

What's New & Changing

# FORESIGHTS INTO NE OHIO'S IT TALENT NEEDS

# EMERGING DEMAND FOR SKILLS NEEDED TO WORK WITH IOT PROJECTS

Nationally as well as locally, few ads include IoT in Job Title. Instead, we search for ads that include one or more of the key skills or competencies needed to work on IoT projects. This indicates extent to which employers seek to hire workers **Capable** of working with IoT whenever that need arises.

## TOP SEVEN COMPETENCIES LINKED WITH IOT

- Apache Hadoop; Hbase; Real Time Streaming Protocol; Real-Time Operating System (RTOS); Amazon Elastic Compute Cloud (EC2); Embedded Systems; or Machine Learning are the seven skills used to search for ads.
- “Hadoop is a data storage and processing technology and machine learning is a data analysis technology. Both are like two sides of a coin.” **These two combined account for most of the ads!**
- <sup>!</sup> <https://www.quora.com/What-is-the-difference-between-Hadoop-and-machine-learning>

## NE Ohio Occupations with Most Ads for Top Skills Needed to Work in IoT, During 2017

**Apache Hadoop; Hbase; Real Time Streaming Protocol; Real-Time Operating System (RTOS); Amazon Elastic Compute Cloud (EC2); Embedded Systems; or Machine Learning**

BGTOCC Code	BGTOCC	Job Postings	
		#	%
	<b>Top 10 Occupations</b>		
15113100	<b>Software Developer / Engineer</b>	209	29.9%
<b>15111191</b>	<b>Data Scientist</b>	<b>71</b>	<b>10.2%</b>
15114191	Data Engineer	32	4.6%
15119991	Data / Data Mining Analyst	29	4.2%
<b>15113300</b>	<b>Computer Systems Engineer / Architect</b>	<b>27</b>	<b>3.9%</b>
15114100	Database Administrator	24	3.4%
<b>15119906</b>	<b>Database Architects</b>	<b>24</b>	<b>3.4%</b>
15119902	<b>Network Engineer / Architect</b>	<b>21</b>	3.0%
15119901	<b>Software QA Engineer / Tester</b>	<b>18</b>	2.6%
15119994	Business Intelligence Architect / Developer	16	2.3%
	<b>Next Top 10 Occupations</b>		
15204100	<b>Statistician</b>	14	2.0%
13111100	<b>Business / Management Analyst</b>	13	1.9%
15119907	Data Warehousing Specialist	12	1.7%
17206100	<b>Hardware Engineer</b>	12	1.7%
15114200	Network / Systems Administrator	11	1.6%
15119995	IT Project Manager	9	1.3%
11202192	<b>Product Manager</b>	9	1.3%
15119993	Business Intelligence Analyst	8	1.1%
33302106	<b>Security / Defense Intelligence Analyst</b>	8	1.1%
15119900	Technology Consultant	8	1.1%
<b>Source: Labor Insight Jobs (Burning Glass Technologies)</b>		<b>575</b>	<b>82.4%</b>

# A CLUSTER OF ADS TRANSCENDS OCCUPATIONS

- Searching literature on skills needed to work on IoT projects and running several iterations of queries to isolate ads listings varying combinations of these skills resulted in the final information about Occupations most often listed these skills.
- Not all of these ads IoT projects/ applications employers currently have. However, whatever their job assignments are at point of hire, these workers will have knowledge of and competency in these critical skills to work in IoT.
- As is the case for all IT ads, ads for developers dominates this list at 30%. Data Scientist and Data Engineer had the 2<sup>nd</sup> and 3<sup>rd</sup> most ads (as well as others highlighted). This suggests these workers need to possess advanced skills in software design, data analytics and networking--all critical to working with IoT.

# TOP JOB TITLES

## NE Ohio Job Titles in Ads for Top Skills Needed to Work in IoT, During 2017

Title	Job Postings	
	#	%
Software Development Engineer	95	11.8%
Software Developer	27	3.3%
Developer	24	3.0%
Data Scientist	22	2.7%
Systems Engineer	18	2.2%
Data Analyst	17	2.1%
Java Developer	15	1.9%
Hardware Engineer	13	1.6%
Data Architect	12	1.5%
Mainframe Programmer	12	1.5%
Business Intelligence Developer	9	1.1%
Firmware Engineer	9	1.1%
Hadoop Administrator	9	1.1%
Solutions Architect	9	1.1%
Intern	8	1.0%
<b>Source: Labor Insight Jobs (Burning Glass Technologies)</b>	<b>37.1%</b>	

- Developer is the noun that appears in the largest number of job titles in ads, a total of 21% of all titles.
- Data Scientist, Architect, Engineer or Analyst appear the second most often.

# INFORMATION TECHNOLOGY & ANALYSIS DOMINATE THE SKILLS IN ADS

NE Ohio: Skills Appearing Most in Ads Listing Top IoT Skills

	Job Postings			Job Postings	
	#	%		#	%
<b>ANALYSIS</b>			<b>INFORMATION TECHNOLOGY</b>		
Machine Learning	253	35.1%	Big Data	404	56.1%
Data Science	176	24.4%	SQL	298	41.4%
Statistical Software	142	19.7%	Software Development Principles	295	41.0%
Mathematics	119	16.5%	Scripting Languages	288	40.0%
Business Intelligence	101	14.0%	Operating Systems	235	32.6%
Data Analysis	100	13.9%	Java	217	30.1%
Visualization	98	13.6%	Data Warehousing	199	27.6%
Statistics	73	10.1%	Programming Principles	187	26.0%
<b>BUSINESS</b>			C and C++	185	25.7%
Project Management	141	19.6%	System Design and Implementation	177	24.6%
Business Process and Analysis	136	18.9%	Data Management	142	19.7%
<b>CUSTOMER AND CLIENT SUPPORT</b>			Extraction, Transformation, and Loading (ETL)	132	18.3%
Basic Customer Service	99	13.8%	Microsoft Development Tools	130	18.1%
<b>DESIGN</b>			JavaScript and jQuery	112	15.6%
User Interface and User Experience (UI/UX) Design	51	7.1%	Database Administration	111	15.4%
<b>ENGINEERING</b>			Microsoft Office and Productivity Tools	106	14.7%
Electrical and Computer Engineering	202	28.1%	Technical Support	105	14.6%
			Enterprise Resource Planning (ERP)	80	11.1%
			Software Quality Assurance	73	10.1%
			<b>MANUFACTURING AND PRODUCTION</b>		
			Product Development	105	14.6%

Source: Labor Insight Jobs (Burning Glass Technologies)

## NE Ohio: Faster Growing Demand for Skills Often are Ones Needed in IoT

SKILL	POSTINGS REQUESTED	GROWTH
<b>Machine Learning</b>	260	Much Faster
<b>Data Science</b>	159	Much Faster
<b>Apache Hive</b>	108	Much Faster
Tableau	73	Much Faster
Node.js	43	Much Faster
AngularJS	41	Much Faster
Sqoop	40	Much Faster
Random Forests	21	Much Faster
Risk Management Framework	17	Much Faster
<b>Apache Hadoop</b>	385	Faster
<b>Python</b>	273	Faster
<b>Big Data</b>	255	Faster
<b>R</b>	104	Faster
NoSQL	65	Faster
PIG	57	Faster
Predictive Analytics	45	Faster
<b>Data Visualization</b>	44	Faster
Natural Language Processing	44	Faster
Git	42	Faster
MongoDB	35	Faster
Neural Networks	33	Faster
Apache Webserver	32	Faster
Cassandra	32	Faster
SAP	30	Faster
Robotics	29	Faster
Scrum	27	Faster
Social Media	24	Faster
PostgreSQL	23	Faster
Troubleshooting Technical Issues	21	Faster
Software as a Service (SaaS)	20	Faster
Prospective Clients	18	Faster
<b>Source: Labor Insight Jobs (Burning Glass Technologies)</b>		

## SKILLS NEEDED FOR IOT AMONG FASTER GROWING IN DEMAND

Burning Glass has developed a methodology for projecting the future demand of skills in the job market. We provide projections for individual skills and clusters of related skills. These projections combine econometric time series models with machine learning approaches to predict the growth in job posting demand for skills. This report shows a 2 year projected change in demand comparing September – November in 2016 to the equivalent periods in 2018. The Growth Category indicators (Much Faster/ Faster/ Similar/Slower/ Much Slower) are relative to other skills in the same skill cluster, or relative to other skill clusters in the same cluster family.

- Many of these (some highlighted in bold) are among those used to search for ads for IoT.

# INDUSTRY WITH MOST ADS

## NE Ohio Industries with Most Ads for Top Skills Needed to Work in IoT, During 2017

Apache Hadoop; Hbase; Real Time Streaming Protocol; **Real-Time Operating System (RTOS)**;  
Amazon Elastic Compute Cloud (EC2); **Embedded Systems**; or **Machine Learning**

NAICS Code	Industry	Job Postings	
		#	%
54	Professional, Scientific, and Technical Services (54)	281	50.6%
52	Finance and Insurance (52)	103	18.6%
31-33	Manufacturing (31-33)	74	13.3%
51	Information (51)	21	3.8%
56	Administrative and Support and Waste Management and Remediation Services (56)	18	3.2%
61	Educational Services (61)	13	2.3%
62	Health Care and Social Assistance (62)	13	2.3%
	Sub total	523	94.2%

Source: Labor Insight Jobs (Burning Glass Technologies)

- Half of these ads are from employers in Professional, Scientific, & Technical Services. This sector is home to the top management and technology consulting.
- Finance and Insurance and Manufacturing account for 31% of them.



## NE Ohio Employers with Most Ads for Top Skills Needed to Work in IoT

**Apache Hadoop; Hbase; Real Time Streaming Protocol; Real-Time Operating System (RTOS); Amazon Elastic Compute Cloud (EC2); Embedded Systems; or Machine Learning**

Employer	Job Postings	
	#	%
Accenture	107	20.5%
Rockwell Automation Incorporated	34	6.5%
The PNC Financial Services Group, Inc.	22	4.2%
Deloitte	20	3.8%
Progressive	17	3.3%
Keycorp	14	2.7%
Oracle	12	2.3%
Progressive Insurance	12	2.3%
Bendix Commercial Vehicle Systems Llc	11	2.1%
Case Western Reserve University	11	2.1%
Diebold	9	1.7%
General Electric Company	9	1.7%
Precision Systems	9	1.7%
Fifth Third Bank	7	1.3%
Goodyear	7	1.3%
IBM	7	1.3%
Bendix	6	1.1%
Federal Reserve Bank of Cleveland	5	1.0%
Parker Hannifin	5	1.0%
<b>Subtotal</b>	<b>324</b>	<b>62.0%</b>

Source: Labor Insight Jobs (Burning Glass Technologies)

## MAJOR EMPLOYERS FROM THESE SECTORS DOMINATE DEMAND

- Accenture tops the list with 20% of all ads.
- These firms had the most posting during 2017 and, combined, provided 62% of the job opportunities.
- Generally, these are large business enterprises.
- Nationally, Amazon, Deloitte, and IBM produce most ads for IoT Jobs.

# EMPLOYERS WANT EXPERIENCED WORKERS

- The majority of employers include experience requirements for these ads—71% .
- Employers want at least 3 years of experience in 82% of these ads.
- 54% have openings for mid-level jobs requiring 3 to 5 years of experience. More senior positions are posted and account for 27%.

Software Developer Ads Listing IoT Skills			All Ads Listing IoT Skills	
Experience Level	Job Postings			
	%	#	#	%
9+ years	5.56%	8	40	7.6%
6 to 8 years	10.42%	15	102	19.5%
3 to 5 years	61.81%	89	285	54.4%
0 to 2 years	22.22%	32	97	18.5%
Total Ads	209	144	216	29.2%
Not Listed	0.31%	65	<b>740</b>	

**Source: Labor Insight Jobs (Burning Glass Technologies)**

# EMPLOYERS WITH THESE JOBS WANT A BACHELOR'S DEGREE MINIMUM

## NE Ohio Advertised Minimum or Preferred Education for Top Skills Needed to Work in IoT, During 2017

Education	Job Postings	
	#	%
High school or vocational training	12	2.0%
Associate's degree	11	1.9%
Bachelor's degree	524	88.2%
Master's degree	175	29.5%
Doctoral degree	70	11.8%
Total Ads Listing Education	594	100.0%
Not Specified	213	26.4%

Source: Labor Insight Jobs (Burning Glass Technologies)

- 88% of all ads require or prefer a Bachelors degree
- 30% want or would prefer a Master's degree
- These up-credentialing of these positions suggest that employers are searching for highly skilled workers based on education completed as well as prior job experience.

## EMPLOYERS MORE LIKELY TO LIST MAJORS FOR EDUCATION & THE LIST IS DIVERSE

NE Ohio College Majors Listed in Ads for Top Skills Needed to Work in IoT, During 2017

Programs of study	Job Postings	
	#	%
Computer Science	297	67.2%
Electrical And Electronics Engineering	118	26.7%
Engineering, General	111	25.1%
Computer Engineering	97	21.9%
Statistics, General	74	16.7%
Mathematics, General	45	10.2%
Business Administration And Management, General	41	9.3%
Economics, General	37	8.4%
Finance, General	26	5.9%
Information Technology	26	5.9%
Operations Research	25	5.7%
Econometrics And Quantitative Economics	21	4.8%
<b>Not Major Listed</b>	<b>365</b>	<b>45.2%</b>

Source: Labor Insight Jobs (Burning Glass Technologies)

- For these ads, employers list college majors more often than they do generally when posting IT jobs. 55% of these ads list one or more majors preferred.
- Computer Science, as always, tops the list, favored by 67% of ads for these specific positions.
- What is more interesting is the others most often mentioned are engineering majors.
- Information Technology, as a major is mentioned only in 6% of ads.

# CERTIFICATIONS EMPLOYERS VALUE

## NE Ohio College Majors Listed in Ads for Top Skills Needed to Work in IoT, During 2017

Certifications	Job Posting
IT Infrastructure Library (ITIL) Certification	11
Six Sigma Green Belt Certification	7
Certified Energy Manager	5
Project Management Certification	5
Certified Novell Administrator	4
Licensed Professional Engineer	4
Certified ScrumMaster (CSM)	3
Cisco Certified Network Associate (CCNA)	3
Security Clearance	3
Six Sigma Certification	3
American Board for Engineering and Technology (ABET) Accredited	2
Certified A+ Technician	2
Certified Scrum Developer (CSD)	2
<b>Source: Labor Insight Jobs (Burning Glass Technologies)</b>	

- Even for this very specific set of IT ads, employers do not require industry/vendor certifications as a condition to hire.
- This list is useful, however, as indicative of what employers value as specific areas of knowledge or mastery once on the job.

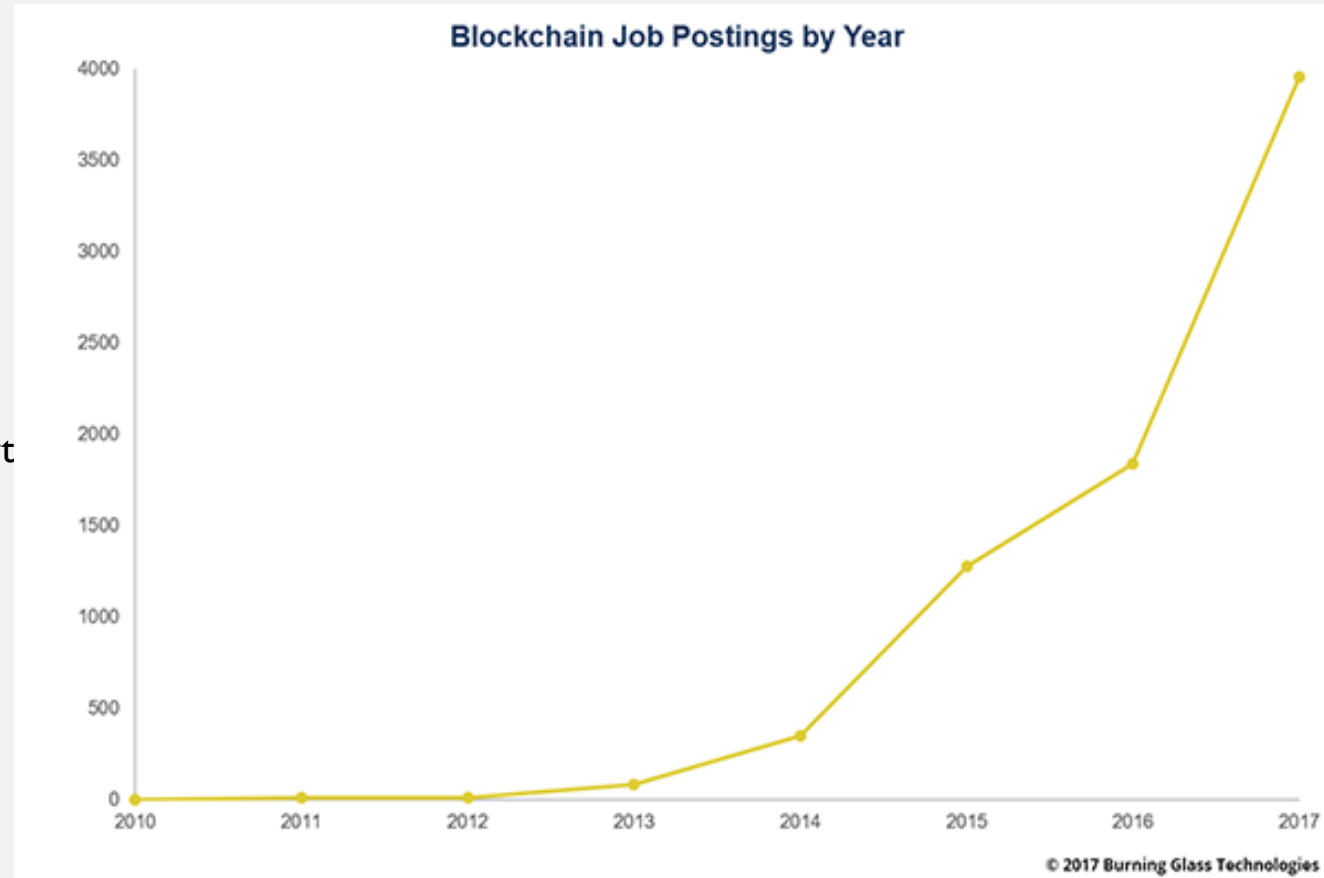
## SUMMING UP

- Across NE Ohio there are only a few job postings with a clear connection to a firm's involvement with IoT; certainly in terms of doing these projects in-house. During 2017 only 33 ads had IoT in the job title.
- What is more important, though, is that employers increasingly are revealing demand with advanced programming skills such as Adobe Hadoop and Machine Learning that are important in other applications but are critical to IoT at some future time.
- Tracking trends and gaining insight into the future of IT work is best done by tracking knowledge and skills that emerge over time and found in job ads which is the 'beef' or proof that employers are changing jobs and how they source labor.
- The single most important observation about technology, especially disruptive sources, is that skills transcend occupations., and technologies are combining in variety of ways.
- The emerging interest in Blockchain technology is being seen as a way to expand opportunities for IoT.

# EMERGENCE OF BLOCKCHAIN TECHNOLOGY

# BLOCKCHAINS: NEW DISRUPTIVE TECHNOLOGY?

- Nationally, **blockchain developers** are now the most sought-after commodity in the job marketplace, with the number of job openings requiring the skill doubling since the beginning of the year. As the demand for experts in the field exceeds the supply, big companies are looking to implement the new transaction technology offer salaries well above \$100k per year.<sup>1</sup>
- The graph displays the exponential growth of ads in the last two years, according to Burning Glass researchers.
- Some of the largest firms in the nation are moving rapidly to start new applications for Blockchains.
- Blockchain expertise is envisioned as impacting demand for developers, project managers, quality engineers, web designers, etc.
- Nationally, IBM and Accenture had the postings for job wanting blockchain technology as a skill set during last 365 days.
- <sup>1</sup> <https://btcmanager.com/demand-blockchain-skills-exceeding-supply-companies-hiring-time/> Aug. 2018





# EXAMPLES OF BLOCKCHAIN APPLICATIONS

Simply put, Blockchain technology is a new way of storing data in a distributed ledger that allows multiple stakeholders to confidently and securely share access to the same information. Two possible applications are:

## Shared Machinery

- A blockchain system could enable the collaborative ownership and usage of machinery like 3d printers, laser cutters, and woodworking tools that populate maker spaces worldwide. Smart contracts could determine whether the individual had the appropriate reputation to use the laser cutter to craft their embroidery pattern on a leather bomber jacket. The rules of the machine would depend upon the owner's agreements between themselves, and the current status of those agreements.

## Community Solar

- In Brooklyn, NY there is [an ongoing experiment for a community](#) to [use a blockchain](#) to record the production of solar energy and enable the purchase of excess renewable energy credits. The device itself has an identity and builds a reputation through its history of records and exchange. People can aggregate purchasing power easier, share the burden of maintenance, and trust that devices are recording actual solar production.

## LABOR MARKET DEMAND IS STILL IN EARLY STAGES

“Beyond cryptocurrencies, blockchain will supercharge **artificial intelligence** and **IoT** to make everything from supply chains to digital identity management smarter and more secure.”, according to Accenture.

“It might be a good idea for employers to start figuring out where they will find blockchain talent, even as they are still considering how the technology will change their business”, according to a recent blog by Burning Glass researchers.

Quantifying demand: a combination of two measures were used to search for inclusion of blockchain technology into real-time labor market demand:

- Search for ads that include references to blockchain technology any where in the text of the ad.
- Alternatively, search for ads where the listed job title includes the word ‘Blockchain’.

# NATION: OVER 11,000 ADS REFERENCE BLOCKCHAIN TECHNOLOGY IN LAST 365 DAYS

Nation Specialized Skills Most Often Appearing in Ads Listing Blockchain Technology During Last 365 Days			
Skills	Job Postings	Skills	Job Postings
Blockchain	100.0%	<i>DevOps</i>	10.6%
Java	25.8%	<i>Bitcoin</i>	10.2%
Python	20.4%	Linux	9.6%
JavaScript	20.1%	Cryptography	9.4%
Software Engineering	17.2%	Node.js	9.2%
Software Development	15.8%	NoSQL	8.0%
C++	14.0%	Product Management	8.0%
<i>Artificial Intelligence</i>	12.6%	Business Development	7.7%
<i>Machine Learning</i>	12.4%	Big Data	6.8%
<i>Internet of Things (IoT)</i>	12.3%	Docker Software	6.8%
SQL	12.3%	Social Media	6.5%
Project Management	12.0%	Product Development	6.5%
		<i>Scrum</i>	6.4%
Source: Labor Insight Jobs (Burning Glass Technologies)			

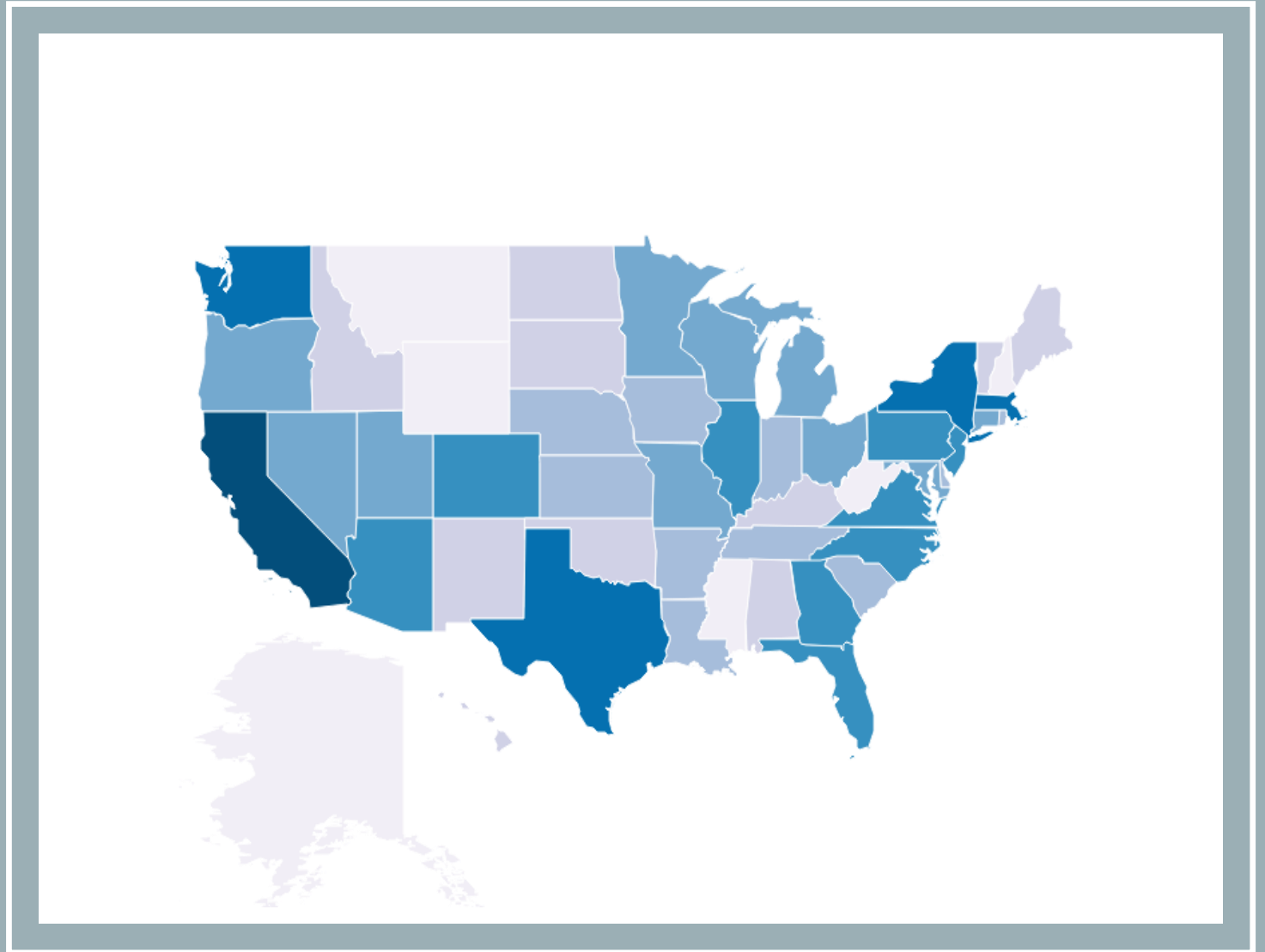
- Over 11,000 ads referenced Blockchain in ad, while 2,705 included Blockchain in job title for the ad.
- Top skills in addition to Blockchain are not at all the same as the list of specialized skills that appear in most ads for IT workers in general.
- The italicized ones are directly or indirectly related to working on projects where blockchain technology is now emerging—bitcoin, IoT and AI.
- These skills are linked with automation and working in teams on complex applications.
- IBM and Accenture are the top firms nationally posted these ads.

CURRENTLY, OHIO  
IS MUCH BELOW  
AVERAGE IN TERMS  
OF ADS FOR  
BLOCKCHAIN

Ohio ranks 17<sup>th</sup> among  
all states in terms of ads  
per 10,000 persons  
employed at .28.

Darker shading means  
more demand.

Source is Burning Glass



## NATION: TOP EMPLOYERS & POSITIONS POSTED

As of September 2018, these firms posted ads for Blockchain technology within the previous 12 months.

The nature of the job posted, based on title vary greatly among employers.

While competing for the skill set, they are not competing with each other for the same workers.

Top Employers in Nation and top Positions Posted for Blockchain Technology, Last 12 Months			
EMPLOYER	JOB POSTINGS IN THE LAST 12 MONTHS	EMPLOYER	JOB POSTINGS IN THE LAST 12 MONTHS
<b>IBM</b>	<b>761</b>	<b>American Express</b>	<b>111</b>
Intern	132	Vice President, Finance, Technology	53
Financial Consultant	39	Director of Engineering	51
Software Architect	37	Information Security Specialist	2
Research Intern, Artificial Intelligence	36	Global Product Owner, Infrastructure, Services	1
Product Marketing Manager	34	Information Security Manager	1
<b>Accenture</b>	<b>665</b>	<b>JP Morgan Chase Company</b>	<b>101</b>
Senior Advisory Technician/Manager	56	Treasury Manager	8
Corporate Strategy Manager	53	Product Designer	6
Supply Chain Manager	41	Software Development Engineer	6
Technology Consultant	37	Product Manager/Vice President	5
Technology Manager	35	Community Manager	4
<b>Consensus Corporation</b>	<b>260</b>	<b>Deloitte</b>	<b>100</b>
Software Development Engineer	15	Senior Strategy Consultant	18
Product Designer	14	Security Manager	17
Product Manager	7	Chief Financial Officer	12
Intern	6	Marketing Manager	8
Quality Assurance Engineer	6	Finance Operations Manager	7
<b>Citi</b>	<b>114</b>	<b>Intelletec Llc</b>	<b>94</b>
Cyber Risk Specialist	79	Senior Engineer	13
Compliance Officer	3	Software Development Engineer	9
Director, Legal, Delivery	2	Java Engineer	7
Global Digital Strategy Svp	2	Engineer	5
Global Digital Strategy Vice President	2	Lead Android Engineer	4

Source: Labor Insight Jobs (Burning Glass Technologies)

## Nation Top Occupations Listing Blockchain Technology and Top Skills for Each Occupation During last 365 Days

Occupation	Job Postings			Occupation	Job Postings		
	Total Blockchain Ads	% of Total Ads Occupation	% of All Blockchain Ads		Total Blockchain Ads	% of Total Ads Occupation	% of All Blockchain Ads
<b>Software Developers, Applications</b>	<b>2,506</b>		<b>23.9%</b>	<b>Computer Systems Engineers/Architects</b>	<b>549</b>		<b>5.2%</b>
Blockchain	2,506	100.0%		Blockchain	549	100.0%	
Java	1,358	54.2%		Java	206	37.5%	
Software Engineering	1,079	43.1%		Linux	170	31.0%	
Python	898	35.8%		Machine Learning	130	23.7%	
JavaScript	862	34.4%		DevOps	123	22.4%	
Software Development	705	28.1%		JavaScript	113	20.6%	
C++	665	26.5%		Python	103	18.8%	
SQL	636	25.4%		Internet of Things (IoT)	100	18.2%	
Linux	513	20.5%		Cryptography	97	17.7%	
Node.js	455	18.2%		C++	91	16.6%	
<b>Marketing Managers</b>	<b>568</b>		<b>5.4%</b>	<b>Web Developers</b>	<b>549</b>		<b>5.2%</b>
Blockchain	568	100.0%		Blockchain	549	100.0%	
Product Management	389	68.5%		JavaScript	346	63.0%	
Project Management	201	35.4%		AngularJS	132	24.0%	
Product Development	160	28.2%		Front-end Development	123	22.4%	
Product Sales	153	26.9%		Java	118	21.5%	
Scrum	128	22.5%		Node.js	113	20.6%	
Social Media	109	19.2%		Python	113	20.6%	
Artificial Intelligence	104	18.3%		Web Development	112	20.4%	
Business Analysis	103	18.1%		HTML5	104	18.9%	
User Acceptance Testing (UAT)	100	17.6%		Web Application Development	96	17.5%	
<b>Computer Systems Analysts</b>	<b>478</b>		<b>4.6%</b>	<b>Information Security Analysts</b>	<b>315</b>		<b>3.0%</b>
Blockchain	478	100.0%		Blockchain	315	100.0%	
JavaScript	167	34.9%		Cryptography	207	65.7%	
Java	163	34.1%		Information Security	172	54.6%	
Python	160	33.5%		Information Systems	136	43.2%	
C++	157	32.8%		Machine Learning	129	41.0%	
Bitcoin	127	26.6%		Internet of Things (IoT)	125	39.7%	
NoSQL	80	16.7%		Risk Assessment	123	39.0%	
Cryptography	61	12.8%		NIST Cybersecurity Framework	111	35.2%	
Copying	60	12.6%		Risk Management	102	32.4%	
Software Development	60	12.6%		Conflict Management	100	31.7%	

Source: Labor Insight Jobs (Burning Glass Technologies)

# NATION: EMERGENCE OF BLOCKCHAIN DEMAND

- These are the top six occupations with ads seeking Blockchain Technology from applicants.
- All but Marketing Managers are IT positions.
- These blockchain ads differ from all ads for each occupation, and as of yet, are only a small fraction of total demand for each.
- The top skills for each occupation differ across occupations, and in each case these skills are associated with postings seeking developers or analysts who need to know and have some level competency working with blockchains.

## Ohio Top Occupations with Postings Listing Blockchain Technology during last 365 Day

Occupation Title	Description	Job Postings
<b>Software Developer / Engineer</b>	Designs or improves computer software. Oversees the entire software development process. Analyzes customer or user needs, designs programs, writes code or instructs computer programmers, tests design, and documents programs. May assist with upgrades or maintenance. May specialize in the design of computer applications or computer systems.	23
<b>Business Intelligence Analyst</b>	Collects and analyzes data that provides an accurate picture of business operations and performance for a company. Completes statistical analysis of current and historic business data, identifies trends and develops projections. Presents data analysis that informs planning and strategic decision making for a company.	6
<b>IT Project Manager</b>	Manages projects for a company in the information technology industry. Projects may include initiatives to create new products or improve or expand technology or systems. Identifies project requirements, develops and manages project budgets and schedules, leads project teams, and manages communications with project stakeholders, including company management and clients.	5
<b>Supply Chain / Logistics Manager</b>	Manages the work involved with moving materials, including raw materials, finished products or data, in a cost effective way. Supervises logistics analysts who gather data on production, storage and transportation costs; looks for ways to streamline production and implement cost savings.	5
<b>UI / UX Designer / Developer</b>	Assist with technology design to make products easier for people to use. Determine user preferences and assess the process that users follow to access product functions; develop and test new design models, and incorporate findings in to improved product design. Research the behavior of internet users and consumers, compile information about the target audience for a site, and develop website layout, design and technology features that improve accessibility and value for users.	5
<b>Computer Systems Engineer / Architect</b>	Creates computer and data communication networks for companies and organizations. Plans and designs layout for a network, determines the hardware needed and placement of computers, servers, cables and routers; determines data storage and system capacity, speed and software needed for a system.	4
<b>Data / Data Mining Analyst</b>	Develops computer programs to analyze large customer information databases for companies and organizations. Analyzes data to identify patterns and provide information relevant to a particular business, industry or field; analysis may be used for marketing, or to detect fraud in financial transactions, or for research. Develops computer programs to protect confidential customer information.	4
<b>Network Engineer / Architect</b>	Designs and builds computer network systems, including software and hardware. Runs program and system tests, solves technical problems and maintains the network system. Designs and analyzes computer network models.	4
<b>Auditor</b>	Examines records to determine the financial status of a company or organization. Inspects accounts and account books, prepares reports on the accuracy of internal financial records and accounting procedures.	3
<b>Business / Management Analyst</b>	Provides strategic management consulting to companies and businesses. Advises on ways to improve operations, increase efficiency, reduce costs and increase revenues; may recommend systems or organizational change. May specialize in an area of business practice or a specific industry; may also specialize in consulting with government agencies.	3
<b>Business Continuity Planner / Analyst</b>	Researches company operations and develops strategies for companies to implement in the event of a disaster or significant unexpected problems affecting operations.	3
<b>Cyber / Information Security Engineer / Analyst</b>	Designs systems that protect the security of large databases, including databases with customer information and patient files. Examines client computer systems, identifies weak points in security, develops and implements new systems, monitors and responds to security issues.	3

# OHIO TOP OCCUPATIONS FOR BLOCKCHAIN

- Software developers top the list, not surprising.
- The remaining occupations have few posting and are among the more newer occupations in IT.

Ohio Ads with Blockchain in Job Title, Last 365 Days			
Title	Employer	Location	
<b>NE Ohio</b>			
Financial Services Emerging Technician Advisor Senior Manager Rpa, Blockchain, Ai, Cloud, Security, Devops	Accenture	Cleveland, OH	
Blockchain Architect Manager	Accenture	Cleveland, OH	
Technician Advisory Manager Blockchain	Accenture	Cleveland, OH	
Business Analyst, Blockchain/Ai/Legal Analytics Firm	N/A	Cleveland, OH	
Blockchain Architect - Golang, Java, Blockchain	N/A	Cleveland, OH	
Blockchain Architect	N/A	Cleveland, OH	
Blockchain Developer - Node Js	N/A	Westlake, OH	
Blockchain Developer - Node Js	N/A	Westlake, OH	
Blockchain Developer	N/A	Westlake, OH	
Blockchain Developer	N/A	Westlake, OH	
Blockchain Developer - Node Js	N/A	Westlake, OH	
Fpga Firmware Developer - Blockchain	N/A	North Canton, OH	
<b>SW Ohio</b>			
Emerging Technology Advisor Rpa, Ai, Blockchain, Cloud Manager	Accenture	Cincinnati, OH	
Financial Services Emerging Technician Advisor Senior Manager Rpa, Blockchain, Ai, Cloud, Security, Devops	Accenture	Cincinnati, OH	
Emerging Technology Advisor Financial Services Consultant Rpa, Blockchain, Ai, Cloud	Accenture	Cincinnati, OH	
Emerging Technology Advisor Rpa, Ai, Blockchain, Cloud Manager	Accenture	Cincinnati, OH	
Technician Advisory Manager Blockchain	Accenture	Cincinnati, OH	
Blockchain Developer	Corporate Biz Solutions Inc	Cincinnati, OH	
Blockchain Developer	NTT Data	Cincinnati, OH	
Blockchain Solutions Architect	NTT Data	Cincinnati, OH	
Blockchain Developer	NTT Data	Cincinnati, OH	
Blockchain Solutions Architect	NTT Data	Cincinnati, OH	
Blockchain Developer	N/A	Dayton, OH	
<b>Central Ohio</b>			
Emerging Technology Advisor Rpa, Ai, Blockchain, Cloud Manager	Accenture	Columbus, OH	
Emerging Technology Advisor Rpa, Ai, Blockchain, Cloud Manager	Accenture	Columbus, OH	
Blockchain Architect Manager	Accenture	Columbus, OH	
College Graduates - Lead Blockchain Engineer	Crosbynyc	Columbus, OH	
Senior Consultant - Blockchain Developer - Financial Markets	IBM	Columbus, OH	
Blockchain And Distributed Ledger Technologies - Architect	IBM	Columbus, OH	
Blockchain Technical Solutions Architect	IBM	Columbus, OH	
Blockchain And Distributed Ledger Technologies - Architect	IBM	Columbus, OH	
Senior Consultant - Blockchain Developer - Financial Markets	IBM	Columbus, OH	
<b>NW Ohio</b>			
College Graduates - Lead Blockchain Engineer	N/A	Toledo, OH	

# WHERE ARE THE JOBS IN OHIO?

- For ads with Blockchain in the title, Cincinnati, Cleveland and Columbus had almost all ads during the last 365 Days.
- Accenture and IBM posted most of the ads.



## Ohio Top Skill Sub-Clusters for Ads Seeking Blockchain Technologies Last 365 Days

Skill Clusters	Job Postings	
	#	%
<b>Information Technology</b>		
Software Development Principles	55	41.0%
System Design and Implementation	44	32.8%
Java	43	32.1%
<b>Internet of Things (IoT)</b>	35	26.1%
<b>Artificial Intelligence</b>	33	24.6%
JavaScript and jQuery	32	23.9%
Software Development Methodologies	32	23.9%
Scripting Languages	31	23.1%
SQL Databases and Programming	25	18.7%
<b>Cybersecurity</b>	24	17.9%
Management Information System (MIS)	44	32.8%
Big Data	26	19.4%
IT Management	17	12.7%
Other Programming Languages	17	12.7%
Web Development	16	11.9%
Operating Systems	15	11.2%
C and C++	14	10.4%
Cloud Solutions	14	10.4%
Data Warehousing	13	9.7%
<b>Business</b>		
Business Process and Analysis	23	17.2%
Business Strategy	22	16.4%
Project Management	18	13.4%
Business Management	14	10.4%
<b>Analysis</b>		
<b>Machine Learning</b>	21	15.7%
Data Analysis	17	12.7%
Data Mining	13	9.7%
<b>Source: Labor Insight Jobs (Burning Glass Technologies)</b>		

## OHIO: TOP SKILLS ASSOCIATED WITH BLOCKCHAIN TECHNOLOGY IN ADS

- California the loin-share of ads with an interest in Blockchains.
- Ohio businesses had only 142 of the over 11,000 ads nationally. And only 37 of the 2,705 ads with Blockchain in the job title.
- Since most of these positions were in IT, not surprising that specific technical skills clustered around IT.
- Some skills or areas of expertise appeared much more often in these ads than for all IT ads overall.
- Prominent among them were IoT; AI; Cyber-security; and Machine Learning.

### Comparing NE Ohio and Ohio: Specialized Skills in Ads Seeking Blockchain Technologies Last 365 Days

Skills	Description	NE Ohio	Ohio
Blockchain	Working experience of Blockchain, which is a continuously growing list of records, called blocks, which are linked and secured using cryptography. Each block typically contains a cryptographic hash of the previous block, a timestamp and transaction data. By design, a blockchain is inherently resistant to modification of the data. This makes blockchains potentially suitable for the recording of events, medical records, and other records management activities, such as identity management, transaction processing, documenting provenance, food traceability or voting.	100.0%	100.0%
<i>Cryptography</i>	Experience of the practice of developing techniques for secure communication in the presence of third parties.	33.3%	14.4%
Java		30.8%	29.5%
<i>Copying</i>	Copying is the duplication of information or an artifact based only on an instance of that information or artifact, and not using the process that originally generated it.	28.2%	9.6%
<i>Artificial Intelligence</i>	Artificial intelligence (AI, also machine intelligence, MI) is intelligence demonstrated by machines, in contrast to the natural intelligence (NI) displayed by humans and other animals.	25.6%	22.6%
<i>Node.js</i>	Node.js is an open source, cross-platform runtime environment for developing server-side and networking applications. Node.js applications are written in JavaScript, and can be run within the Node.js runtime on OS X, Microsoft Windows, and Linux.	17.9%	11.6%
<i>DevOps</i>	Working experience of DevOps. DevOps is the combination of cultural philosophies, practices, and tools that increases an organization's ability to deliver applications and services at high velocity: evolving and improving products at a faster pace than organizations using traditional software development and infrastructure management processes.	15.4%	17.8%
Linux	Linux (pronounced LIN-ks or, less frequently, LYN-ks) is a Unix-like computer operating system assembled under the model of free and open-source software development and distribution.	15.4%	8.9%
<i>Machine Learning</i>	Machine learning is the subfield of computer science that, according to Arthur Samuel, gives "computers the ability to learn without being explicitly programmed." Evolved from the study of pattern recognition and computational learning theory in artificial intelligence, machine learning explores the study and construction of algorithms that can learn from and make predictions on data such algorithms overcome following strictly static program instructions by making data-driven predictions or decisions, through building a model from sample inputs.	15.4%	15.1%
Project Management		15.4%	13.7%
.NET	.NET Framework (pronounced dot net) is a software framework developed by Microsoft that runs primarily on Microsoft Windows.	12.8%	4.1%
Customer Service	Experience working with customers to ensure their satisfaction with a product or service.	12.8%	7.5%
<i>Git</i>	Git () is a version control system (VCS) for tracking changes in computer files and coordinating work on those files among multiple people.	12.8%	7.5%
Information Systems	An information system (IS) is an organized system for the collection, organization, storage and communication of information.	12.8%	15.1%
Python	Python is a widely used high-level programming language for general-purpose programming, created by Guido van Rossum and first released in 1991.	12.8%	21.9%
<i>Business Acumen</i>	"Working experience of Business Acumen. Business acumen ("Business savvy" and "business sense" are often used as synonyms) is keenness and quickness in understanding and dealing with a "business situation" (risks and opportunities) in a manner that is likely to lead to a good outcome. Additionally, business acumen has emerged as a vehicle for improving financial performance and leadership development."	10.3%	8.9%
<i>Internet of Things (IoT)</i>	The Internet of things (IoT) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data.	10.3%	26.0%
Public Accounting		10.3%	2.7%
Scrum	Scrum is a framework for managing software development.	10.3%	11.0%
Software Development		10.3%	15.1%
<i>Tokenization</i>	Working experience of Tokenization, which, when applied to data security, is the process of substituting a sensitive data element with a non-sensitive equivalent, referred to as a token, that has no extrinsic or exploitable meaning or value. The tokenization system provides data processing applications with the authority and interfaces to request tokens, or detokenize back to sensitive data.	10.3%	2.7%
Source: Labor Insight Jobs (Burning Glass Technologies)		39 Ads	146 Ads

# COMPARING NE OHIO WITH OHIO

- A deeper dive into specific skills included in ads where blockchain technology is of some importance reveals a number of skills (highlighted in italics and blue shading) that typically do not appear in ads for the occupations identified.
- They are of particular interest to employers in association with their interest in blockchain technology.

# EDUCATION REQUIRED NATION VS OHIO

Employers often cite a required education level of completion, plus a preferred.

While a Bachelor's is required about 80% of the time, significant numbers of employers preferred a Master's degree.

An associate degree is simply not a college credential employers list as acceptable for these openings.

Nation and Ohio Compared: Advertised Education for Ads with Blockchain, Last 365 Days				
Education	Minimum Accepted Plus Preferred		Minimum Accepted	
	Job Postings		Job Postings	
	Nation	Ohio	Nation	Ohio
High school or vocational training	1.9%	10.1%	1.9%	10.3%
Associate's degree	0.8%	--	0.7%	--
Bachelor's degree	88.2%	79.7%	86.8%	79.5%
Master's degree	38.3%	36.7%	7.4%	9.0%
Doctoral degree	10.8%	7.6%	3.2%	1.3%
Ads with Information	5,504	79	5,504	79
No Information	5,674	67	5,674	67
Total Ads	11,178	146	11,178	146

Source: Labor Insight Jobs (Burning Glass Technologies)

- The Ohio data that indicates that one in ten ads will accept a vocational credential is an outlier.
- This might be the result of mis-assignment of these ads to blockchains.

# COMPUTER SCIENCE IS MAJOR MOST PREFERRED BY EMPLOYERS

## NE Ohio College Majors Listed in Ads for Blockchain Technology, Last 365 Days

Programs of study--67% of Ads Listed No Information	Job Postings
Computer Science	64.5%
Business Administration And Management, General	31.1%
Engineering, General	16.5%
Mathematics, General	12.4%
Computer Engineering	8.5%
Finance, General	7.8%
Marketing/Marketing Management, General	4.4%
Electrical And Electronics Engineering	4.1%
Information Technology	3.9%
Management Information Systems, General	3.9%
Economics, General	3.9%
Communication, General	3.2%
Accounting	3.2%
Physics	2.2%
Statistics, General	1.8%
<b>Total Ads Listing Majors</b>	<b>3,700</b>
<b>Source: Labor Insight Jobs (Burning Glass Technologies)</b>	

- Aside from computer science, the list of majors listed in ads focused on blockchain technology are even more wide-ranging than was the case for IoT.
- This may be the result of blockchains applications and their understand is more focused on other professions, not just IT or engineering. Business majors are included more often.

# PRIOR WORK EXPERIENCE REQUIRED

## Nation & Ohio: Prior Work Experience, Last 365 Days

Experience Level	Job Postings	
	Nation	Ohio
9+ years	14.2%	15.6%
6 to 8 years	16.4%	30.2%
3 to 5 years	51.0%	36.5%
0 to 2 years	18.4%	17.7%
Ads with Information	6,908	96
No Information	4,270	50

Source: Labor Insight Jobs (Burning Glass Technologies)

- For all IT ads, about one in five are at entry-level (0 to 2 years prior work experience). Fewer of these jobs posted are at the entry level.
- National, most (51%) are mid-level (3 to 5 years), with 30% demanding even more experience.
- The Ohio postings are even more skewed to senior experienced workers.