** Programming Language Occupations**

**Labor Market Information Report**

**Foothill College**

Prepared by the San Francisco Bay Center of Excellence

for Labor Market Research

March 2019

# Recommendation

Based on all available data, there appears to be a significant undersupply of Programming Language workers compared to the demand for this cluster of occupations in the Bay region and in the Silicon Valley sub-region (Santa Clara County). There is a projected annual gap of about 20,665 students in the Bay region and 2,294 students in the Silicon Valley 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 these 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 Foothill College and in the region.

# Introduction

This report profiles Programming Language Occupations in the 12 county Bay region and in the Silicon Valley sub-region for the revision to an existing program at Foothill 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 User Support Specialists (SOC 15-1151):** Provide technical assistance to computer users**.** Answer questions or resolve computer problems for clients in person, or via telephone or electronically. May provide assistance concerning the use of computer hardware and software, including printing, installation, word processing, electronic mail, and operating systems. Excludes “Network and Computer Systems Administrators” (15-1142).
 |
| Entry-Level Educational Requirement: Some college, *no degree* |
| Training Requirement: None |
| Percentage of Community College Award Holders or Some Postsecondary Coursework: 41% |
| * **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% |
|  |
| * **Web Developers (SOC 15-1134):** Design, create, and modify Web sites. Analyze user needs to implement Web site content, graphics, performance, and capacity. May integrate Web sites with other computer applications. May convert written, graphic, audio, and video components to compatible Web formats by using software designed to facilitate the creation of Web and multimedia content. Excludes “Multimedia Artists and Animators” (27-1014).
 |
| Entry-Level Educational Requirement: Associate's degree |
| Training Requirement: None |
| Percentage of Community College Award Holders or Some Postsecondary Coursework: 25% |
| * **Computer and Information Systems Managers (SOC 11-3021):** Plan, direct, or coordinate activities in such fields as electronic data processing, information systems, systems analysis, and computer programming. Excludes “Computer Occupations" (15-1111 through 15-1199).
 |
| Entry-Level Educational Requirement: Bachelor's *degree* |
| Training Requirement: None |
| Percentage of Community College Award Holders or Some Postsecondary Coursework: 21*%* |

# Occupational Demand

**Table 1. Employment Outlook for Programming Language Occupations in Bay Region**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Occupation  | 2017 Jobs | 2022 Jobs | 5-Yr Change | 5-Yr % Change | 5-Yr Open-ings | Average Annual Open-ings | 10% Hourly Wage | Median Hourly Wage |
| Software Developers, Applications | 89,372 | 109,872 | 20,499  | 23% | 51,391 | 10,278 | $38.68  | $62.13  |
| Computer User Support Specialists | 29,393 | 34,005 | 4,612  | 16% | 15,944 | 3,189 | $20.02  | $32.70  |
| Software Developers, Systems Software | 40,748 | 44,919 | 4,171  | 10% | 17,637 | 3,527 | $40.21  | $65.42  |
| Web Developers | 10,306 | 12,242 | 1,937  | 19% | 5,802 | 1,160 | $20.83  | $38.90  |
| Computer and Information Systems Managers | 25,897 | 29,357 | 3,461  | 13% | 13,343 | 2,669 | $55.65  | $86.30  |
| **Total** | **195,716** | **230,396** | **34,680**  | **18%** | **104,118** | **20,823** | **$37.50**  | **$60.37**  |

*Source: EMSI 2019.1*

**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 Programming Language Occupations in Silicon Valley Sub-Region**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Occupation  | 2017 Jobs | 2022 Jobs | 5-Yr Change | 5-Yr % Change | 5-Yr Open-ings | Average Annual Open-ings | 10% Hourly Wage | Median Hourly Wage |
| Software Developers, Applications | 10,106 | 11,375 | 1,269  | 13% | 4,634 | 927 | $32.77  | $57.83  |
| Computer User Support Specialists | 5,092 | 5,490 | 398  | 8% | 2,313 | 463 | $19.30  | $29.05  |
| Software Developers, Systems Software | 4,717 | 4,966 | 249  | 5% | 1,807 | 361 | $33.94  | $61.17  |
| Web Developers | 2,177 | 2,327 | 150  | 7% | 951 | 190 | $19.56  | $28.48  |
| Computer and Information Systems Managers | 4,172 | 4,385 | 213  | 5% | 1,773 | 355 | $43.76  | $75.74  |
| **TOTAL** | **26,263** | **28,543** | **2,279**  | **9%** | **11,477** | **2,296** | **$31.02**  | **$53.26**  |

*Source: EMSI 2019.1*

**Silicon Valley Sub-Region** includes Santa Clara County

### Job Postings in Bay Region and Silicon Valley Sub-Region

**Table 3. Number of Job Postings by Occupation for latest 12 months (Feb 2018 - Jan 2018)**

| Occupation | Bay Region | Silicon Valley |
| --- | --- | --- |
|  Software Developers, Applications (15-1132.00) | 105,796 | 50,257 |
|  Web Developers (15-1134.00) | 25,242 | 10,258 |
|  Computer User Support Specialists (15-1151.00) | 14,324 | 5,226 |
|  Computer and Information Systems Managers (11-3021.00) | 1,956 | 656 |
|  Software Developers, Systems Software (15-1133.00) | 1,325 | 665 |
| **Total** |  **148,643**  |  **67,062**  |

*Source: Burning Glass*

**Table 4. Top Job Titles for Programming Language Occupations for latest 12 months (Feb 2018 - Jan 2018)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Common Title | Bay | Silicon Valley | Common Title | Bay | Silicon Valley |
| Software Development Engineer | 32,635 | 15,008 | Applications Developer | 1,488 | 546 |
| Java Developer | 7,475 | 4,346 | Android Developer | 1,445 | 752 |
| Devops Engineer | 3,819 | 1,774 | Principal Software Engineer | 1,259 | 554 |
| Applications Engineer | 3,021 | 1,818 | User Interface (UX)/User Experience (UX) Designer | 1,199 | 370 |
| User Experience (UX) Designer | 2,789 | 1,172 | Senior Engineer | 1,144 | 401 |
| Software Developer | 2,768 | 1,354 | PHP Developer | 1,078 | 203 |
| Java Engineer | 2,580 | 1,415 | iOS Developer | 1,048 | 527 |
| Python Developer | 1,902 | 1,215 | Senior Devops Engineer | 1,031 | 427 |
| Front End Developer | 1,857 | 893 | Desktop Support | 1,014 | 337 |
| Developer | 1,693 | 708 | .Net Developer | 945 | 207 |
| Senior Developer | 1,648 | 668 | Software Engineering Manager | 885 | 376 |
| User Interface (UI) Developer | 1,631 | 947 | Technical Support Engineer | 763 | 430 |
| Web Developer | 1,613 | 613 | Software Architect | 709 | 356 |
| Engineer | 1,538 | 840 | Full Stack Developer | 641 | 287 |

*Source: Burning Glass*

# Industry Concentration

**Table 5. Industries hiring Programming Language 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) | 34,646 | 35,722 | 20% | 20.0% |
| Computer Systems Design Services (541512) | 21,607 | 22,034 | 17% | 12.4% |
| Internet Publishing and Broadcasting and Web Search Portals (519130) | 18,979 | 20,125 | 42% | 11.3% |
| Software Publishers (511210) | 17,817 | 18,859 | 27% | 10.6% |
| Electronic Computer Manufacturing (334111) | 15,341 | 15,856 | 10% | 8.9% |
| Data Processing, Hosting, and Related Services (518210) | 6,219 | 6,758 | 41% | 3.8% |
| Other Computer Related Services (541519) | 4,720 | 4,841 | 24% | 2.7% |
| Corporate, Subsidiary, and Regional Managing Offices (551114) | 3,685 | 3,925 | 15% | 2.2% |
| Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology) (541715) | 3,019 | 3,165 |  (1%) | 1.8% |
| Semiconductor and Related Device Manufacturing (334413) | 2,077 | 2,076 |  (5%) | 1.2% |
| Research and Development in Biotechnology (except Nanobiotechnology) (541714) | 1,641 | 1,738 | 44% | 1.0% |
| Colleges, Universities, and Professional Schools (State Government) (902612) | 1,667 | 1,730 | 11% | 1.0% |
| Temporary Help Services (561320) | 1,703 | 1,707 | 7% | 1.0% |

*Source: EMSI 2019.1*

**Table 6. Top Employers Posting Programming Language Occupations in Bay Region and Silicon Valley Sub-Region (Feb 2018 - Jan 2018)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Employer | Bay | Employer | Bay | Employer | Silicon Valley |
| Capital Markets Placement | 2,245 | Redolent, Inc | 340 | Apple Inc. | 2,175 |
| Apple Inc. | 2,233 | Techfetch Com | 334 | Cisco Systems Inc | 1,170 |
| Amazon | 1,504 | eBay | 330 | Amazon | 916 |
| Cisco Systems Incorporated | 1,325 | Splunk | 317 | Google Inc. | 886 |
| Google Inc. | 1,139 | Adobe Systems | 311 | Vmware Incorporated | 452 |
| Scoop Technologies | 1,053 | Amazon Lab126 | 310 | Paypal | 390 |
| Facebook | 784 | Best Buy | 289 | Intel Corporation | 370 |
| IBM | 639 | Bayone Solutions | 277 | IBM | 342 |
| Oracle | 621 | Twitter | 274 | Walmart / Sam's | 301 |
| Workday, Inc | 554 | Etouch Systems Corp | 270 | Redolent, Inc | 273 |
| Microsoft Corporation | 526 | Linkedin Limited | 257 | eBay | 253 |
| Vmware Incorporated | 475 | Wipro | 257 | SAP | 247 |
| Salesforce | 459 | Xoriant Incorporated | 250 | Amazon Lab126 | 245 |
| Paypal | 428 | Palo Alto Networks | 244 | Palo Alto Networks | 243 |
| SAP | 427 | Revature | 243 | Nvidia Corporation | 238 |
| Walmart / Sam's | 425 | Infoobjects Inc | 241 | Dell | 217 |
| Intel Corporation | 372 | Accenture | 238 | Fortinet Incorporated | 215 |
| Redolent, Inc | 340 | Nvidia Corporation | 238 | Linkedin Limited | 212 |
| Techfetch Com | 334 | Uber | 234 | Techfetch Com | 205 |
| Capital Markets Placement | 2,245 | Sony Electronics Inc | 228 | Splunk | 191 |
| Apple Inc. | 2,233 | Deloitte | 227 | Xilinx Incorporated | 189 |

*Source: Burning Glass*

# Educational Supply

There are 10 community colleges in the Bay Region issuing 158 awards on average annually (last 3 years) on TOP 0707.00 - Computer Software Development and TOP 0708.00 - Computer Infrastructure and Support. Foothill College is the only college in the Silicon Valley Sub-Region issuing awards on these TOP codes, issuing 2 awards on average annually (last 3 years) on Computer Software Development.

**Table 7. Awards on TOP 0707.00 - Computer Software Development and TOP 0708.00 - Computer Infrastructure and Support in the Bay Region**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| College | Sub-Region | TOP | Headcount | Associates | Certificates | Total |
| **Cabrillo** | Santa Cruz & Monterey | 70800 | 335 |   |   |   |
| **Contra Costa** | East Bay | 70800 | n/a |   | 1 | 1 |
| **DeAnza** | Silicon Valley | 70800 | 312 |   |   |   |
| **Diablo Valley** | East Bay | 70800 | 125 |   |   |   |
| **Foothill** | Silicon Valley | 70800 | 304 |   |   |   |
| **Gavilan** | Santa Cruz & Monterey | 70800 | 95 | 1 |   | 1 |
| **Las Positas** | East Bay | 70800 | 184 |   |   |   |
| **Los Medanos** | East Bay | 70800 | n/a | 4 | 4 | 8 |
| **Mission** | Silicon Valley | 70800 | 43 |   |   |   |
| **Ohlone** | East Bay | 70800 | 64 |   | 1 | 1 |
| **San Francisco** | Mid-Peninsula | 70800 | 345 | 39 | 9 | 48 |
| **San Mateo** | Mid-Peninsula | 70800 | n/a | 1 | 2 | 3 |
| **Santa Rosa** | North Bay | 70800 | 205 |   |   |   |
| **Slyline** | Mid-Peninsula | 70800 | 112 |   |   |   |
| **Foothill** | Silicon Valley | 70700 | 2,518 |  | 2 | 2 |
| **San Francisco** | Mid-Peninsula | 70700 | n/a |  | 2 | 2 |
| **San Mateo** | Mid-Peninsula | 70700 | n/a | 6 | 85 | 91 |
| **Solano** | North Bay | 70700 | 1,401 |  | 2 | 2 |
| **Total Bay Region** |  |  **6,043**  |  **51**  |  **107**  |  **158**  |
| **Total Silicon Valley Sub-Region** |  |  **3,177**  |  **0**  |  **2**  |  **2**  |

# *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 20,823 annual openings for Programming Language Occupations and 158 annual (3-year average) awards for an annual undersupply of 20,665 students. In the Silicon Valley Sub-Region, there is also a large gap with 2,296 annual openings and 2 annual (3-year average) awards for an annual undersupply of 2,294 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) | Foothill College (All CTE Programs) | State (0707.00)  | Bay (0707.00) | Silicon Valley (0707.00)  | Foothill College (0707.00) |
| % Employed Four Quarters After Exit | 74% | 77% | 62% | 59% | n/a | n/a |
| Median Quarterly Earnings Two Quarters After Exit | $10,550 | $15,310 | $12,500 | $14,169 | n/a | n/a |
| Median % Change in Earnings | 46% | 82% | 54% | 37% | n/a | n/a |
| % of Students Earning a Living Wage | 63% | 76% | 67% | 68% | n/a | n/a |

*Source: Launchboard Pipeline (version available on 3/6/19)*

# Skills, Certifications and Education

**Table 9. Top Skills for Programming Language Occupations in Bay Region (Feb 2018 - Jan 2018)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Skill | Postings | Skill | Postings | Skill | Postings |
| Java | 50,519 | AngularJS | 11,311 | Ruby | 8,481 |
| Software Engineering | 47,854 | UNIX | 11,180 | Microsoft C# | 8,293 |
| Python | 34,810 | React Javascript | 10,163 | JavaScript Object Notation (JSON) | 8,059 |
| JavaScript | 34,741 | Continuous Integration (CI) | 10,026 | Docker Software | 7,894 |
| Software Development | 34,128 | HTML5 | 10,023 | Kubernetes | 7,826 |
| SQL | 24,742 | MySQL | 10,000 | Product Management | 7,811 |
| Linux | 23,148 | NoSQL | 9,851 | Software Architecture | 7,768 |
| C++ | 19,882 | Technical Support | 9,835 | Extensible Markup Language (XML) | 7,728 |
| Git | 16,159 | Scrum | 9,731 | Node.js | 7,625 |
| Web Application Development | 14,319 | Quality Assurance and Control | 9,690 | Web Development | 7,594 |
| Object-Oriented Analysis and Design (OOAD) | 13,976 | Data Structures | 9,400 | Machine Learning | 7,580 |
| Debugging | 13,331 | Agile Development | 9,396 | Project Management | 7,578 |
| DevOps | 13,111 | Customer Service | 9,038 | Big Data | 7,556 |
| Oracle | 12,280 | jQuery | 8,884 | Apache Hadoop | 7,495 |
| Unit Testing | 12,233 | Scalability Design | 8,860 | Hypertext Preprocessor (PHP) | 7,442 |

*Source: Burning Glass*

**Table 10. Certifications for Programming Language Occupations in the Bay Region (Feb 2018 - Jan 2018)**

Note: 95% 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 |
| Driver's License | 1,245 | Certified Scrum Trainer (CST) | 195 |
| IT Infrastructure Library (ITIL) Certification | 1,188 | Certified Salesforce Administrator | 177 |
| Certified A+ Technician | 1,065 | Apple Certified Macintosh Technician | 146 |
| Security Clearance | 850 | Project Management Professional (PMP) | 144 |
| Cisco Certified Network Associate (CCNA) | 452 | SANS/GIAC Certification | 140 |
| Microsoft Certified Professional (MCP) | 432 | Certified Information Systems Auditor (CISA) | 126 |
| Project Management Certification | 397 | ITIL Foundation | 118 |
| ITIL Certification | 379 | Certified ScrumMaster (CSM) | 109 |
| CompTIA Network+ | 373 | Certified Information Security Manager (CISM) | 106 |
| Certified Information Systems Security Professional (CISSP) | 322 | Capability Model Maturity Integration (CMMI) Certification | 103 |
| Cisco Certified Internetwork Expert (CCIE) | 277 | Computer Science Certification | 94 |
| Cisco Certified Network Professional (CCNP) | 253 | Certified Salesforce Platform Developer II | 89 |
| Salesforce Developer | 229 | Certified Scrum Professional (CSP) | 86 |
| Microsoft Certified Solutions Associate (MCSA) | 220 | Java Certification | 83 |
| Certified Salesforce Platform Developer | 214 | Microsoft Certified Desktop Support Technician (Legacy) | 82 |
| Microsoft Certified Solutions Expert (MCSE) | 213 | Certified Novell Administrator | 78 |
| CompTIA Security+ | 206 | Microsoft Certified Technology Specialist (MCTS) | 78 |

*Source: Burning Glass*

**Table 11. Education Requirements for Programming Language 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 | 1,789 (2%) |
| Associate Degree | 1,350 (2%) |
| Bachelor’s Degree or Higher | 72,094 (96%) |

*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