** Computer Science Occupations**

**Labor Market Information Report**

**Merritt College**

Prepared by the San Francisco Bay Center of Excellence

for Labor Market Research

November 2018

# Recommendation

Based on all available data, there appears to be a significant undersupply of Computer Science workers compared to the demand for this cluster of occupations in the Bay region and in the East Bay sub-region (Alameda and Contra Costa Counties). The gap is about 17,900 students annually in the Bay region and about 2,040 students annually in the East Bay sub-region.

This report also provides student outcomes data on employment and earnings for programs on TOP 0707.00 - Computer Software Development in the state and region. It is recommended that this data be reviewed to better understand how outcomes for students taking courses on this TOP code compare to potentially similar programs at colleges in the state and region, as well as to outcomes across all CTE programs at Merritt College and in the region.

# Introduction

This report profiles Computer Science Occupations in the 12 county Bay region and in the East Bay sub-region for a proposed new program at Merritt College.

|  |
| --- |
| * **Software Developers, Applications (SOC 15-1132):** Develop, create, and modify general computer applications software or specialized utility programs. Analyze user needs and develop software solutions. Design software or customize software for client use with the aim of optimizing operational efficiency. May analyze and design databases within an application area, working individually or coordinating database development as part of a team. May supervise computer programmers.
 |
| *Entry-Level Educational Requirement: Bachelor's degree* |
| *Training Requirement: None* |
| *Percentage of Community College Award Holders or Some Postsecondary Coursework: 13%* |
|  |
| * **Computer Systems Analysts (SOC 15-1121)**: Analyze science, engineering, business, and other data processing problems to implement and improve computer systems. Analyze user requirements, procedures, and problems to automate or improve existing systems and review computer system capabilities, workflow, and scheduling limitations. May analyze or recommend commercially available software.
 |
| *Entry-Level Educational Requirement: Bachelor's degree* |
| *Training Requirement: None* |
| *Percentage of Community College Award Holders or Some Postsecondary Coursework: 21%* |
|  |
| * **Software Developers, Systems Software (SOC 15-1133):** Research, design, develop, and test operating systems-level software, compilers, and network distribution software for medical, industrial, military, communications, aerospace, business, scientific, and general computing applications. Set operational specifications and formulate and analyze software requirements. May design embedded systems software. Apply principles and techniques of computer science, engineering, and mathematical analysis.
 |
| *Entry-Level Educational Requirement: Bachelor's degree* |
| *Training Requirement: None* |
| *Percentage of Community College Award Holders or Some Postsecondary Coursework: 13%* |
|  |
| * **Information Security Analysts (SOC 15-1122):** Plan, implement, upgrade, or monitor security measures for the protection of computer networks and information. 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. Excludes “Computer Network Architects” (15-1143).
 |
| *Entry-Level Educational Requirement: Bachelor's degree* |
| *Training Requirement: None* |
| *Percentage of Community College Award Holders or Some Postsecondary Coursework: 27%* |
|  |
| * **Network and Computer Systems Administrators (SOC 15-1142):** Install, configure, and support an organization’s local area network (LAN), wide area network (WAN), and Internet systems or a segment of a network system. Monitor network to ensure network availability to all system users and may perform necessary maintenance to support network availability. May monitor and test Web site performance to ensure Web sites operate correctly and without interruption. May assist in network modeling, analysis, planning, and coordination between network and data communications hardware and software. May supervise computer user support specialists and computer network support specialists. May administer network security measures. Excludes “Information Security Analysts”(15-1122), “Computer User Support Specialists” (15-1151), and “Computer Network Support Specialists” (15-1152).
 |
| *Entry-Level Educational Requirement: Bachelor's degree* |
| *Training Requirement: None* |
| *Percentage of Community College Award Holders or Some Postsecondary Coursework: 38%* |

# Occupational Demand

**Table 1. Employment Outlook for Computer Science Occupations in Bay Region**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Occupation  | 2017 Jobs | 2022 Jobs | 5-Yr Change | 5-Yr % Change | 5-Yr Open-ings | Annual Open-ings | 10% Hourly Wage | Median Hourly Wage |
| Software Developers, Applications | 90,031 | 109,101 | 19,070  | 21% | 49,809 | 9,962 | $38.71  | $62.17  |
| Computer Systems Analysts | 32,292 | 36,023 | 3,731  | 12% | 14,442 | 2,888 | $33.25  | $53.21  |
| Software Developers, Systems Software | 40,880 | 44,555 | 3,675  | 9% | 17,045 | 3,409 | $40.33  | $65.52  |
| Information Security Analysts | 3,569 | 4,521 | 952  | 27% | 2,254 | 451 | $29.35  | $55.56  |
| Network and Computer Systems Administrators | 15,697 | 17,336 | 1,639  | 10% | 6,669 | 1,334 | $29.79  | $49.09  |
| **Total** | **182,469** | **211,536** | **29,067** | **16%** | **90,219** | **18,044** | **$37.16**  | **$60.08**  |

*Source: EMSI 2018.4*

**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 Computer Science Occupations in East Bay Sub-Region**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Occupation  | 2017 Jobs | 2022 Jobs | 5-Yr Change | 5-Yr % Change | 5-Yr Open-ings | Annual Open-ings | 10% Hourly Wage | Median Hourly Wage |
| Software Developers, Applications | 10,169 | 11,655 | 1,486  | 15% | 4,859 | 972 | $32.38  | $57.87  |
| Computer Systems Analysts | 5,486 | 5,752 | 266  | 5% | 2,065 | 413 | $29.89  | $45.70  |
| Software Developers, Systems Software | 4,760 | 5,077 | 318  | 7% | 1,871 | 374 | $33.44  | $61.15  |
| Information Security Analysts | 564 | 668 | 105  | 19% | 304 | 61 | $36.58  | $57.53  |
| Network and Computer Systems Administrators | 3,538 | 3,675 | 138  | 4% | 1,254 | 251 | $26.80  | $49.12  |
| **TOTAL** | **24,515** | **26,828** | **2,313**  | **9%** | **10,352** | **2,071** | **$31.32**  | **$54.51**  |

*Source: EMSI 2018.4*

**East Bay Sub-Region** includes Alameda and Contra Costa Counties

### Job Postings in Bay Region and East Bay Sub-Region

**Table 3. Number of Job Postings by Occupation for latest 12 months (Nov 2017 - Oct 2018)**

|  |  |  |
| --- | --- | --- |
| Occupation | Bay Region | East Bay |
| Software Developers, Applications (15-1132.00) | 89,660 | 11,232 |
| Computer Systems Analysts (15-1121.00) | 12,691 | 2,228 |
| Information Security Analysts (15-1122.00) | 7,431 | 987 |
| Network and Computer Systems Administrators (15-1142.00) | 6,167 | 1,206 |
| Software Developers, Systems Software (15-1133.00) | 1,179 | 167 |
| **Total** | **117,128** | **15,820** |

*Source: Burning Glass*

**Table 4. Top Job Titles for Computer Science Occupations for latest 12 months (Nov 2017 - Oct 2018)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Common Title | Bay | East Bay | Common Title | Bay | East Bay |
| Software Development Engineer | 26,900 | 2,794 | iOS Developer | 905 | 45 |
| Java Developer | 6,027 | 867 | Senior Devops Engineer | 853 | 80 |
| Devops Engineer | 3,343 | 543 | .Net Developer | 832 | 301 |
| Applications Engineer | 2,602 | 355 | Software Engineering Manager | 708 | 69 |
| Java Engineer | 2,342 | 259 | Systems Analyst | 666 | 143 |
| Software Developer | 2,170 | 261 | Senior Engineer | 636 | 43 |
| Business Systems Analyst | 2,100 | 462 | Technical Consultant | 613 | 5 |
| Developer | 2,064 | 292 | Security Analyst | 541 | 118 |
| Security Engineer | 1,699 | 106 | Software Architect | 538 | 53 |
| Python Developer | 1,473 | 121 | Salesforce Developer | 513 | 94 |
| Systems Administrator | 1,387 | 287 | Full Stack Developer | 512 | 83 |
| Senior Developer | 1,306 | 202 | Lead Developer | 462 | 86 |
| Applications Developer | 1,231 | 192 | Mobile App Developer | 446 | 132 |
| Android Developer | 1,212 | 91 | C++ Developer | 431 | 25 |
| Principal Software Engineer | 1,090 | 85 | Business Analyst | 430 | 89 |
| Engineer | 946 | 81 | Security Architect | 416 | 52 |

*Source: Burning Glass*

# Industry Concentration

**Table 5. Industries hiring Computer Science Workers in Bay Region**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Industry – 6 Digit NAICS (No. American Industry Classification) Codes | Jobs in Industry (2017) | Jobs in Industry (2022) | % Change (2017-22) | % in Industry (2017) |
| Custom Computer Programming Services (541511) | 39,242 | 40,227 | 19% | 21.6% |
| Computer Systems Design Services (541512) | 24,481 | 24,803 | 16% | 13.3% |
| Internet Publishing and Broadcasting and Web Search Portals (519130) | 17,241 | 17,800 | 37% | 9.6% |
| Software Publishers (511210) | 17,161 | 17,712 | 22% | 9.5% |
| Electronic Computer Manufacturing (334111) | 15,326 | 15,492 | 6% | 8.3% |
| Data Processing, Hosting, and Related Services (518210) | 6,741 | 7,051 | 35% | 3.8% |
| Other Computer Related Services (541519) | 5,355 | 5,461 | 24% | 2.9% |
| Corporate, Subsidiary, and Regional Managing Offices (551114) | 5,243 | 5,404 | 8% | 2.9% |
| Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology) (541715) | 2,763 | 2,833 |  (6%) | 1.5% |
| Semiconductor and Related Device Manufacturing (334413) | 2,361 | 2,358 |  (5%) | 1.3% |
| Engineering Services (541330) | 1,932 | 1,950 | 12% | 1.0% |
| Temporary Help Services (561320) | 1,840 | 1,840 | 7% | 1.0% |

*Source: EMSI 2018.4*

**Table 6. Top Employers Posting Computer Science Occupations in Bay and East Bay Sub-Region (Nov 2017 - Oct 2018)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Employer | Bay | Employer | Bay | Employer | East Bay |
| Apple Inc. | 2,462 | Accenture | 493 | Capital Markets Placement | 598 |
| Capital Markets Placement | 1,530 | Nvidia Corporation | 408 | Workday, Inc | 529 |
| Amazon | 1,320 | Microsoft Corporation | 406 | Ellie Mae | 161 |
| Google Inc. | 1,210 | Vmware Incorporated | 401 | Tesla Motors | 145 |
| Cisco Systems Incorporated | 1,083 | Intel Corporation | 367 | Accenture | 118 |
| Workday, Inc | 700 | SAP | 357 | Kaiser Permanente | 109 |
| Facebook | 662 | Walmart / Sam's | 353 | General Electric Company | 97 |
| Oracle | 613 | eBay | 351 | Ideahelix | 88 |
| IBM | 573 | Deloitte | 348 | Synergisticit | 84 |
| Salesforce | 563 | Paypal | 312 | Pandora Media | 83 |

*Source: Burning Glass*

# Educational Supply

There are 10 community colleges in the Bay Region issuing 145 awards annually on TOP 0707.00 - Computer Software Development and TOP 0702.10 - Software Applications. There are three colleges in the East Bay sub-region issuing 32 awards annually on these two TOP codes.

**Table 7. Awards on TOP 0707.00 - Computer Software Development and TOP 0702.10 - Software Applications in the Bay Region**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| College | Sub-Region | TOP Code | Headcount | Associates | Certificates | Total |
| **Berkeley City** | East Bay | 0707 |  291  |  |  |  |
| **Canada** | Mid-Peninsula | 0707 |  399  |  |  |  |
| **Chabot**  | East Bay | 0707 |  802  |  |  |  |
| **Diablo Valley** | East Bay | 0707 | 3,316 |  |  |  |
| **Evergreen Valley** | Silicon Valley | 0707 | 20 |  |  |  |
| **Foothill** | Silicon Valley | 0707 | 2,577 |  |  |  |
| **Gavilan** | Silicon Valley | 0707 | 326 |  |  |  |
| **Hartnell** | Santa Cruz & Monterey | 0707 | 245 |  |  |  |
| **Laney** | East Bay | 0707 | 455 |  |  |  |
| **Las Positas** | East Bay | 0707 | 563 |  |  |  |
| **Marin** | North Bay | 0707 | 110 |  |  |  |
| **Merritt** | East Bay | 0707 | 133 |  |  |  |
| **Mission** | Silicon Valley | 0707 | 717 |  |  |  |
| **Monterey** | Santa Cruz & Monterey | 0707 | 254 |  |  |  |
| **Napa** | North Bay | 0707 | 156 |  |  |  |
| **Ohlone** | East Bay | 0707 | 771 |  |  |  |
| **San Francisco** | Mid-Peninsula | 0707 | 2,136 |  | 2 | 2 |
| **San Jose City** | Silicon Valley | 0707 | 391 |  |  |  |
| **San Mateo** | Mid-Peninsula | 0707 | 725 | 6 | 85 | 91 |
| **Santa Rosa** | North Bay | 0707 | 63 |  |  |  |
| **Skyline** | Mid-Peninsula | 0707 | 121 |  |  |  |
| **Solano** | North Bay | 0707 | 1,401 |  | 2 | 2 |
| **West Valley** | Silicon Valley | 0707 | 318 |  |  |  |
| **Alameda** |  | 070210 | 81 |  |  |  |
| **Berkeley** |  | 070210 | 52 |  |  |  |
| **Cabrillo** |  | 070210 | 167 |  |  |  |
| **Chabot**  | East Bay | 070210 | 192 | 3 | 1 | 4 |
| **Contra Costa** | East Bay | 070210 | 314 | 1 | 1 | 2 |
| **Diablo Valley** | East Bay | 070210 | 626 | 11 | 15 | 26 |
| **Gavilan** | Silicon Valley | 070210 | 16 | 1 |  | 1 |
| **Hartnell** |  | 070210 | 85 |  |  |  |
| **Merritt** |  | 070210 | 78 |  |  |  |
| **Mission** |  | 070210 | 93 |  |  |  |
| **Monterey** | Santa Cruz & Monterey | 070210 | 332 | 1 |  | 1 |
| **Napa** |  | 070210 | 163 |  |  |  |
| **Ohlone** |  | 070210 | 12 |  |  |  |
| **Santa Rosa** | North Bay | 070210 | n/a |  | 12 | 12 |
| **Solano** | North Bay | 070210 | n/a | 3 | 1 | 4 |
| **West Valley** | Silicon Valley | 070210 | 384 |  |  |  |
| **Total Bay Region** |  |  **22,804**  |  **26**  |  **122**  |  **145**  |
| **Total East Bay Sub-Region** |  |  **7,463**  |  **15**  |  **17**  |  **32**  |

# *Source: IPEDS, Data Mart and Launchboard*

NOTE: Headcount of students who took one or more courses is for 2016-17. The annual average for awards is 2014-17 unless there are only awards in 2016-17. The annual average for other postsecondary is for 2013-16.

# Gap Analysis

Based on the data included in this report, there is a large labor market gap in the Bay region with 18,044 annual openings for the Computer Science occupational cluster and 145 annual awards for an annual undersupply of 17,899 students. In the East Bay Sub-Region, there is also a gap with 2,071 annual openings and 32 annual awards for an annual undersupply of 2,039 students.

# Student Outcomes

**Table 8. Four Employment Outcomes Metrics for Students Who Took Courses on TOP 0707.00 - Computer Software Development**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 2015-16 | Bay (All CTE Programs) | Merritt College (All CTE Programs) | State (TOP 0707.00) | Bay (TOP 0707.00) | East Bay (TOP 0707.00) | Merritt College (TOP 0707.00) |
| % Employed Four Quarters After Exit | 75% | 70% | 61% | 58% | n/a | n/a |
| Median Quarterly Earnings Two Quarters After Exit | $13,996 | $9,613 | $12,520 | $13,618 | n/a | n/a |
| Median % Change in Earnings | 40% | 41% | 48% | 37% | n/a | n/a |
| % of Students Earning a Living Wage | 63% | 60% | 58% | 63% | n/a | n/a |

*Source: Launchboard Pipeline (version available on 11/06/18)*

# Skills, Certifications and Education

**Table 9. Top Skills for Computer Science Occupations in Bay Region (Nov 2017 - Oct 2018)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Skill | Postings | Skill | Postings | Skill | Postings |
| Java | 41,155 | MySQL | 7,267 | React Javascript | 4,984 |
| Software Engineering | 37,697 | Data Structures | 7,217 | Product Management | 4,949 |
| Python | 29,651 | Agile Development | 7,128 | HTML5 | 4,943 |
| Software Development | 27,522 | PERL Scripting Language | 6,899 | Kubernetes | 4,942 |
| Linux | 22,217 | Microsoft C# | 6,851 | Apache Webserver | 4,857 |
| SQL | 21,646 | Scalability Design | 6,821 | Ansible | 4,672 |
| JavaScript | 20,899 | AngularJS | 6,702 | E-Commerce | 4,658 |
| C++ | 16,452 | Extensible Markup Language (XML) | 6,448 | Chef Infrastructure Automation | 4,644 |
| Oracle | 12,042 | Apache Hadoop | 6,442 | Configuration Management | 4,586 |
| Git | 11,888 | Business Process | 6,437 | Scala | 4,580 |
| UNIX | 10,698 | Big Data | 6,348 | Bash | 4,559 |
| Debugging | 10,474 | JavaScript Object Notation (JSON) | 5,897 | Information Systems | 4,529 |
| Object-Oriented Analysis and Design (OOAD) | 10,471 | Software Architecture | 5,847 | Hypertext Preprocessor (PHP) | 4,422 |
| DevOps | 10,405 | Machine Learning | 5,812 | Computer Engineering | 4,411 |
| Unit Testing | 8,843 | Salesforce | 5,795 | Information Security | 4,374 |
| Web Application Development | 8,393 | Relational Databases | 5,563 | Product Development | 4,330 |
| Quality Assurance and Control | 8,041 | jQuery | 5,404 | PostgreSQL | 4,311 |
| Continuous Integration (CI) | 7,982 | Customer Service | 5,369 | Puppet | 4,298 |
| Project Management | 7,907 | Apache Kafka | 5,355 | Virtualization | 4,223 |
| NoSQL | 7,583 | Software as a Service (SaaS) | 5,348 | Scheduling | 4,187 |
| Scrum | 7,457 | System Administration | 5,268 | Node.js | 4,171 |
| Ruby | 7,268 | Docker Software | 5,209 | Atlassian JIRA | 4,081 |

*Source: Burning Glass*

**Table 10. Certifications for Computer Science Occupations in the Bay Region (Nov 2017 - Oct 2018)**

Note: 93% of records have been excluded because they do not include a certification. As a result, the chart below may not be representative of the full sample.

|  |  |  |  |
| --- | --- | --- | --- |
| Certification | Postings | Certification | Postings |
| Certified Information Systems Security Professional (CISSP) | 2,380 | Certified Salesforce Administrator | 187 |
| IT Infrastructure Library (ITIL) Certification | 1,194 | Certified Scrum Trainer (CST) | 179 |
| Certified Information Systems Auditor (CISA) | 1,035 | Cisco Certified Security Professional | 179 |
| SANS/GIAC Certification | 992 | Certified Salesforce Platform Developer | 154 |
| Certified Information Security Manager (CISM) | 822 | Security+ | 150 |
| Security Clearance | 709 | Microsoft Certified Professional (MCP) | 143 |
| Project Management Certification | 658 | CompTIA Network+ | 134 |
| Driver's License | 602 | Red Hat Certified Engineer (RHCE) | 125 |
| Cisco Certified Network Associate (CCNA) | 574 | GIAC Certified Intrusion Analyst | 117 |
| Cisco Certified Network Professional (CCNP) | 475 | Certified A+ Technician | 115 |
| CompTIA Security+ | 430 | Capability Model Maturity Integration (CMMI) Certification | 100 |
| ITIL Certification | 387 | Certified ScrumMaster (CSM) | 96 |
| Information Systems Certification | 371 | Vmware Certified Professional (VCP) | 94 |
| Cisco Certified Internetwork Expert (CCIE) | 353 | Systems Security Certified Practitioner (SSCP) | 91 |
| Project Management Professional (PMP) | 315 | Certified Scrum Professional (CSP) | 90 |
| Certified in Risk and Information Systems Control | 273 | Automation Certification | 86 |
| Salesforce Developer | 240 | ITIL Foundation | 85 |
| GIAC Certified Incident Handler (GCIH) | 227 | GIAC Certified Forensic Analyst | 84 |
| GIAC Security Essentials (GSEC) | 210 | Java Certification | 84 |
| Microsoft Certified Solutions Expert (MCSE) | 207 | Six Sigma Certification | 79 |
| Microsoft Certified Solutions Associate (MCSA) | 193 | Certified in The Governance of Enterprise IT (CGEIT) | 77 |

*Source: Burning Glass*

**Table 11. Education Requirements for Computer Science Occupations in Bay Region**

Note: 49% of records have been excluded because they do not include a degree level. As a result, the chart below may not be representative of the full sample.

|  |  |
| --- | --- |
| Education (minimum advertised) | Latest 12 Mos. Postings |
| High school or vocational training | 1,085 (2%) |
| Associate Degree | 648 (1%) |
| Bachelor’s Degree or Higher | 58,377 (97%) |

*Source: Burning Glass*

# Methodology

Occupations for this report were identified by use of skills listed in O\*Net descriptions and job descriptions in Burning Glass. Labor demand data is sourced from Economic Modeling Specialists International (EMSI) occupation data and Burning Glass job postings data. Educational supply and student outcomes data is retrieved from multiple sources, including CTE Launchboard and CCCCO Data Mart.

# Sources

O\*Net Online

Labor Insight/Jobs (Burning Glass)

Economic Modeling Specialists International (EMSI)

CTE LaunchBoard [www.calpassplus.org/Launchboard/](http://www.calpassplus.org/Launchboard/)

Statewide CTE Outcomes Survey

Employment Development Department Unemployment Insurance Dataset

Living Insight Center for Community Economic Development

Chancellor’s Office MIS system

# Contacts

For more information, please contact:

* Doreen O’Donovan, Data Research Analyst, for Bay Area Community College Consortium (BACCC) and Centers of Excellence (CoE), doreen@baccc.net or (831) 479-6481
* John Carrese, Director, San Francisco Bay Center of Excellence for Labor Market Research, jcarrese@ccsf.edu or (415) 267-6544