

Computer Programming

Inland Empire/Desert Region (Riverside-San Bernardino-Ontario Metropolitan Statistical Area)

Summary

- Employment for the computer programming occupational group is expected to **increase by 9% between 2017 and 2022** in the Inland Empire/Desert Region. Nearly **3,000 job openings** will be available over the five-year timeframe.
- The entry-level wage for all occupations in the computer programming occupational group is **above the MIT Living Wage estimate of \$12.30 per hour** for a single adult living in the Inland Empire/Desert Region.
- There appears to be an opportunity for program growth based on the average annual number of program completions for the selected community college programs (**64 average annual community college credentials**), and the annual openings for computer programming occupations in the local region (**594 annual job openings**).

Introduction

This report details relevant occupations to the computer programming. This program prepares students for entry-level programming positions through the instruction of methods, procedures, symbols, and rules used in planning and writing instructions in computer language for the solution of problems. The occupations included in the computer programming occupational group are:

- Computer Network Support Specialists
- Computer Programmers
- Software Developers, Applications
- Software Developers, Systems Software
- Web Developers

Job Opportunities

In 2017, there were more than 6,900 computer programming jobs in the Inland Empire/Desert Region. This occupational group is projecting to increase employment 9% by 2022. Employers in the region will need to hire nearly 3,000 workers over the next five years to fill new jobs and backfill jobs that workers are permanently vacating (includes retirements). Appendix A, Table 1 shows the

projected job growth, wages, education, training, and work experience required for each of the occupations in this group.

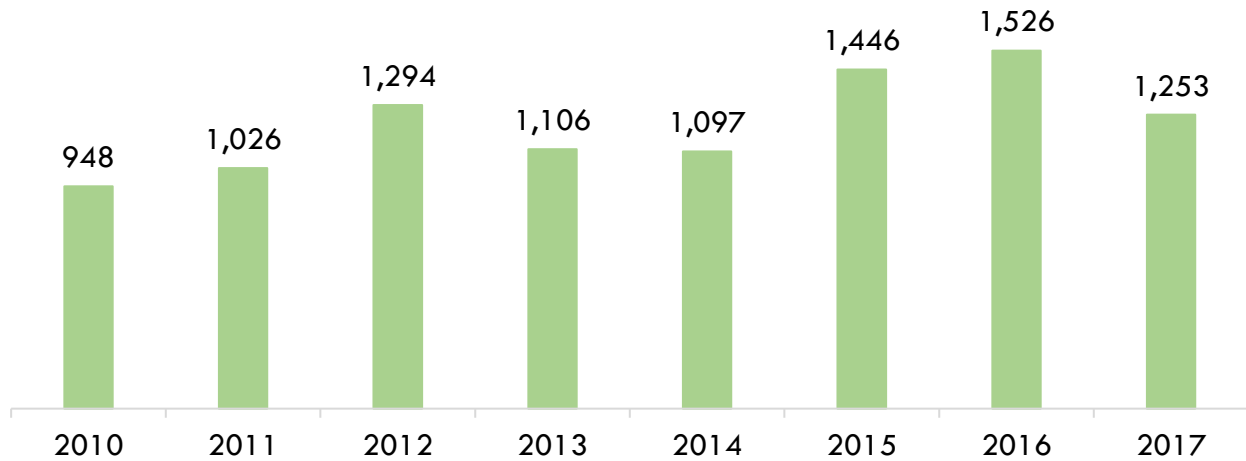
Exhibit 1: Five-year projections for the computer programming occupational group in the Inland Empire/Desert Region

Region	2017 Jobs	5-Yr Change	5-Yr % Growth (New Jobs)	5-Yr Openings (New + Replacement Jobs)	Annual Openings (New + Replacement Jobs)	% of workers age 55+
Inland Empire/Desert	6,915	616	9%	2,968	594	14%

Source: EMSI 2018.2

Over the last 12 months (June 2017 to May 2018), there were 1,339 advertisements (ads) for jobs in the computer programming occupational group in the Inland Empire/Desert Region. From 2010 to 2017, there was an annual average of 1,212 job ads per year (Exhibit 2).

Exhibit 2: Number of online job postings for the computer programming occupational group in the Inland Empire/Desert Region, 2010 to 2017



Source: Burning Glass – Labor Insights

The average time to fill for computer programming occupations in the Inland Empire/Desert Region is 20 days greater than the national average, indicating that it is much harder for local employers to find qualified candidates to fill their open positions. Exhibit 3 shows the number of job ads posted during the last 12 months along with the regional and national average time to fill.

Exhibit 3: Job ads by each of the computer programming occupations in the Inland Empire/Desert Region during the last 12 months and time to fill, June 2017 – May 2018

Occupation	Job Ads	Regional Average Time to Fill (Days)	National Average Time to Fill (Days)
Software Developers, Applications	932	70	45
Web Developers	249	43	38
Computer Programmers	118	56	41
Computer Network Support Specialists	32	43	37
Software Developers, System Software	8	70	45
TOTAL	1,339	-	-

Source: Burning Glass – Labor Insights

Earnings

The entry-level wage for each of the occupations in the computer programming occupational group is above the MIT Living Wage estimate of \$12.30 per hour for a single adult living in the Inland Empire/Desert Region. Median wages for these occupations are sufficient for an adult living in a household with one other working adult and one child (\$14.50 per hour, per adult or \$30,160 annually for each adult). Exhibit 4 displays wage information for this occupational group in the Inland Empire/Desert Region.

Exhibit 4: Earnings for the computer programming occupational group in the Inland Empire/Desert Region

Occupation	Entry to Experienced Hourly Earnings Range*	Median Wage*	Average Annual Earnings
Software Developers, Systems Software	\$37.16 to \$60.43	\$49.27	\$103,400
Software Developers, Applications	\$37.08 to \$54.69	\$45.35	\$95,700
Computer Programmers	\$26.67 to \$41.06	\$32.36	\$70,500
Computer Network Support Specialists	\$24.25 to \$44.09	\$30.62	\$70,900
Web Developers	\$16.71 to \$27.70	\$20.48	\$50,600

Source: EMSI 2018.2

*Entry is 25th percentile, the median is 50th percentile, experienced is 75th percentile wage.

Employers, Skills, and Education

Exhibit 5 displays the top employers posting job ads for each occupation during the last 12 months.

Exhibit 5: The top employers for the computer programming occupational group in the Inland Empire/Desert Region during the last 12 months, June 2017 – May 2018

Occupation	Top Employers
Software Developers, Applications (n=864)	<ul style="list-style-type: none"> ESRI CGI Group
Web Developers (n=149)	<ul style="list-style-type: none"> ESRI Revature
Computer Programmers (n=89)	<ul style="list-style-type: none"> ESRI San Bernardino County
Computer Network Support Specialists (n=29)	<ul style="list-style-type: none"> Obsidian Solutions Group UnitedHealth Group
Software Developers, System Software (n=7)	<ul style="list-style-type: none"> Vsolvit LLC San Bernardino County Schools

Source: Burning Glass – Labor Insights

Exhibit 6 lists a sample of in-demand specialized and soft skills that employers are seeking when looking for workers to fill computer programming positions.

Exhibit 6: Sample of in-demand skills from employer job ads for computer programming occupations in the Inland Empire/Desert Region, June 2017 – May 2018

Occupation	Specialized skills	Soft skills	Software and Programming skills
Software Developers, Applications (n=864)	<ul style="list-style-type: none"> Software Engineering Object-Oriented Analysis and Design (OOAD) .NET 	<ul style="list-style-type: none"> Communication Skills Teamwork/ Collaboration Problem Solving 	<ul style="list-style-type: none"> SQL Microsoft C# JavaScript
Web Developers (n=235)	<ul style="list-style-type: none"> JavaScript SQL Website Design 	<ul style="list-style-type: none"> Communication Skills Problem Solving Creativity 	<ul style="list-style-type: none"> jQuery HTML5 Microsoft C#
Computer Programmers (n=103)	<ul style="list-style-type: none"> SQL Server Project Management Information Systems 	<ul style="list-style-type: none"> Problem Solving Communication Skills Writing 	<ul style="list-style-type: none"> SQL Microsoft C# JavaScript

Occupation	Specialized skills	Soft skills	Software and Programming skills
Computer Network Support Specialists (n=31)	<ul style="list-style-type: none"> System/Network Configuration Information Systems Information Security 	<ul style="list-style-type: none"> Communication Skills Planning Research 	<ul style="list-style-type: none"> Cisco Switching Cisco Routers Microsoft Exchange
Software Developers, System Software (n=7)	<ul style="list-style-type: none"> System Architecture Client/Server Oracle Development 	<ul style="list-style-type: none"> Writing Troubleshooting Teamwork/ Collaboration 	<ul style="list-style-type: none"> Oracle SQL Visual Basic

Source: Burning Glass – Labor Insights

Exhibit 7 displays the entry-level education level education typically required to enter each occupation according to the Bureau of Labor Statistics, educational attainment for incumbent workers with “some college, no degree” and an “associate degree” according to the U.S. Census, and the minimum advertised education requirement requested by employers in online job ads.

Exhibit 7: Educational attainment and online job ads with minimum advertised education requirements for the computer programming occupational group in the Inland Empire/Desert Region, June 2017 – May 2018

Occupation	Typical Entry-Level Education Requirement	Educational Attainment*	Minimum Advertised Education Requirement from Job Ads			
			Number of Job Postings (n=)	High school diploma or vocational training	Associate degree	Bachelor's degree or higher
Software Developers, Applications	Bachelor's degree	13%	544	4%	6%	90%
Web Developers	Associate degree	25%	139	9%	6%	85%
Computer Programmers	Bachelor's degree	22%	86	10%	7%	83%
Computer Network Support Specialists	Associate degree	41%	23	26%	22%	52%

Occupation	Typical Entry-Level Education Requirement	Educational Attainment*	Minimum Advertised Education Requirement from Job Ads			
			Number of Job Postings (n=)	High school diploma or vocational training	Associate degree	Bachelor's degree or higher
Software Developers, System Software	Bachelor's degree	13%	6	50%	-	50%

Source: EMSI 2018.2, Burning Glass – Labor Insights

*Percentage of incumbent workers with a Community College Credential or Some Postsecondary Coursework

Industry

Staffing patterns show the industries that employ the most workers of a specific occupation. Exhibit 8 displays the industries that hire computer programming occupations in the two-county region.

Exhibit 8: Top industries employing computer programming occupations in the Inland Empire/Desert Region, June 2017 – May 2018

Occupation	Top Industries from Staffing Pattern (NAICS) - % of occupation employed in industry	Industry Classification from Job Ads	
		Number of Job Postings (n=)	Top Industries from Job Ads (NAICS)
Software Developers, Applications	<ul style="list-style-type: none"> Computer Systems Design and Related Services (5415) 29% Employment Services (5613) 7% 	420	<ul style="list-style-type: none"> Professional and Commercial Equipment and Supplies Merchant Wholesalers (4234) Computer Systems Design and Related Services (5415)
Web Developers	<ul style="list-style-type: none"> Computer Systems Design and Related Services (5415) 33% Management, Scientific, and Technical Consulting Services (5416) 5% 	87	<ul style="list-style-type: none"> Professional and Commercial Equipment and Supplies Merchant Wholesalers (4234) Computer Systems Design and Related Services (5415)
Computer Programmers	<ul style="list-style-type: none"> Computer Systems Design and Related Services (5415) 37% Employment Services (5613) 5% 	60	<ul style="list-style-type: none"> Executive, Legislative, and Other General Government Support (9211) Colleges, Universities, and Professional Schools (6113)

Occupation	Top Industries from Staffing Pattern (NAICS) - % of occupation employed in industry	Industry Classification from Job Ads	
		Number of Job Postings (n=)	Top Industries from Job Ads (NAICS)
Computer Network Support Specialists	<ul style="list-style-type: none"> Education and Hospitals (Local Government) (9036) 12% Computer Systems Design and Related Services (5415) 11% 	17	<ul style="list-style-type: none"> Executive, Legislative, and Other General Government Support (9211) Colleges, Universities, and Professional Schools (6113)
Software Developers, System Software	<ul style="list-style-type: none"> Computer Systems Designs and Related Services (5415) 27% Professional and Commercial Equipment and Supplies Merchant Wholesalers (4234) 6% 	4	<ul style="list-style-type: none"> Executive, Legislative, and Other General Government Support (9211) Software Publishers (5112)

Source: EMSI 2018.2, Burning Glass – Labor Insights
 NAICS = North American Industry Classification System

Student Completions

Exhibit 9 shows the annual average regional community college credentials (associate degrees and certificates) conferred during the three academic years between 2014 and 2017, with the relevant TOP code. Please note, a credential is not equivalent to a single person in search of a job opening since a student may earn more than one credential, such as an associate degree in addition to a certificate. Community College student outcome information was obtained from the CTE LaunchBoard based on the selected TOP code(s) and region.

Exhibit 9: Annual average community college student completions for computer programming programs in the Inland Empire/Desert Region

0707.10 Computer Programming	Annual Community College Headcount (2016-17)	Community College Annual Average Credentials (2014-17)
Barstow	10	
Chaffey – Programming Foundations	326	
Copper Mountain	23	
Associate Degree		5
Certificate 30 to < 60 semester units		3
Crafton Hills	21	

0707.10 Computer Programming	Annual Community College Headcount (2016-17)	Community College Annual Average Credentials (2014-17)
Moreno Valley – Computer Programming	299	
Associate Degree		3
Certificate 18 to < 30 semester units		3
Mt. San Jacinto – CIS: Programming	854	
Certificate 30 to < 60 semester units		5
Norco College – Computer Programming/Game Programming	437	
Associate Degree		7
Certificate 30 to < 60 semester units		3
Certificate 18 to < 30 semester units		4
Certificate 6 to < 18 semester units		7
Riverside – Computer Programming/Java Programming/C++ Programming	428	
Associate Degree		6
Certificate 18 to < 30 semester units		5
Certificate 6 to < 18 semester units		11
San Bernardino – Computer Science	133	
Associate Degree		2
Victor Valley – Programming I/Programming II	208	
Certificate 18 to < 30 semester units		*1
Total Community College Headcount (2016-17)	2,637	
Total Annual Average Community College Credentials (2014-17)		64

Source: LaunchBoard, IPEDS, COCI

*Victory Valley awarded one certificate in 2014-15

0707.10 Computer Programming program Strong Workforce outcomes in the Inland Empire/Desert Region in the academic year 2015-16 [unless noted otherwise]:

- Number of course enrollments: 3,746 (CA Median: 3,746) [2016-17]
- Number of students who transferred to a 4-year institution: 292 (CA: 413)
- Employed in the second fiscal quarter after exit: 60% (CA: 61%)
- Median earnings in the second fiscal quarter after exit: \$6,778 (CA: \$7,170)
- Employed in the fourth fiscal quarter after exit: 62% (CA: 64%)
- Job closely related to field of study: 60% (CA: 65%) [2014-15]
- Median annual earnings: \$21,574 (CA: \$31,391)
- Median change in earnings: 68% (CA: 50%)
- The proportion of students who attained a living wage: 43% (CA: 56%)



Sources

O*Net Online

Labor Insight/Jobs (Burning Glass)

Economic Modeling Specialists International (EMSI)

CTE LaunchBoard

MIT Living Wage Calculator

Chancellor's Office Curriculum Inventory (COCI, version 2.0)

The Integrated Postsecondary Education Data System (IPEDS)

Michael Goss, Director

Center of Excellence, Inland Empire/Desert Region

michael.goss@chaffey.edu

June 2018



Appendix A: Occupation definitions, sample job titles, five-year projections, and earnings for computer programming occupations

Occupation Definitions (SOC code), Education and Training Requirement, Community College Education Attainment

Computer Programmers (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.

Sample job titles: Analyst Programmer, Applications Developer, Computer Programmer, Computer Programmer Analyst, Internet Programmer, Java Developer, Programmer, Programmer Analyst, Software Developer, Web Programmer

Entry-Level Educational Requirement: Bachelor's degree

Training Requirement: None

Percentage of incumbent workers with a Community College Credential or Some Postsecondary

Coursework: 22%

Software Developers, Applications (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.

Sample job titles: Application Developer, Application Integration Engineer, Applications Developer, Computer Consultant, Information Technology Analyst (IT Analyst), Software Architect, Software Developer, Software Development Engineer, Software Engineer, Technical Consultant

Entry-Level Educational Requirement: Bachelor's degree

Training Requirement: None

Percentage of incumbent workers with a Community College Credential or Some Postsecondary

Coursework: 13%



Software Developers, Systems Software (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.

Sample job titles: Developer, Infrastructure Engineer, Network Engineer, Publishing Systems Analyst, Senior Software Engineer, Software Architect, Software Developer, Software Engineer, Systems Coordinator, Systems Engineer

Entry-Level Educational Requirement: Bachelor's degree

Training Requirement: None

Percentage of incumbent workers with a Community College Credential or Some Postsecondary Coursework: 13%

Web Developers (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.

Sample job titles: Designer, Technology Applications Engineer, Web Architect, Web Design Specialist, Web Designer, Web Developer, Web Development Director, Web Development Instructor, Webmaster

Entry-Level Educational Requirement: Associate degree

Training Requirement: None

Percentage of incumbent workers with a Community College Credential or Some Postsecondary Coursework: 25%



Computer Network Support Specialists (15-1152)

Analyze, test, troubleshoot, and evaluate existing network systems, such as local area network (LAN), wide area network (WAN), and Internet systems or a segment of a network system. Perform network maintenance to ensure networks operate correctly with minimal interruption.

Sample job titles: Computer Network Specialist, IT Consultant (Information Technology Consultant), Network Engineer, Network Specialist, Network Support Specialist, Network Technical Analyst, Network Technician, Personal Computer Network Analyst, Senior IT Assistant (Senior Information Technology Assistant), Systems Specialist

Entry-Level Educational Requirement: Associate degree

Training Requirement: None

Percentage of incumbent workers with a Community College Credential or Some Postsecondary Coursework: 41%



Table 1. 2017 to 2022 job growth, wages, education, training, and work experience required for the computer programming occupational group, Inland Empire/Desert Region

Occupation (SOC)	2017 Jobs	5-Yr Change	5-Yr % Growth	Annual Openings (New + Replacement Jobs)	Entry-Experienced Hourly Wage*	Median Hourly Wage*	Average Annual Earnings	Typical Entry-Level Education & On-The-Job Training Required	Work Experience Required
Software Developers, Applications (15-1132)	2,902	271	9%	245	\$37.08 to \$54.69	\$45.35	\$95,700	Bachelor's degree & none	None
Web Developers (15-1134)	1,069	126	12%	103	\$16.71 to \$27.70	\$20.48	\$50,600	Associate degree & none	None
Computer Network Support Specialists (15-1152)	1,001	94	9%	94	\$24.25 to \$44.09	\$30.62	\$70,900	Associate degree & none	None
Computer Programmers (15-1133)	985	10	1%	65	\$26.67 to \$41.06	\$32.36	\$70,500	Bachelor's degree & none	None
Software Developers, Systems Software (15-1133)	958	115	12%	87	\$37.16 to \$60.43	\$49.27	\$103,400	Bachelor's degree & none	None
Total	6,915	616	9%	594	-	-	-	-	-

Source: EMSI 2018.2

*Entry Hourly is 25th percentile wage, the median is 50th percentile wage, experienced is 75th percentile wage.