** Game and Simulation Programming Occupations**

**Labor Market Information Report**

**City College of San Francisco**

Prepared by the San Francisco Bay Center of Excellence

for Labor Market Research

October 2018

# Recommendation

Based on all available data, there appears to be a significant undersupply of Game and Simulation Programming workers compared to the demand for this cluster of occupations in the Bay region and in the Mid-Peninsula sub-region (San Francisco and San Mateo Counties). The gap is about 15,875 students annually in the Bay region and 5,840 students annually in the Mid-Peninsula sub-region.

This report also provides student outcomes data on employment and earnings for programs on TOP 0707.10 - Computer Programming 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 City College of San Francisco and in the region.

# Introduction

This report profiles Game and Simulation Programming Occupations in the 12 county Bay region and in the Mid-Peninsula sub-region for a proposed new program at City College of San Francisco. Labor market information (LMI) is not available at the eight-digit SOC Code level for Video Game Designers (15-1199.11), therefore, the data shown in Tables 1 and 2 is for Computer Occupations, All Other (at the six digit SOC level) and likely overstates demand for Video Game Designers.

|  |
| --- |
| * **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 Occupations, All Other (SOC** **15-1199):** All computer occupations not listed separately. Excludes “Computer and Information Systems Managers” (11-3021), “Computer Hardware Engineers” (17-2061), “Electrical and Electronics Engineers” (17-2070), “Computer Science Teachers, Postsecondary” (25-1021), “Multimedia Artists and Animators” (27-1014), “Graphic Designers” (27-1024), “Computer Operators” (43-9011), and “Computer, Automated Teller, and Office Machine Repairs” (49-2011). |
| *Entry-Level Educational Requirement: Bachelor's degree* |
| *Training Requirement: None* |
| *Percentage of Community College Award Holders or Some Postsecondary Coursework: 35%* |
|  |
| * **Computer Programmers (SOC 15-1131):** Create, modify, and test the code, forms, and script that allow computer applications to run. Work from specifications drawn up by software developers or other individuals. May assist software developers by analyzing user needs and designing software solutions. May develop and write computer programs to store, locate, and retrieve specific documents, data, and information. |
| *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%* |

# Occupational Demand

**Table 1. Employment Outlook for Game and Simulation Programming 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 Occupations, All Other | 19,753 | 21,788 | 2,035 | 10% | 8,847 | 1,769 | $26.52 | $53.50 |
| Computer Programmers | 14,212 | 14,794 | 583 | 4% | 5,307 | 1,061 | $27.67 | $48.82 |
| Software Developers, Systems Software | 40,880 | 44,555 | 3,675 | 9% | 17,045 | 3,409 | $40.33 | $65.52 |
| **Total** | **164,876** | **190,239** | **25,363** | **15%** | **81,008** | **16,202** | **$36.70** | **$60.81** |

*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 Game and Simulation Programming Occupations in Mid-Peninsula 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 | 29,717 | 37,549 | 7,832 | 26% | 18,171 | 3,634 | $39.89 | $66.06 |
| Computer Occupations, All Other | 7,931 | 8,949 | 1,019 | 13% | 3,767 | 753 | $28.11 | $53.81 |
| Computer Programmers | 4,782 | 5,205 | 423 | 9% | 1,999 | 400 | $27.21 | $49.42 |
| Software Developers, Systems Software | 11,075 | 12,901 | 1,826 | 16% | 5,541 | 1,108 | $42.39 | $65.17 |
| **TOTAL** | **53,505** | **64,605** | **11,100** | **21%** | **29,479** | **5,896** | **$37.53** | **$62.57** |

*Source: EMSI 2018.4*

**Mid-Peninsula Sub-Region** includes San Francisco and San Mateo Counties

### Job Postings in Bay Region and Mid-Peninsula Sub-Region

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

|  |  |  |
| --- | --- | --- |
| Occupation | Bay Region | Mid-Peninsula |
| Software Developers, Applications (15-1132.00) | 84,717 | 30,905 |
| Computer Programmers (15-1131.00) | 3,655 | 1,133 |
| Software Developers, Systems Software (15-1133.00) | 1,139 | 450 |
| Video Game Designers (15-1199.11) | 938 | 353 |
| **Total** | **90,449** | **32,841** |

*Source: Burning Glass*

**Table 4. Top Job Titles for Game and Simulation Programming Occupations for latest 12 months (Oct 2017 - Sept 2018)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Common Title | Bay | Mid-Peninsula | Common Title | Bay | Mid-Peninsula |
| Software Development Engineer | 24,995 | 9,836 | C++ Developer | 402 | 94 |
| Java Developer | 5,634 | 1,401 | Full Stack Engineer | 379 | 111 |
| Devops Engineer | 3,164 | 1,135 | Software Development Manager | 369 | 106 |
| Applications Engineer | 2,496 | 637 | Machine Learning Engineer | 358 | 140 |
| Java Engineer | 2,232 | 721 | Solutions Engineer | 335 | 184 |
| Software Developer | 1,997 | 653 | Oracle Developer | 334 | 114 |
| Python Developer | 1,384 | 329 | Developer, Information And Technology Industry | 317 | 97 |
| Developer | 1,275 | 449 | Performance Engineer | 294 | 125 |
| Senior Developer | 1,263 | 525 | Business Intelligence Developer | 283 | 133 |
| Applications Developer | 1,135 | 433 | Senior Android Engineer | 267 | 169 |
| Android Developer | 1,114 | 486 | Principal Engineer | 253 | 120 |
| Principal Software Engineer | 1,005 | 489 | Android Engineer | 246 | 152 |
| Engineer | 885 | 325 | Senior .Net Developer | 245 | 99 |
| iOS Developer | 852 | 417 | Java/J2EE Developer | 241 | 82 |
| Senior Devops Engineer | 792 | 389 | Data Developer | 225 | 68 |
| .Net Developer | 763 | 271 | Senior iOS Developer | 224 | 122 |
| Senior Engineer | 636 | 319 | Applications Architect | 214 | 74 |
| Software Engineering Manager | 617 | 271 | Hadoop Developer | 213 | 20 |
| Salesforce Developer | 487 | 212 | iOS Engineer | 205 | 154 |
| Software Architect | 486 | 178 | Applications Analyst | 199 | 60 |
| Full Stack Developer | 480 | 234 | Solutions Architect | 195 | 85 |
| Programmer/Analyst | 463 | 160 | Verification Engineer | 183 | 9 |
| Lead Developer | 443 | 182 | Build Release Engineer | 181 | 16 |
| Mobile App Developer | 419 | 164 | iOS App Developer | 181 | 106 |

*Source: Burning Glass*

# Industry Concentration

**Table 5. Industries hiring Game and Simulation Programming 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) | 35,399 | 36,189 | 17% | 21.6% |
| Computer Systems Design Services (541512) | 22,039 | 22,264 | 15% | 13.3% |
| Software Publishers (511210) | 18,287 | 18,836 | 21% | 11.2% |
| Internet Publishing and Broadcasting and Web Search Portals (519130) | 16,727 | 17,267 | 37% | 10.3% |
| Electronic Computer Manufacturing (334111) | 13,511 | 13,664 | 6% | 8.1% |
| Data Processing, Hosting, and Related Services (518210) | 5,992 | 6,245 | 32% | 3.7% |
| Other Computer Related Services (541519) | 4,842 | 4,922 | 22% | 2.9% |
| Corporate, Subsidiary, and Regional Managing Offices (551114) | 3,636 | 3,744 | 9% | 2.2% |
| Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology) (541715) | 2,399 | 2,459 | (7%) | 1.5% |
| Semiconductor and Related Device Manufacturing (334413) | 2,145 | 2,143 | (5%) | 1.3% |
| Engineering Services (541330) | 1,697 | 1,713 | 12% | 1.0% |
| Federal Government, Civilian, Excluding Postal Service (901199) | 1,661 | 1,653 | (0%) | 1.0% |

*Source: EMSI 2018.4*

**Table 6. Top Employers Posting Game and Simulation Programming Occupations in Bay Region and Mid-Peninsula Sub-Region (Oct 2017 - Sept 2018)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Employer | Bay | Employer | Bay | Employer | Mid-Peninsula |
| Apple Inc. | 2,172 | Nvidia Corporation | 369 | Facebook | 476 |
| Capital Markets Placement | 1,495 | Intel Corporation | 358 | Amazon | 445 |
| Amazon | 1,321 | eBay | 343 | Salesforce | 435 |
| Cisco Systems Incorporated | 830 | SAP | 332 | Capital Markets Placement | 403 |
| Google Inc. | 743 | IBM | 321 | Oracle | 314 |
| Workday, Inc | 672 | Vmware Incorporated | 321 | Twitter | 195 |
| Oracle | 512 | Walmart / Sam's | 309 | Microsoft Corporation | 157 |
| Facebook | 483 | Accenture | 265 | Autodesk Incorporated | 156 |
| Salesforce | 441 | Etouch Systems Corporation | 260 | Capgemini | 147 |
| Microsoft Corporation | 371 | Infoobjects Inc | 257 | IBM | 139 |

*Source: Burning Glass*

# Educational Supply

There are 14 community colleges in the Bay Region issuing 328 awards annually on TOP 0707.10 - Computer Programming. There are two colleges in the Mid-Peninsula sub-region issuing 56 awards annually.

**Table 7. Awards on TOP 0707.10 - Computer Programming in the Bay Region**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| College | Sub-Region | Headcount | Associates | Certificates | Total |
| **Berkeley City** | East Bay | 289 | 2 | 4 | 5 |
| **Cabrillo** | Santa Cruz & Monterey | n/a | 6 | 20 | 26 |
| **Contra Costa** | East Bay | n/a | 2 | 1 | 3 |
| **De Anza** | Silicon Valley | 2,247 | 7 | 29 | 37 |
| **Diablo Valley** | East Bay | 1,386 | 43 | 112 | 155 |
| **Gavilan** | Silicon Valley | 323 | 8 | 3 | 11 |
| **Hartnell** | Santa Cruz & Monterey | 245 | 11 | 1 | 12 |
| **Laney** | East Bay | 455 | 1 | 1 | 2 |
| **Las Positas** | East Bay | 548 | 1 | 2 | 3 |
| **Ohlone** | East Bay | 771 | 1 | 0 | 1 |
| **San Francisco** | Mid-Peninsula | 2,004 |  | 54 | 54 |
| **San Jose City** | Silicon Valley | 369 | 6 | 6 | 12 |
| **San Mateo** | Mid-Peninsula | 682 | 1 | 1 | 2 |
| **Solano** | North Bay | n/a | 4 | 0 | 4 |
| **Total Bay Region** | | **9,319** | **93** | **235** | **328** |
| **Total Mid-Peninsula Sub-Region** | | **2,686** | **1** | **55** | **56** |

# *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 16,202 annual openings for the Game and Simulation Programming occupational cluster and 328 annual awards for an annual undersupply of 15,874. In the Mid-Peninsula sub-region, there is also a gap with 5,896 annual openings and 56 annual awards for an annual undersupply of 5,840.

# Student Outcomes

**Table 8. Four Employment Outcomes Metrics for Students Who Took Courses on TOP 0707.10 - Computer Programming**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 2015-16 | Bay  (All CTE Programs) | City College of San Francisco (All CTE Programs) | State (TOP 0707.10) | Bay  (TOP 0707.10) | Mid-Peninsula (TOP 0707.10) | City College of San Francisco (TOP 0707.10) |
| % Employed Four Quarters After Exit | 75% | 72% | 64% | 65% | 67% | 70% |
| Median Quarterly Earnings Two Quarters After Exit | $13,996 | $10,794 | $10,653 | $13,215 | $14,024 | $14,564 |
| Median % Change in Earnings | 40% | 46% | 51% | 54% | 65% | 66% |
| % of Students Earning a Living Wage | 63% | 55% | 58% | 63% | 65% | 66% |

*Source: Launchboard Pipeline (version available on 10/15/18)*

# Skills, Certifications and Education

**Table 9. Top Skills for Game and Simulation Programming Occupations in Bay Region (Oct 2017 - Sept 2018)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Skill | Postings | Skill | Postings | Skill | Postings |
| Java | 37,329 | Web Application Development | 7,407 | Extensible Markup Language (XML) | 5,625 |
| Software Engineering | 34,440 | Continuous Integration (CI) | 7,217 | Big Data | 5,621 |
| Python | 24,781 | NoSQL | 6,814 | PERL Scripting Language | 5,503 |
| Software Development | 24,102 | Quality Assurance and Control | 6,703 | Software Architecture | 5,337 |
| JavaScript | 18,417 | Data Structures | 6,625 | JavaScript Object Notation (JSON) | 5,252 |
| SQL | 17,690 | MySQL | 6,443 | Machine Learning | 5,093 |
| Linux | 17,167 | Agile Development | 6,385 | jQuery | 5,027 |
| C++ | 14,955 | Scrum | 6,303 | Relational Databases | 4,932 |
| Git | 10,902 | AngularJS | 6,289 | Apache Kafka | 4,778 |
| Object-Oriented Analysis and Design (OOAD) | 9,765 | Microsoft C# | 6,279 | Docker Software | 4,534 |
| Debugging | 9,378 | Ruby | 6,172 | HTML5 | 4,383 |
| Oracle | 8,998 | Scalability Design | 5,996 | Salesforce | 4,369 |
| DevOps | 8,838 | Apache Hadoop | 5,823 | Project Management | 4,341 |
| UNIX | 8,609 | Extensible Markup Language (XML) | 5,625 | Apache Webserver | 4,242 |
| Unit Testing | 8,129 | Big Data | 5,621 | Scala | 4,218 |

*Source: Burning Glass*

**Table 10. Certifications for Game and Simulation Programming Occupations in the Bay Region (Oct 2017 - Sept 2018)**

Note: 96% 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 |
| IT Infrastructure Library (ITIL) Certification | 450 | Automation Certification | 65 |
| Security Clearance | 351 | Certified Information Security Manager (CISM) | 61 |
| Driver's License | 301 | CompTIA Security+ | 59 |
| Project Management Certification | 250 | Certified Salesforce Advanced Developer | 57 |
| Salesforce Developer | 234 | Mbe Certified | 54 |
| Certified Information Systems Security Professional (CISSP) | 221 | ITIL Foundation | 50 |
| ITIL Certification | 169 | Salesforce Platform App Builder | 49 |
| Cisco Certified Network Associate (CCNA) | 164 | Certified Novell Administrator | 48 |
| Cisco Certified Internetwork Expert (CCIE) | 149 | Microsoft Certified Solutions Developer (MCSD) | 48 |
| Cisco Certified Network Professional (CCNP) | 144 | Certified Salesforce Platform Developer I | 44 |
| Project Management Professional (PMP) | 136 | First Aid Cpr Aed | 43 |
| Certified Scrum Trainer (CST) | 130 | Certified ScrumMaster (CSM) | 42 |
| Certified Salesforce Administrator | 128 | Certified Senior System Architect | 42 |
| Certified Salesforce Platform Developer | 124 | Certified Salesforce Platform Developer II | 41 |
| SANS/GIAC Certification | 102 | Cisco Certified Security Professional | 39 |
| Capability Model Maturity Integration (CMMI) Certification | 85 | Certified Scrum Professional (CSP) | 38 |
| Java Certification | 79 | Red Hat Certified Engineer (RHCE) | 38 |
| Certified Information Systems Auditor (CISA) | 78 | Six Sigma Certification | 38 |
| Microsoft Certified Professional (MCP) | 66 | AWS Certified DevOps Engineer | 36 |

*Source: Burning Glass*

**Table 11. Education Requirements for Game and Simulation Programming 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 | 519 (1%) |
| Associate Degree | 331 (1%) |
| Bachelor’s Degree or Higher | 44,986 (98%) |

*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

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