**Table 5. Industries Hiring for Machine Learning, Deep Learning, and Programming (Artificial Intelligence) Occupations in the Bay Region**

Industry - 6 Digit NAICS (No. American Industry Classification) Codes	Jobs in Industry (2023)	Jobs in Industry (2028)	% Change (2023-28)	% Occupation Group in Industry (2023)
Custom Computer Programming Services	2,955	3,782	28%	13%
Corporate, Subsidiary, and Regional Managing Offices	1,051	2,587	146%	9%
Computer Systems Design Services	1,294	1,820	41%	7%
Computing Infrastructure Providers, Data Processing, Web Hosting, and Related Services	1,299	1,943	50%	6%

Industry - 6 Digit NAICS (No. American Industry Classification) Codes	Jobs in Industry (2023)	Jobs in Industry (2028)	% Change (2023-28)	% Occupation Group in Industry (2023)
Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology)	1,333	1,727	30%	6%
Software Publishers	1,462	1,697	16%	6%
Web Search Portals and All Other Information Services	1,040	1,128	8%	4%
Research and Development in Biotechnology (except Nanobiotechnology)	775	996	28%	3%
Media Streaming Distribution Services, Social Networks, and Other Media Networks and Content Providers	646	666	3%	3%
Administrative Management and General Management Consulting Services	440	519	18%	2%

Source: Lightcast 2025.3

**Table 6. Top Employers Posting Machine Learning, Deep Learning, and Programming (Artificial Intelligence) Occupations in the Bay Region and the Silicon Valley Subregion**

Employer	Bay	Employer	Silicon Valley
Google	380	Apple	334
Apple	354	Tiktok	300
Tiktok	302	Google	293
Harnham	301	Amazon	218
Amazon	282	Walmart	138
Meta	243	PayPal	108

Source: Lightcast 2025.3; "Job Posting Analytics." Dec. 2024 - Nov. 2025

## Educational Supply

There are no community colleges in the Bay Region issuing awards on average annually (last 3 years ending 2023-24) on TOP 0799.00 - Other Information Technology.

There are no other CTE educational institutions in the Bay Region issuing awards on average annually (last 3 years ending 2022-23) on CIP 11.0102- Artificial Intelligence and Robotics.

## Gap Analysis

Based on the data included in this report, there is a labor market gap in the Bay Region with 2,458 annual openings for the Machine Learning, Deep Learning, and Programming (Artificial Intelligence) occupational cluster and no annual (3-year average) awards for an annual undersupply of 2,458 students. In the Silicon Valley Subregion, there is also a gap with 1,021 annual openings and no annual (3-year average) awards for an annual undersupply of 1,021 students.

## Student Outcomes

**Table 8. Four Employment Outcomes Metrics for Students Who Took Courses on TOP 0799.00 - Other Information Technology**

Metric Outcomes	Bay All CTE Program	State 0799.00	Bay 0799.00	Silicon Valley 0799.00
Students with a Job Closely Related to Their Field of Study	74%	71%	75%	NA
Median Annual Earnings for SWP Exiting Students	\$53,090	\$46,188	\$48,630	NA
Median Change in Earnings for SWP Exiting Students	24%	13%	19%	NA
Exiting Students Who Attained the Living Wage	54%	59%	47%	NA

Source: Launchboard Strong Workforce Program Median of 2018 to 2021.

## Skills, Certifications and Education

**Table 9. Top Skills in Job Postings for Machine Learning, Deep Learning, and Programming (Artificial Intelligence) Occupations in the Bay Region**

Skill	Posting	Skill	Posting
Python (Programming Language)	6,488	Scalability	2,696
SQL (Programming Language)	5,900	Tableau (Business Intelligence Software)	2,688
Data Science	5,549	Workflow Management	2,339
Data Analysis	5,435	Finance	2,290
Computer Science	5,249	Data Visualization	2,281
Machine Learning	4,955	SAP Applications	2,078
Statistics	4,204	Automation	1,917
Dashboard	3,162	Project Management	1,916
Artificial Intelligence	3,068	Economics	1,798
R (Programming Language)	3,061	Business Requirements	1,704

Source: Lightcast 2025.3; "Job Posting Analytics." Dec. 2024 - Nov. 2025

**Table 10. Certifications in Job Postings for Machine Learning, Deep Learning, and Programming (Artificial Intelligence) Occupations in the Bay Region**

Certification	Posting	Certification	Posting
Epic EMR Certification	177	Project Management Professional Certification	88
SAP Certification	121	Oracle Certification	52

Certification	Posting	Certification	Posting
GIAC Certifications	108		

Source: Lightcast 2025.3; "Job Posting Analytics." Dec. 2024 - Nov. 2025

**Table 11. Education Requirements for Machine Learning, Deep Learning, and Programming (Artificial Intelligence) Occupations in the Bay Region**

Education Level	Job Postings	% of Total
High school or GED	232	2%
Associate degree	283	2%
Bachelor's degree & higher	14,876	97%

Source: Lightcast 2025.3; "Job Posting Analytics." Dec. 2024 - Nov. 2025

Note: 36% of records have been excluded because they do not include a degree level. As a result, the chart above may not be representative of the full sample.

## Methodology

Occupations for this report were identified by use of job descriptions and skills listed in O\*Net. Labor demand data is sourced from Lightcast occupation and job postings data. Educational supply and student outcomes data is retrieved from multiple sources, including CCCC Data Mart and CTE Launchboard.

## Sources

O\*Net Online  
 Lightcast  
 CTE LaunchBoard [www.calpassplus.org](http://www.calpassplus.org)  
 Statewide CTE Outcomes Survey  
 Employment Development Department Unemployment Insurance Dataset  
 CCCC Data Mart

## Contacts

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