CENTER OF EXCELLENCE FOR LABOR MARKET RESEARCH
LOS ANGELES

Labor Market Analysis: 0707.00 – Computer Software Development
11.0102 – Artificial Intelligence and Robotics
Artificial Intelligence (AI) Literacy Certificate

Los Angeles Center of Excellence, May 2026

Program Endorsement:	Endorsed: All Criteria Met ☐	Endorsed: Some Criteria Met ☒	Not Endorsed ☐
Program Endorsement Criteria			
Supply Gap:	Yes ☑ *(See below)*		No ☐
Living Wage: (Entry-Level, 25th)	Yes ☑		No ☐
Education:	Yes ☐		No ☑
Emerging Occupation(s)			
Yes ☑			No ☐

SUMMARY

This report analyzes whether local labor market demand is being met by community college programs aligned with the identified middle-skill occupations[1] or whether a shortage of workers exists. Labor market demand is measured by annual job openings while education supply is measured by the number of awards (degrees and certificates) conferred on average each year.

Based on the available data, there appears to be a slight supply gap for the three identified occupations in the region. While the number of awards conferred is nearly the same as the number of job openings, the talent supply is within the COE's acceptable margin (the number of the number of awards issued is 25% over or under the number of annual openings) and is therefore considered "supply met" rather than a "supply gap." For this reason, real-time labor market data is included in this report as well – to provide a more nuanced view of the regional job market for artificial intelligence-related occupations. While entry-level wages are higher than the self-sufficiency standard wage in both Los Angeles and Orange counties, the three occupations in this report typically require a bachelor's degree.

<u>Recommendation:</u> Due to two of three program endorsement criteria being met, the Los Angeles Center of Excellence for Labor Market Research (LA COE) endorses this proposed program.

[1] Middle-skill occupations typically require some postsecondary education, but less than a bachelor's degree. The COE classifies middle-skill jobs as the following:

- All occupations that require an educational requirement of some college, associate degree or apprenticeship;
- All occupations that require a bachelor's degree, but also have more than one-third of their existing labor force with an educational attainment of some college or associate degree; or
- All occupations that require a high school diploma or equivalent or no formal education, but also require short- to long-term on-the-job training where multiple community colleges have existing programs.

Key Findings

Supply Gap

- 5,748 annual job openings are projected in the region through 2029. This number is slightly greater than the three-year average of 5,738 awards conferred by educational institutions in the region.
    - Although there are nearly the same number of awards conferred as job openings, the data suggests that the ***demand has been met for these occupations within the LA/OC region*** since the three-year average number of awards (supply) is within the COE's 25% margin of annual job openings (demand).
    - Over the past 12 months, there were 22,645 online job postings related to these target occupations, and of these jobs **4,271 listed artificial intelligence as a specialized skill.**

Living Wage

- All three occupations have entry-level wages **above** Los Angeles County's self-sufficiency standard hourly wage ($24.03/hour). [2]

Educational Attainment

- A bachelor's degree is the typical entry-level education for all the target occupations in this report, according to the Bureau of Labor Statistics (BLS).
- The national-level educational attainment data indicates between 13% and 46% of workers in the field have completed an associate degree or less education, while between 54% and 87% hold a bachelor's degree or more education.

Community college supply

- 28 community colleges issued awards related to information technology and/or artificial intelligence in the greater LA/OC region.
- 1,596 awards (degrees and certificates) were conferred on average each year between 2023 and 2025.

Other postsecondary supply

- 33 educational institutions in the LA/OC region have conferred awards in programs related to information technology and/or artificial intelligence over the past three years.
- 4,142 awards were conferred on average each year by other postsecondary institutions throughout the greater LA/OC region between 2022 and 2024.

TARGET OCCUPATIONS

LA COE prepared this report to provide regional labor market and postsecondary supply data related to three target occupations and one emerging occupation. Currently, there is not a standard occupational classification (SOC) code for a middle-skill occupation in the field of artificial intelligence. While the occupations in this report typically require a bachelor's degree and are not traditionally considered middle-skill[3], these occupations are most closely aligned with

[2] Center for Women's Welfare, University of Washington. (2024). *The self-sufficiency standard for California 2024.* http://selfsufficiencystandard.org/California.

[3] The COE classifies middle-skill jobs as the following:

the knowledge, skills, and abilities required for an entry-level job seeker in the emerging field of artificial intelligence. For full occupation descriptions, please see Appendix.

- ***Software Developers* (15-1252)** [4]
- ***Computer Occupations, All Other* (15-1299)** [5]
- ***Data Scientists* (15-2051)** [6]
- ***Business Intelligence Analysts* (15-2051.01)** [7]

OCCUPATIONAL DEMAND

Exhibit 1 shows the five-year occupational demand projections for the target occupations in this report related to artificial intelligence. In the greater Los Angeles/Orange County region, the number of jobs related to these occupations is projected to increase by 4% through 2029. There will be more than 5,700 job openings per year through 2029 due to job growth and replacements. The majority of jobs in 2024 for these target AI-related occupations (69%) were located in Los Angeles County.

Exhibit 1: Current employment and occupational demand, Los Angeles and Orange counties[8]

Geography	2024 Jobs	2029 Jobs	2024-2029 Change	2024-2029 % Change	Annual Openings
Los Angeles	64,323	66,679	2,356	4%	4,008
Orange	28,605	29,501	897	3%	1,740
Total	**92,928**	**96,181**	**3,253**	**4%**	**5,748**

Detailed Occupation Data

Exhibit 2 displays the current employment and projected occupational demand for each of the target occupations in Los Angeles County. The average percentage of workers aged 55+ across all occupations in the Los Angeles/Orange County region is 26%; occupations with a larger share of workers aged 55 and older typically have greater replacement needs to offset the amount of

- All occupations that require an educational requirement of some college, associate degree or apprenticeship;
- All occupations that require a bachelor's degree, but also have more than one-third of their existing labor force with an educational attainment of some college or associate degree; or
- All occupations that require a high school diploma or equivalent or no formal education, but also require short- to long-term on-the-job training where multiple community colleges have existing programs.

[4] Software Developers, Quality Assurance Analysts, and Testers (bls.gov)
[5] Computer Occupations, All Other (bls.gov)
[6] Data Scientists (bls.gov)
[7] Business Intelligence Analysts (O*NET OnLine)
[8] Five-year change represents new job additions to the workforce. Annual openings include new jobs and replacement jobs that result from retirements and separations.

impending retirements. On average, 81% of workers across all occupations in California are employed full-time.

Exhibit 2: Detailed employment and occupational demand, Los Angeles County[9]

Occupation	2024 Jobs	2029 Jobs	5-Yr % Change	Annual Openings	% Aged 55 and older	% Full Time Workers
Software Developers	39,025	40,389	3%	2,295	14%	99%
Computer Occupations, All Other	18,016	18,133	1%	1,109	19%	90%
Data Scientists	7,282	8,158	12%	604	14%	Data unavailable
Total	**64,323**	**66,679**	**4%**	**4,008**	**-**	**-**

WAGES

The labor market endorsement in this report considers the entry-level hourly wages for these target occupations related to artificial intelligence in Los Angeles County as they relate to the county's self-sufficiency standard wage. Orange County wages are included below in order to provide a complete analysis of the greater Los Angeles/Orange County region.

Los Angeles County

All three occupations have entry-level wages above the self-sufficiency standard wage for one adult ($24.03 in Los Angeles County). Typical entry-level hourly wages are in a range between $32.38 and $58.16. (Exhibit 3). Experienced workers can expect to earn wages between $72.68 and $83.99.

Exhibit 3: Earnings for occupations in Los Angeles County

Occupation	Entry-Level Hourly Earnings (25th Percentile)	Median Hourly Earnings	Experienced Hourly Earnings (75th Percentile)	Median Annual Earnings*
Software Developers	$58.16	$74.49	$83.99	$154,900
Computer Occupations, All Other	$32.38	$48.21	$72.68	$100,300
Data Scientists	$39.67	$59.85	$79.48	$124,500

*Rounded to the nearest $100

Orange County

All three occupations have entry-level wages above the self-sufficiency standard wage for one adult ($27.13 in Orange County). Typical entry-level hourly wages are in a range between $31.83 and $57.91 (Exhibit 4). Experienced workers can expect to earn wages between $71.51 and $83.57.

[9] Five-year change represents new job additions to the workforce. Annual openings include new jobs and replacement jobs that result from retirements and separations.

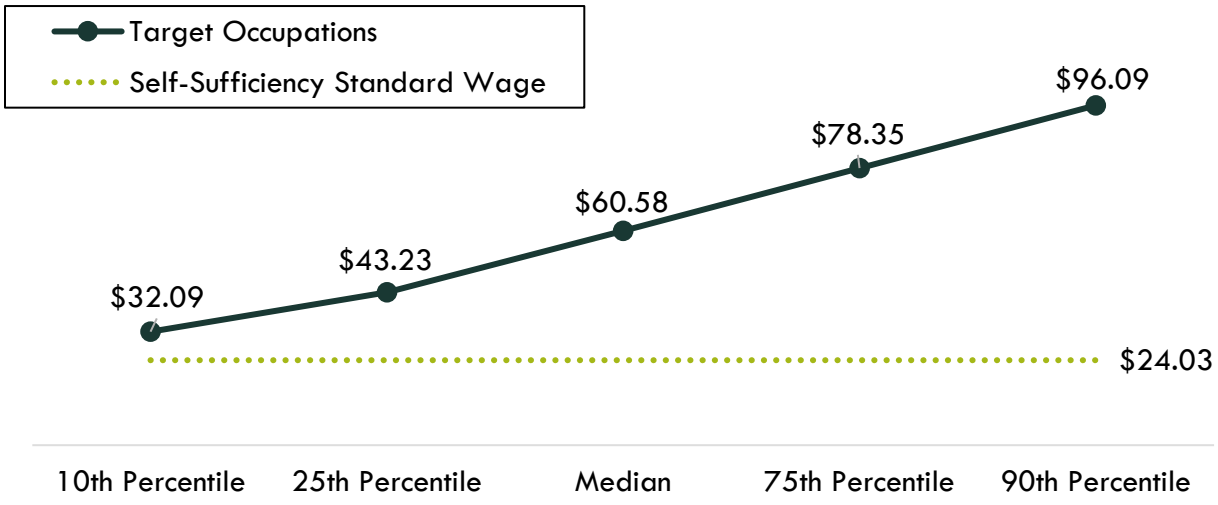
Exhibit 4: Earnings for occupations in Orange County

Occupation	Entry-Level Hourly Earnings (25th Percentile)	Median Hourly Earnings	Experienced Hourly Earnings (75th Percentile)	Median Annual Earnings*
Software Developers	$57.91	$74.13	$83.57	$154,200
Computer Occupations, All Other	$31.83	$47.44	$71.51	$98,700
Data Scientists	$38.64	$58.27	$77.36	$121,200

*Rounded to the nearest $100

Across the greater Los Angeles and Orange County region, the average entry-level hourly earnings for the occupations in this report are $43.23; this is above the living wage for one single adult in Los Angeles County ($24.03). Exhibit 5 shows the average hourly wage for the occupations in this report, for entry-level to experienced workers.

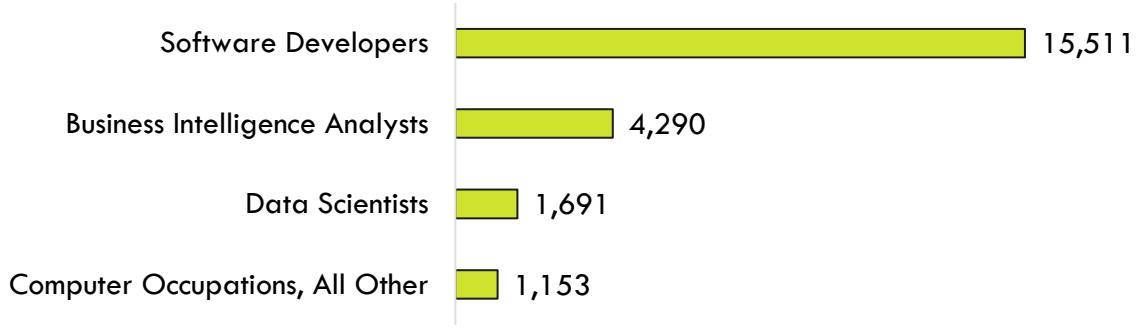
Exhibit 5: Average hourly earnings for target occupations, Los Angeles and Orange counties



JOB POSTINGS BY OCCAUPTION

There were 22,645 online job postings related to target occupations in this report listed in the past 12 months in Los Angeles and Orange counties. Exhibit 6 displays the number of job postings by occupation. The majority of job postings (68%) were for *software developers*, followed by *business intelligence analysts* (19%) and *data scientists* (7%).

Exhibit 6: Job postings by occupation (last 12 months), Los Angeles and Orange counties



Job postings were analyzed for the most common job titles, skills, and employers associated with the target occupations in this report (Exhibit 7).

Exhibit 7: Most commonly requested job titles, skills and employers in job postings, Los Angeles and Orange counties

Top Job Titles	Top Skills	Top Employers
• Software engineers • Data analysts • Embedded software engineers • Data scientists • Solutions architects • Principal software engineers • Software developers	• Computer science • Python (programming language) • Scalability • Software engineering • SQL (programming language) • Workflow management • Software development	• Northrop Grumman • Anduril Industries • Amazon • Robert Half* • Accenture • Boeing • Disney • Insight Global* • DataAnnotation

*Staffing company

In the greater Los Angeles/Orange County region, 61% of the target job postings listed a minimum educational requirement. Exhibit 8 details the number and percentage of job postings by educational level.

Exhibit 8: Education levels requested in job postings for target occupations, Los Angeles and Orange counties

Education Level	Job Postings	% of Job Postings
Bachelor's degree	12,989	94%
Associate degree	458	3%
High school diploma or vocational training	434	3%

JOB POSTINGS BY SKILL

Of these 22,645 online job postings, **4,271 listed artificial intelligence as a specialized skill.** These 4,271 job postings were analyzed for the most common job titles, skills, and employers associated with artificial intelligence skills (Exhibit 9).

Exhibit 9: Most commonly requested job titles, skills and employers in targeted job postings listing artificial intelligence as a specialized skill, Los Angeles and Orange counties

Top Job Titles	Top Skills	Top Employers
• Software engineers • AI trainers • Data scientists • Artificial intelligence engineers • Solutions architects • Full stack engineers • Full stack developers	• Artificial intelligence • Machine learning • Python (programming language) • Computer science • Scalability • Workflow management • Software engineering	• DataAnnotation • Amazon • Accenture • Jobot* • Google • Disney • Robert Half* • Anduril Industries

*Staffing company

In the greater Los Angeles/Orange County region, 62% of the target job postings listed a minimum educational requirement. Exhibit 10 details the number and percentage of job postings by educational level.

Exhibit 10: Education levels requested in job postings for occupations related to artifiical intelligence, Los Angeles and Orange counties

Education Level	Job Postings	% of Job Postings
Bachelor's degree	2,503	95%
Associate degree	82	3%
High school diploma or vocational training	50	2%

EDUCATIONAL ATTAINMENT

The Bureau of Labor Statistics (BLS) lists a bachelor's degree as the typical entry-level education for each of the occupations in this report (Exhibit 11). The national-level educational attainment data indicates between 13% and 46% of workers in the field have completed an associate degree or less education, while between 54% and 87% hold a bachelor's degree or more education. The Bureau of Labor Statistics (BLS) lists the following typical entry-level education levels for the occupations in this report:

Exhibit 11: Entry-level education preferred by employers nationally, Bureau of Labor Statistics

Occupation	Education Level
Software Developers	Bachelor's degree
Computer Occupations, All Other	Bachelor's degree
Data Scientists	Bachelor's degree

EDUCATIONAL SUPPLY

Community College Supply

Exhibit 12 shows the annual and three-year average number of awards conferred by community colleges in programs that have historically trained for the occupations of interest. The colleges with the most completions in the region are Orange Coast, Santa Monica, and Mt. San Antonio.

Exhibit 12: Regional community college awards (certificates and degrees), 2023-2025

TOP Code	Program	College	2022-23 Awards	2023-24 Awards	2024-25 Awards	3-Year Average
0701.00	Information Technology, General	Citrus	-	1	-	0
		East LA	18	25	12	18
		Glendale	16	17	14	16
		LA Mission	3	2	2	2
		LA Southwest	1	7	3	4
		Long Beach	73	63	87	74
		Mt San Antonio	12	22	18	17
		West LA	-	3	2	2
		LA Subtotal	**123**	**140**	**138**	**134**
		Orange Coast	-	-	17	6
		OC Subtotal	**-**	**-**	**17**	**6**
		Supply Subtotal/Average	**123**	**140**	**155**	**139**
0702.00	Computer Information Systems	Citrus	2	5	4	4
		Compton	4	4	1	3
		East LA	23	42	57	41
		El Camino	19	27	34	27
		Glendale	11	5	5	7
		LA City	4	20	21	15
		LA Harbor	2	3	5	3
		LA Mission	-	-	2	1
		LA Southwest	20	10	-	10
		LA Trade-Tech	35	18	25	26
		Long Beach	6	26	45	26
		Mt San Antonio	41	41	44	42
		Pasadena	-	-	2	1
		Rio Hondo	13	14	10	12
		Santa Monica	2	6	45	18
		West LA	8	7	12	9
		LA Subtotal	**190**	**228**	**312**	**243**
		Coastline	7	11	3	7

TOP Code	Program	College	2022-23 Awards	2023-24 Awards	2024-25 Awards	3-Year Average
		Fullerton	48	51	46	48
		N. Orange Continuing Ed.	-	-	10	3
		Orange Coast	-	-	246	82
		Saddleback	-	1	2	1
		Santa Ana	8	23	31	21
		Santiago Canyon	5	2	-	2
		OC Subtotal	**68**	**88**	**338**	**165**
		Supply Subtotal/Average	**258**	**316**	**650**	**408**
0706.00	Computer Science (transfer)	Cerritos	26	12	17	18
		Citrus	57	49	55	54
		El Camino	19	31	45	32
		Glendale	14	25	12	17
		LA City	11	17	24	17
		LA Harbor	-	-	6	2
		LA Mission	3	2	-	2
		LA Southwest	-	1	-	0
		Long Beach	25	30	30	28
		Rio Hondo	9	10	25	15
		Santa Monica	64	85	84	78
		West LA	7	5	9	7
		LA Subtotal	**235**	**267**	**307**	**270**
		Cypress	16	35	46	32
		Fullerton	-	25	26	17
		Golden West	2	18	19	13
		Irvine	55	27	63	48
		Orange Coast	-	2	116	39
		Saddleback	38	27	31	32
		Santa Ana	28	41	27	32
		Santiago Canyon	19	28	23	23
		OC Subtotal	**158**	**203**	**351**	**237**
		Supply Subtotal/Average	**393**	**470**	**658**	**507**
0707.00	Computer Software Development	LA Harbor	2	-	1	1
		LA Mission	-	-	1	0
		LA Pierce	7	9	22	13
		Santa Monica	2	-	2	1
		West LA	1	4	3	3
		LA Subtotal	**12**	**13**	**29**	**18**
		Golden West	1	1	1	1
		Saddleback	16	24	31	24
		OC Subtotal	**17**	**25**	**32**	**25**
		Supply Subtotal/Average	**29**	**38**	**61**	**43**

TOP Code	Program	College	2022-23 Awards	2023-24 Awards	2024-25 Awards	3-Year Average
0707.10	Computer Programming	Cerritos	2	2	2	2
		Citrus	7	9	10	9
		East LA	1	2	6	3
		Glendale	-	1	1	1
		LA City	19	30	25	25
		LA Harbor	6	1	4	4
		LA Mission	6	15	25	15
		LA Pierce	7	7	8	7
		LA Southwest	3	3	6	4
		LA Valley	15	15	35	22
		Long Beach	4	4	8	5
		Mt San Antonio	65	68	76	70
		Pasadena	37	46	51	45
		Santa Monica	55	77	153	95
		West LA	-	1	-	0
		LA Subtotal	**227**	**281**	**410**	**306**
		Cypress	5	6	10	7
		Fullerton	-	1	2	1
		Orange Coast	250	202	14	155
		Santa Ana	-	5	2	2
		Santiago Canyon	3	4	1	3
		OC Subtotal	**258**	**218**	**29**	**168**
		Supply Subtotal/Average	**485**	**499**	**439**	**474**
0799.00	Other Information Technology	Glendale	-	2	2	1
		Mt San Antonio	1	24	26	17
		LA Subtotal	**1**	**26**	**28**	**18**
		Santa Ana	5	10	3	6
		OC Subtotal	**5**	**10**	**3**	**6**
		Supply Subtotal/Average	**6**	**36**	**31**	**24**
		Supply Total/Average	**1,294**	**1,499**	**1,994**	**1,596**

Exhibit 13 displays the community college awards broken down by award type. In this case, the majority of awards issued by community colleges are associate degrees (53%).

Exhibit 13: Community college awards by award type, 2023-2025

Award Type	# of Awards	% of Awards
A.A./A.A.-T./A.S./A.S.-T. degrees	851	53%
Certificates	718	45%
Noncredit awards	27	2%
Total	**1,596**	**100%**

Other Postsecondary Supply

For a comprehensive regional supply analysis, it is important to consider the supply from other institutions in the region that provide training programs for the target occupations. Exhibit 14 shows the number of awards conferred by these institutions in relevant programs. Due to different data collection periods, the most recent data is from 2022 to 2024. Between 2022 and 2024, other postsecondary college institutions in the region conferred an average of 4,142 bachelor's and sub-baccalaureate awards. Sub-baccalaureate awards include associate degrees, postsecondary awards, and other academic awards that typically take fewer than four years to complete. In the past three years, there have been no bachelor's degrees or sub-baccalaureate awards conferred under the target CIP Code: Artificial Intelligence and Robotics (11.0102)

Exhibit 14: Other regional postsecondary awards, 2022-2024

CIP Code	Program	Postsecondary Institution	2021-22 Awards	2022-23 Awards	2023-24 Awards	3-Year Average
11.0101	Computer and Information Sciences, General	Azusa Pacific Univ.	5	7	1	4
		Chapman University	25	20	11	19
		LA Pacific College	2	2	12	5
		Loyola Marymount University	51	35	52	46
		Univ. of La Verne	20	22	21	21
		Univ. of Mass. Global	37	39	21	32
		Univ. of the People	478	783	1,077	779
11.0103	Information Technology	Bethesda University	-	1	2	1
		Brand College	18	23	13	18
		CSU-Dominguez Hills	17	19	14	17
		CSU-Los Angeles	90	86	101	92
		CSU-Northridge	45	43	37	42
		Platt College-Anaheim	12	16	12	13
		Platt College-LA	3	6	3	4
		University of La Verne	15	7	8	10
		Univ. of Mass. Global	1	1	4	2
		Westcliff University	1	2	-	1

CIP Code	Program	Postsecondary Institution	2021-22 Awards	2022-23 Awards	2023-24 Awards	3-Year Average
11.0201	Computer Programming/ Programmer, General	ABCO Technology	14	17	10	14
11.0701	Computer Science	Azusa Pacific Univ.	9	8	5	7
		Biola University	15	13	12	13
		CA Institute of Tech.	77	67	94	79
		CPSU-Pomona	202	264	323	263
		CSU-Dominguez Hills	82	83	84	83
		CSU-Fullerton	325	369	449	381
		CSU-Long Beach	254	306	335	298
		CSU-Los Angeles	148	170	184	167
		CSU-Northridge	251	256	235	247
		Chapman University	50	56	74	60
		Claremont McKenna College	13	5	9	9
		Concordia Univ.-Irvine	3	9	16	9
		Harvey Mudd College	48	53	37	46
		Occidental College	31	30	26	29
		Pitzer College	10	2	2	5
		Pomona College	49	49	65	54
		Scripps College	6	1	-	2
		Southern CA Institute of Technology	5	-	6	4
		UC-Irvine	729	454	589	591
		UC-Los Angeles	348	340	352	347
		USC	287	305	352	315
15.1202	Computer/ Computer Systems Technology/ Technician	Learnet Academy	2	3	-	2
30.3001	Computational Science	Chapman University	1	11	16	9
		Supply Total/Average	**3,779**	**3,983**	**4,664**	**4,142**

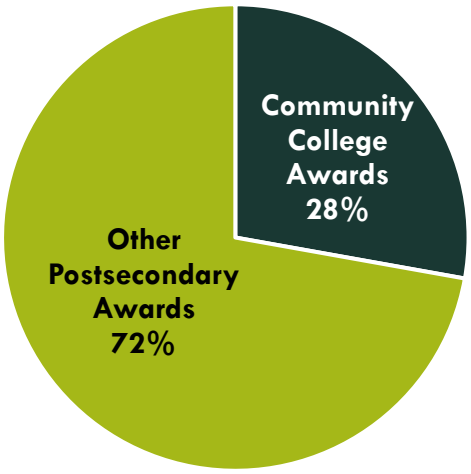
Exhibit 15 shows the breakdown of other postsecondary awards by award type. The majority of awards issued by other postsecondary schools are bachelor's degrees (89%).

Exhibit 15: Other postsecondary awards by award type, 2022-2024

Award Type	# of Awards	% of Awards
Bachelor's degrees	3,694	89%
Sub-baccalaureate awards	448	11%
Total	**4,142**	**100%**

Exhibit 16 shows the proportion of community college awards conferred in the greater Los Angeles/Orange County region compared to the number of other postsecondary awards for the programs in this report. The majority of awards conferred in these programs are awarded by other institutions in the greater Los Angeles/Orange County region.

Exhibit 16: Percentage of community college awards compared to other postsecondary institution awards in the Los Angeles/Orange County region



APPENDIX: OCCUPATION DESCRIPTIONS

LA COE prepared this report to provide regional labor market supply and demand data related to these target occupations:

- ***Software Developers* (15-1252)** Research, design, and develop computer and network software or specialized utility programs. Analyze user needs and develop software solutions, applying principles and techniques of computer science, engineering, and mathematical analysis. Update software or enhance existing software capabilities. May work with computer hardware engineers to integrate hardware and software systems and develop specifications and performance requirements. May maintain databases within an application area, working individually or coordinating database development as part of a team.[10]
- ***Computer Occupations, All Other* (15-1299)** All computer occupations not listed separately.[11]

[10] Software Developers, Quality Assurance Analysts, and Testers (bls.gov)
[11] Computer Occupations, All Other (bls.gov)

- ***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. [12]
- ***Business Intelligence Analysts* (15-2051.01)** Produce financial and market intelligence by querying data repositories and generating periodic reports. Devise methods for identifying data patterns and trends in available information sources. [13]

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DATA SOURCES

- O*NET Online
- Lightcast (formerly Emsi)
- Bureau of Labor Statistics (BLS)
- California Employment Development Department, Labor Market Information Division, OES
- California Community Colleges Chancellor's Office Management Information Systems (MIS)
- Self-Sufficiency Standard at the Center for Women's Welfare, University of Washington
- Chancellor's Office Curriculum Inventory (COCI 2.0)

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[12] Data Scientists (bls.gov)
[13] Business Intelligence Analysts (onetonline.org)