

Digital Forensic Investigations

Inland Empire/Desert Region (Riverside and San Bernardino counties)

This workforce demand report uses state and federal job projection data developed before the economic impact of COVID-19. The COE is monitoring the situation and will provide more information as it becomes available. Please consult with local employers to understand their current employment needs.

Summary

- Community college public administration programs provide the knowledge, skills, and abilities that prepare students for employment in one community college-level and two bachelor degree-level occupations.
- Combined, these occupations are projected to have 165 annual job openings through 2025, increasing employment by 11% across all industries.
- The 10th percentile hourly earnings for these occupations are between \$26.23 and \$43.64 per hour, above the regional \$24.36 per hour self-sustainable wage standard for a single adult with one child.
- Regional community colleges have issued 19 awards annually over the last three academic years.

Introduction

Digital forensics investigation involves accessing information on computers, cell phones, and other digital devices to gather internet and computer crimes evidence. Computer forensics specialists may have computer backgrounds or police officers with computer training (Chron, 2021). A survey of law enforcement professionals from the U.S. Department of Justice – Office of Justice Programs reveals that larger agencies employ only a handful of sworn and civilian employees dedicated to digital forensics. Law enforcement professionals indicate that while civilians may have greater computer skills, they may not have experience discerning the usefulness of evidence for investigations (Davis et al., pg. 15). Furthermore, agency representatives stated that civilians have limited opportunities for promotion within law enforcement agencies; therefore, departments may choose to train the existing law enforcement workforce in digital forensics (Davis et al., pg. 16).

California Community College forensics, evidence, and investigation programs prepare students for employment through training related to the theories, principles, and techniques of forensic science and investigation in the justice system (Taxonomy of Programs, 2012). The knowledge, skills, and abilities provided by forensics, evidence, and investigation programs lead to three distinct occupations, collectively referred to as the digital forensic investigation occupational group in this report. The Standard Occupational Classification

System (SOC) does not contain a single occupation that captures the demand for digital forensics workers. The following occupations provide the closest approximation of demand for digital forensics workers:

- Detectives and Criminal Investigators (SOC 33-3021)
- Forensic Science Technicians (19-4092)
- Information Security Analysts (15-1212)

This report aims to quantify regional demand for these digital forensic investigation positions in the Inland Empire/Desert Region. The labor market data included in this report is limited to the public sector (NAICS 92). Between 22% and 100% of regional workers in the digital forensic investigation occupational group work in the public sector.

Job Counts and Projections

In 2020, there were 1,399 combined digital forensic investigation jobs in the public sector in the Inland Empire/Desert Region. Employment in the digital forensic investigation occupational group is expected to rise by 8% through 2025 in the public sector. The digital forensic investigation occupational group is projected to have 165 annual job openings across all industries. Exhibit 1 displays the job counts, five-year projected job growth, job openings, and the share of incumbent workers age 55 years and greater working in the digital forensic investigation occupational group.

Exhibit 1: Five-year projections for the digital forensic investigation occupational group, 2020-2025

Occupation	2020 Jobs	2025 Jobs	5-Yr % Change (New Jobs)	Annual Openings (New + Replacement Jobs)*	% of workers age 55+
Detectives and Criminal Investigators	1,049	1,126	7%	83	15%
Forensic Science Technicians	262	294	12%	39	20%
Information Security Analysts	88	94	6%	43	16%
Total	1,399	1,513	8%	165	16%

Source: Emsi 2021.3

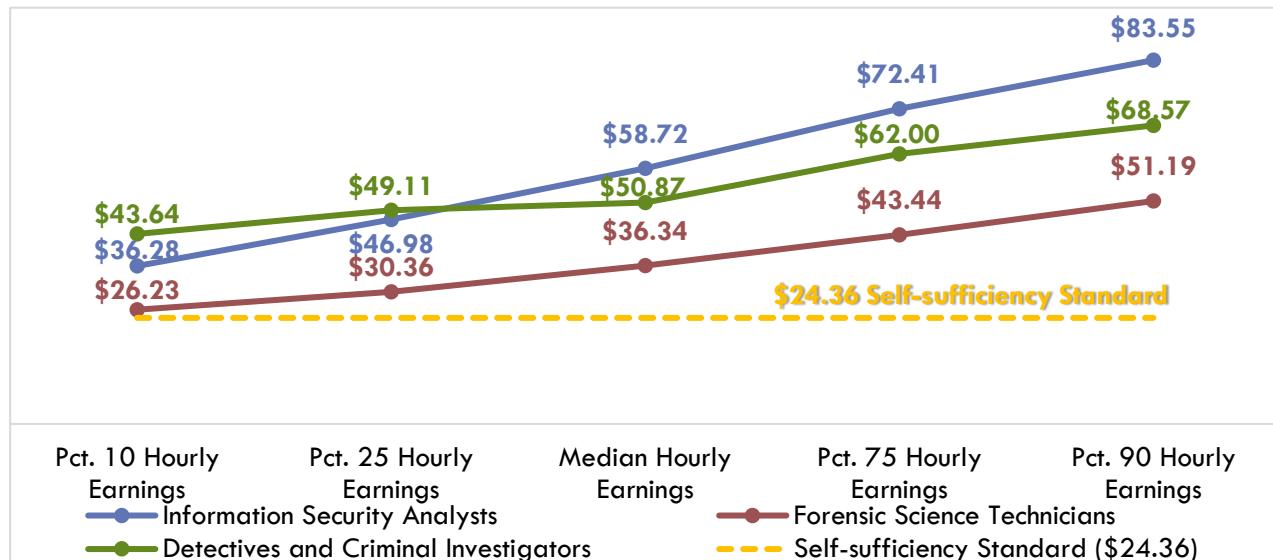
*Annual job openings for digital forensic investigation occupations employed in all industries

Earnings and Benefits

Community colleges should ensure their training programs lead to employment opportunities that provide self-sustainable income. The University of Washington estimates that a self-sufficient hourly rate for a single adult with one school-age child is \$24.36 per hour or \$51,452 annually in Riverside County; \$23.73 per hour or \$50,119 annually in San Bernardino County (Pearce, 2021). For this study, the higher hourly earnings requirement in Riverside County is adopted as the self-sufficiency standard for the two-county region.

Exhibit 2 displays the hourly earnings for the digital forensic investigation occupational group. The hourly earnings for the digital forensic investigation occupational group surpass the self-sufficiency standard at the 10th percentile, indicating that nearly all workers in the field earn a self-sustainable wage.

Exhibit 2: Hourly earnings by percentile for digital forensic investigation occupations



Source: Emsi 2021.3

According to the occupation guides developed by the California Labor Market Information Division, benefits for the digital forensic investigation occupational group typically include medical and dental insurance (Detailed Occupational Guides, 2021).

Job Advertisements for Digital Forensic Investigation Workers

Since the demand for digital forensic investigation workers is difficult to identify using traditional labor market information, a job advertisement search may provide insight into the regional demand. Since the SOC system does not contain a digital forensic investigations occupation, a keyword search was conducted. The keyword search for digital forensic investigations included the following keywords: digital forensics, computer forensics, digital forensic investigation, and digital evidence. Job ad results are limited to the public sector (NAICS 92).

Over the last 12 months, there were no job advertisements for digital forensics investigation workers posted in the Inland Empire/Desert Region. There were eight total job advertisements posted for digital forensics investigators in California over the last 12 months. Approximately 63% of online job ads were classified as information security analysts (SOC 15-1122) and detectives and criminal investigators (33-3021). Exhibit 3 displays the job titles included in advertisements for digital forensic investigation workers.

Exhibit 3: Job titles included in digital forensic investigation job advertisements

Job Titles	Job Ads
Digital Forensics Investigator	2
Senior Digital Investigative Analyst	1
Police Digital Forensics Examiner I/II	1
Digital Forensics Examiner	1
Special Agent Cybersecurity/Technology	1
Criminal Investigator	1
District Attorney Investigator II/III	1
Total	8

Source: Burning Glass – Labor Insights

Advertised Salary from Online Job Ads

Exhibit 4 displays online job ad salary data for digital forensic investigation workers in California over the last 12 months. There were insufficient online job advertisements to determine if digital forensic investigations workers earn wages above the region's \$51,452 annual (\$24.36 hourly) self-sufficiency standard. Consider the salary information with caution since only 40% of online job postings for these occupations provided salary information. The salary figures are prorated to reflect full-time, annual wage status.

Exhibit 4: Advertised salary information

Number of job postings	Real-Time Salary Information				
	Less than \$35,000	\$35,000 to \$49,999	\$50,000 to \$74,999	More than \$75,000	Average Annual Salary
4	-	-	25%	75%	N/A

Source: Burning Glass – Labor Insights

Employers, Skills, Education, and Work Experience

Exhibit 5 displays the employers that posted the most job ads during the last 12 months in California. Displaying employer names provides some insight into where students may find employment after completing a program.

Exhibit 5: Employers posting the most job ads for the digital forensic investigation occupational group

Employers	Job Ads
Federal Bureau of Investigation (FBI)	2
Monterey County	2
US Department of Justice	2
Santa Barbara County	1
City of Bakersfield	1

Employers	Job Ads
Total	8

Source: Burning Glass – Labor Insights

Exhibit 6 lists a sample of specialized, employability, and software and programming skills employers seek when looking for workers to fill digital forensic investigation positions. Specialized skills are occupation-specific skills that employers request for industry or job competency. Employability skills are foundational skills that transcend industries and occupations; this category is often referred to as "soft skills." The skills requested in job postings may be utilized to guide curriculum development.

Exhibit 6: Sample of in-demand skills from employer job ads

Specialized skills (n=8)	Employability skills	Software and Programming skills
<ul style="list-style-type: none"> • Computer Forensics • Information Systems • Warrants • Computer Hardware/Software Knowledge • Repair • Authentication 	<ul style="list-style-type: none"> • Organizational Skills • Research • Written Communication • Preparing Reports • Teamwork/Collaboration • Building Effective Relationships 	<ul style="list-style-type: none"> • Microsoft Office • Systems Analysis • Linux • EnCase

Source: Burning Glass – Labor Insights

Exhibit 7 displays the minimum advertised education requirements for digital forensic investigation workers. The minimum advertised education requirements for digital forensic investigation workers are evenly distributed among the three educational categories. Each of the job advertisements with education requirements sought candidates with a computer science background or training.

Exhibit 7: Minimum advertised education requirements

Real-Time Minimum Advertised Education Requirement			
Number of Job Ads	High school or vocational training	Associate degree	Bachelor's degree or higher
6	33%	33%	33%

Source: Emsi 2021.3, Burning Glass – Labor Insights

Exhibit 8 displays the real-time work experience requirements from employer job ads. Job advertisements indicate that previous work experience may be important to employers seeking digital forensic investigation workers.

Exhibit 8: Work experience required and real-time work experience requirements

Real-Time Work Experience			
Number of job postings	0 – 2 years	3 – 5 years	6+ years
8	37%	50%	13%

Source: Emsi 2021.3, Burning Glass – Labor Insights

Programs Completions and Student Outcomes

Exhibit 9 displays completion data for California Community College forensics, evidence, and investigation (TOP 2105.40) programs between 2017 and 2020. Over the last three academic years, two regional community colleges issued 19 awards annually in forensics, evidence, and investigation programs. The student completion and outcome methodology are available on page 11.

Exhibit 9: 2017-20, Annual average community college awards for the forensics, evidence, and investigation programs in the Inland Empire/Desert Region

TOP 2105.40 – Forensics, Evidence, and Investigation (Local Program Title)	Certificate requiring 6 to < 18-semester units	Total CC Annual Average Awards, Academic Years 2017-20
Norco (Crime Scene Investigations TOP 2105.00)	7	7
Riverside (Investigative Technician)	12	12
Total	19	19

Source: MIS Data Mart

California program outcome data may provide a useful insight into the likelihood of success for the proposed program. Community college student outcome information based on the selected TOP code and region is provided in Exhibit 10. The outcome methodology is available in the appendix section of this report.

Exhibit 10: 2105.40 – Forensics, evidence, and investigation strong workforce program outcomes

Strong Workforce Program Metrics: 2105.40 – Forensics, Evidence, and Investigation Academic Year 2018-19, unless noted otherwise	Inland Empire/Desert Region	California
Unduplicated count of enrolled students (2019-20)	154	1,441
Completed 9+ career education units in one year (2019-20)	47%	46%
Perkins Economically disadvantaged students	88%	83%
Students who earned a degree, certificate, or attained apprenticeship (2019-20)	-	75
Transferred to a four-year institution (transfers)	18	178
Job closely related to the field of study (2017-18)	-	49%
Median annual earnings (all exitors)	\$26,992	\$27,994

Strong Workforce Program Metrics: 2105.40 – Forensics, Evidence, and Investigation Academic Year 2018-19, unless noted otherwise	Inland Empire/Desert Region	California
Median change in earnings (all exiters)	66%	18%
Attained a living wage (completers and skills-builders)	52%	38%

Sources: LaunchBoard Community College Pipeline and Strong Workforce Program Metrics

San Bernardino Valley College has an 18-unit digital forensics certificate program under their Computer Information Systems (TOP 0702.00) program. The catalog description states that this program prepares students for entry-level work in the digital forensics field but does indicate if this program is related to law enforcement activities (San Bernardino Valley College, 2021). This program has not issued any known awards in the 16<30-semester unit range.

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References

Burning Glass Technologies. (2021). *Labor Insights/Jobs*. Retrieved from <https://www.burning-glass.com/>

California Community Colleges Chancellor's Office. LaunchBoard. (2021). California Community Colleges LaunchBoard. Retrieved from <https://www.calpassplus.org/Launchboard/Home.aspx>

California Community Colleges Chancellor's Office. LaunchBoard. (2021a). *Strong Workforce Program Metrics Data Element Dictionary*. Pg. 3. Retrieved from <https://www.calpassplus.org/MediaLibrary/calpassplus/launchboard/Documents/SWP-DED.PDF>

California Community Colleges Chancellor's Office. (2021). Chancellor's Office Curriculum Inventory (COCI), version 3.0. Retrieved from <https://coci2.ccctechcenter.org/programs>

California Community Colleges Chancellor's Office Management Information Systems (MIS) Data Mart. (2021). *Data Mart*. Retrieved from <https://datamart.cccco.edu/datamart.aspx>

California Community Colleges Chancellor's Office, Curriculum and Instructional Unit, Academic Affairs Division. (2012). *Taxonomy of Programs, 6th Edition, Corrected Version*. Retrieved from <https://www.cccco.edu/-/media/CCCCO-Website/About-Us/Divisions/Digital-Innovation-and-Infrastructure/Research/Files/TOPmanual6200909corrected12513.ashx?la=en&hash=94C709CA83C0380B28415579395A5F536736C7C1>

Carnevale, A. P., Jayasundera, T., & Repnikov, D. (n.d.). Understanding Online Job Ads Data. Retrieved from <https://cew.georgetown.edu/wp-content/uploads/2014/11/OCLM.Tech.Web.pdf>

Chron. (August 30, 2021). IT-Related Police Careers. Retrieved from <https://work.chron.com/itrelated-police-careers-1828.html>

Davis, R., Goodison, S., & Jackson, B. (2015). U.S. Department of Justice Office. Office of Justice Programs. *Digital Evidence and the U.S. Criminal Justice System: Identifying Technology and Other Needs to More Effectively Acquire and Utilize Digital Evidence*. Retrieved from <https://www.ojp.gov/pdffiles1/nij/grants/248770.pdf>

Economic Modeling Specialists International (Emsi). (2021). Datarun 2021.3. Retrieved from <https://www.economicmodeling.com/>

Labor Market Information Division. Employment Development Department of California. (2021). *Detailed Occupational Guides*. Retrieved from <https://www.labormarketinfo.edd.ca.gov/OccGuides/Search.aspx>

National Center for O*NET Development. (2021). O*NET OnLine. Retrieved from <https://www.onetonline.org/>

Pearce, D. University of Washington. (2021). *Self Sufficiency Standard – California*. Retrieved from <http://www.selfsufficiencystandard.org/california>

San Bernardino Valley College. (2021). San Bernardino Valley College Catalog, 2021-2022 Edition. Digital Forensics Certificate of Achievement. Retrieved from <https://catalog.valleycollege.edu/degree-certificate-program-index/computer-information-technology/digital-forensics-certificate-achievement/>

U.S. Department of Education. Institute of Education Sciences, National Center for Education Statistics. Integrated Postsecondary Education System (IPEDS). (2021). Retrieved from <https://nces.ed.gov/ipeds/use-the-data>

Appendix: Occupation definitions, sample job titles, five-year projections, and earnings for digital forensic investigation occupations

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

Information Security Analysts (15-1212)

Plan, implement, upgrade, or monitor security measures for the protection of computer networks and information. Assess system vulnerabilities for security risks and propose and implement risk mitigation strategies. 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.

Sample job titles: Information Security Officer, Information Security Specialist, Information Systems Security Analyst, Information Systems Security Officer (ISSO), Information Technology Security Analyst (IT Security Analyst), Network Security Analyst, Security Analyst, Systems Analyst

Entry-Level Educational Requirement: Bachelor's degree

Training Requirement: None

Work Experience: Less than five years

Percentage of incumbent workers with a Community College Award or Some Postsecondary Coursework: 26%

Forensic Science Technicians (19-4092)

Collect, identify, classify, and analyze physical evidence related to criminal investigations. Perform tests on weapons or substances, such as fiber, hair, and tissue to determine significance to investigation. May testify as expert witnesses on evidence or crime laboratory techniques. May serve as specialists in area of expertise, such as ballistics, fingerprinting, handwriting, or biochemistry.

Sample job titles: Crime Laboratory Analyst, Crime Scene Analyst, Crime Scene Technician (Crime Scene Tech), CSI (Crime Scene Investigator), Evidence Technician, Forensic Science Examiner, Forensic Scientist, Forensic Specialist, Latent Fingerprint Examiner, Latent Print Examiner

Entry-Level Educational Requirement: Bachelor's degree

Training Requirement: Between one and twelve months of on-the-job training

Work Experience: None

Percentage of incumbent workers with a Community College Award or Some Postsecondary Coursework: 37%



Detectives and Criminal Investigators (33-3021)

Conduct investigations related to suspected violations of federal, state, or local laws to prevent or solve crimes.

Sample job titles: Criminal Investigator, Detective, Detective Sergeant, Fugitive Detective, Fugitive Investigator, Investigator, Narcotics Detective, Narcotics Investigator, Police Detective, Special Agent

Entry-Level Educational Requirement: High school diploma or equivalent

Training Requirement: Between one and twelve months of on-the-job training

Work Experience: Less than five years

Percentage of incumbent workers with a Community College Award or Some Postsecondary Coursework: 32%

Appendix: Methodology

Exhibit 9 displays the average annual California Community College (CCC) awards conferred during the three academic years between 2017 and 2020 from the California Community Colleges Chancellor's Office Management Information Systems (MIS) Data Mart. Awards are the combined total of associate degrees and certificates issued during the timeframe, divided by three in this case to calculate an annual average. This is done to minimize the effect of atypical variations that might be present in a single year.

Community college student outcome information is from LaunchBoard and based on the selected TOP code and region. These metrics are based on records submitted to the California Community Colleges Chancellor's Office Management Information Systems (MIS) by community colleges, which come from self-reported student information from CCC Apply and the National Student Clearinghouse. Employment and earnings metrics are sourced from California's Employment Development Department's Unemployment Insurance database records. When available, outcomes for completers are reported to demonstrate the impact that earning a degree or certificate can have on employment and earnings. For more information on the types of students included in each metric, please see the web link for LaunchBoard's Strong Workforce Program Metrics Data Element Dictionary in the References section (LaunchBoard, 2021a). Finally, employment in a job closely related to the field of study comes from self-reported student responses on the CTE Employment Outcomes Survey (CTEOS), administered by Santa Rosa Junior College (LaunchBoard, 2021a).

Job postings data is limited to the information provided by employers and the ability of artificial intelligence search engines to identify this information. Additionally, preliminary calculations by Georgetown Center on Education and the Workforce found that "just 30 to 40 percent of openings for candidates with some college or an associate degree, and only 40 to 60 percent of openings for high school diploma holders appear online" (Carnevale et al., 2014). Online job postings often do not reveal employers' hiring intentions; it is unknown if employers plan to hire one or multiple workers from a single online job posting or if they are collecting resumes for future hiring needs. A closed job posting may not be the result of a hired worker.

Table 1. 2020 to 2025 job growth, percentage of jobs in the public sector, wages, entry-level education, training, and work experience required for the digital forensic investigation occupational group in the public sector

Occupation (SOC)	2020 Jobs	% of Total Jobs in Public Sector	5-Year Change (New Jobs)	5-Year % Change (New Jobs)	Entry-Experienced Hourly Wage (10 th to 90 th percentile)	Median Hourly Wage (50 th percentile)	Average Annual Earnings	Entry-Level Education & On-The-Job-Training	Work Experience Required
Detectives and Criminal Investigators (33-3021)	1,049	100%	76	7%	\$43.64 to \$68.57	\$50.87	\$112,800	High school diploma or equivalent & 1-12 months	Less than 5 years
Forensic Science Technicians (19-4092)	262	94%	32	12%	\$26.23 to \$51.19	\$36.34	\$77,600	Bachelor's degree & 1-12 months	None
Information Security Analysts (15-1212)	88	22%	6	6%	\$36.28 to \$83.55	\$58.72	\$123,100	Bachelor's degree & None	Less than 5 years
Public Sector Total	1,399	81%	114	8%	-	-	-	-	-

Source: Emsi 2021.3

Table 2. 2020 to 2025 job growth, wages, entry-level education, training, and work experience required for the digital forensic investigation occupational group in all industries

Occupation (SOC)	2020 Jobs	5-Year Change (New Jobs)	5-Year % Change (New Jobs)	Annual Openings (New + Replacement Jobs)	Entry-Experienced Hourly Wage (10 th to 90 th percentile)	Median Hourly Wage (50 th percentile)	Average Annual Earnings	Entry-Level Education & On-The-Job-Training	Work Experience Required
Detectives and Criminal Investigators (33-3021)	1,049	78	7%	83	\$43.64 to \$68.57	\$50.87	\$112,800	High school diploma or equivalent & 1-12 months	Less than 5 years
Information Security Analysts (15-1212)	399	75	19%	43	\$36.28 to \$83.55	\$58.72	\$123,100	Bachelor's degree & None	Less than 5 years
Forensic Science Technicians (19-4092)	279	34	12%	39	\$26.23 to \$51.19	\$36.34	\$77,600	Bachelor's degree & 1-12 months	None
Total	1,727	187	11%	165	-	-	-	-	-

Source: Emsi 2021.3