



Big Data

Ground-Breaking Analysis of Employment in the Information Economy

Authored by

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FORWARD

There is a natural partnership between business and academia when it comes to workforce development.

- Corporate entities depend on a robust supply of qualified and capable workforce talent in order to grow their business and achieve strategic objectives.
- Educational institutions have an implied contract with their students, promising them meaningful employment upon attainment of their degree credentials.

This partnership, though critically important, is particularly challenging in fields where the discipline is an emerging one and where experience is limited, skills are being developed largely through on-the-job training, and educational programs lack best-practice models of comparison.

Big Data is a new and emerging discipline that exhibits all of these characteristics. McKinsey and Company was one of the first to place a national spotlight on the term Big Data describing it as the next frontier for innovation, competition and productivity. Their May 2011 report made the case that 15 of 17 industrial sectors in the U.S. have more stored data per company than the U.S. Library of Congress and the increasing volume and detail of information captured by enterprises, the rise of multimedia, social media and the Internet of Things will fuel exponential growth in data for the foreseeable future.

The power and potential of Big Data depends on the availability of both talent and technology to harness its value. McKinsey's report estimated that by 2018, the United States alone could face a shortage of 140,000 to 190,000 people with analytical skills as well as 1.5 million managers and analysts with the know-how to use the analysis of Big Data to make effective decisions.

This report, and the analysis contained herein, is both timely and valuable in its ability to enhance discussion, dialogue and collaboration between industry and academia about the emerging discipline of Big Data. This report analyzes the dimensions of the career pathway (number of jobs, average compensation, and geographical distribution of jobs) and the requirements of the employment opportunity (job responsibilities, technical and soft skill proficiencies).

It is our hope that this report will aid in the development of dynamic, innovative academic programs and a pipeline of workforce talent that support the industry needs for trained professionals. Big Data is the next frontier in the information economy.

Lou Piazza

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INTRODUCTION

The sheer volume of information available in digital archives has become a global phenomenon attracting the attention of policy makers, business leaders, and technicians.

Corporate entities archive large volumes of privately owned, transactional data, capturing information about their customers, suppliers and operations.

Public datasets, containing a wealth of information, are stored in “the cloud” and accessible via the Internet. These datasets cover a broad range of topics in both the public and private sector.

Networked sensors are embedded in the physical world of devices such as mobile phones, energy meters, automobiles and industrial machines sensing and storing data in a universe labeled “The Internet of Things”.

Billions of individuals store and publish photos, videos and other types of multimedia content on social media sites, smartphones, and other computing devices.

Big Data is a new, emerging discipline that is more than just another way of saying ‘analytics’. The discipline of Big Data features three key properties (a) unprecedented volumes of data, (b) expectations for real-time (or near real time) access, and (c) information stored in a wide variety of both structured and unstructured formats. These three properties (the three “V”s of Big Data), volume, velocity and variety, exceed the capabilities of legacy tools and systems.



BIG DATA

700,000 ONLINE JOB POSTINGS
\$79,384 AVERAGE ANNUAL SALARY
MANY JOBS REQUIRE DEGREE CREDENTIALS
(B.A., B.S. OR EVEN M.S.)



OCCUPATIONAL CATEGORIES

DATA ENGINEER
DOMAIN SPECIALIST
DATA ANALYST
DATA SCIENTIST

Pioneering companies see great promise and value in Big Data. They are using a new generation of tools and systems to measure and manage every element of their business. They glean intelligence from the data in order to gain a competitive advantage; they use the data to make decisions better and faster than ever before. Other companies, in their industry segment, are forced to do the same in order to compete.

Data-driven decision making allows corporations to more efficiently and successfully manage internal operations; it allows marketers to strategically target consumers with focused campaigns for their goods and services; it allows healthcare professionals to search for more effective and lower cost modes of patient care; it enables financial service firms in their fight to identify and prevent fraud; it aids public safety officials as they strive to

effectively combat terror, and it provides policy makers with valuable insights into the key issues facing our society.

This rapid expansion of institutional data is opening doors for workers with the skills to manage, manipulate, and derive meaning from Big Data. In 2014, there were 700,000 online job postings for occupations supporting Big Data – that is, occupations supporting the collection, storage, and analysis of massive data sets too large for traditional database and computing technology. Many of these roles represent new and emerging occupations requiring a unique set of skills rarely found in the job market.

Because these skills are new and comparatively rare, the rapid growth of this field is challenging for employers as they struggle to find Big Data talent. Job postings for many of the fastest-growing and most critical Big Data roles remain open far longer than the national average of 33 days. For example, job postings for the positions of Data Scientist and Biostatistician remained open, on average, for 38 and 50 days respectively.

To shed light on this skills gap and better understand the evolving requirements of the career pathway, Burning Glass and BATEC have identified key occupations within the Big Data landscape and conducted an analysis of employer demand across the market for Big Data workers. We hope that these findings are useful for educators, employers, and job seekers as they attempt to better understand what roles are in demand across the Big Data ecosystem and how training programs can respond to employer needs in this emerging field.

THE TOP TEN THINGS YOU NEED TO KNOW...

1. Big Data is a new, emerging discipline that is more than just another way of saying ‘analytics’. The discipline of Big Data features three key properties (a) unprecedented volumes of data, (b) expectations for real-time (or near real time) access, and (c) information stored in a wide variety of both structured and unstructured formats. These three properties (the three “V”s of Big Data), volume, velocity and variety, exceed the capabilities of legacy tools and systems.
2. There has been little employment history or detailed occupational data for the emerging field of Big Data. As a result, there is a lack of defined routes to advancement and a deficit of actionable information for educators, job seekers, and employers.
3. Big Data’s job market is large and growing. In 2014, there were 700,000 million online postings in this category.
4. Career opportunities in Big Data can be segmented into four broad categories: Data Engineer, Domain Specialist, Data Analyst, and Data Scientist.
5. One occupational category, Data Engineer, contains roles which are responsible for building and maintaining the information infrastructure. It includes such established jobs as Data Warehousing Specialists, Database Administrators, Data Management Specialists, and Information Technology Specialists.
6. Three occupational categories, Domain Specialist, Data Analyst, and Data Scientist, contain jobs which are focused on analyzing and interpreting data. Many of these jobs are either new positions or existing positions with significantly modified job descriptions.
7. Employers are struggling to fill Big Data jobs. Many of these jobs require a unique combination of skills, both in Information Technology and in Statistical Mathematics. Job postings in this field are often open 25% to 50% longer than the national average of 33 days.
8. Big Data jobs pay well. The average annual compensation is \$79,384; this is a 25% premium over the average salary for all jobs requiring a bachelor’s degree or higher. Advancement and longevity in this career pathway require a personal commitment to continued education, as employers, in large numbers, prefer workers to have a minimum of a bachelor’s degree (many require even more advanced levels of education).
9. The industry is calling for both new academic programs (post graduate programs in data analytics for incumbent workers), and modification of existing academic programs (integration of new emerging software systems, and new data management paradigms).
10. Fundamental proficiency in data analytics is creeping into a broad range of traditional occupations. The job descriptions in the occupational category Domain Specialist are being redefined. Big Data skills and competencies are becoming a requirement for traditional decision makers in Business Operations, E-Commerce, Healthcare, Financial Services, and Digital Security.

APPROACH AND METHODOLOGY

To conduct this analysis, data was drawn from Burning Glass Technologies' detailed database of online employer demand, which includes over 90 million current and historical job postings. Burning Glass collects postings from close to 40,000 online job sites and extracts top-line information about each job such as title, employer and industry. An artificial intelligence engine then reads each job description and identifies specific job titles, skills, and qualifications that employers are specifying. Duplicate postings are eliminated leaving only unique job postings for further analysis.

Using this database of online employer demand, Burning Glass identified occupations leveraging core Big Data skills related to the collection, storing, cleaning, manipulating, and analyzing of data. These occupations are based upon Burning Glass's occupational classification system, which includes new and emerging Big Data occupations not fully captured by O*NET classifications, such as Data Scientists.

These roles were grouped into categories based upon functional similarities. The categories were analyzed and compared across multiple factors, including size, skill and certification requirements, requested education and experience levels, and top locations, to understand the key dynamics shaping the Big Data jobs universe. The average length of time that job postings in each occupation remained open was calculated to identify the jobs taking the longest to fill, which provides insight into the roles that represent the greatest pain points for employers.

In addition to a nationwide analysis, each Big Data job category was analyzed in seven key markets for Big Data workers. These markets included the following Metropolitan Statistical Areas (MSAs):

Bay Area ¹	New York City
Boston	Southern Ohio ²
Chicago	Washington D.C.
Miami	

Finally, Burning Glass' resume database of almost 60 million career transitions was mined to identify how workers move from one role to another, and analyzed which Big Data jobs have similar skill profiles to identify career advancement opportunities for Big Data workers.

Unless otherwise noted, all data in this analysis reflect the 2014 calendar year.

¹ Bay Area includes the Metropolitan Statistical Areas (MSAs) of San Francisco and San Jose

² Southern Ohio includes the MSAs of Springfield, Dayton, Cincinnati and Columbus

DETAILED FINDINGS

Big Data jobs are spread throughout the economy and offer lucrative opportunities for both students and job seekers. In 2014 there were nearly 700,000 Big Data-related job postings. On average, these postings advertised salaries of \$79,384, a 25% premium over the average salary for jobs requiring Bachelor degrees or graduate level education. Career opportunities in Big Data afford extensive opportunity for advancement. This report segments, for analysis purposes, Big Data job opportunities into four broad occupational categories: Data Engineer, Domain Specialist, Data Analyst, and Data Scientist

The first occupational category, Data Engineer, is defined as those jobs which are responsible for the availability and integrity of the information infrastructure. Individuals, in these positions, collect, store, and share data within the organization. The technical requirements for this occupational category are similar to those of the established set of Data Management professions. However the tool set of languages, utilities and paradigms are different for the Big Data ecosystem. Data Engineer positions often serve as an entry point into the field of Big Data, and can serve as a stepping stone into higher analyst-level positions.



DATA ENGINEER

ENTRY POINT INTO THE FIELD OF BIG DATA
BUILD AND MAINTAIN INFORMATION INFRASTRUCTURE



DOMAIN SPECIALIST

SUBJECT MATTER EXPERT
RELIES ON DASHBOARDS, REPORTS, AND MODELS
GAINS INSIGHTS AND MAKES DATA-INFORMED DECISIONS

The second occupational category, Domain Specialist, is defined as those jobs which use basic analytical tools and quantitative methods in order to derive insights related to a specific functional domain. Many of these jobs are legacy positions staffed by well-established subject matter

experts (Credit Analysts, Actuaries, and Marketing Strategists). These individuals, armed with more information, better tools and analytical skills are increasing their reliance and dependence on data in order to inform their decision making.

The third occupational category, Data Analyst, is defined as those jobs responsible for mining and manipulating datasets to build quantitative models. Professionals in this category use specialized toolkits to build dashboards, reports and analytic models using large



DATA ANALYST

MINE AND MANIPULATE LARGE DATASETS
BUILD QUANTITATIVE MODELS TO DERIVE INSIGHTS

(sometimes private, many times public) datasets and are responsible for creating and supporting the use of analytics within the context of the business.

The fourth occupational category, Data Scientist, is defined as those jobs responsible for supervising the use of advanced tools, statistics, and other quantitative methods to build sophisticated quantitative models. Professionals in this category usually have advanced degrees and are tasked with wide-ranging oversight over the information assets used within an organization. This occupational category is the smallest in terms of total postings, but has shown the strongest growth, spiking 94% since 2010. Job postings in this category remain open longer than any other category (38 days), and the average salary is the highest (\$92,044).



DATA SCIENTIST

USE ADVANCED TOOLS AND METHODS TO BUILD SOPHISTICATED QUANTITATIVE MODELS AND OVERSEE UTILIZATION OF INFORMATION ASSETS

Summary Statistics

The Data Scientist category, though modest in size (22,644 postings) has experienced extraordinary growth (94%) and is the highest paid (average annual salary of \$92,044). The occupational category, Data Engineer, is also considerable in size (224,097 postings) and is well paid (average salary of \$86,354). Domain Specialist is the largest single category of Big Data positions (321,981 postings) and saw 45% growth since 2010. This partly comes, in part, at the expense of the Data Analyst (the only Big Data category to show a decline in job postings). The most likely explanation for this decline (-24%) is that the duties presently performed by the Data Analyst is shifting to Domain Specialists who can bring domain experience and context to the decision making process.

	Total Postings	Growth (2010-2014)	Average Salary	Average Days Open
Data Engineer	224,097	9%	\$86,354	34 Days
Domain Specialist	321,981	45%	\$73,294	30 Days
Data Analyst	130,030	[-24%]	\$76,535	32 Days
Data Scientist	22,644	94%	\$92,044	38 Days

Educational Requirements

There is significant opportunity in each occupational category for candidates with varying levels of educational credentials, and employers, in large number, place value on academic credentials in this emerging field. There is a significant number of opportunities for sub-baccalaureate candidates (most of which are in the Data Engineer category), and the workforce opportunity expands dramatically for candidates possessing a bachelor's degree (68% of all Data Analyst jobs, 68% of all Data Engineer jobs, and 69% of all Data Scientist jobs). Strong incentives also exist for graduate-level candidates: within each category at least 25% of all job openings require a Masters or Ph.D. degree.

	A.S.	B.S.	M.S.	Ph.D.
Data Engineer	17,928 (8%)	152,386 (68%)	44,819 (20%)	11,205 (5%)
Domain Specialist	6,440 (2%)	218,947 (68%)	74,056 (23%)	22,539 (7%)
Data Analyst	2,601 (2%)	87,120 (67%)	29,907 (23%)	11,703 (9%)
Data Scientist	--	4,755 (21%)	5,661 (25%)	12,454 (55%)

Experience Requirements

The career pathway in Big Data is open to entry-level workers with appropriate skills and educational credentials. All occupational categories have either a significant number of opportunities (nearly 100,000 postings for Domain Specialists), or a significant percentage of opportunities (15% to 30% for Data Engineers, Data Scientists, and Domain Specialists) for candidates with little or no work experience.

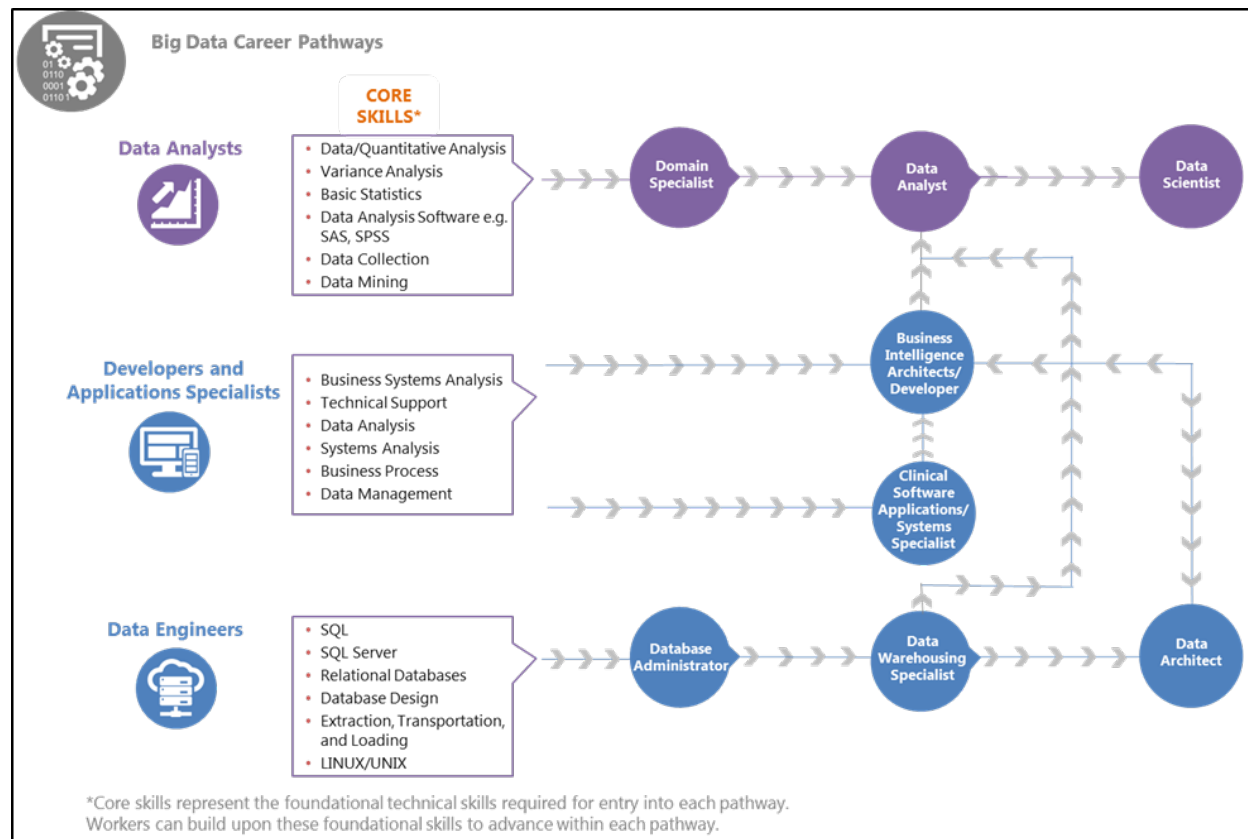
	0 to 2 years	3 to 8 years	9+ years
Data Engineer	35,856 (16%)	163,591 (73%)	24,651 (11%)
Domain Specialist	96,594 (30%)	206,067 (64%)	22,538 (7%)
Data Analyst	27,306 (21%)	92,321 (71%)	10,402 (8%)
Data Scientist	6,556 (29%)	14,039 (62%)	2,037 (9%)

Occupational Categories and Representative Job Titles

Category & Description	Job Titles
Data Engineer	
<p><i>Builds and Maintains the Information Infrastructure</i></p> <p><i>Skilled in Hadoop, Hive, Cassandra, MapReduce, MongoDB, NoSQL</i></p>	<p>Database Administrator Business Intelligence Architect / Developer Clinical Software Applications / Systems Specialist Data Architect Data Warehousing Specialist</p>
Domain Specialist	
<p><i>Uses data models to derive insight and inform decision making</i></p> <p><i>Skilled in SQL and data analysis and visualization tools such as R, SAS, STATA, SPSS, and Tableau.</i></p>	<p>Business / Management Analyst Financial Analyst Operations Analyst Risk Manager / Analyst Credit Analyst E - Commerce Analyst Geographer / GIS Specialist Research Associate / Analyst Actuary Supply Chain Analyst / Specialist Security / Defense Intelligence Analyst Pricing Analyst Financial Examiner Clinical Data Manager Fraud Analyst Survey Researcher / Analyst</p>
Data Analyst	
<p><i>Create and Publish Analytic Models</i></p> <p><i>Skilled in Multivariate Regression, Pattern Recognition, Web Mining and Data Modeling</i></p>	<p>Business Intelligence Analyst Data Analyst Data Mining Analyst Marketing Research Analyst</p>
Data Scientist	
<p><i>Develop and Define Quantitative Models</i></p> <p><i>Skilled in Machine Learning, Markov Chains, Natural Language Processing, Bayesian Modeling, Cluster Analysis and Neural Networks</i></p>	<p>Data Scientist Statistician Biostatistician Quantitative Analyst Economist Chief Analytics Officer</p>

Career Pathways and Transitions

Distinct opportunities for career advancement are beginning to develop across the Big Data landscape. Workers, with the right mix of skills, training and experience are consistently advancing across category boundaries. Each category analyzed in this report occupies a unique space in the Big Data ecosystem, and job seekers, educators and employers will benefit from insight into the dynamics of the transition points across category boundaries.



There are significant opportunities for advancement within the large and established Data Engineer category. Proficiency in database management, knowledge of relational databases, good communication and problem solving skills, as well as strong technical writing skills are requisites for most jobs in this category.

Successful individuals within this category can, with the addition of basic proficiency in data analysis and some exposure to business intelligence, transition outside the category into one of positions in the Data Analyst category.

Business Intelligence Architects and Clinical Applications Specialists occupy the junction between Data Engineer and Data Analyst. They are skilled in analyzing the needs of business with respect to data and systems, and are tasked with either creating the software that businesses need to interpret data (Business Intelligence Architects), or managing the software that companies use to track medical-related data (Clinical Applications Specialists).

The business culture is increasingly looking to, and expecting, data based analytics as justification for both operational and strategic decisions. For many Domain Specialists, this will require post graduate education in both programming and data management. Advancement out of the occupational category into the Data Analyst category is strictly a matter of experience and proficiency. While Domain Specialists are required to be familiar with R, Python, SQL, Hadoop, MongoDB, PIG and comparable languages and tools, Data Analysts are required to have an advanced level of proficiency in these same tools.

However, technical proficiency alone is not sufficient. Virtually all of the occupations in both the Data Analyst and Data Scientist categories require quantitative skills, such as regression analysis, statistics and predictive modeling. Familiarity with natural language processing and machine learning are also important.

In the case of Data Analysts trying to reach the highest-level Data Scientist roles, job seekers may also need to return to school and earn a graduate degree in a quantitative field, which has become the baseline educational credential for many of these roles.

Implications

- Job seekers and educators are being invited to respond to the evolving Big Data landscape by focusing on the skills and credentials that employers are requesting with increased frequency. They can focus on a foundation of analytical skills—such as general data management, statistics, and programming skills—which will contribute to almost any role in Big Data and broaden their career options in the field.
- The struggle that employers have filling some of the newest and fastest-growing roles, such as Data Scientists, may be alleviated by more effective signaling between employers and educators regarding the core competencies required on the job. As demand grows for sophisticated tools and analytical approaches (such as natural language processing, Markov Chains, and Hadoop) this shift in employer needs must be communicated to educators so they can build educational programs around these emerging market needs.
- Many new and emerging Big Data roles, such as Data Scientists, are asking for a diverse mix of experience, advanced educational credentials, and highly sophisticated skills which few job seekers possess. It is critical, therefore, for employers to understand the skills and credentials that are hardest to find so they may recruit workers more successfully and focus internal training programs around the credentials the market can't yet supply.
- Understanding career pathways within Big Data can help job seekers to plan their careers in the field, and educators can support job seekers by offering programs that focus on the skills and credentials necessary for advancement along the Big Data career ladder. Similarly, employers can use career pathways to identify workers already within their organization who possess most of the skills necessary to succeed in Big Data positions.

SPECIFIC PROFILES

Data Engineer

Data Engineers build and maintain the technological infrastructure necessary to collect, store, and share large amounts of data. They specialize in building and supporting the data systems used by the three analyst categories (Domain Specialist, Data Analyst and Data Scientist). Data Engineers comprise the second largest occupational group in this report, with nearly 225,000 job postings. Although growth has not accelerated as strongly as is the case for other Big Data roles, demand for Data Engineers nonetheless grew 9% since 2010.

On average, job postings for Data Engineers and Systems Specialists remain open for 34 days, which is in line with the overall average posting duration of 33 days. However, some roles within this category remain open much longer, suggesting they suffer from critical skill gaps, or a mix of disparate skills. Clinical Software Applications/Systems Specialists, for example, remained open for 41 days, on average. This role is a hybrid position that often combines IT skills with knowledge and proficiency in health care-related issues.

	Total Postings	Growth (2010 to 2014)	Average Salary	Average Days Open
Data Engineer	224,097	9%	\$86,353.95	34 Days
BI Application Developer	46,693	[-34%]	\$98,085	32 Days
Clinical System Specialist	26,702	>100%	\$103,094	41 Days
Database Administrator	101,430	20%	\$77,229	31 Days
Data Architect	26,164	8%	\$87,177	28 Days
Data Warehousing Spec	23,108	40%	\$82,428	35 Days

The vast majority of Data Engineer jobs require a Bachelor degree or more advanced level of education (92% of all postings in this category). There are, however, a significant number of postings (17,928, more than all other job categories combined) that offer opportunities for strong candidates to enter this field before gaining the necessary academic credentials. One profession, Clinical Software Applications/Systems Specialists, is higher than the national average, with 21% of postings open for workers without a bachelor's degree.

	A.S.	B.S.	M.S.	Ph.D.
Data Engineer	17,928 (8%)	152,386 (68%)	44,819 (20%)	11,205 (5%)
BI Application Developer	468 (1%)	34,085 (73%)	9,805 (21%)	2,334 (5%)
Clinical System Specialist	5,607 (21%)	10,680 (40%)	9,879 (37%)	534 (2%)
Database Administrator	12,171 (12%)	73,029 (72%)	13,185 (13%)	4,057 (4%)
Data Architect	523 (2%)	17,529 (67%)	6,279 (24%)	2,093 (8%)
Data Warehousing Spec	693 (3%)	14,789 (64%)	5,777 (25%)	1,848 (8%)

The vast majority of Data Engineer jobs require some level of experience (84% of all postings in this category require at least three years of experience). There are, however, a significant number of postings (35,856) that offer opportunities for entry-level candidates. One profession, Database Administrator, is higher than the national average, with 20% of postings open to workers with little to no professional experience.

	0 to 2 years	3 to 8 years	9+ years
Occupational Category	35,856 (16%)	163,591 (73%)	24,651 (11%)
BI Application Developer	5,136 (11%)	35,019 (75%)	6,537 (14%)
Clinical System Specialist	3,471 (13%)	21,895 (82%)	1,335 (5%)
Database Administrator	20,286 (20%)	72,015 (71%)	9,128 (9%)
Data Architect	4,186 (16%)	17,529 (67%)	4,447 (17%)
Data Warehousing Spec	3,928 (17%)	15,944 (69%)	3,235 (14%)

Knowledge of Big Data-specific technologies is of critical importance for Data Engineers and Systems Specialists, with employers demanding skills such as Hadoop, MongoDB, and NoSQL. These skills were requested, in addition to the, more traditional IT skills such as those relating to data security, data management and disaster recovery.

Top Data Related Specialized Skills

Data Management	Database Analysis Tools & Languages	SQL Skills	Emerging Big Data Skills
Database Administration	Extraction Transforming and Loading Tools	SQL	Hadoop
Data Modeling	Data Analysis	SQL Server	Scrum
Data Warehousing	Java	Oracle PL/SQL	Agile Development
Database Management	Informatica	SQL Server Reporting Services	Hive
Disaster Recovery Planning	Microsoft C#	Microsoft SQL	Splunk
Systems Development Lifecycle	.NET Programming	Transact-SQL	MongoDB
Relational Databases	PERL	MySQL	MapReduce
Relational Database Management Systems	Shell Scripts	Microsoft SQL Server Integration Services	PIG
Debugging	Teradata	Postgre-SQL	

Top Non-Data Related Specialized Skills

Business Systems and Analysis	Top Baseline Skills
Business Intelligence	Communication Skills
Business Processes	Writing
Process Optimization	Organizational Skills
Business Systems Analysis	Troubleshooting
Business Analysis	Problem Solving
	Project Management

Demand for certifications in the Data Engineer occupation group can be significant with 13% of postings requesting some kind of certification.

Occupational Category	Percentage	Top Certifications
BI Application Developer	10%	Salesforce.com Developer TOGAF
Clinical System Specialist	36%	Project Management Certification EPIC Certification
Database Administrator	10%	Oracle (Oracle Certified Associate) Database Administrator (DBA)
Data Architect	7%	Microsoft Certified Engineer (MCSE) TOGAF
Data Warehousing Spec	9%	Project Management Certification (PMP) Certified Info Sec Professional (CISSP)

Employer demand for Data Engineers is most highly concentrated in technological hubs (San Francisco-San Jose and Boston), government and defense centers (Washington, D.C. and Denver) and financial capitals (New York, Chicago, and Dallas). In each case, the density of job postings, as a ratio compared to the population (the location quotient), is more than 50% higher than the national average.

Metro Area	Postings
New York	18,719
Washington, D.C.	13,086
San Francisco	12,572
Chicago	10,959
Los Angeles	8,712
Dallas	7,800
Boston	7,290
Atlanta	6,499
Philadelphia	5,055
San Jose	4,848

Metro Area	Location Quotient
San Jose	3.0
Washington, D.C.	2.7
San Francisco	2.2
Charlotte	2.2
Denver	2.0
Austin	1.8
Atlanta	1.7
Columbus	1.7
Boston	1.7
Dallas	1.5

Location Analysis

Although this is the largest job category in Big Data, its growth has been inconsistent across geographies. In Boston and Miami, for example, posting growth since 2010 has been more than 20%. In Washington, D.C., New York, and the Bay Area, however, growth was actually negative. Nevertheless, Data Engineers and Systems Specialists command strong salaries across geographies, with average advertised salaries ranging from just over \$80,000 in Southern Ohio and Miami to over \$100,000 in New York. These roles remained open longest in the Bay Area, Boston, and Miami, where postings were significantly above the national average of 33 days.

	Total Postings	Growth (2010 to 2014)	Average Salary	Average Days Open	Location Quotient
Nationally	224,097	9%	\$86,353.95	34 Days	1.0
Bay Area	12,572	[-5%]	\$98,228	39 Days	2.7
Boston	7,290	20%	\$97,544	37 Days	1.7
Chicago	10,959	13%	\$94,420	36 Days	1.5
Miami	3,043	24%	\$83,815	37 Days	0.8
New York	18,719	[-18%]	\$103,061	28 Days	1.3
Southern Ohio	4,855	9%	\$81,533	27 Days	1.2
Washington, D.C.	13,086	[-6%]	\$93,967	35 Days	2.7

The vast majority of Data Engineer jobs require a Bachelor degree or more advanced level of education (92% of all postings in this category). There are, however, a significant number of postings (17,928, more than all other job categories combined) that offer opportunities for strong candidates to enter this field before gaining the necessary academic credentials. Most of the urban centers analyzed in this report (Miami being the sole exception) have a stronger preference (more than 92%) for a Bachelor degree or higher level of academic credential.

	A.S.	B.S.	M.S.	Ph.D.
Nationally	17,928 (8%)	152,386 (68%)	44,819 (20%)	11,205 (5%)
Bay Area	377 (3%)	8,298 (66%)	2,892 (23%)	1,006 (8%)
Boston	292 (4%)	4,957 (68%)	1,604 (22%)	365 (5%)
Chicago	658 (6%)	7,781 (71%)	2,082 (19%)	438 (4%)
Miami	304 (10%)	2,039 (67%)	609 (20%)	91 (3%)
New York	749 (4%)	12,916 (69%)	3,931 (21%)	1,123 (6%)
Southern Ohio	340 (7%)	3,544 (73%)	825 (17%)	146 (3%)
Washington, D.C.	393 (3%)	9,422 (72%)	2,486 (19%)	785 (6%)

Entry-level opportunities for Data Engineers are consistent across geographies, with around 15% of job postings open for entry-level candidates. Mid-level and advanced-level opportunities are also relatively consistent across geographies, although in Washington, D.C. 18% of postings request over eight years of experience, compared with 11% nationwide.

	0 to 2 years	3 to 8 years	9+ years
Nationally	35,856 (16%)	163,591 (73%)	24,651 (11%)
Bay Area	1,634 (13%)	9,052 (72%)	1,886 (15%)
Boston	1,166 (16%)	5,395 (74%)	729 (10%)
Chicago	1,863 (17%)	8,000 (73%)	1,096 (10%)
Miami	396 (13%)	2,404 (79%)	213 (7%)
New York	2,621 (14%)	13,665 (73%)	2,433 (13%)
Southern Ohio	777 (16%)	3,447 (71%)	583 (12%)
Washington, D.C.	1,963 (15%)	8,768 (67%)	2,355 (18%)

Domain Specialist

Domain Specialists use quantitative methods and analytical tools to complement their specialized knowledge in a functional domain. They utilize analytical software packages and tools, but typically do not require advanced data science methods or techniques.

The occupational group, Domain Specialist, encompasses a wide spectrum of job descriptions, specialties such as business and finance, security and defense, geography, and medical-related occupations. Two positions (Business/Management and Financial Analysts) dominate this category (75% of the job postings). Overall, growth in postings in this occupational group has been strong at 45% between 2010 and 2014. Certain positions (Operations Analysts and Supply Chain Analysts) have experienced the strongest growth, at over 90% each since 2010.

The average advertised salary for this occupational group was just under \$74,000 in 2014. Certain positions (Risk Analysts and Security/Defense Intelligence Analysts) paid particularly well, with average advertised salaries close to \$90,000. In general, Domain Specialists are easier to fill than other Big Data roles—postings in the occupation group (they remain online for 30 days on average). Nonetheless, some occupations buck this trend and are proving to be hiring pain points for employers. For example, certain postings (Research Associates and Clinical Data Managers) remained online for 39 days and 36 days respectively (with average salaries well below other comparable professions).

	Total Postings	Growth (2010 to 2014)	Average Salary	Average Days Open
Domain Specialist	321,981	45%	\$73,294	30 Days
Actuary	8,855	47%	\$84,328	33 Days
Business Analyst	119,450	42%	\$81,608	30 Days
Clinical Data Manager	2,326	31%	\$53,191	36 Days
Credit Analyst	12,459	48%	\$63,965	26 Days
E-Commerce Analyst	10,462	65%	\$71,933	31 Days
Financial Analyst	85,366	42%	\$68,756	32 Days
Financial Examiner	2,529	>100%	\$79,788	28 Days
Fraud Analyst	1,975	>100%	\$50,355	25 Days
GIS Specialist	10,192	47%	\$63,932	28 Days
Operations Analyst	25,407	91%	\$71,260	27 Days
Pricing Analyst	3,768	46%	\$63,451	35 Days
Research Associate	9,787	[-21%]	\$48,770	39 Days
Risk Manager	15,283	78%	\$89,626	32 Days
Security Analyst	6,652	33%	\$89,007	26 Days
Supply Chain Analyst	7,026	95%	\$65,238	22 Days
Survey Analyst	6,652	33%	\$89,007	26 Days

A bachelor's degree is the most commonly requested education level for this occupational category with nearly all job postings requesting a bachelor's degree or greater. Employer demand for more advanced levels of education is lower than other Analyst categories (68% of postings requested bachelor's-level qualifications) and only 30% of postings still requested some form of graduate degree.

	A.S.	B.S.	M.S.	Ph.D.
Domain Specialist	5,671 (2%)	193,648 (68%)	61,690 (23%)	16,907 (7%)
Actuary	--	7,285 (82%)	1,243 (14%)	266 (3%)
Business Analyst	1,194 (1%)	84,809 (71%)	23,890 (20%)	8,361 (7%)
Clinical Data Manager	302 (13%)	1,581 (68%)	348 (15%)	116 (5%)
Credit Analyst	996 (8%)	9,095 (73%)	1,744 (14%)	747 (6%)
E-Commerce Analyst	313 (3%)	7,741 (74%)	1,987 (19%)	418 (4%)
Financial Analyst	--	55,487 (65%)	25,609 (30%)	4,268 (5%)
Financial Examiner	--	1,846 (73%)	379 (15%)	303 (12%)
Fraud Analyst	474 (24%)	1,244 (63%)	237 (12%)	39 (2%)
GIS Specialist	1,630 (16%)	6,522 (64%)	1,426 (14%)	611 (6%)
Operations Analyst	762 (3%)	18,038 (71%)	4,827 (19%)	1,778 (7%)
Pricing Analyst	--	2,637 (70%)	866 (23%)	226 (6%)
Research Associate	195 (2%)	3,719 (38%)	2,446 (25%)	3,227 (34%)
Risk Manager	--	8,711 (57%)	4,737 (31%)	1,986 (13%)
Security Analyst	66 (1%)	4,855 (73%)	1,263 (19%)	465 (7%)
Supply Chain Analyst	210 (3%)	4,988 (71%)	1,545 (22%)	351 (5%)
Survey Analyst	--	2,062 (31%)	1,862 (28%)	2,727 (41%)

Domain Specialists often serve as a starting point for many workers looking to move into Big Data-related roles, and as such offer strong opportunities for entry-level workers – 30% of the postings in this occupational category are open to entry-level job seekers. As workers gain additional experience they may move into more advanced, or they may target progressively more sophisticated occupational categories of Data Analyst and/or Data Scientist with the right mix of on-the-job experience and additional education.

	0 to 2 years	3 to 8 years	9+ years
Domain Specialist	84,532 (30%)	178,353 (64%)	16,899 (7%)
Actuary	2,221 (25%)	5,508 (62%)	1,066 (12%)
Business Analyst	33,446 (28%)	77,642 (65%)	8,361 (7%)
Clinical Data Manager	976 (42%)	1,256 (54%)	93 (4%)
Credit Analyst	4,485 (36%)	7,350 (59%)	498 (4%)
E-Commerce Analyst	2,824 (27%)	7,009 (67%)	732 (7%)
Financial Analyst	27,317 (32%)	55,487 (65%)	3,414 (4%)
Financial Examiner	885 (35%)	1,517 (60%)	126 (5%)
Fraud Analyst	987 (50%)	869 (44%)	118 (6%)
GIS Specialist	3,261 (32%)	6,217 (61%)	713 (7%)
Operations Analyst	8,130 (32%)	15,498 (61%)	1,778 (7%)
Pricing Analyst	1,130 (30%)	2,486 (66%)	150 (4%)
Research Associate	3,914 (40%)	5,382 (55%)	489 (5%)
Risk Manager	2,292 (15%)	11,003 (72%)	1,986 (13%)
Security Analyst	1,796 (27%)	3,525 (53%)	1,330 (20%)
Supply Chain Analyst	1,987 (28%)	4,777 (68%)	281 (4%)
Survey Analyst	2,394 (36%)	3,791 (57%)	399 (6%)

Domain Specialists are expected to have foundational data analysis skills combined with domain-specific knowledge, most commonly in business and finance. Skills, such as SAS and SPSS, are in high demand, alongside Visual Basic, which is used to create macros for the Microsoft Office Suite, including Excel.

Top Data Related Specialized Skills

Financial Analysis	Programming Skills	Data Analysis
Financial Analysis	SAS	Data Analysis
Forecasting	SQL	Variance Analysis
Risk Management	SPSS	Data Collection
Financial Modeling		Data Mining
Cash Flow Analysis		Quantitative Analysis
		Tableau

Top Non-Data Related Specialized Skills

Business Management	Baseline Skills
Supply Chain Management	Communication Skills
Management Reporting	Organizational Skills
Concept Development	Writing
Process Improvement	Research
Business Administration	Problem Solving
	Microsoft Office
	Microsoft Visio
	Visual Basic

Certifications are in moderate demand with 14% of Domain Specialists requesting at least one certification, but demand varies significantly by occupation. Employers of Risk Managers/Analysts require certifications in around one-quarter of postings, primarily in

information systems security credentials. Similarly, employers demand certifications in accounting, finance, and fraud in around one-fifth of job postings for Financial Analysts and Financial Examiners.

Occupational Category	Percentage Requesting Certifications	Top Certifications
Actuary	8%	Certified Public Accountant (CPA) Chartered Financial Analyst (CFA)
Business Analyst	12%	Certified Risk Manager Project Management Certification (PMP)
Clinical Data Manager	16%	Certified Tumor Registrar Registered Health Information Technician
Credit Analyst	9%	Chartered Financial Analyst (CFA) Certified Public Accountant (CPA)
E-Commerce Analyst	9%	Certified Risk Manager Project Management Certification (PMP)
Financial Analyst	21%	Certified Public Accountant (CPA) Chartered Financial Analyst (CFA)
Financial Examiner	20%	Certified Anti-Money Laundering Certified Fraud Examiner Certified Public Accountant
Fraud Analyst	19%	Certified Fraud Examiner Certified Public Accountant (CPA) Chartered Financial Analyst (CFA)
GIS Specialist	7%	GIAC Information Security Professional
Operations Analyst	12%	Certified Public Accountant (CPA) Project Management Certification (PMP) Six Sigma Certification
Pricing Analyst	6%	Certified Risk Manager Certified Public Accountant Salesforce.com Administrator
Research Associate	<5%	N/A
Risk Manager	23%	Certified Information Systems Auditor (CISA) Certified Info Sys Security (CISSP) Certified Info Security Manager (CISM)
Security Analyst	6%	Certified Info Sys Security (CISSP) Network + Certified
Supply Chain Analyst	< 5%	N/A
Survey Analyst	< 5%	N/A

Employment opportunities, in this occupational category, are most heavily concentrated in technological hubs such as Washington, D.C. and San Francisco, but they also are in high-demand in financial centers such as Charlotte, N.C., and Bridgeport, CT.

Metro Area	Postings
New York	35,323
Washington, D.C.	19,456
Chicago	17,533
Los Angeles	12,796
San Francisco	10,886
Dallas	10,877
Boston	10,200
Atlanta	8,514
Philadelphia	8,370
Houston	6,491

Metro Area	Location Quotient
Washington, D.C.	2.8
San Jose	2.2
San Francisco	2.2
Charlotte	1.8
New York	1.8
Chicago	1.7
Boston	1.7
Denver	1.6
Atlanta	1.5
Columbus	1.5

Location Analysis

Postings for this occupational category have grown 45% nationally since 2010, but certain geographies, Southern Ohio, Washington, D.C., and Miami, were significantly higher than the national average, where postings increased 65%, 78%, and 105%, respectively. Four geographies (Boston, Chicago, New York and Washington) feature high concentrations of postings (70% higher in case of Boston, Chicago and New York, 180% higher in Washington) than the national average.

Many of the geographies studied (Southern Ohio and Miami are the only exceptions) feature average salaries above the national norm of \$73,294. Washington DC is significantly above the norm at \$96,891.

Job postings are open on average 30 days on a national basis (10% below the average for all jobs). Positions appear to be easier to fill in New York and Southern Ohio (29 days and 25 days respectively), and more difficult to fill in the Bay Area, Boston and Chicago (36 days, 36 days and 37 days respectively).

	Total Postings	Growth (2010 to 2014)	Average Salary	Average Days Open	Location Quotient
Nationally	321,981	45%	\$73,294	30 Days	1.0
Bay Area	16,034	56%	\$86,703	36 Days	1.1
Boston	10,238	27%	\$82,190	37 Days	1.7
Chicago	17,591	78%	\$77,011	37 Days	1.7
Miami	4,751	105%	\$69,636	35 Days	0.9
New York	35,446	24%	\$87,165	29 Days	1.7
Southern Ohio	7,080	65%	\$65,798	25 Days	1.2
Washington, D.C.	10,503	16%	\$96,891	32 Days	2.8

Domain Specialists are principally bachelor's-level degreed professionals across most geographies, with about 60% to 70% of postings requesting a bachelor's degree in each location analyzed. Employers in both the Bay Area and Boston, however, are slightly more likely to request graduate-level educational credentials (39% and 35% respectively).

	A.S.	B.S.	M.S.	Ph.D.
Nationally	6,439 (2%)	218,947 (68%)	74,055 (23%)	22,538 (7%)
Bay Area	160 (1%)	9,620 (60%)	4,649 (29%)	1,603 (10%)
Boston	102 (1%)	6,552 (64%)	2,765 (27%)	819 (8%)
Chicago	175 (1%)	11,961 (68%)	4,397 (25%)	1,055 (6%)
Miami	95 (2%)	3,373 (71%)	1,045 (22%)	237 (5%)
New York	354 (1%)	23,748 (67%)	8,507 (24%)	2,835 (8%)
Southern Ohio	141 (2%)	5,097 (72%)	1,416 (20%)	424 (6%)
Washington, D.C.	195 (1%)	13,067 (67%)	4,095 (21%)	2,340 (12%)

In nearly every location analyzed, about 30% of the postings in this occupational category are open to entry-level candidates. In Washington, D.C., however, 39% of openings are available to entry-level job seekers. Washington, D.C. is also the only location surveyed with above-average demand for workers with over 8 years of experience.

	0 to 2 years	3 to 8 years	9+ years
Nationally	96,594 (30%)	206,067 (64%)	22,538 (7%)
Bay Area	3,848 (24%)	11,063 (69%)	1,122 (7%)
Boston	2,764 (27%)	6,859 (67%)	511 (5%)
Chicago	5,101 (29%)	11,610 (66%)	1,055 (6%)
Miami	1,330 (28%)	3,183 (67%)	190 (4%)
New York	10,279 (29%)	1,417 (4%)	2,481 (7%)
Southern Ohio	1,911 (27%)	4,814 (68%)	354 (5%)
Washington, D.C.	7,606 (39%)	9,751 (50%)	2,145 (11%)

Data Analyst

Data Analysts mine and manipulate data to build quantitative models that can be used to derive insights from large datasets. They use some of the same tools and techniques as data scientists, but typically apply existing models and tools rather than building new structures and methods. Business Intelligence Analysts constitute the largest occupation in this group, followed by Data Mining Analysts and Market Research Analysts.

There were over 130,000 postings for Data Analysts in 2014, and it is the only occupational category to experience a decline in demand since 2010. This decline may reflect either

- a. an increase in both the importance and requirements for positions in this job category. Many positions, formerly classified as Data Analyst, may over time, be migrating into the Data Scientist category, or
- b. an increase in the scope of responsibilities and requirements (knowledge of data analytics and proficiency with analytic tools) for positions in the Domain Specialist may be slowly eroding the need for dedicated Data Analysts.

	Total Postings	Growth (2010 to 2014)	Average Salary	Average Days Open
Data Analyst	130,030	[-24%]	76,535	32 Days
Business Intelligence	74,125	[-46%]	\$83,828	33 Days
Data Mining Analyst	40,901	86%	\$69,864	32 Days
Market Research	15,004	30%	\$58,671	29 Days
Quantitative Analyst	2,649	45%	\$112,867	34 Days
Statistician	4,832	16%	\$75,452	38 Days

Data Analysts require at least a bachelor's degree, with 67% of postings calling for a bachelor's degree and 32% requesting graduate-level credentials. Data Mining Analysts have the greatest educational requirements, with 26% of postings calling for a master's degree and 14% requesting a Ph.D.

	A.S.	B.S.	M.S.	Ph.D.
Data Analyst	2,600 (2%)	87,120 (67%)	29,906 (23%)	11,702 (9%)
Business Intelligence	741 (1%)	51,887 (70%)	15,566 (21%)	5,188 (7%)
Data Mining Analyst	818 (2%)	24,131 (59%)	10,634 (26%)	5,726 (14%)
Market Research	150 (1%)	10,202 (68%)	3,600 (24%)	1,050 (7%)

About one-fifth of Data Mining Analyst postings are open to entry-level workers, with the greatest concentration of entry-level opportunities in Market Research Analysts (33%).

	0 to 2 years	3 to 8 years	9+ years
Data Analyst	27,306 (21%)	92,321 (71%)	10,402 (8%)
Business Intelligence	11,860 (16%)	54,852 (74%)	7,412 (10%)
Data Mining Analyst	10,634 (26%)	27,812 (68%)	2,045 (5%)
Market Research	4,951 (33%)	9,602 (64%)	450 (3%)

Data Analysts are expected to be fluent in both the technological side of data management, with skills in SQL, data warehousing, and relational databases, as well as advanced data analysis such as regression modeling, predictive modeling, and data mining. Data Analysts are also required to be fluent in at least one statistical programming language such as SAS, R or Python.

Top Data Related Specialized Skills

Database Administration	Advanced Analytics
Data Management	Data Mining
Data Warehousing	Predictive Models
Data Modeling	Data Visualization
Extraction, Transformation & Loading	Predictive Analytics
Relational Databases	Logistic Regression
Database Design	Factor Analysis
	Pattern Recognition

Top Non-Data Related Specialized Skills

Business Processes	Programming Skills	Top Baseline Skills
Business Process	SQL	Communication Skills
Business Analysis	SAS	Writing
Business Intelligence	JAVA	Organization Skills
Business Objects	SPSS	Problem Solving
Cognos Impromptu	R	Project Management
Tableau	Python	Microsoft Office
SAP		Microsoft VISIO
Enterprise Resource Planning		

Data Analysts are not a highly certified occupational group, with just 8% of postings asking for a certification. The most commonly demanded certificates are domain-specific (finance, risk, and fraud).

Occupational Category	Percentage	Top Certifications
Business Intelligence Analyst	9%	Certified Public Accountant SAP Certification Certified Risk Manager Capability Model Maturity Integration (CMMI)
Data Analyst	< 5%	Chartered Financial Analyst Financial Risk Manager Project Management Certification (PMP)
Market Research	11%	Certified Risk Manager Chartered Financial Analyst (CFA) Series 7

Data Analysts are in greatest demand across many of the most technologically advanced geographies, such as San Francisco and Washington, D.C. They are most highly concentrated in the Bay Area (San Francisco-San Jose), as well as the finance and insurance hub of Bridgeport, CT.

Metro Area	Postings
New York	12,026
Chicago	6,994
Los Angeles	5,359
San Francisco	5,291
Washington, D.C.	5,192
Dallas	4,624
Boston	4,220
Atlanta	3,969
Philadelphia	3,633
San Jose	3,500

Metro Area	Location Quotient
San Jose	3.8
Bridgeport	2.9
San Francisco	2.6
Charlotte	2.4
Washington, D.C.	1.9
Atlanta	1.8
Denver	1.7
Boston	1.7
Chicago	1.7
Columbus	1.6

Location Analysis

The number of job postings, in this category, has declined, both nationally and across most of the regions analyzed for this report, since 2010 (Miami being the only exception). Data Analyst jobs still advertise salaries above \$80,000 in many of the geographies, and remain open longer than the national average of 32 days in every location except for New York (30 days) and Southern Ohio (28 Days).

	Total Postings	Growth (2010 to 2014)	Average Salary	Average Days Open	Location Quotient
Nationally	130,030	[-24%]	\$76,535	32 Days	1.0
Bay Area	8,791	[-11%]	\$89,687	37 Days	1.5
Boston	4,220	[-19%]	\$85,175	42 Days	1.7
Chicago	6,994	[-22%]	\$86,218	40 Days	1.7
Miami	1797	0%	\$77,613	38 Days	0.8
New York	12,026	[-39%]	\$89,494	30 Days	1.5
Southern Ohio	2,727	[-27%]	\$73,186	28 Days	1.2
Washington, D.C.	5,192	[-53%]	\$86,245	34 Days	2.8

The majority of Data Analyst jobs require either a bachelor's or a master's degree, and in certain geographies (Bay Area, New York, Boston, and Southern Ohio) over 10% of postings request a Ph.D..

	A.S.	B.S.	M.S.	Ph.D.
Nationally	2,600 (2%)	87,120 (67%)	29,906 (23%)	11,702 (9%)
Bay Area	87 (1%)	5,098 (58%)	2,285 (26%)	1,318 (15%)
Boston	42 (1%)	2,700 (64%)	1,055 (25%)	422 (10%)
Chicago	69 (1%)	4,616 (66%)	1,678 (24%)	629 (9%)
Miami	35 (2%)	1,275 (71%)	413 (23%)	71 (4%)
New York	120 (1%)	7,696 (64%)	2,765 (23%)	1,322 (11%)
Southern Ohio	54 (2%)	1,745 (64%)	572 (21%)	327 (12%)
Washington, D.C.	51 (1%)	3,582 (69%)	103 (2%)	363 (7%)

There are a substantial number of entry level opportunities (20% to 25%) in every geography analyzed. Mid-level opportunities are also relatively steady across geographies, but in both the Bay Area and Washington, D.C. over 10% of Data Analyst openings request over eight years of experience, slightly higher than the national average of 8%.

	0 to 2 years	3 to 8 years	9+ years
Nationally	27,306 (21%)	92,321 (71%)	10,402 (8%)
Bay Area	1,758 (20%)	6,153 (70%)	879 (10%)
Boston	928 (22%)	2,996 (71%)	295 (7%)
Chicago	1,538 (22%)	4,895 (70%)	559 (8%)
Miami	395 (22%)	1,329 (74%)	71 (4%)
New York	2,765 (23%)	8,177 (68%)	1,082 (9%)
Southern Ohio	545 (20%)	1,990 (73%)	163 (6%)
Washington, D.C.	1,142 (22%)	3,426 (66%)	623 (12%)

Data Scientist

Data Scientists utilize advanced analytical tools, statistics, and other methods to build sophisticated quantitative models used to derive business insights, such as customer targeting, medical research, and advanced financial analysis. The occupations require robust analysis skills across a variety of domains, including Data Scientists, Statisticians, Biostatisticians, Quantitative Analysts, and Economists. Data Scientists represent an offspring from more traditional analyst roles, and leverage advanced analytical skills – such as machine learning and natural language processing – to derive insights from large, unstructured datasets that would be difficult or impossible to analyze using conventional tools and methods.

The remarkable growth in Data Scientist job postings (94% growth, 2010 to 2014) is a leading indicator of the growing importance of Big Data. The position Data Scientist (as compared to the broader occupational category of Data Scientist) has experienced tremendous growth (fivefold from 2010 to 2014). Other positions in this category have also registered strong growth during this same period. This recent surge in demand has challenged employers attempting to source such talent. Most occupations (Economist being the only exception) had average posting durations longer than the national average of 33 days. Two occupational categories, Data Scientists and Biostatisticians had particularly long average posting durations, at 38 days and 50 days, respectively

	Total Postings	Growth (2010 to 2014)	Average Salary	Average Days Open
Data Scientist	22,644	94%	\$92,044	38 Days
Biostatistician	3,515	39%	\$79,768	50 Days
Data Scientist	9,538	>100%	\$110,592	38 Days
Economist	2,110	28%	\$91,927	32 Days
Quantitative Analyst	2,649	45%	\$112,867	34 Days
Statistician	4,832	16%	\$75,452	38 Days

Data Scientists are often required to have advanced degrees. In 2014, 25% of the postings in this occupational category requested at least a masters' degree; 55% request a Ph.D.. This creates a conundrum for employers because the advanced educational requirements suggest that it will take years for this talent pipeline to develop. The difficulty employers are having in filling these roles is unlikely to abate anytime soon.

	A.S.	B.S.	M.S.	Ph.D.
Data Scientist	--	4,755 (21%)	5,661 (25%)	12,454 (55%)
Biostatistician	--	351 (10%)	808 (23%)	2,355 (67%)
Data Scientist	--	1,907 (20%)	1,812 (19%)	5,818 (61%)
Economist	--	654 (31%)	527 (25%)	928 (44%)
Quantitative Analyst	--	503 (19%)	741 (28%)	1,403 (53%)
Statistician	--	1,304 (27%)	1,787 (37%)	1,739 (36%)

In 2014, 29% of the job postings in this category were open to entry-level jobseekers. This varied by occupation, however, with 47% of Economist postings open to entry-level jobseekers, and 20% of Data Scientist postings open to entry-level workers.

	0 to 2 years	3 to 8 years	9+ years
Data Scientist	6,566 (29%)	14,039 (71%)	2,943 (13%)
Biostatistician	913 (26%)	2,249 (64%)	351 (10%)
Data Scientist	1,907 (20%)	6,676 (70%)	953 (10%)
Economist	991 (47%)	886 (42%)	221 (10%)
Quantitative Analyst	927 (35%)	1,642 (62%)	105 (4%)
Statistician	1,739 (36%)	2,657 (55%)	386 (8%)

Compared to other data analysts, Data Scientists make greater use of advanced mathematical and programmatic methods such as machine learning, predictive models and clustering, along with analytic tools such as SAS, R, and Python, remain important. Similarly, Data Scientists are expected to be fluent in the use of Big Data technologies such as Hadoop, PIG, and NoSQL, which do not yet see widespread use amongst the other categories of data analysts.

Top Data Related Specialized Skills

Data Analysis	Data Management
Machine Learning	Relational Databases
Data Mining	Data Warehousing
Predictive Models	Hadoop
Simulation	MapReduce
Clustering	NoSQL
Decision Trees	Mahout
Natural Language Processing	Cassandra
Neural Networks	

Top Non-Data Related Specialized Skills

Domain Specific Skills	Programming Skills	Top Baseline Skills
Epidemiology	SAS	Research
Biostatistics	R	Communication Skills
BioInformatics	Python	Writing
Business Intelligence	JAVA	Organizational Skills
Econometrics	MATLAB	Problem Solving
Business Analysis	PIG	Microsoft Office

Currently, there are few Data Scientist postings calling for certification, with fewer than 5% of postings requesting any certification whatsoever in 2014. The few that did asked for domain-specific certifications such as Chartered Financial Analyst (CFA).

Occupational Category	Percentage	Top Certifications
Biostatistician	< 5%	N/A
Data Scientist	< 5%	N/A
Economist	6%	Chartered Financial Analyst Programming Certification (e.g. Java)
Quantitative Analyst	11%	Chartered Financial Analyst Financial Risk Manager
Statistician	5%	Chartered Financial Analyst Financial Risk Manager

Data Scientists are heavily concentrated in the technological hubs of San Francisco, San Jose, and Boston, as well as the government and defense industry center of Washington, D.C.

Metro Area	Postings
New York	3,094
Washington, D.C.	2,125
San Francisco	1,881
Boston	1,552
Chicago	934
San Jose	846
Seattle	768
Los Angeles	697
Philadelphia	682
Dallas	489

Metro Area	Location Quotient
San Francisco	5.3
San Jose	5.2
Washington, D.C.	4.3
Boston	3.6
Seattle	2.6
New York	2.1
Philadelphia	1.5
Chicago	1.3
Atlanta	1.1
Dallas	0.9

Location Analysis

Among the key locations analyzed, Data Scientist jobs show the strongest demand, and the strongest salaries, in the technology-focused economies of New York, the Bay Area, Washington, D.C., and Boston. In each of these cities, the role of the Data Scientist offers salaries well above the national average of \$92,044, and in New York and the Bay Area they push well into the six figures. The Bay Area and Boston also represent the epicenters of technological innovation related to Big Data, and this is reflected in their above-average growth in number of postings. These roles are remaining open the longest in the Bay Area and Chicago, the latter of which has strong salaries and growth, but likely does not have a fully developed pool of experienced data science workers.

	Total Postings	Growth (2010 to 2014)	Average Salary	Average Days Open	Location Quotient
Nationally	22,644	94%	\$92,044	38 Days	1.0
Bay Area	2,727	188%	\$122,896	46 Days	2.6
Boston	1,552	100%	\$99,655	42 Days	3.6
Chicago	934	99%	\$97,773	57 Days	1.3
Miami	113	33%	\$80,074	39 Days	0.3
New York	3,094	78%	\$115,104	34 Days	2.1
Southern Ohio	270	88%	\$81,866	29 Days	0.5
Washington, D.C.	2,125	58%	\$106,206	36 Days	4.4

REGIONAL ANALYSIS

The following tables provide a regional view of the aforementioned occupational groups.

Bay Area

	Total Postings (2014)	Growth (2010-2014)	Average Salary	Average Days Open
Data Engineer	12,572	[-5%]	\$98,228	39 Days
Domain Specialist	16,034	56%	\$86,703	36 Days
Data Analyst	8,791	[-11%]	\$89,687	37 Days
Data Scientist	2,727	188%	\$122,896	46 Days

Boston

	Total Postings (2014)	Growth (2010-2014)	Average Salary	Average Days Open
Data Engineer	7,290	20%	\$97,544	37 Days
Domain Specialist	10,238	27%	\$82,190	37 Days
Data Analyst	4,220	[-19%]	\$85,175	42 Days
Data Scientist	1,552	100%	\$99,655	42 Days

Chicago

	Total Postings (2014)	Growth (2010-2014)	Average Salary	Average Days Open
Data Engineer	10,959	13%	\$94,420	36 Days
Domain Specialist	17,591	78%	\$77,011	37 Days
Data Analyst	6,994	[-22%]	\$86,218	40 Days
Data Scientist	934	99%	\$97,773	57 Days

Miami

	Total Postings (2014)	Growth (2010-2014)	Average Salary	Average Days Open
Data Engineer	3,043	24%	\$83,815	37 Days
Domain Specialist	4,751	105%	\$69,636	35 Days
Data Analyst	1,797	0%	\$77,613	38 Days
Data Scientist	113	33%	\$80,074	39 Days

New York

	Total Postings (2014)	Growth (2010-2014)	Average Salary	Average Days Open
Data Engineer	18,719	[-18%]	\$103,061	28 Days
Domain Specialist	35,446	24%	\$87,165	29 Days
Data Analyst	12,026	[-39%]	\$84,494	30 Days
Data Scientist	3,094	78%	\$115,104	34 Days

Southern Ohio

	Total Postings (2014)	Growth (2010-2014)	Average Salary	Average Days Open
Data Engineer	4,855	9%	\$81,533	27 Days
Domain Specialist	7,080	65%	\$65,798	25 Days
Data Analyst	2,727	[-27%]	\$73,186	28 Days
Data Scientist	270	88%	\$81,866	29 Days

Washington, D.C.

	Total Postings (2014)	Growth (2010-2014)	Average Salary	Average Days Open
Data Engineer	13,086	[-6%]	\$93,967	35 Days
Domain Specialist	19,503	16%	\$96,891	32 Days
Data Analyst	5,192	[-53%]	\$86,245	34 Days
Data Scientist	2,125	58%	\$106,206	36 Days

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About BATEC

www.batec.org

BATEC (Broadening Advanced Technological Education Connections), a National Science Foundation-funded Center of Excellence for Computing and Information Technologies, is dedicated to the complex mission of developing career-focused pathways and practical work experience for motivated, typically underserved high school, community college and university students in urban environments which feature a high demand for skilled labor.

About Burning Glass

www.burning-glass.com

Burning Glass Technologies delivers job market analytics that empower employers, workers, and educators to make data-driven decisions. Burning Glass is reshaping how the job market works, with data that identify the skill gaps that keep job seekers and employers apart and tools that enable both sides to bridge that gap and connect more easily. Based in Boston, Burning Glass is playing a growing role in informing the global conversation on education and the workforce, and in creating a job market that works for everyone.

About NSF

www.nsf.gov

The National Science Foundation's (NSF) Advanced Technological Education (ATE) program seeks to improve the education of technicians who work in advanced industries that are important to the nation's economy and security. The program involves partnerships between academic institutions and industry to promote improvement in the education of science and engineering technicians at the undergraduate and secondary school levels. The ATE program supports curriculum development; professional development of college faculty and secondary school teachers; career pathways to two-year colleges from secondary schools and from two-year colleges to four-year institutions; and other activities.



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