



Geographic Information Systems (TOP 2206.10)

November 2023

Prepared by the South Central Coast Center of Excellence for
Labor Market Research

Program Recommendation

This report was compiled by the South Central Coast¹ Center of Excellence to provide regional labor market data for the program recommendation – Geographic Information Systems. This report can help determine whether there is demand in the local labor market that is not being met by the supply from programs of study (CCC and non-CCC) that align with this occupation group.

Key Findings

- In the South Central Coast region, **the number of jobs related to Geographic Information Systems are expected to remain steady** for Geodetic Surveyors and **increase** for Software Developers, Data Scientists, Cartographers and Photogrammetrists, and Surveying and Mapping Technicians.
- Geographic Information Systems is anticipated to experience a **low risk of automation** for all five related occupations.
- In 2021 there were 1,151 regional completions in programs related to the occupations identified as aligned with Geographic Information Systems and 1,429 openings, indicating an **undersupply**.
- Typical entry-level education **ranges from a high school diploma or equivalent** for Surveying and Mapping Technicians **to a bachelor's degree** for the other four related occupations.
- Completers of Geographic Information Systems programs from the 2019-2020 academic year in the South Central Coast region had a **median annual wage upon completion of \$60,292**.
- 72% of students are **employed within a year** after completing a program.
- 70% of students **attained a living wage** within a year of completion.
- Completers experienced an average of +12% **change in earnings after exiting**.
- 77% of students were **part-time**, 11% **skill builders**, 29% **first-generation**, and 63% **economically disadvantaged**.

¹ The South Central Coast Region consists of San Luis Obispo County, Santa Barbara County, Ventura County, and the following cities from North Los Angeles County: Canyon Country, Castaic, Lake Hughes, Lancaster, Littlerock, Llano, Newhall, Palmdale, Pearblossom, Santa Clarita, Stevenson Ranch, and Valencia.

Occupation Codes and Descriptions

There are five occupations in the standard occupational classification (SOC) system that were identified as related to Geographic Information Systems for this analysis. The occupation titles and descriptions, as well as reported job titles, are included in Exhibit 1.

Exhibit 1 – Occupation, Description, and Sample Job Titles

SOC Code	Title	Description	Sample of Reported Job Titles
15-1252	Software Developers	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.	Application Developer, Application Integration Engineer, Developer, Infrastructure Engineer, Network Engineer, Software Architect, Software Developer, Software Development Engineer, Software Engineer, Systems Engineer
15-2051	Data Scientists	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.	--

SOC Code	Title	Description	Sample of Reported Job Titles
17-1021	Cartographers and Photogrammetrists	Research, study, and prepare maps and other spatial data in digital or graphic form for one or more purposes, such as legal, social, political, educational, and design purposes. May work with Geographic Information Systems (GIS). May design and evaluate algorithms, data structures, and user interfaces for GIS and mapping systems. May collect, analyze, and interpret geographic information provided by geodetic surveys, aerial photographs, and satellite data.	Aerial Photogrammetrist, Cartographer, Cartographic Designer, Digital Cartographer, Mapper, Photogrammetric Technician, Photogrammetrist, Stereo Compiler, Stereoplotter Operator
17-1022.01	Geodetic Surveyors	Measure large areas of the Earth's surface using satellite observations, global navigation satellite systems (GNSS), light detection and ranging (LIDAR), or related sources.	Geodesist, Geodetic Advisor, Geodetic Engineer, Geodetic Survey Director, Geodetic Surveyor, Land Surveyor, Licensed Land Surveyor
17-3031	Surveying and Mapping Technicians	Perform surveying and mapping duties, usually under the direction of an engineer, surveyor, cartographer, or photogrammetrist, to obtain data used for construction, mapmaking, boundary location, mining, or other purposes. May calculate mapmaking information and create maps from source data, such as surveying notes, aerial photography, satellite data, or other maps to show topographical features, political boundaries, and other features. May verify accuracy and completeness of maps.	Aerotriangulation Specialist, Engineering Technician, Geospatial Analyst, Mapping Editor, Mapping Technician, Photogrammetric Compilation Specialist, Photogrammetric Technician, Stereoplotter Operator, Survey Technician, Tax Map Technician

Source: O*NET Online

Current and Future Employment

In the South Central Coast region, the number of jobs related to Geographic Information Systems are expected to remain steady for Geodetic Surveyors and increase for Software Developers, Data Scientists, Cartographers and Photogrammetrists, and Surveying and Mapping Technicians.

Exhibit 2 – Five-Year Projections for Geographic Information Systems in the South Central Coast Region

SOC	Occupation	2022 Jobs	2027 Jobs	2022-2027 Change	2022-2027 % Change
15-1252	Software Developers	6,148	6,792	644	10%
15-2051	Data Scientists	774	903	129	17%
17-1021	Cartographers and Photogrammetrists	110	117	7	6%
17-1022 (for 17-1022.01)	Surveyors (for Geodetic Surveyors)	298	309	11	4%
17-3031	Surveying and Mapping Technicians	295	314	19	6%

Source: Lightcast™ Analyst 2022

Earnings

Exhibit 3 contains hourly wages and annual average earnings for these occupations. Entry-level hourly earnings are represented by the 25th percentile of wages, median hourly earnings are represented by the 50th percentile of wages, and experienced hourly earnings are represented by the 75th percentile of wages, demonstrating various levels of employment.

Exhibit 3 – Earnings for Geographic Information Systems in the South Central Coast Region

SOC	Occupation	Entry-Level Hourly Earnings	Median Hourly Earnings	Experienced Hourly Earnings
15-1252	Software Developers	\$53.01	\$63.95	\$79.50
15-2051	Data Scientists	\$35.05	\$49.56	\$67.77
17-1021	Cartographers and Photogrammetrists	\$29.40	\$37.83	\$45.48
17-1022 (for 17-1022.01)	Surveyors (for Geodetic Surveyors)	\$29.29	\$44.78	\$57.96
17-3031	Surveying and Mapping Technicians	\$22.21	\$32.63	\$43.97

Source: Lightcast™ Analyst 2022

Exhibit 3b – Earnings for Geographic Information Systems in the South Central Coast Region



Source: Family Needs Calculator (Living wage is based on Single Adult households with no children); Lightcast™ Analyst 2022

Employer Job Postings

In this research brief, real-time labor market information is used to provide a more nuanced view of the current job market, as it captures job advertisements for occupations relevant to the field of study. Employer job postings are consulted to understand who is looking for professionals in a given field, and what they are looking for in potential candidates. To identify job postings related to Geographic Information Systems the following standard occupational classifications were used:

15-1252	Software Developers
15-2051	Data Scientists
17-1021	Cartographers and Photogrammetrists
17-1022.01	Geodetic Surveyors
17-3031	Surveying and Mapping Technicians

Top Occupations

In 2022, there were 5,306 employer postings for the occupations related to Geographic Information Systems.

Exhibit 4 – Top Occupations by Job Postings

SOC Code	Occupation	Job Postings, Full Year 2022
15-1252	Software Developers	4,195
15-2051	Data Scientists	973
17-1022.01	Geodetic Surveyors	84
17-3031	Surveying and Mapping Technicians	51
17-1021	Cartographers and Photogrammetrists	3

Source: Lightcast™ Analyst 2022

Exhibit 4b – Top Occupations and Risk of Automation

SOC Code	Occupation	Risk of Automation
15-1252	Software Developers	Low
15-2051	Data Scientists	Low
17-1022.01	Geodetic Surveyors	Low
17-3031	Surveying and Mapping Technicians	Low
17-1021	Cartographers and Photogrammetrists	Low

Source: Lightcast™ Analyst 2022

Top Titles

The top job titles for employers posting ads for jobs related to Geographic Information Systems are listed in Exhibit 5. Software Engineers is mentioned as the job title in 24% of all relevant job postings (668 postings).

Exhibit 5 – Job Titles

Title	Job Postings, Full Year 2022
Software Engineers	668
Principle Software Engineers	154
Software Developers	145
Data Scientists	130
Data Analysts	129

Source: Lightcast™ Analyst 2022

Top Employers

Exhibit 6 lists the major employers hiring professionals in the Geographic Information Systems field. The top employer posting job ads was Amgen. The top worksite cities for these occupations were Thousand Oaks, Santa Barbara, Goleta, San Luis Obispo, and Westlake Village.

Exhibit 6 – Top Employers (n=5,306)

Employer	Job Postings, Full Year 2022
Amgen	269
Elevance Health	193
Northrop Grumman	187
Raytheon Technologies	134
Revature	119

Source: Lightcast™ Analyst 2022

Skills

The tables in Exhibit 7 list employers' most commonly requested skills in job postings related to Geographic Information Systems. Computer Science is the most sought-after specialized skill for employers, followed by Software Engineering and Software Development. Communications, Management, and Problem Solving were the most requested baseline skills. Python, SQL, and Java were the most commonly requested software and programming skills.

Exhibit 7 – Specialized Skills (n= 31,216)

Skills	Job Postings, Full Year 2022
Computer Science	1,958
Software Engineering	1,890
Software Development	1,471
Python	1,281
SQL	1,157
Agile Methodology	1,154
Java	986
C++	967
Amazon Web Services	815
Automation	805
JavaScript	774
Data Analysis	755
C#	741
Debugging	662
Linux	656

Source: Lightcast™ Analyst 2022

Exhibit 7b – Baseline Skills (n= 22,517)

Skills	Job Postings, Full Year 2022
Communications	2,068
Management	1,456
Problem Solving	1,017
Operations	985
Leadership	882
Mathematics	878
Writing	807
Troubleshooting (Problem Solving)	792
Planning	700
Research	694

Source: Lightcast™ Analyst 2022

Exhibit 7c – Software and Programming Skills (n= 19,753)

Skills	Job Postings, Full Year 2022
Python	1,281
SQL	1,161
Java	987
C++	967
Amazon Web Services	822
JavaScript	775
C#	744
Linux	661
C	624
Application Programming Interface (API)	600

Source: Lightcast™ Analyst 2022

Industry Concentration

Exhibit 8 shows the industries with the most Geographic Information Systems postings in the South Central Coast region. Note: 17% of records have been excluded because they do not include an industry. As a result, the chart below may not be representative of the full sample.

Exhibit 8 – Industries Employing the Most in the Geographic Information Systems Field, 2022

Industry	Occupation Group Jobs in Industry	% of Occupation Group in Industry
Manufacturing	1,340	30%
Professional, Scientific, and Technical Services	1,019	23%
Administrative and Support and Waste Management and Remediation Services	564	13%
Finance and Insurance	366	8%
Information	208	5%

Source: Lightcast™ Analyst 2022

Certifications

Exhibit 9 lists the most in-demand certifications in the Geographic Information Systems field. The top requested certification in job postings was Security Clearance.

Exhibit 9 – Certifications (n= 1,964)

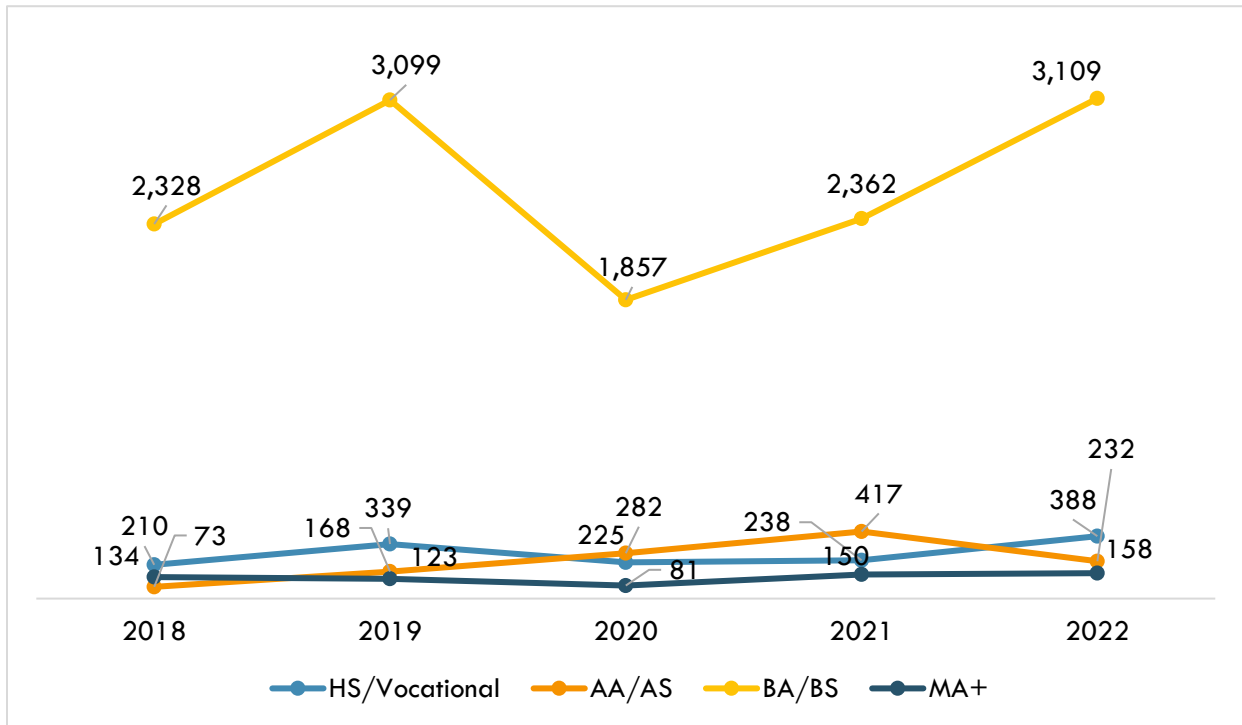
Certifications	Job Postings, Full Year 2022
Security Clearance	445
Secret Clearance	398
Valid Driver's License	172
Top Secret Clearance	113
Top Secret-Sensitive Compartmented Information (TS/SCI Clearance)	80

Source: Lightcast™ Analyst 2022

Job Postings - Minimum Educational Attainment Over Time

Exhibit 10 displays the change in job advertisements over the last five years for Geographic Information Systems, according to the minimum advertised education. In 2022, there were 3,887 total job ads posted with a minimum advertised education, with 3,109 of them requiring a bachelor’s degree.

Exhibit 10 – Educational Demand, Minimum Advertised



Source: Lightcast™ Analyst 2022

Job Postings – Proportion of Job Postings by Minimum Educational Attainment Required

To gauge employer preference for candidates with particular education levels, the proportion of job postings by minimum advertised education appears in Exhibit 11. Employers posting job ads for Geographic Information Systems have frequently sought candidates with a bachelor’s degree.

Exhibit 11 – Occupational Demand by Education, Minimum Advertised

Minimum Education Requirement	2018	2019	2020	2021	2022
HS Diploma / Vocational Training	8%	9%	9%	8%	10%
Associate Degree	3%	5%	12%	13%	6%
Bachelor’s Degree	85%	83%	76%	75%	80%
Graduate Degree	5%	3%	3%	5%	4%

Source: Lightcast™ Analyst 2022

Education and Training

Exhibit 12 shows the typical entry-level education requirement for the occupations of interest, along with the typical on-the-job training needed to attain competency in the occupation.

Exhibit 12 – Education and Training Requirements

SOC	Occupation	Typical entry-level education	Typical on-the-job training
15-1252	Software Developers	Bachelor's degree	None
15-2051	Data Scientists	Bachelor's degree	None
17-1021	Cartographers and Photogrammetrists	Bachelor's degree	None
17-1022.01	Geodetic Surveyors	Bachelor's degree	Internship/Residency
17-3031	Surveying and Mapping Technicians	High school diploma or equivalent	Moderate-term on-the-job training

Source: Bureau of Labor Statistics Employment Projections (Educational Attainment)

Regional Completions and Openings

There were 1,151 regional completions (2021) and 1,429 regional openings (2021) in the South Central Coast region aligned with programs related to the occupations in this report.

Exhibit 13 – Completions and Openings

19 Regional Institutions had Related Programs (2021)	1,151 Regional Completions (2021)	1,429 Annual Openings (2021)
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Source: Lightcast™ Analyst 2022

Related Programs

CIP Code	Program	Completions (2021)
11.0701	Computer Science	640
14.0901	Computer Engineering, General	159
45.0702	Geographic Information Science and Cartography	95
11.0103	Information Technology	89
45.0701	Geography	64
14.0903	Computer Software Engineering	61
11.0401	Information Science/Studies	21
11.0201	Computer Programming/Programmer, General	14
11.0804	Modeling, Virtual Environments and Simulation	8

Source: Lightcast™ Analyst 2022

CCC and Non-CCC Awards

Exhibit 14 lists the number of completers from programs related to Geographic Information Systems in the South Central Coast region.

Exhibit 14 – CCC and Non-CCC Awards the South Central Coast, 2021

CCC Programs	Completers
College of the Canyons	60
Allan Hancock College	52
Santa Barbara City College	31
Cuesta College	28
Moorpark College	24
Antelope Valley College	14
Ventura College	9
Oxnard College	4
Non-CCC Programs	Completers
University of California-Santa Barbara	396
California Polytechnic State University-San Luis Obispo	364
California State University-Channel Islands	86
California Lutheran University	75
California Institute of the Arts	8
Laurus College	0
ITT Technical Institute-Oxnard	0
Central California School of Continuing Education	0
Conejo Valley Adult Education	0
Charter College-Canyon Country	0
The Master's University and Seminary	0

Source: Lightcast™ Analyst 2022

Student Outcomes

The CTE LaunchBoard provides student outcome data on the effectiveness of CTE programs. The following student outcome information was collected from exiters of the regional Geographic Information Systems Programs (TOP: 2206.10) for the 2019-2020 academic year.

- Completers of Geographic Information Systems programs from the 2019-2020 academic year in the South Central Coast region had a **median annual wage upon completion of \$60,292**.
- 72% of students are **employed within a year** after completing a program.
- 70% of students **attained a living wage** within a year of completion.
- Completers experienced an average of +12% **change in earnings after exiting**.
- 77% of students were **part-time**, 11% **skill builders**, 29% **first-generation**, and 63% **economically disadvantaged**.

Sources

O*Net Online, Lightcast™ Analyst 2022, MIT Living Wage Calculator, Bureau of Labor Statistics (BLS) Education Attainment, California Community Colleges Chancellor's Office Management Information Systems (MIS) Data Mart, CTE LaunchBoard, Statewide CTE Outcomes Survey, Employment Development Department Unemployment Insurance Dataset

Notes

Data included in this analysis represent the labor market demand for relevant positions most closely related to Geographic Information Systems. Traditional labor market information was used to show current and projected employment based on data trends, as well as annual average awards granted by regional community colleges. Real-time labor market information captures job post advertisements for occupations relevant to the field of study and can signal demand and show what employers are looking for in potential employees, but is not a perfect measure of the quantity of open positions. All representations have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. The most recent data available at the time of the analysis was examined; however, data sets are updated regularly and may not be consistent with previous reports. Efforts have been made to qualify and validate the accuracy of the data and findings; however, neither the Centers of Excellence for Labor Market Research (COE), COE host district, nor California Community Colleges Chancellor's Office are responsible for the applications or decisions made by individuals and/or organizations based on this study or its recommendations.