** Data Science 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 Data Science 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 annual gap is about 12,160 students annually in the Bay region and 4,650 in the Mid-Peninsula 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 City College of San Francisco and in the region.

# Introduction

This report profiles Data Science Occupations in the 12 county Bay region and in the Mid-Peninsula sub-region for a proposed Data Science Fundamentals Certificate at City College of San Francisco. Labor market information (LMI) is not available at the eight-digit SOC Code level for Bioinformatics Technicians (43-9111.01), therefore the data shown in Tables 1 and 2 is for Statistical Assistants (at the six digit SOC level) and likely overstates demand for Bioinformatics Technicians. Similarly, LMI is not available at the eight-digit SOC Code level for Business Intelligence Analysts (15-1199.08), 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 Business Intelligence Analysts. Finally, Financial Quantitative Analysts (13-2099.01) was not included in this report because the educational requirements for this occupation are Masters degree level (65%) or Bachelor’s/Post-baccalaureate level (26%).

|  |
| --- |
| * **Statistical Assistants (SOC 43-9111):** Compile and compute data according to statistical formulas for use in statistical studies. May perform actuarial computations and compile charts and graphs for use by actuaries. Includes actuarial clerks.
 |
| *Entry-Level Educational Requirement: Bachelor's degree* |
| *Training Requirement: None* |
| *Percentage of Community College Award Holders or Some Postsecondary Coursework: 37%* |
|  |
| * + **Bioinformatics Technicians (43-9111.01):** Apply principles and methods of bioinformatics to assist scientists in areas such as pharmaceuticals, medical technology, biotechnology, computational biology, proteomics, computer information science, biology and medical informatics. Apply bioinformatics tools to visualize, analyze, manipulate or interpret molecular data. May build and maintain databases for processing and analyzing genomic or other biological information.
 |
| *Entry-Level Educational Requirement: Bachelor's degree* |
| *Training Requirement: Employees in these occupations usually need several years of work-related experience, on-the-job training, and/or vocational training.* |
|  |
| * **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%* |

# Occupational Demand

**Table 1. Employment Outlook for Data 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 |
| Statistical Assistants | 227 | 261 | 34  | 15% | 183 | 37 | $19.77  | $27.54  |
| Software Developers, Applications | 89,990 | 110,925 | 20,935  | 23% | 52,354 | 10,471 | $38.70  | $62.15  |
| Computer Occupations, All Other | 19,743 | 22,210 | 2,467  | 12% | 9,395 | 1,879 | $26.51  | $53.49  |
| **Total** | **109,960** | **133,396** | **23,436** | **21%** | **61,933** | **12,386** | **$36.47**  | **$60.52**  |

*Source: EMSI 2018.3*

**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 Data Science 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 |
| Statistical Assistants | 100 | 116 | 16  | 16% | 82 | 16 | $19.60  | $27.54  |
| Software Developers, Applications | 29,694 | 38,362 | 8,668  | 29% | 19,292 | 3,858 | $39.92  | $65.99  |
| Computer Occupations, All Other | 7,924 | 9,174 | 1,250  | 16% | 4,068 | 814 | $28.12  | $53.81  |
| **TOTAL** | **37,718** | **47,653** | **9,934**  | **26%** | **23,441** | **4,688** | **$37.39**  | **$63.33**  |

*Source: EMSI 2018.2*

**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) | 85,080 | 31,069 |
| Business Intelligence Analysts (15-1199.08) | 8,679 | 3,636 |
| Community and Social Service Specialists, All Other (21-1099.00) | 265 |  |
| Financial Quantitative Analysts (13-2099.01) | 152 | 120 |
| Bioinformatics Technicians (43-9111.01) | 50 | 3 |
| Statistical Assistants (43-9111.00) | 6 |  |
| **Total** | **94,232** | **34,828** |

*Source: Burning Glass*

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Common Title | Bay | Mid-Peninsula | Common Title | Bay | Mid-Peninsula |
| Software Development Engineer | 24,947 | 9.876 | .Net Developer | 762 | 271 |
| Java Developer | 5,647 | 1,407 | Sap Consultant | 636 | 134 |
| Devops Engineer | 3,179 | 1,146 | Software Engineering Manager | 620 | 273 |
| Data Analyst | 2,821 | 1,338 | Senior Engineer | 616 | 301 |
| Applications Engineer | 2,496 | 641 | Business Intelligence Analyst | 507 | 200 |
| Java Engineer | 2,236 | 721 | Software Architect | 495 | 180 |
| Software Developer | 1,920 | 645 | Salesforce Developer | 487 | 212 |
| Python Developer | 1,381 | 330 | Full Stack Developer | 480 | 185 |
| Senior Developer | 1,270 | 530 | Business Analyst | 452 | 196 |
| Developer | 1,243 | 442 | Lead Developer | 444 | 183 |
| Applications Developer | 1,141 | 436 | Mobile App Developer | 422 | 166 |
| Android Developer | 1,115 | 487 | Full Stack Engineer | 379 | 185 |
| Principal Software Engineer | 1,007 | 490 | C++ Developer | 374 | 89 |
| Engineer | 973 | 349 | Software Development Manager | 372 | 109 |
| iOS Developer | 854 | 420 | Machine Learning Engineer | 362 | 143 |
| Senior Devops Engineer | 792 | 389 | Solutions Engineer | 335 | 184 |

*Source: Burning Glass*

# Industry Concentration

**Table 5. Industries hiring Data 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) | 23,291 | 28,961 | 24% | 21.2% |
| Computer Systems Design Services (541512) | 14,361 | 17,979 | 25% | 13.1% |
| Internet Publishing and Broadcasting and Web Search Portals (519130) | 14,091 | 19,959 | 42% | 12.8% |
| Software Publishers (511210) | 12,813 | 15,470 | 21% | 11.7% |
| Electronic Computer Manufacturing (334111) | 6,912 | 7,676 | 11% | 6.3% |
| Data Processing, Hosting, and Related Services (518210) | 4,196 | 5,721 | 36% | 3.8% |
| Other Computer Related Services (541519) | 3,197 | 4,297 | 34% | 2.9% |
| Corporate, Subsidiary, and Regional Managing Offices (551114) | 2,669 | 2,854 | 7% | 2.4% |
| Federal Government, Civilian, Excluding Postal Service (901199) | 1,666 | 1,695 | 2% | 1.5% |
| Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology) (541715) | 1,272 | 1,387 | 9% | 1.2% |
| Temporary Help Services (561320) | 1,138 | 1,264 | 11% | 1.0% |
| Semiconductor and Related Device Manufacturing (334413) | 1,106 | 1,055 |  (5%) | 1.0% |
| Custom Computer Programming Services (541511) | 23,291 | 28,961 | 24% | 21.2% |
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*Source: EMSI 2018.2*

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Employer | Bay | Employer | Bay | Employer | Mid-Peninsula |
| Apple Inc. | 2,218 | Microsoft Corporation | 371 | Facebook | 527 |
| Capital Markets Placement | 1,494 | eBay | 367 | Amazon | 462 |
| Amazon | 1,332 | Intel Corporation | 360 | Salesforce | 447 |
| Cisco Systems Incorporated | 850 | IBM | 351 | Capital Markets Placement | 403 |
| Google Inc. | 780 | Walmart / Sam's | 335 | Oracle | 296 |
| Workday, Inc | 692 | SAP | 333 | Twitter | 204 |
| Facebook | 534 | Vmware Incorporated | 319 | Wells Fargo | 186 |
| Oracle | 492 | Accenture | 311 | Deloitte | 165 |
| Salesforce | 455 | Deloitte | 279 | Autodesk Incorporated | 162 |
| Nvidia Corporation | 383 | Paypal | 273 | Microsoft Corporation | 159 |

*Source: Burning Glass*

# Educational Supply

There are five community colleges in the Bay Region issuing 224 awards annually on TOP 0707.00 - Computer Software Development and two colleges in the Mid-Peninsula sub-region issuing 29 awards annually on this TOP code.

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| College | Sub-Region | Headcount | Associates | Certificates | Total |
| City College of San Francisco | Mid-Peninsula | 2,136 |  | 29 | 29 |
| San Mateo | Mid-Peninsula | 725 |  | 10 | 10 |
| De Anza College | Silicon Valley | 3,316 |  | 31 | 31 |
| Diablo Valley College | East Bay | 1,412 | 65 | 56 | 121 |
| Hartnell College | Santa Cruz - Monterey | 245 | 33 |  | 33 |
| **Total Bay Region** | **7,834** | **98** | **126** | **224** |
| **Total Mid-Peninsula Sub-Region** | **2,136** | **0** | **39** | **39** |

# *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 12,386 annual openings for the Data Scienceoccupational cluster and 224 annual awards for an annual undersupply of 12,162 students. In the Mid-Peninsula Sub-Region, there is also a gap with 4,688 annual openings and 39 annual awards for an annual undersupply of 4,649 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) | City College of San Francisco (All CTE Programs) | State (TOP 0707.00) | Bay (TOP 0707.00) | Mid-Peninsula (TOP 0707.00) | City College of San Francisco (TOP 0707.00) |
| % Employed Four Quarters After Exit | 75% | 72% | 64% | 66% | 68% | 71% |
| Median Quarterly Earnings Two Quarters After Exit | $13,996 | $10,794 | $10,920 | $13,683 | $14,714 | $15,150 |
| Median % Change in Earnings | 40% | 46% | 50% | 53% | 66% | 68% |
| % of Students Earning a Living Wage | 63% | 55% | 59% | 64% | 67% | 69% |

*Source: Launchboard Pipeline (version available on 10/9/18)*

# Skills, Certifications and Education

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Skill | Postings | Skill | Postings | Skill | Postings |
| Java | 36,355 | Web Application Development | 7,254 | Machine Learning | 5,575 |
| Software Engineering | 34,179 | Continuous Integration (CI) | 7,048 | Extensible Markup Language (XML) | 5,472 |
| Python | 25,844 | Quality Assurance and Control | 6,769 | PERL Scripting Language | 5,435 |
| Software Development | 23,646 | NoSQL | 6,750 | Project Management | 5,273 |
| SQL | 20,655 | Data Structures | 6,664 | Software Architecture | 5,256 |
| JavaScript | 18,169 | MySQL | 6,478 | Relational Databases | 5,180 |
| Linux | 16,575 | Agile Development | 6,361 | JavaScript Object Notation (JSON) | 5,082 |
| C++ | 14,531 | Apache Hadoop | 6,216 | jQuery | 4,843 |
| Git | 10,615 | Scrum | 6,183 | Salesforce | 4,759 |
| Object-Oriented Analysis and Design (OOAD) | 9,535 | Ruby | 6,162 | Apache Kafka | 4,734 |
| Debugging | 9,139 | Big Data | 6,130 | Docker Software | 4,442 |
| Oracle | 9,112 | AngularJS | 6,081 | Product Management | 4,293 |
| DevOps | 8,654 | Microsoft C# | 6,051 | Scala | 4,258 |
| UNIX | 8,414 | Scalability Design | 6,036 | HTML5 | 4,244 |
| Unit Testing | 7,924 | Data Analysis | 5,833 | Software as a Service (SaaS) | 4,199 |

*Source: Burning Glass*

**Table 10. Certifications for Data Science 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 | 462 | Certified Information Security Manager (CISM) | 62 |
| Project Management Certification | 327 | Certified Novell Administrator | 61 |
| Security Clearance | 315 | Certified Salesforce Advanced Developer | 58 |
| Driver's License | 271 | ITIL Foundation | 58 |
| Salesforce Developer | 239 | Mbe Certified | 54 |
| Certified Information Systems Security Professional (CISSP) | 216 | CompTIA Security+ | 52 |
| ITIL Certification | 180 | Salesforce Platform App Builder | 51 |
| Project Management Professional (PMP) | 168 | Certified ScrumMaster (CSM) | 47 |
| Cisco Certified Network Associate (CCNA) | 163 | Six Sigma Certification | 47 |
| Cisco Certified Internetwork Expert (CCIE) | 149 | Microsoft Certified Solutions Developer (MCSD) | 46 |
| Cisco Certified Network Professional (CCNP) | 145 | Certified Scrum Professional (CSP) | 44 |
| Certified Salesforce Administrator | 138 | SAP Certification | 44 |
| Certified Scrum Trainer (CST) | 135 | Certified Salesforce Platform Developer I | 43 |
| Certified Public Accountant (CPA) | 134 | Certified Senior System Architect | 42 |
| Certified Salesforce Platform Developer | 124 | Certified Salesforce Platform Developer II | 40 |
| SANS/GIAC Certification | 104 | AWS Certified DevOps Engineer | 38 |
| Certified Information Systems Auditor (CISA) | 88 | Cisco Certified Security Professional | 38 |
| Capability Model Maturity Integration (CMMI) Certification | 80 | Red Hat Certified Engineer (RHCE) | 38 |
| Java Certification | 78 | Computer Science Certification | 36 |
| Automation Certification | 66 | Agile Certification | 35 |
| Microsoft Certified Professional (MCP) | 64 | CompTIA Linux+ | 35 |

*Source: Burning Glass*

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

Note: 48% 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 | 501 (1%) |
| Associate Degree | 368 (1%) |
| Bachelor’s Degree or Higher | 47,729 (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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