

# Computer Programmer Occupations

Labor Market Analysis: San Diego County

December 2020

## Summary



The brief provides labor market information about *Computer Programmer Occupations* to assist the San Diego and Imperial Counties Community Colleges with program development and strategic planning. *Computer Programmer Occupations* include “Computer Programmers,” “Software Developers and Software Quality Assurance Analysts and Testers,” and “Web Developers and Digital Interface Designers.” According to available labor market information, *Computer Programmer Occupations* in San Diego County have a labor market demand of 2,674 annual job openings (while average demand for a single occupation in San Diego County is 277 annual job openings), and 15 educational institutions in San Diego County supply 473 awards for these occupations, suggesting that there is a supply gap in the labor market. Entry-level and median wages for all occupations are above the living wage. This brief recommends proceeding with developing a **new** program because 1) these occupations’ entry-level and median earnings are above the living wage; and 2) a supply gap exists for these positions. Colleges should note that **employers typically require a bachelor’s degree as the minimum educational requirement for these occupations.**

## Introduction

This report provides labor market information in San Diego County for the following occupational codes in the Standard Occupational Classification (SOC)<sup>1</sup> system:

- **Computer Programmers (SOC 15-1251):** Create, modify, and test the code and scripts that allow computer applications to run. Work from specifications drawn up by software and web developers or other individuals. May develop and write computer programs to store, locate, and retrieve specific documents, data, and information.
- **Software Developers and Software Quality Assurance Analysts and Testers (SOC 15-1256):** 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. Develop and execute software tests to identify software problems and their causes. Test system modifications to prepare for implementation. Document software and application defects using a bug tracking system and report defects to software or web developers. Create and maintain databases of known defects. May participate in software design reviews to provide input on functional requirements, operational characteristics, product designs, and schedules.
- **Web Developers and Digital Interface Designers (SOC 15-1257):** Develop and implement websites, web applications, application databases, and interactive web interfaces. Evaluate code to ensure that it is properly structured, meets industry standards, and is compatible with browsers and devices. Optimize website performance, scalability, and server-side code and processes. May develop website infrastructure and integrate websites with other computer applications. Design digital user interfaces or websites. Develop and test layouts, interfaces, functionality, and navigation menus to ensure compatibility and usability across browsers or devices. May use web framework applications as well as client-side code and processes. May evaluate web design following web and accessibility standards, and may analyze web use metrics and optimize websites for marketability and search engine ranking. May design and test interfaces that facilitate the human-computer interaction and maximize the usability of digital devices, websites, and software with a focus on aesthetics and design. May create graphics used in websites and manage website content and links.

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<sup>1</sup> The Standard Occupational Classification (SOC) system is used by federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating or disseminating data. [bls.gov/soc](https://www.bls.gov/soc).

For the purpose of this report, these occupations are referred to as *Computer Programmer Occupations*.

## Projected Occupational Demand

Between 2019 and 2024, *Computer Programmer Occupations* are projected to increase by 2,571 net jobs or 10 percent (Exhibit 1 a). During this period, employers in San Diego County are projected to hire 2,674 workers annually to fill new jobs and backfill jobs due to attrition caused by turnover and retirement, for example.

**Exhibit 1a: Number of Jobs for Computer Programmer Occupations (2009-2024)<sup>2</sup>**

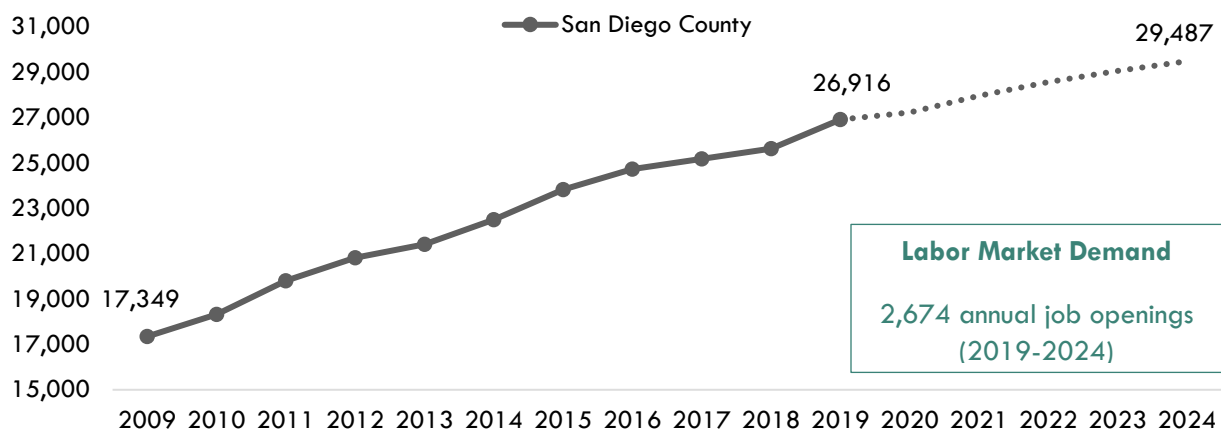


Exhibit 1b breaks down the projected number of jobs change by occupation more specifically: *Software Developers and Software Quality Assurance Analysts and Testers* are projected to increase the most by 2,452 total jobs between 2019 and 2024. *Computer Programmers*, however, are projected to decline during this period (Exhibit 1b).

**Exhibit 1b: Number of Jobs for Computer Programmer Occupations in San Diego County (2019-2024)<sup>3</sup>**

| Occupational Title  | 2019 Jobs     | 2024 Jobs     | 2019 - 2024 Net Jobs Change | 2019-2024 % Net Jobs Change | Annual Job Openings (Demand) |
|---|---------------|---------------|-----------------------------|-----------------------------|------------------------------|
| Software Developers and Software Quality Assurance Analysts and Testers | 20,593        | 23,045        | 2,452                       | 12%                         | 2,169                        |
| Web Developers and Digital Interface Designers                          | 2,288         | 2,490         | 202                         | 9%                          | 221                          |
| Computer Programmers  | 4,035         | 3,952         | -83                         | -2%                         | 284                          |
| <b>Total</b>  | <b>26,916</b> | <b>29,487</b> | <b>2,571</b>                | <b>10%</b>                  | <b>2,674</b>                 |

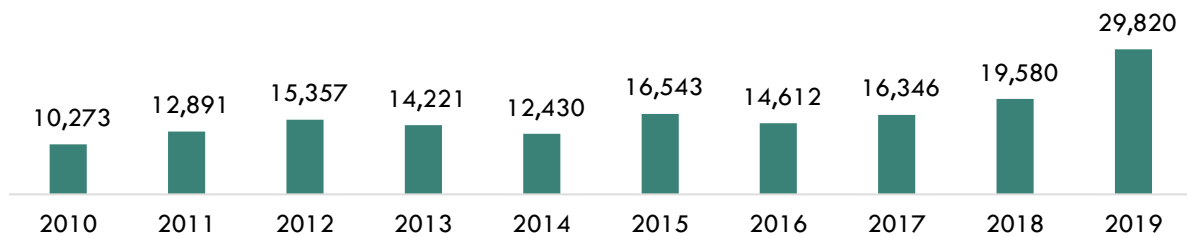
<sup>2</sup> EMSI 2020.04; QCEW, Non-QCEW, Self-Employed.

<sup>3</sup> EMSI 2020.04; QCEW, Non-QCEW, Self-Employed

## Online Job Postings

This report analyzes not only historical and projected data (traditional labor market information or LMI), but also recent data from online job postings (real-time LMI). Online job postings may provide additional insight about recent changes in the labor market that are not captured by historical data. Between 2010 and 2019, there was an average of 16,207 online job postings per year in San Diego County for *Computer Programmer Occupations* (Exhibit 2). Please note that online job postings do not equal labor market demand; demand is represented by annual job openings (Exhibit 1b). Employers may post a position multiple times for various reasons, such as increasing the pool of applicants, for example.

**Exhibit 2: Number of Online Job Postings for Computer Programmer Occupations in San Diego County (2010-2019)<sup>4</sup>**



## Earnings

The entry-level hourly earnings for *Computer Programmer Occupations* range from \$19.37 to \$43.73 (Exhibit 3a).

**Exhibit 3a: Hourly Earnings for Computer Programmer Occupations in San Diego County<sup>5</sup>**

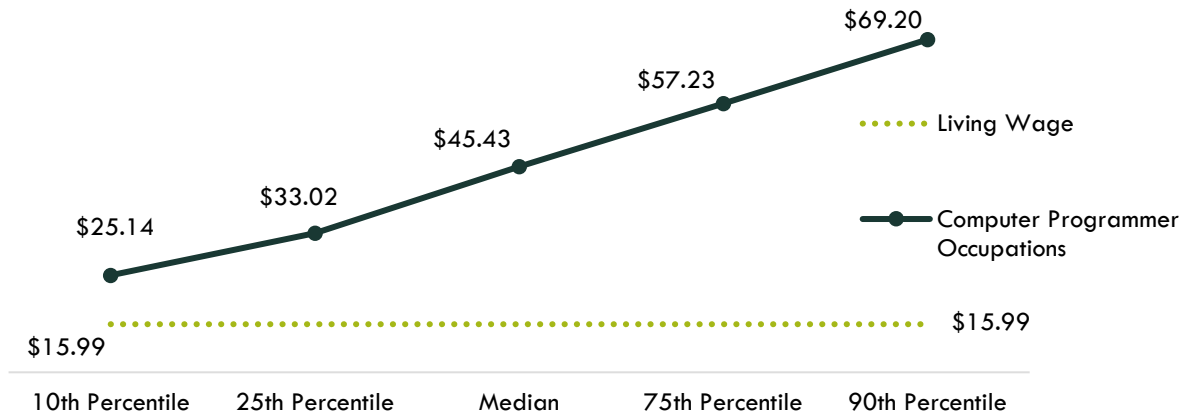
| Occupational Title  | Entry-Level Hourly Earnings (25 <sup>th</sup> Percentile) | Median Hourly Earnings | Experienced Hourly Earnings (75 <sup>th</sup> Percentile) |
|---|---|------------------------|---|
| Software Developers and Software Quality Assurance Analysts and Testers | \$43.73   | \$55.51                | \$68.79   |
| Computer Programmers  | \$35.95   | \$50.90                | \$62.63   |
| Web Developers and Digital Interface Designers                          | \$19.37   | \$29.88                | \$40.27   |

<sup>4</sup> Burning Glass Technologies, "Labor Insight Real-Time Labor Market Information Tool." 2010-2019.

<sup>5</sup> EMSI 2020.04; QCEW, Non-QCEW, Self-Employed

On average, the entry-level hourly earnings for *Computer Programmer Occupations* is **\$33.02**; this is more than the living wage for a single adult in San Diego County, which is **\$15.99** per hour (Exhibit 3b).<sup>6</sup>

**Exhibit 3b: Average Hourly Earnings<sup>7</sup> for Computer Programmer Occupations in San Diego County<sup>8</sup>**



## Educational Supply

Educational supply for an occupation can be estimated by analyzing the number of awards in related Taxonomy of Programs (TOP) or Classification of Instructional Programs (CIP) codes.<sup>9</sup> There are **eight** TOP codes and **17** CIP codes related to *Computer Programmer Occupations* (Exhibit 4).

**Exhibit 4: Related TOP and CIP Codes for Computer Programmer Occupations**

| <i>Computer Programmer Occupations</i>     |
|--|
| TOP 061420: Electronic Game Design         |
| TOP 061430: Website Design and Development |
| TOP 070200: Computer Information Systems   |
| TOP 070210: Software Applications          |
| TOP 070700: Computer Software Development  |
| TOP 070710: Computer Programming           |
| TOP 070900: World Wide Web Administration  |

<sup>6</sup> "California Family Needs Calculator (formerly the Self-Sufficiency Standard)," Insight: Center for Community Economic Development, last updated 2018. [insightccd.org/2018-self-sufficiency-standard](https://insightccd.org/2018-self-sufficiency-standard).

<sup>7</sup> 10th and 25th percentiles could be considered entry-level wages, and 75th and 90th percentiles could be considered experienced wages for individuals who may have been in the occupation longer, received more training than others, etc.

<sup>8</sup> EMSI 2020.04; QCEW, Non-QCEW, Self-Employed.

<sup>9</sup> TOP data comes from the California Community Colleges Chancellor's Office MIS Data Mart ([datamart.cccco.edu](https://datamart.cccco.edu)) and CIP data comes from the Integrated Postsecondary Education Data System ([nces.ed.gov/ipeds/use-the-data/](https://nces.ed.gov/ipeds/use-the-data/)).

### *Computer Programmer Occupations*

TOP 070910: E-Commerce (technology emphasis)

CIP 10.0304: Animation, Interactive Technology, Video Graphics and Special Effects

CIP 11.0103: Information Technology

CIP 11.0199: Computer and Information Sciences, Other

CIP 11.0201: Computer Programming/Programmer, General

CIP 11.0202: Computer Programming, Specific Applications

CIP 11.0203: Computer Programming, Vendor/Product Certification

CIP 11.0299: Computer Programming, Other

CIP 11.0601: Data Entry/Microcomputer Applications, General

CIP 11.0602: Word Processing

CIP 11.0801: Web Page, Digital/Multimedia and Information Resources Design

CIP 11.0899: Computer Software and Media Applications, Other

CIP 11.1003: Computer and Information Systems Security/Information Assurance

CIP 11.1004: Web/Multimedia Management and Webmaster

CIP 15.1202: Computer Technology/Computer Systems Technology

CIP 15.1204: Computer Software Technology/Technician

CIP 50.0411: Game and Interactive Media Design

CIP 52.0208: E-Commerce/Electronic Commerce

According to TOP data, *nine* community colleges supply the region with awards for this occupation: *Cuyamaca College, Grossmont College, MiraCosta College, Palomar College, San Diego City, San Diego Continuing Education, San Diego Mesa College, San Diego Miramar and Southwestern College.* According to CIP data, *six* non-community colleges supply the region with awards, *Advanced Training Associates, Argosy University-The Art Institute of California-San Diego, Associated Technical College-San Diego, California College San Diego, California Institute of Arts & Technology, and Coleman University (Exhibit 5).*

**Exhibit 5: Number of Awards (Certificates and Degrees) Conferred by Postsecondary Institutions  
(Program Year 2014-15 through PY2018-19 Average)**

| TOP6 or CIP | TOP6 or CIP Title               | 3-Yr Annual Average CC Awards (PY16-17 to PY18-19) | Other Educational Institutions 3-Yr Annual Average Awards (PY14-15 to PY16-17) | 3-Yr Total Average Supply (PY14-15 to PY18-19) |
|-------------|---------------------------------|--|--|--|
| 061420      | Electronic Game Design          | <b>5</b>   | <b>0</b>   | <b>5</b>                                       |
|             | • Palomar                       | 1  | 0  |  |
|             | • Southwestern                  | 4  | 0  |  |
| 061430      | Website Design and Development  | <b>110</b>   | <b>0</b>   | <b>110</b>                                     |
|             | • Cuyamaca                      | 5  | 0  |  |
|             | • MiraCosta                     | 2  | 0  |  |
|             | • San Diego Cont. Ed.           | 83   | 0  |  |
|             | • San Diego Mesa                | 20   | 0  |  |
| 070100      | Information Technology, General | <b>8</b>   | <b>0</b>   | <b>8</b>                                       |
|             | • Southwestern                  | 8  | 0  |  |
| 070200      | Computer Information Systems    | <b>78</b>  | <b>0</b>   | <b>78</b>                                      |
|             | • MiraCosta                     | 2  | 0  |  |
|             | • Palomar                       | 15   | 0  |  |
|             | • San Diego City                | 2  | 0  |  |
|             | • San Diego Cont. Ed.           | 25   | 0  |  |
|             | • San Diego Mesa                | 24   | 0  |  |
|             | • San Diego Miramar             | 7  | 0  |  |
|             | • Southwestern                  | 3  | 0  |  |
| 070210      | Software Applications           | <b>71</b>  | <b>0</b>   | <b>71</b>                                      |
|             | • Grossmont                     | 2  | 0  |  |
|             | • MiraCosta                     | 11   | 0  |  |
|             | • San Diego Cont. Ed.           | 47   | 0  |  |
|             | • San Diego City                | 4  | 0  |  |
|             | • San Diego Miramar             | 6  | 0  |  |
|             | • Southwestern                  | 1  | 0  |  |

|         |   |           |           |           |
|---------|---|-----------|-----------|-----------|
| 070700  | Computer Software Development                                 | <b>32</b> | 0         | <b>32</b> |
|         | • Palomar   | 32        | 0         |           |
| 070710  | Computer Programming  | <b>49</b> | 0         | <b>49</b> |
|         | • Grossmont   | 13        | 0         |           |
|         | • MiraCosta   | 8         | 0         |           |
|         | • Palomar   | 4         | 0         |           |
|         | • San Diego City  | 21        | 0         |           |
|         | • San Diego Mesa  | 1         | 0         |           |
|         | • Southwestern  | 2         | 0         |           |
| 070900  | World Wide Web Administration                                 | <b>16</b> | <b>0</b>  | <b>16</b> |
|         | • Grossmont   | 7         | 0         |           |
|         | • Palomar   | 7         | 0         |           |
|         | • San Diego Cont. Ed.   | 2         | 0         |           |
| 070910  | E-Commerce (Technology emphasis)                              | <b>1</b>  | <b>0</b>  | <b>1</b>  |
|         | • MiraCosta   | 0         | 0         |           |
|         | • Southwestern  | 1         | 0         |           |
| 11.0101 | Computer and Information Sciences, General                    | <b>0</b>  | <b>34</b> | <b>34</b> |
|         | • Advanced Training Associates                                | 0         | 27        |           |
|         | • Associated Technical College-San Diego                      | 0         | 7         |           |
| 11.0201 | Computer Programming/Programmer, General                      | <b>0</b>  | <b>30</b> | <b>30</b> |
|         | • California College San Diego                                | 0         | 8         |           |
|         | • Coleman University  | 0         | 22        |           |
| 11.0602 | Word Processing   | <b>0</b>  | <b>0</b>  | <b>0</b>  |
|         | • California Institute of Arts & Technology                   | 0         | 0         |           |
| 11.0801 | Web Page, Digital/Multimedia and Information Resources Design | <b>0</b>  | <b>38</b> | <b>38</b> |
|         | • Argosy University-The Art Institute of California-San Diego | 0         | 36        |           |
|         | • California Institute of Arts & Technology                   | 0         | 0         |           |



|         |   |   |              |            |
|---------|---|---|--------------|------------|
|         | • Coleman University                            | 0 | 2            |            |
| 15.1202 | Computer Technology/Computer Systems Technology | 0 | 1            | 1          |
|         | • California Institute of Arts & Technology     | 0 | 1            |            |
|         |   |   | <b>Total</b> | <b>473</b> |

## Demand vs. Supply

Comparing labor demand (annual openings) with labor supply<sup>10</sup> suggests that there is a **supply gap** for these occupations in San Diego County, with **2,674** annual openings and **473** awards. Comparatively, there are **33,530** annual openings in California and **2,170** awards, suggesting that there is a supply gap across the state<sup>11</sup> (Exhibit 6).

### Exhibit 6: Labor Demand (Annual Openings) Compared with Labor Supply (Average Annual Awards)

|            | <b>Demand</b><br>(Annual Openings) | <b>Supply</b><br>(Total Annual Average Supply) | <b>Supply Gap or Oversupply</b> |
|------------|------------------------------------|--|---------------------------------|
| San Diego  | 2,674                              | 473  | <b>2,201</b>                    |
| California | 33,530                             | 2,170  | <b>31,360</b>                   |

**Please note:** This is a basic analysis of supply and demand of labor. The data does not include workers currently in the labor force who could fill these positions or workers who are not captured by publicly available data. This data should be used to discuss the potential gaps or oversupply of workers; however, it should not be the only basis for determining whether or not a program should be developed.

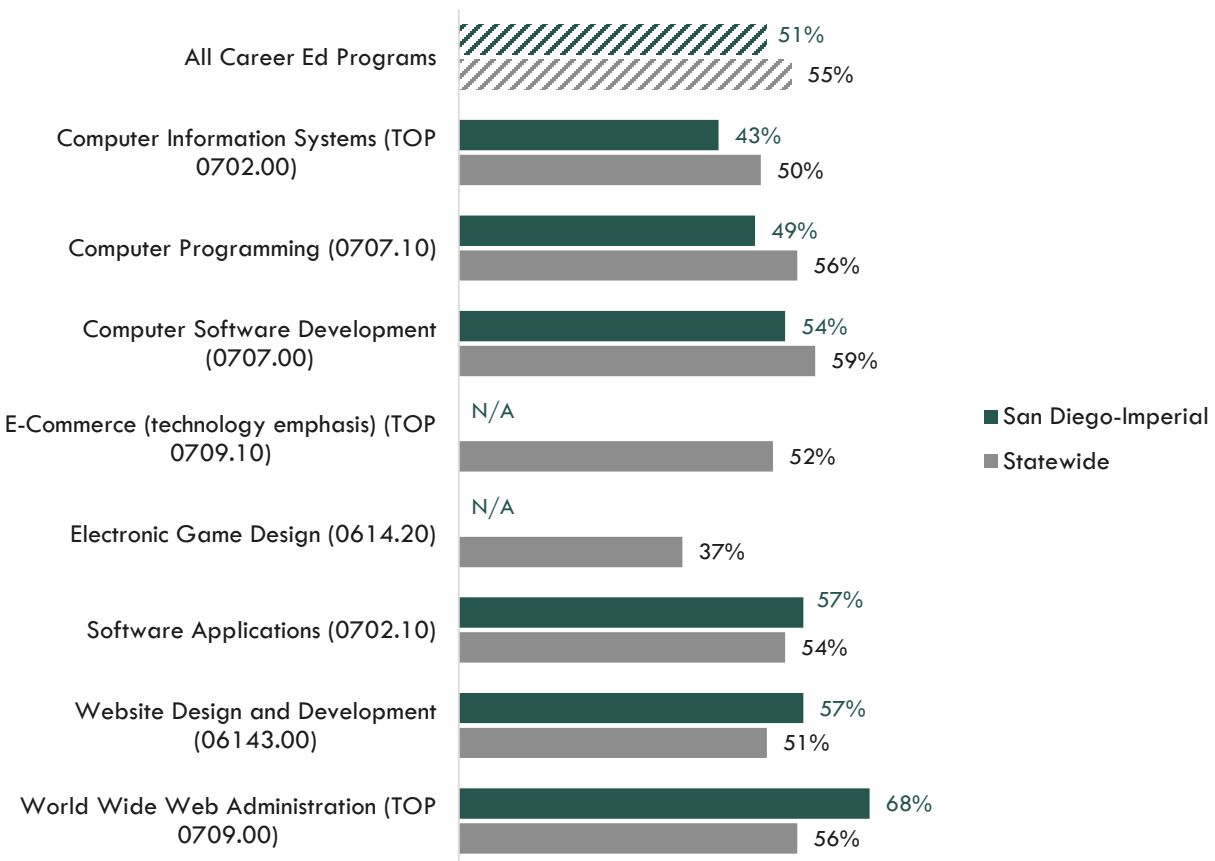
<sup>10</sup> Labor supply can be found from two different sources: EMSI or the California Community Colleges Chancellor's Office MIS Data Mart. EMSI uses CIP codes while MIS uses TOP codes. Different coding systems result in differences in the supply numbers.

<sup>11</sup> "Supply and Demand," Centers of Excellence Student Outcomes, [coecc.net/Supply-and-Demand.aspx](http://coecc.net/Supply-and-Demand.aspx).

## Student Outcomes and Regional Comparisons

According to the California Community Colleges LaunchBoard, between 43 to 68 percent of students in the San Diego-Imperial region earned a living wage after completing a program related to *Computer Programmer Occupations*, compared to 37 to 59 percent statewide and 51 percent of students in Career Education programs in general across the state (Exhibit 7a).

**Exhibit 7a: Proportion of Students Who Earned a Living Wage, PY2017-18<sup>12</sup>**

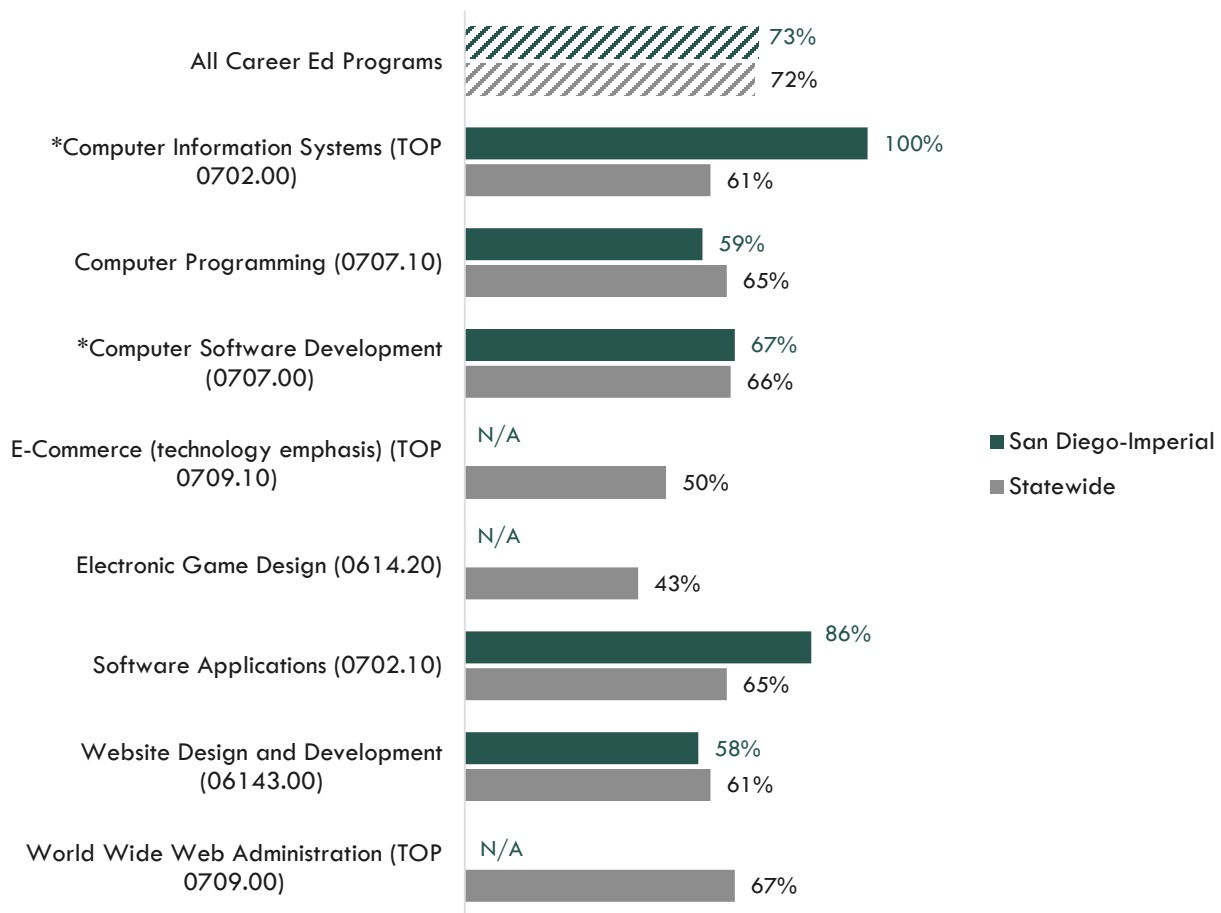


\*sample size had fewer than 10 students  
 "N/A" indicates insufficient data

<sup>12</sup> Among completers and skills builders who exited, the proportion of students who attained a living wage.

According to the California Community Colleges LaunchBoard, between 58 to 100 percent of students in the San Diego-Imperial region obtained a job closely related to their field of study after completing a related program, compared to 43 to 67 percent statewide and 73 percent of students in Career Education programs in general across the state (Exhibit 7b).

**Exhibit 7b: Percentage of Students in a Job Closely Related to Field of Study, PY2016-17<sup>13</sup>**



\*sample size had fewer than 10 students  
 "N/A" indicates insufficient data

<sup>13</sup> Most recent year with available data is Program Year 2016-17. Percentage of Students in a Job Closely Related to Field of Study: Among students who responded to the CTEOS, the percentage reporting employment in the same or similar field as their program of study.

## Top Employers

Between January 1, 2017 and December 31, 2019, the top five employers in San Diego County for these occupations were [Qualcomm](#), [CACI](#), [Northrop Grumman](#), [General Atomics](#), and [Intuit](#) (Exhibit 8).

### Exhibit 8: Top Employers in San Diego County for Computer Programmer Occupations<sup>14</sup>

| Top Employers   |  |
|---|--|
| <ul style="list-style-type: none"><li>• Qualcomm</li><li>• CACI</li><li>• Northrop Grumman</li><li>• General Atomics</li><li>• Intuit</li></ul> | <ul style="list-style-type: none"><li>• Teradata Operations, Inc.</li><li>• ServiceNow</li><li>• Booz Allen Hamilton Inc.</li><li>• BAE Systems</li><li>• Viasat</li></ul> |

## Education, Skills and Certifications

*Computer Programmer Occupations* have a national educational attainment ranging from an [associate degree](#) to a [bachelor's degree](#) (Exhibit 9a).

### Exhibit 9a: National Educational Attainment for Computer Programmer Occupations<sup>15</sup>

| Occupational Title  | Typical Entry-Level Education |
|---|-------------------------------|
| Computer Programmers  | Bachelor's degree             |
| Software Developers and Software Quality Assurance Analysts and Testers | Bachelor's degree             |
| Web Developers and Digital Interface Designers                          | Associate degree              |

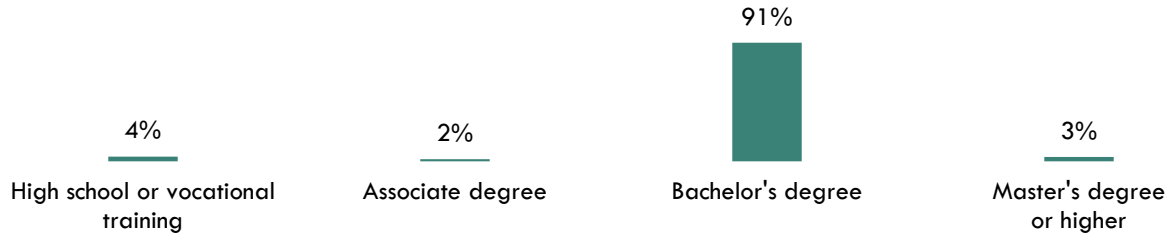
Based on online job postings between January 1, 2017 and December 31, 2019 in San Diego County, the top listed educational requirement for *Computer Programmer Occupations* is a [bachelor's degree](#) (Exhibit 9b).<sup>16</sup>

<sup>14</sup> Burning Glass Technologies, "Labor Insight Real-Time Labor Market Information Tool." 2017-2019.

<sup>15</sup> EMSI 2020.04; QCEW, Non-QCEW, Self-Employed.

<sup>16</sup> Burning Glass Technologies, "Labor Insight Real-Time Labor Market Information Tool." 2017-2019.

**Exhibit 9b: Educational Requirements for Computer Programmer Occupations in San Diego County<sup>17</sup>**



\*May not add to 100% due to rounding

Exhibit 10 lists the top specialized, soft and software skills that appeared in online job postings between January 1, 2017 and December 31, 2019.

**Exhibit 10: Top Skills for Computer Programmer Occupations in San Diego County<sup>18</sup>**

| Specialized Skills   | Soft Skills   | Software Skills   |
|--|---|---|
| <ul style="list-style-type: none"> <li>Object-Oriented Analysis and Design</li> <li>Unit Testing</li> <li>Scrum</li> <li>Debugging</li> <li>Web Application Development</li> </ul> | <ul style="list-style-type: none"> <li>Communication Skills</li> <li>Teamwork / Collaboration</li> <li>Problem Solving</li> <li>Writing</li> <li>Troubleshooting</li> </ul> | <ul style="list-style-type: none"> <li>Software Engineering</li> <li>Software Development</li> <li>Java</li> <li>JavaScript</li> <li>SQL</li> </ul> |

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<sup>17</sup> "Educational Attainment for Workers 25 Years and Older by Detailed Occupation," Bureau of Labor Statistics, last modified September 4, 2019. [bls.gov/emp/tables/educational-attainment.htm](https://bls.gov/emp/tables/educational-attainment.htm).

<sup>18</sup> Burning Glass Technologies, "Labor Insight Real-Time Labor Market Information Tool." 2017-2019.

### **Important Disclaimers**

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. This study examines the most recent data available at the time of the analysis; 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 the report 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.

This workforce demand report uses state and federal job projection data that was developed before the economic impact of COVID-19. The COE is monitoring the situation and will provide more information as it becomes available. Please consult with local employers to understand their current employment needs.