# ILINOIS INNOVATION INDEX

## 2018 TALENT INDEX COMPUTER AND DATA SCIENCE LEAD THE WAY

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## **EXECUTIVE SUMMARY**

Illinois is a national leader in STEM talent production. Despite being the sixth-largest state by population, Illinois ranks fifth nationally in STEM degree production, with nearly 25,000 STEM degrees awarded in 2017. Illinois is also the second-leading producer of computer science degrees nationally, which have more than doubled over the past five years.

Despite the perception that many of Illinois computer science graduates leave the state after graduation, new analysis of LinkedIn data shows that recent computer science graduates in Illinois are 4.5 times more likely to work in Chicago than any other city. Despite the pull of recent graduates to Chicago, too many recent computer science graduates are still leaving for large tech companies located outside the state.

Illinois' strength in both computer science and business has led the state to become a leader in data science, an interdisciplinary field that uses scientific methods to gain insight from complex data. Illinois ranks fifth nationally in data-science related degrees, and first in management sciences and quantitative methods degrees—which include modeling, programming, and forecasting techniques to analyze business performance. The state also ranks fourth nationally by employment in data science fields with jobs growing at more than twice the national rate.

International students make up a large share of Illinois' STEM graduates. This is especially true in computer science, where more than half of all degrees in the state are awarded to international students. The state's ability to attract talent globally presents an opportunity to grow the state's highly-skilled workforce. However, the ability of international students to remain in the state depends heavily on restrictive federal immigration policy.

Illinois has the fifth largest STEM workforce in the United States with more than 320,000 STEM professionals. Over the last five years, the STEM workforce has grown more quickly than the national average, adding more than 32,000 jobs since 2013. STEM jobs in Illinois are weighted toward computer occupations, which make up more than half of all STEM jobs in the state and are growing more quickly than the national average. However, crucial software development occupations have seen minimal growth. Instead, growth in computer occupations has come primarily from support occupations, such as computer systems analysts, user support specialists, and systems managers.

Diversity and inclusion in STEM fields remains elusive. The share of women earning STEM degrees in Illinois falls below the national average. However, computer science has been a bright spot. The number of women earning computer science degrees has more than tripled since 2013. By ethnicity, Asian students account for a larger share of STEM degrees, compared with the national average, while African-American students make up a smaller share. Compared with the overall workforce, both African-American and Hispanic professionals are underrepresented in STEM occupations. More must be done to increase inclusion in Illinois' STEM talent pipeline.

## **KEY FINDINGS**

#### **STEM TALENT SUPPLY**

- Despite being the sixth largest state by population, Illinois ranks fifth nationally in STEM degree production. STEM degrees in Illinois reached a new record high in 2017 with 24,474 STEM bachelor's, master's, and doctoral degrees awarded in the state.
- As a share of all degrees, Illinois produces slightly fewer STEM degrees than the national average. In 2017, 19 percent of degrees were awarded in STEM fields, compared with 19.7 percent nationally. However, the state has closed the gap since 2013 when 15.3 percent of Illinois' degrees were in STEM, compared with 16.4 percent nationally.
- Computer science degrees in Illinois have more than doubled since 2013, reaching 3,733 in 2017, a new record for the state. Illinois remains the second-largest producer of computer science degrees in the nation, accounting for 9.9 percent of all computer science degrees awarded in the United States.
- Illinois is a growing hub for data science, ranking fifth nationally with 3,724 degrees in data science-related fields. Jobs in data science have also grown at more than twice the national rate over the last five years.
- Illinois is the fourth leading producer of MBAs in the nation, boasting two of the top two MBA programs in the world. The quality and quantity of business talent in Illinois is critical to the commercialization of innovation and startup activity.
- → Illinois trails the national average for the share of women earning STEM degrees, but progress has been made in computer science. By ethnicity, the makeup of domestic STEM graduates in Illinois is largely similar to the national average. However, the share of African-American students earning STEM graduates has fallen over the past five years, from 6.5 percent in 2013 to 5.4 percent in 2017.
- International students make up a significantly larger share of STEM graduates in Illinois, compared with the nation (29.2 percent versus 20.5 percent). In computer science, more than half of Illinois' graduates are international students.
- New LinkedIn data show Illinois' recent computer science graduates are 4.5 times more likely to work in Chicago than any other city. Despite the pull of recent graduates to Chicago, many of the largest employers of Illinois' recent computer science graduates are large tech companies located outside the state. Top Illinois-based employers of the state's recent computer science graduates include Discover, Motorola, State Farm, HERE, and Allstate.

#### **STEM TALENT DEMAND**

- Illinois has the fifth-largest STEM workforce in the United States, reaching 321,550 in 2017. By share of the overall workforce, 55 out of every 1,000 jobs in Illinois is in a STEM field.
- → Illinois' STEM workforce is growing more quickly than the national average. Over the last five years, STEM employment in Illinois has risen 2.7 percent annually, compared with 2.2 percent growth nationwide. The state added 32,420 STEM jobs between 2013 and 2017.
- Compared to the national average, STEM jobs in Illinois are more heavily weighted toward computer occupations, which make up more than half of all STEM jobs in the state. However, growth in computer occupations has come predominantly from computer support occupations, while jobs in software development have remained flat.
- Top companies by STEM job postings in Illinois include Oracle, Anthem (Blue Cross Blue Shield), General Electric, Deloitte, and Abbvie. The most common job titles in postings include software engineer, project manager (computer and mathematical), java developer, design engineer (architecture and engineering), and systems engineer (computer and mathematical).
- Among the top 20 markets nationally for software engineers, Chicago ranks 11th by job density. This finding suggests that Chicago's market for software engineering jobs has room to grow to match the state's production of talent.
- The average annual wage for STEM professionals in Illinois is \$79,812, which is higher than the national average of \$77,915. Compared with the national average, STEM professionals in several key areas earn higher wages in Illinois. These areas include computer occupations (\$91,438 versus \$83,319), life sciences (\$73,664 versus \$71,633), and mathematics (\$92,982 versus \$88,669).
- → By purchasing power, wages for STEM professionals stretch further in Chicago than in many leading tech cities nationally. Compared to a national baseline of \$1.00, the value of a dollar in Chicago is \$0.96, significantly higher than in New York City (\$0.82) or San Francisco (\$0.80). By this metric, a professional in Chicago earning \$80,000 per year has the same purchasing power as a professional earning \$96,000 in San Francisco.
  - Women, African-American, and Hispanic professionals remain underrepresented in STEM jobs—both in Illinois and nationally. African-American professionals make up 9.9 percent of Illinois' overall workforce, but just 4.9 percent of the STEM workforce. Similarly, Hispanic of Latino professionals make up 11.1 percent of the state's overall workforce, but just 5.2 percent of the STEM workforce.

## UPDATED METHODOLOGY

The definition of STEM used to aggregate bachelor's, master's, and doctoral degrees conferred by universities in our supply-side analysis has changed for 2018. This updated definition aligns with the National Science Foundation's definition of STEM degrees. It is important to note that this new definition does not include health degrees that have been included in previous talent issues. This includes nursing degrees, which account for more than 80 percent of STEM health degrees. In prior issues, the growth of nursing degrees had a disproportionate effect on overall STEM degree growth. We feel this updated definition, which removes STEM health degrees, provides a more discerning view of Illinois' STEM talent landscape.

In previous years, demand-side analysis of the talent issue has featured both STEM and STEM-related occupations, as defined by the U.S. Bureau of Labor Statistics. However, to better align with the new Index definition of STEM degrees, demand-side analysis in this issue excludes STEM-related occupations, which are overwhelmingly in health fields. A full list of degrees and occupations include in this analysis can be in the <u>full methodology</u>.

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## **STEM TALENT SUPPLY**

### **ILLINOIS' STEM DEGREES REACH NEW RECORD HIGH**

Illinois is a national leader in STEM talent production. Despite being the sixth largest state by population, Illinois ranks fifth nationally in STEM degree production. In 2017, STEM degrees in Illinois reached a new record high with 24,474 STEM bachelor's, master's, and doctoral degrees awarded in the state.<sup>1</sup> As a share of all degrees, Illinois produces slightly fewer degrees than the national average. However, the state has closed the gap since 2013, when 15.3 percent of Illinois' degrees were in STEM, compared with 16.4 percent nationally.

<sup>1</sup> Beginning in 2018, the Illinois Innovation Index has adopted the National Science Foundation's definition of STEM degrees. This definition does not include degrees in health fields. For more information, see the <u>full</u> <u>Index methodology</u>.



Compared with the national average, STEM degrees in Illinois are more heavily weighted toward the graduate-level. In 2017, 40 percent of STEM degrees in the state were awarded at the master's or doctoral level, compared with 30.8 percent nationally. STEM degrees are particularly prevalent at the master's level, where 34.9 percent of STEM degrees are awarded, compared with 25.8 percent nationally.

#### NIU GROWING COMPUTER AND DATA SCIENCE, PARTNERING WITH DISCOVER





Due to growing demand in computing fields, Northern Illinois University (NIU) is expanding degree programs offered to students by introducing a new doctoral program in computer science. The program will emphasize areas aligned with the university's laboratory partnerships and faculty expertise, including high-performance computing, graphics and visualization, data analytics, and bioinformatics. In February 2019, NIU's College of Business will also begin offering an online master's in data analytics. The program will prepare students for data-driven leadership and problem-solving through the application SAS, R, Python, and more.

NIU is also connecting students with in-state employers. This year, Discover Financial Services opened its new code\_orange program in NIU's main library. As part of the program, tech-savvy juniors and seniors are hired by Discover and are paid to work on and help develop new Discover technologies in the areas of mobile-software development, web-application coding, blue-tooth development, and person-to-person payment systems. Students in the program work alongside leading professionals and apply skills learned in the classroom to address real-world business challenges. The code\_orange program provides students with a line-of-sight to quality careers post-graduation, while providing Discover the opportunity to build a strong talent pipeline.

#### **ENGINEERING, COMPUTER AND INFORMATION SCIENCES LEAD DEGREE PRODUCTION**

Both in Illinois and nationally, STEM degrees are weighted toward engineering, computer and information sciences, and biological sciences. However, Illinois pulls above the national average for the share of STEM degrees in computer and information sciences. The state also exceeds the national average for the share of STEM degrees in mathematics and business management. Degree production strength in these fields has led to Illinois' strength in data science.<sup>2</sup>

Since 2013, Illinois has seen double-digit annual growth of STEM degrees in interdisciplinary studies, engineering technologies, and computer and information sciences. Degrees in interdisciplinary studies combine coursework from two or more STEM disciplines, such as mathematics and computer science, or biological and physical science. Engineering technology degrees typically prepare students for the deployment of new technologies. Growth in computer and information sciences can be largely attributed to the growth of computer science degrees in Illinois.<sup>3</sup> <sup>2</sup> Further analysis of data science can be found on page 13.

<sup>3</sup> Further analysis of computer science degrees can be found on page 9.

#### **ILLINOIS INNOVATION INDEX**

#### STEM Degrees by Subject Area

Illinois & USA 2017 (%)



Illinois USA





#### CAGR 2013-17 (%)

**Source:** U.S. Department of Education. Institute of Education Sciences, National Center for Education Statistics

### **ILLINOIS' COMPUTER SCIENCE TALENT GROWTH AND RETENTION**

Computer science degrees in Illinois have more than doubled since 2013, reaching 3,733 in 2017, a new record for the state.<sup>4</sup> Though computer science has seen rapid growth nationwide, Illinois' 21.5 percent annual growth in computer science outpaces nationwide annual growth of 19.8 percent since 2013. Illinois remains the second-largest producer of computer science degrees in the nation, accounting for 9.9 percent of computer science degrees awarded in the United States.

<sup>4</sup> Computer science degrees make up a subset of the larger computer and information sciences subject area referenced earlier in this analysis. The computer and information sciences subject area also includes peripheral degrees such as network and IT management degrees.



In addition to growth of computer science degrees in Illinois, degrees in computer engineering, which combines aspects of computer science and electrical engineering, have grown by 21.2 percent annually since 2013, faster than national growth of 13.5 percent. Illinois produced 474 computer engineering degrees in 2017. In total, the state produced 4,207 computer

science and computer engineering degrees in 2017, which also ranks second nationally.

As the second-largest producer of computer science degrees in the country, retention of these graduates is critical to the growth of the state's economy. Despite the perception that much of Illinois' computer science talent leaves the state, new analysis from LinkedIn shows Chicago is by far the most likely destination for the state's computer science graduates. Since 2013, Illinois' computer science graduates are 4.5 times more likely to work in Chicago than second-placed San Francisco. Champaign-Urbana also ranks as the fourth most likely destination for these graduates.



Despite the high volume of recent computer science graduates staying in Illinois, the largest employers of these graduates are out-of-state tech giants like Amazon, Facebook, Google, and Microsoft. Recent computer science graduates who remain in the state are more widely dispersed among a larger number of companies, often outside of traditional tech industries. Top employers of Illinois' recent computer science graduates in-state include Accenture, Allstate, Discover, HERE, and State Farm. Overall, about half of Illinois' recent computer science graduates work in the software and IT industry, with about 15 percent working in finance. Manufacturing, corporate services, and healthcare industries each supply about 5 percent of the jobs for Illinois' recent computer science graduates.

#### **ILLINOIS INNOVATION INDEX**





New analysis of LinkedIn data also provides insight into Chicago's market for software engineers, a core occupation for those with computer science degrees. Chicago ranks as the seventh-largest market for software engineers in the country. However, among the top 20 markets nationally for software engineers, Chicago ranks 11th by job density.<sup>5</sup> This finding suggests that Chicago's market for software engineering jobs has room to grow to match the state's production of talent.

<sup>5</sup> LinkedIn analysis defines job density as the number of software engineering job postings relative to the number of recent computer science graduates in the region.

#### **UIUC EXPANDING INTERDISCIPLINARY COMPUTER SCIENCE, BOOSTING RETENTION**

**I**ILLINOIS

Through its CS + X degree offerings, the University of Illinois at Urbana-Champaign (UIUC) is at the leading edge of interdisciplinary computer science education. These CS + X degrees offer a solid grounding in computer science with training in the arts or sciences that allow students to bring computational skills to fields where they are increasingly in demand. In fall 2018, the program expanded to include degrees in CS + Advertising, CS + Economics, CS + Geography & Geographic Information Science, and CS + Philosophy. These degrees join six existing CS + X degrees, as well as long-standing degrees in Mathematics & Computer Science and Statistics & Computer Science. As of the 2017-18 academic year, more than 600 UIUC students were enrolled in interdisciplinary computer science degree programs.

In addition to expanding the scope of computer science education, UIUC is creating a retention link between its students and Chicago's tech scene through its City Scholars program. City Scholars offers current undergraduate computer science and engineering students the chance to live and work in Chicago while maintaining a competitive course load taught locally and online. Working 20 hours each week for one of City Scholar's 17 company partners, students gain valuable experience while creating professional connections that increase their likelihood of post-graduation employment in Chicago.

#### **UCHICAGO EXPANDING COMPUTING AND DATA SCIENCE RESOURCES**

CHICAGO

Computer science degrees awarded at the University of Chicago (UChicago) have nearly doubled over the last five years. To support this growth, the university is investing in new faculty and facilities. UChicago recently renovated its John Crerar Library for the Department of Computer Science and the university's new Center for Data and Computing (CDAC). The new space provides a hub for student collaboration, instruction, research, and support. In addition to the new space, UChicago has hired 13 new faculty over the last two years to help lead the university's growth in computing and data science. The new crop of faculty bring expertise in networking, theory, human-computer interaction, computer vision, machine learning, and more.

### **ILLINOIS A GROWING HUB FOR DATA SCIENCE**

Data science is an emerging, interdisciplinary field that uses scientific methods to gain insight from complex data. The field exists at the intersection of computer and information sciences and business. Data science has come to encompass earlier fields like business analytics, business intelligence, predictive modeling, and statistics. As an evolving field, data science doesn't fit neatly into any one degree or occupation. Degrees in computer and information sciences, mathematics, and business can all lead to employment in data science.

Illinois ranks fifth nationally with 3,724 degrees in these data science-related fields in 2017.<sup>6</sup> Compared with the national average, these degrees make up a larger share of all degrees in Illinois (2.9 percent versus 2.2 percent). Illinois ranks first in the nation in degrees in management sciences and quantitative methods, producing one out of every eight degrees (12.5 percent) awarded nationally in the field. Degrees in management sciences and quantitative methods align with data science, using mathematical modeling, programming, and forecasting techniques to analyze business performance. Illinois also ranks third nationally in data modeling/warehousing and database administration, and in statistics.

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<sup>6</sup> Data science-related
degrees include CIP codes
11.04, 11.0802, 11.0804, 27,
30.30, and 52.13. Note that
these degrees align with
data science, but that not
all graduates will pursue
occupations in the field.
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Illinois' traditional strength in business and financial services has also led the state to become a leader in data science employment. Illinois ranks fourth nationally with 9,160 professionals employed in data science-related occupations in 2017.<sup>7</sup> Since 2013, jobs in this field have grown by 16.6 percent annually, more than twice the national growth rate of 7.9 percent. Operations research analysts have grown especially quickly in Illinois, nearly doubling over <sup>7</sup> Data science-related occupations include actuaries, mathematicians, operations research analysts, and statisticians, as defined by the Bureau of Labor Statistics. the past five years, from 3,190 jobs in 2013 to 6,200 in 2017. Operations research analysts are high-level problem-solvers who use optimization, data mining, statistical analysis, and mathematical modeling to develop solutions that help organizations operate more efficiently and cost-effectively. The average annual wage for operations research analysts in Illinois is \$90,310, which is higher than the national average of \$80,393.

#### NORTHWESTERN LEADING THE WAY IN ARTIFICIAL INTELLIGENCE



Northwestern

University

Northwestern University has seen significant growth in both computer science and interdisciplinary computing programs. To meet rising demand in computer science fields, Northwestern University recently moved its computer science department to a new 23,000-square-foot space on the university's Evanston campus. The new space will be used to accommodate increasing student enrollment, a growing number of faculty, and new research connections with other parts of campus.

Stemming from the growth of artificial intelligence (AI) technologies, Northwestern has also created a new Master of Science in Artificial Intelligence program. The new degree program trains students on emerging technologies like machine intelligence and how they can be deployed to interact and integrate with human partners. Along with the master's program in AI, Northwestern partnered with NVIDIA to launch its new Deep Learning Lab. The interdisciplinary lab uses data science to produce academic research and technological solutions in collaboration with corporate partners—ranging from Fortune 500 corporations to startups.

### **TALENT MIGRATION PATTERNS**

Talent migration patterns remain consistent with those reported in previous issues of the Index. LinkedIn net migration data show Chicago attracts talent from across the Midwest, especially from large college towns, such as Bloomington, IN; Iowa City, IA; and Lafayette, IN.<sup>8</sup> Chicago also attracts from regional cities like Wichita, Detroit, and Cincinnati. Conversely, Chicago exports talent to industry hubs and growing cities like Denver, San Francisco, Los Angeles, and Seattle.

<sup>8</sup> Data via LinkedIn's monthly Workforce Report for Chicago, October 2018. Includes all LinkedIn members, not only those in STEM. <u>Full analysis here</u>.

#### **MBAS AND POSTDOCS**

Illinois is the fourth leading producer of MBAs in the nation with 6,782 MBAs awarded in 2017. Beyond the volume of MBA graduates in the state, Illinois boasts the top two MBA programs in the world, according to The Economist.<sup>9</sup> In 2018, the publication ranked the University of Chicago's Booth School of Business as the top MBA program in the world, followed by Northwestern University's Kellogg School of Management in second. Though not a STEM degree, the quality and quantity of business talent in Illinois is critical to the commercialization of innovation and startup activity in the state.

Illinois ranks sixth nationally with 1,932 science and engineering postdoctoral researchers (postdocs) employed by Illinois universities. Postdocs provide critical capacity for university research in STEM fields.

<sup>9</sup> <u>Top Full Time MBA Rankings</u>. The Economist, 2018.

#### **ILLINOIS TECH OPENS NEW KAPLAN INSTITUTE**

ILLINOIS INSTITUTE

In October, the Illinois Institute of Technology (Illinois Tech) opened the Ed Kaplan Family Institute for Innovation and Tech Entrepreneurship. The new Institute will promote talent growth at the university through instruction in the basics of innovation, entrepreneurship, and human-centered design. The space will feature new equipment and tools in leading-edge tech areas like 3D-maker spaces, AR/MR/VR labs and demo spaces, robotics, as well as a large variety of alternative workspaces, presentation rooms, and assembly areas. The Institute will provide an interdisciplinary space where students, faculty, and industry can develop solutions for the kinds of next-generation problems which will increasingly require collaboration.

#### **UIC EXPANDING ENGINEERING FACILITIES**



In late 2017, the University of Illinois at Chicago (UIC) began construction of its new Engineering Innovation Building. The new 50,000-square-foot building is part of UIC's 2017-2027 Implementation Plan, designed to expand facilities and infrastructure to meet growing enrollment at the university's College of Engineering, which has nearly doubled over the last decade. The new Engineering Innovation Building is scheduled to open in 2019 and will have space for labs, classrooms, and offices for faculty and staff. UIC is also planning a new computer science facility, dubbed the Computing, Design, Research and Learning Center (CDRLC), which it hopes to open in 2021.

### **DIVERSITY AND INCLUSION IN ILLINOIS' STEM TALENT PRODUCTION**

Historically, Illinois' strength in STEM talent production has not been matched by its inclusivity. Though the state is making strides in certain areas, true diversity and inclusion in STEM fields has remained elusive. In 2017, 34.8 percent of STEM degrees in Illinois were awarded to women, compared with 37.8 percent nationally. Though the number of women receiving STEM degrees has increased over the past five years (from 7,082 in 2013, to 8,515 in 2017), increasing male enrollment in STEM fields has meant that the share of degrees awarded to women has fallen from 35.9 percent in 2013 to 34.8 percent in 2017.

Though Illinois trails the national average for women earning STEM degrees overall, the growth of women in computer science has been a bright spot for the state. Since 2013, the number of women earning computer science degrees has more than tripled from 267 to 857 in 2017. This growth has resulted in 23 percent of the state's computer science degrees being awarded to women, which is higher than the national average of 21.4 percent.

In 2017, 64 percent of domestic STEM graduates were white, 16.5 percent were Asian, 10.8 percent were Hispanic, 5.4 percent were African-American, and 3 percent were of two or more races.<sup>10</sup> The ethnic makeup of STEM graduates in Illinois is largely similar to the national average with Asian graduates making up a slightly larger share of graduates in Illinois than nationally.





Since 2013, the share of domestic STEM graduates who are white has fallen, while the share of Asian (14.2 percent to 16.5 percent) and Hispanic (7.3 percent to 10.8 percent) has increased. The share of African-American STEM graduates has fallen from 6.5 percent in 2013 to 5.4 percent in 2017. Computer science degrees awarded to domestic students are weighted toward white and Asian students, who collectively accounted for 81.8 percent of Illinois' computer science degrees in 2017. However, the share of computer science degrees awarded to Hispanic students in Illinois has more than doubled during the past five years. In 2013, 4.6 percent of computer science degrees were awarded to Hispanic students, compared with 9.9 percent in 2017. Though the number of computer degrees awarded to African-American students has doubled since 2013 (from 43 to 86), African-Americans remain underrepresented in computer science, making up 5.3 percent of domestic graduates in 2017.

### THE CRITICAL ROLE OF INTERNATIONAL STUDENTS

Compared with the national average, international students make up a significantly larger share of STEM graduates in Illinois. In 2017, international students were awarded 29.2 percent of STEM degrees in the state, compared with 20.5 percent nationally. Illinois ranks fourth nationally for the number of international students earning STEM degrees. Since 2013, the number of international students earning STEM degrees from Illinois universities has nearly doubled—from 3,727 in 2013 to 7,137 in 2017. Computer science degrees awarded in Illinois are especially weighted toward international students. In 2017, 55 percent of degrees in the field were awarded to international students, compared with 37.3 percent nationally. The number of international students receiving computer science degrees in Illinois has more than tripled over the past five years—from 638 in 2013 to 2,052 in 2017.

The ability of international students to remain in the state and grow Illinois' STEM workforce depends heavily on federal immigration policy. To insure international students educated in Illinois have an opportunity to stay and contribute to the state's technology and innovation economy, programs like Optional Practical Training (OPT) and the H-1B visa are critical. OPT allows international students to stay in the country for 12 months post-graduation to seek employment. International graduates with STEM degrees who are employed can also qualify for a 24-month OPT extension. OPT and the STEM OPT extension allow international students to begin their careers while applying for longer-term legal status through the H-1B lottery process. Recently, the Trump administration has signaled an intent to roll-back OPT, including eliminating the OPT STEM extension. Such an action would make it significantly more challenging for international STEM graduates to stay in the country and weaken the STEM talent pipeline in Illinois.

## **STEM TALENT DEMAND**

### **STEM JOBS CATCHING UP TO NATIONAL AVERAGE**

Illinois has the fifth-largest STEM workforce in the United States, reaching 321,550 in 2017.<sup>11</sup> By share of the overall workforce, STEM jobs in Illinois slightly trail the national average with 55 out of every 1,000 professionals employed in a STEM field, compared with 59 nationally. Though Illinois trails the national average for the share of jobs in STEM fields, the state's STEM workforce is growing more quickly than the national average. Since 2013, STEM employment in Illinois has risen 2.7 percent annually, compared with 2.2 percent growth nationwide. In total, Illinois added 32,420 STEM jobs between 2013 and 2017.

<sup>11</sup> This analysis uses the Bureau of Labor Statistics definition for STEM occupations. See the <u>full methodology</u> for more details.



### JOBS IN STEM LED BY COMPUTER OCCUPATIONS

Both in Illinois and nationally, the majority of STEM jobs are in computer areas. However, computer areas make up a larger share of STEM jobs in Illinois than nationally (50.9 percent versus 48.7 percent). STEM jobs in the state are also more heavily weighted toward management (8.4 percent versus 7 percent), which includes computer and information systems managers, as well as architectural and engineering managers. Illinois' STEM jobs in engineering, management, mathematics, and life sciences have all grown significantly more quickly than the national average since 2013.

#### **ILLINOIS INNOVATION INDEX**



The largest STEM occupations in the state are dominated by those in computer fields, which make up eight of the top 10 by employment. The state's three largest STEM occupations by employment are software developers (applications), computer systems analysts, and computer user support specialists. Unlike many peer states, jobs in software development (both applications and systems software developers) have seen minimal growth in Illinois. Instead, occupations like computer systems analysts, user support

specialists, and systems managers have been responsible for the vast majority of growth seen among computer occupations. These occupations design, implement, and maintain computer systems for organizations.

#### Largest STEM Occupations by **Employment**





Jobs added since 2013

Illinois Employment 2017

Source: U.S. Bureau of Labor Statistics, Occupational **Employment Statistics.** 

IL vs US (%)

Illinois

USA 



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### **STEM JOB POSTINGS**

Over the past year, companies with the most STEM job postings in Illinois include technology, healthcare, consulting, and insurance companies.<sup>12</sup> Top companies include Oracle, Anthem (Blue Cross Blue Shield), General Electric, Deloitte, and Abbvie. Top job titles among postings also illustrate the growth of computer occupations in the state with software engineer, java developer, and systems engineer among the most common. Project managers, design engineers, quality assurance engineers, and project engineers are among the non-computer occupations with the most job postings.

<sup>12</sup> Data via the Emsi Labor Market Analytics platform.



### WAGES AND PURCHASING POWER IN ILLINOIS

On average, professionals in STEM fields earn significantly higher wages than those in non-STEM fields. The average annual wage for STEM professionals in Illinois is \$79,812, compared with \$56,301 for non-STEM professionals.<sup>13</sup> The average annual wage for STEM professionals in Illinois also exceeds the national average (\$79,812 versus \$77,915). STEM professionals in several key areas earn higher wages in Illinois, compared with the national average. These areas include

<sup>13</sup> Data via the Bureau of Labor Statistics National Occupational Employment and Wage Estimates, May 2017. computer occupations (\$91,438 versus \$83,319), life sciences (\$73,664 versus \$71,633), and mathematics (\$92,982 versus \$88,669).

Statewide, purchasing power in Illinois is on par with the national average. Compared with the national baseline of \$1.00, the value of a dollar in Illinois is \$1.01.<sup>14</sup> At the city-level, purchasing power in Chicago is significantly higher than in many peer cities. The value of a dollar in Chicago is \$0.96, higher than Denver (\$0.94), Seattle (\$0.90), and Boston (\$0.90). Purchasing power in Chicago is significantly higher than in New York City (\$0.82) or San Francisco (\$0.80). By this metric, a professional in Chicago earning \$80,000 per year has the same purchasing power as a professional earning \$96,000 in San Francisco.

#### San Antonio \$1.06 Austin \$1.00 Dallas \$1.00 Houston \$0.98 Chicago \$0.96 Philadelphia \$0.94 \$0.94 Denver Seattle \$0.90 Boston \$0.90 San Diego \$0.86 Los Angeles \$0.85 Washington DC \$0.84 New York City \$0.82 San Francisco \$0.80 San Jose \$0.79

#### Spending Power Adjusted Value of a Dollar

Chicago & Select Cities, 2017



**Source:** Bureau of Economic Analysis

<sup>&</sup>lt;sup>14</sup> Based on Bureau of Economic Analysis Regional Price Parity data, 2016. Based on a national baseline of \$1.00. Values above \$1.00 indicate higher than average purchasing power, while values below \$1.00 indicate lower than average purchasing power.

#### **ROSALIND FRANKLIN UNIVERSITY WORKING TO INCREASE INCLUSION IN STEM**



Rosalind Franklin University's (RFU) nationally-recognized INSPIRE program aims to attract Latino students to health and STEM fields through an applied summer research and mentoring program offered from high school through college. Approximately 20 students participate in the program each year, with 63 percent reported to be pursuing careers in STEM, compared to 8 percent of Latino students nationally. RFU also partnered with nearby North Chicago Community High School in the creation of a Healthcare Careers Pathway, designed to help students explore potential careers while offering academic preparation for rigorous core courses and experiential learning in the university's simulation and anatomy labs.

### **DEMOGRAPHICS OF STEM EMPLOYMENT IN ILLINOIS**

By gender and ethnicity, the makeup of Illinois' STEM workforce largely mirrors the nation with women, African-American, and Hispanic professionals underrepresented in STEM occupations. Women make up 26.2 percent of all STEM professionals in Illinois in line with the national average of 26.5 percent.<sup>15</sup> Women make up 49 percent of the overall workforce in Illinois.

<sup>15</sup> Demographic data via the US Census Bureau's American Community Survey (ACS), 2012-2016 Public Use Microdata Sample (PUMS).



By ethnicity, the STEM workforce in Illinois largely mirrors national trends. However, Illinois' STEM workforce is slightly more weighted toward white (72.2 percent versus 70.8 percent) and Asian professionals (14.7 percent versus 14.0 percent). Compared to Illinois' overall workforce, both African-American and Hispanic professionals are underrepresented in STEM occupations. African-American professionals make up 9.9 percent of the state's overall workforce, but just 4.9 percent of the STEM workforce. Similarly, Hispanic professionals make up 11.1 percent of the state's overall workforce, but just 5.2 percent of the STEM workforce.

Compared to the national average, foreign-born professionals make up a larger share of Illinois' STEM workforce. In Illinois, 20.9 percent of STEM professionals are foreign-born, compared with 19.8 percent nationally.

#### THE PWR ACT AND EMPLOYER ENGAGEMENT IN ILLINOIS' STEM TALENT PIPELINE



University-industry partnerships are critical to Illinois' talent pipeline and innovation economy, but engagement with employers should begin before students reach college. Often, students leave high school without a clear understanding of STEM jobs or the skills needed to persist through college and gain meaningful employment. In 2016, Illinois enacted the Postsecondary and Workforce Readiness (PWR) Act, which aims to improve the alignment and transition from high school to college and into careers. One component of the PWR Act is the College and Career Pathway Endorsement, which demonstrates readiness for college and careers through the completion of career exploration and 60 hours of internships or similar experiences. This provides students the opportunity to engage with employers earlier, creating a line-of-sight to a quality career in the state.

This need to connect high school learners with the state's leading STEM employers has driven the work of the Illinois Science and Technology Institute (ISTI). ISTI programs connect companies and universities with classrooms to build a stronger and more inclusive STEM talent pipeline. ISTI's programs allow professionals at some of Illinois' most innovative companies and universities to mentor high school students on real-world business problems and independent research projects. For 2018-19, ISTI is engaging 44 high schools and 17 companies, including AbbVie, Baxter, Caterpillar, Microsoft, Motorola Solutions, Northrop Grumman, and Uptake. Students have the unique opportunity to innovate alongside mentors from each of these companies and come up with new ideas, products, prototypes, designs, etc. that address pressing issues. These experiences help students build confidence in STEM skills and create new connections to career pathways in STEM fields.

#### **ILLINOIS INNOVATION INDEX**

## **ILLINOIS' PATH FORWARD**

Illinois has planted a flag as a leading producer of computer science talent nationally. Strength in computing, paired with the state's robust business community, has also led Illinois to become a leader in data science. Now, Illinois' challenge is to turn talent production into economic growth.

Talent retention is crucial. Though Chicago is the most likely destination for Illinois' in-demand computer science graduates, too many leave the state to work for large tech companies elsewhere. Expanding connections between the state's top employers and its most sought-after students can help boost retention. These engagements are especially impactful when students are given an opportunity to work for an in-state employer prior to graduation—exposing students to employment opportunities in Illinois, while providing employers a chance to develop real-world skills in students before offering them a full-time position.

Student-employer engagement should also begin before college. Often, students leave high school without a clear understanding of the skills needed to persist through college and gain meaningful employment in STEM fields. However, exposure to opportunities at in-state companies can create a line-ofsight to STEM careers, as well as an understanding of the pathway to get there. Creating this line-of-sight to STEM careers through employer engagement is also critical to increasing diversity and inclusion in STEM fields, which must be improved to insure equitable economic growth in the state.

The attraction and retention of talent in key areas is also dependent on the pool of jobs available in the state. Though Illinois is the second-largest producer of CS degrees nationally, Chicago ranks 11th in software engineering job density, according to LinkedIn. Supporting the creation and growth of new companies can boost the number of available jobs for new graduates. From 2013-2017, universities in the state produced 942 startups.<sup>16</sup> Providing additional support for these startups, such as grants or matching federal funds, can help these young companies grow, expanding the pool of available STEM jobs in the process.

<sup>16</sup> <u>Illinois Innovation Index:</u> <u>University Entrepreneurship</u> <u>2018.</u>

## ACKNOWLEDGMENTS

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The Illinois Science & Technology Coalition (ISTC) is a member-driven nonprofit that measures, connects, and enriches the Illinois innovation economy. Created by the State of Illinois over 25 years ago, we make powerful links between the state's universities, industry, startups, and government to strengthen our economy and talent pipeline through data collection, policy advocacy, and programs.

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