

# HOW LOUISVILLE CAN BECOME A STRONGER AND MORE EQUITABLE HUB FOR AI AND DATA ECONOMY JOBS

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# EXECUTIVE SUMMARY

Like many other cities and regions around the country, Louisville, Ky. faces a series of stark economic and social challenges coinciding with the COVID-19 crisis. As local leaders attempt to chart a course for an economically and racially inclusive recovery, opportunities to create and preserve good-paying jobs in growing sectors—and ensure equitable access to those jobs—are emerging as key priorities. How well Louisville’s economy is positioned to innovate and adopt the latest technologies—particularly those that fall under the heading of *artificial intelligence* (AI)—may dictate the pace, distribution, and sustainability of its recovery.

This report offers a first-of-its-kind benchmarking of AI positioning and preparedness for metropolitan economies, comparing Louisville to its peer regions around the country. It examines a wide range of AI-related data that portrays Louisville and its peers on five key drivers of technological success: collaboration, innovation, talent, industry specialization, and financial capital and startup ecosystem. The report sheds light not only on AI-specific activities and competencies characteristic of cities involved in the production of AI technologies, but also a wider range of adjacent *data economy* attributes that may indicate a city’s readiness to adopt AI technologies at greater scale. It finds that:

- Louisville ranks lower than most of its peers on AI-specific measures of innovation, talent, and startup ecosystem. Nevertheless, it has

a considerable base of talent and companies specializing in the wider data economy—most notably in key strong clusters such as health care and business services. These provide Louisville with important foundations for wider adoption of cutting-edge AI techniques and applications.

- Louisville faces two key challenges as it seeks to establish a stronger foothold in the AI economy. First, while its strong clusters exhibit many data economy functions and occupations, many of those assets are tied up in the very largest companies and institutions. Moreover, the lack of recent growth in data economy capabilities relative to peer regions suggests potential threats to future industry competitiveness. Second, Louisville’s data economy remains racially exclusive; the metro area’s Black workers are less represented in computer and mathematical occupations than in only two of its 16 peer regions. The legitimacy of the region’s overall recovery strategy—and its ability to meaningfully accelerate growth in the data economy—will depend on whether it generates new opportunities for Black residents and Black-majority communities.
- As Louisville approaches these new opportunities and challenges, it does so with an enviable institutional landscape that, by collaboratively facilitating data access, funding, training, and business development, could form the basis for a powerful and equitable AI

strategy. As evidence of this, a wide range of stakeholders (including public sector, secondary and higher education, corporate, startup, and civic intermediaries) has engaged with the Louisville Future of Work Initiative and Brookings Metro to inform this assessment. The region must now marshal these AI-relevant assets and institutions toward a more specific, shared vision for competitive and inclusive growth.

The creation of the Louisville Future of Work initiative in 2019 has provided the city and region with a head start toward building higher-quality, more equitable economic opportunities in fields that can contribute meaningfully toward that vision. This report points to three areas for deepening focus and investment that can facilitate a technologically enabled, broad-based, and racially equitable recovery from the COVID-19 recession:

- **Broaden and diversify Louisville’s AI talent pipeline.** Scale and sustain emerging talent development efforts at all levels—secondary, postsecondary, retraining, and continuing education—that can help the region seed new enterprises, transition existing businesses, and attract new good jobs from elsewhere. Ensure strong connections to local employers and deeper reach into communities of color, while emphasizing the cultivation of specific AI-related skills (e.g., in data management and algorithm development) that can signal Louisville’s emerging proficiencies in that space.
- **Support AI adoption and adaptation in Louisville’s businesses.** Build a stronger local ecosystem—particularly in areas of existing sectoral and data economy strength such as lifelong wellness and aging—involving startups, middle-market companies, large corporations, and supporting civic institutions committed to using data in new ways to solve business challenges. At the same time, enable transformation in other prominent clusters such as business services, transportation and logistics, and advanced manufacturing through either sector-specific organizations or cross-cutting strategies focused on adopting AI and data economy tools and developing associated talent. Throughout, feature the experiences and center the needs of women- and minority-owned businesses to fully support their success in Louisville’s wider technological transformation.
- **Develop and market Louisville’s AI niche in the broader region.** Seek opportunities to join with larger Midwestern and Southeastern neighbors in a “super-regional” hub for AI- and data-economy-enabled health care solutions. Universities, chambers, and corporations across Indianapolis, Louisville, and Nashville, Tenn. should explore steps to strategically share an AI-enabled workforce, supply chain, and research assets in health care and life sciences that leverage their respective specializations and position themselves more prominently for businesses development and high-quality job growth.

# BACKGROUND

In June 2019, Louisville Metro Government and Microsoft announced a digital alliance with the goal of making Louisville a regional hub for artificial intelligence (AI), the Internet of Things (IoT), and data science. The Louisville Future of Work Initiative launched in November 2019 to support Louisville's data ecosystem and to tell the story of its efforts and potential in this area.

The Metropolitan Policy Program at the Brookings Institution (Brookings Metro) has partnered with the Future of Work Initiative through local focus groups and data analysis to create this first-of-its-

kind, citywide AI benchmarking and strategy report focused on supporting three key outcomes:

- **Regional hub:** Making Louisville the best mid-sized city in America for opportunities in AI and data innovation.
- **Workforce transformation:** Making Louisville's workforce the most data-credentialed per capita in the nation.
- **Industry development:** Making Louisville lead the nation in the rate of growth of good-paying AI/data economy jobs.

Photo credit: Louisville Forward



As Louisville pursues these core strategies, it is committed to **diversity and inclusion** values that ensure participants in the local AI/data economy represent the whole community, and **“AI for Good”** values that ensure fairness, reliability, transparency, and accountability in the efforts that the Future of Work Initiative supports.

After outlining an overall approach and methodology, this strategy report summarizes the findings from Brookings Metro’s original analysis of Louisville’s position and potential to grow good jobs, develop talent, and achieve sustainable economic prosperity in the age of AI. It concludes with key strategic considerations for the region as it pursues the outcomes and embraces the values described above.

While this analysis is largely based on data that predated the devastating health and economic effects of the COVID-19 pandemic as well as the protests and turmoil that followed the deaths of Breonna Taylor and George Floyd at the hands of law enforcement, we believe its findings nonetheless establish a critical baseline for the future of the Louisville economy and its potential for inclusive growth for three key reasons.

First, the sharp economic downturn initiated by the pandemic seems likely to accelerate automation, increase demand for technological skills, and create opportunities for companies that can leverage data to enhance both productivity and safety. Researchers find that automation tends to happen in bursts, especially during economic shocks like the COVID-19 recession. During these periods, employers tend to shed less-skilled workers and replace them with technology and (fewer) higher-

skilled workers.<sup>1</sup> New analysis suggests that the combination of automation potential and viral transmission risk is higher in Midwestern labor markets such as Louisville, and is more pronounced for female workers without a college degree.<sup>2</sup> In this vein, Louisville’s ability to innovate and adapt to emerging technologies in the AI realm may help determine the direction and pace of its recovery from the COVID-19 recession.

Second, the individuals and families most immediately impacted by the downturn are disproportionately members of groups too often excluded from economic opportunity: people of color, immigrants, and lower-wage workers. According to the U.S. Census Bureau, 55% of Black individuals and 60% of Latino or Hispanic individuals have experienced a loss of employment income in their household since the pandemic began, versus 42% of white individuals. The same is true for 55% of households earning under \$50,000 annually, but only 38% of those earning at least \$100,000 annually.<sup>3</sup> Expanding participation in Louisville’s data economy for groups that have suffered the greatest degree of economic displacement could help determine the region’s path to sustainable recovery.

Finally, growing demands for racial justice—particularly for Louisville’s African American community in the wake of Breonna Taylor’s death—must shape efforts to diversify leadership and participation in what has largely been a racially exclusive part of the economy in Louisville and other major American cities. The legitimacy of the region’s overall recovery strategy and efforts within it to accelerate growth in the data economy rest in no small part on their success in generating meaningful new opportunities for Black residents and Black-majority communities.

# METHODOLOGY

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This strategy report assesses Louisville’s AI preparedness through two key **themes** and across multiple **drivers** of success in those thematic areas. In each area, it **benchmarks** Louisville against several of its peer regions to highlight local strengths and limitations, assessing existing advantages Louisville could exploit and weaknesses that regional efforts must seek to address.

**Themes:** This report analyzes and benchmarks Louisville’s AI preparedness along two key themes that inform the design of the goals and strategies identified above:

- Louisville’s capacity to **produce** AI-related technologies, reflected by the presence and growth of AI-specific innovation, talent, and companies.<sup>4</sup>
- Louisville’s capacity to **adopt** AI-related skills and technologies to enhance the competitiveness of its workforce and businesses, reflected by the presence and growth of industry specializations, workers, and companies that are using AI and the wider “data economy” to support unique competitive niches for Louisville.

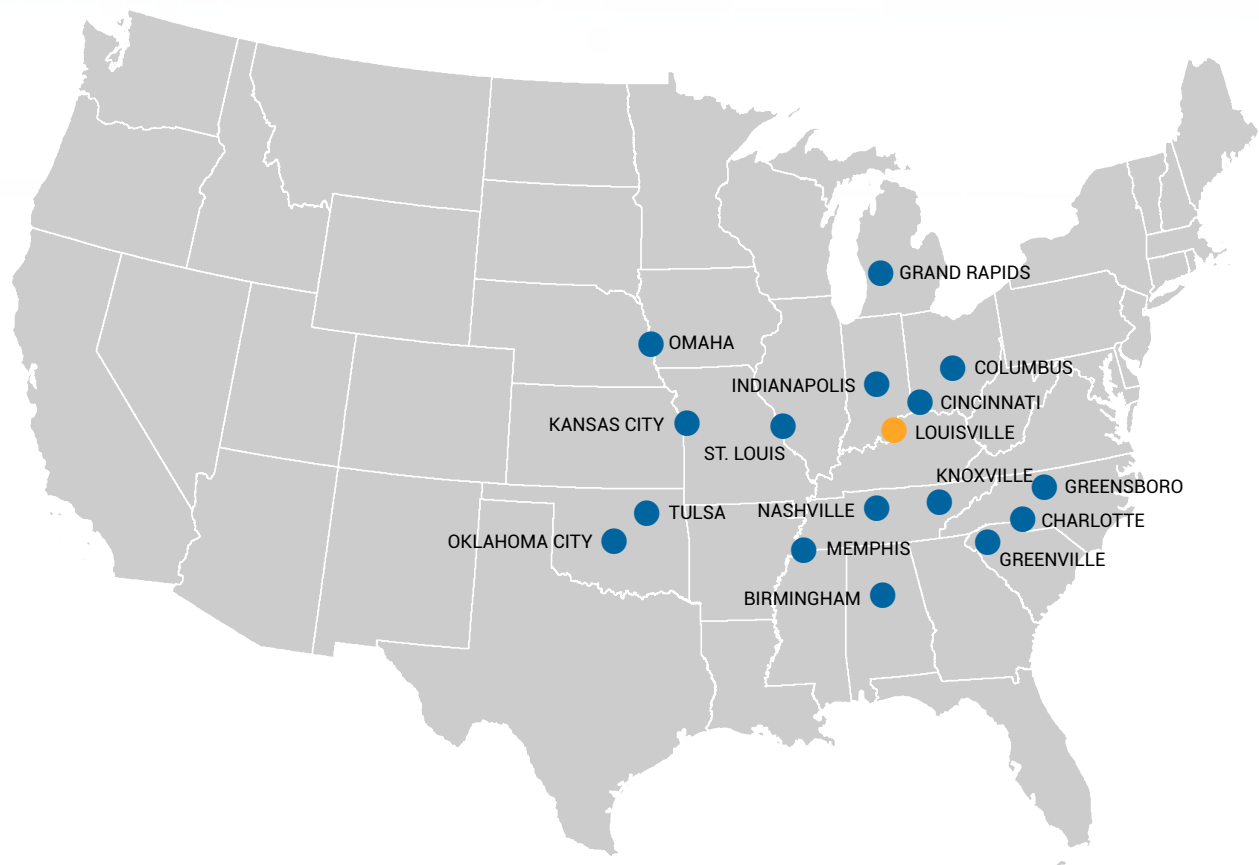
## What is artificial intelligence?

The realm of artificial intelligence (AI) eludes a simple definition. Historically, scientists have used AI to refer to computers doing things that—if done by humans—would be said to require “intelligence,” like planning, problem-solving, or prediction.<sup>7</sup> Echoing this, the Microsoft monograph *The Future Computed* defines AI as “a set of technologies that enable computers to perceive, learn, reason, and assist in decision-making to solve problems in ways that are similar to what people do.”<sup>8</sup> The most influential field underlying AI has been machine learning: computers’ use of algorithms to find statistical patterns in massive amounts of data. The growing sophistication of those algorithms, together with greatly increased processing speeds and data storage capabilities, have yielded explosions in machine learning applications such as speech and facial recognition, natural language processing, and preference prediction. Because these technologies are evolving so rapidly, it is difficult at any one time to say exactly *what AI is*. This analysis uses a variety of measures, defined somewhat differently depending on available data, to provide a fuller picture of AI’s presence in Louisville and other metro area economies.

**Drivers:** Based on a framework adapted from a recent study of leading AI clusters around the world, this report examines Louisville's AI preparedness by examining data across five drivers of technological success: **collaboration, innovation, talent, industry specialization, and financial capital and startup ecosystem.**<sup>5</sup> Where sufficient data exists, the report illustrates: 1) why the driver matters for cities' AI preparedness, and 2) how Louisville performs in that driver, both with respect to AI *production* and AI *adoption*, as applicable. We use a variety of data sources to conduct these assessments, and detail these in each case.

**Benchmarks:** Based on the work of the Greater Louisville Project and its partners at the University of Louisville, we compare Louisville to its geographic peers on measures of AI preparedness.<sup>6</sup> These peers are similar to Louisville in key economic respects. In nearly all cases, measures for Louisville and its peers represent metropolitan areas, which approximate regional economies. Louisville-Jefferson County represents about half the population and jobs of the wider Louisville metro area, which stretches across 10 counties in Kentucky and Southern Indiana.

**Map 1. Louisville's peer regions stretch across the Midwest and Southeast US**



Source: Greater Louisville Project.

# FINDINGS

## 1. Collaboration: Louisville has enviable collaborative structures, but has not yet marshaled them toward a clear, shared technological purpose.

The most AI-dynamic metropolitan economies tend to combine a set of institutions and industry players into a rich, collaborative innovation ecosystem that aligns research and development, commercialization, talent attraction and development, and entrepreneurial support toward a common vision of AI's value to the local economy. An AI-ready region also requires a coherent community-level strategy, involving commitment not only among leadership but also grassroots stakeholders.

While not easily measurable through empirical data, Brookings Metro's experience with many U.S. cities suggests that Louisville benefits from stronger-than-average collaboration in multiple areas that, by facilitating data access, funding, training, and business development, can form the basis for a powerful AI strategy. Groups that have engaged in the design process for Louisville's AI strategy are emblematic of this collaborative spirit, and include:

- **Public sector:** Jefferson County Public Schools (JCPS), KentuckianaWorks, Louisville Forward, the Office of Civic Innovation and Technology
- **Higher education:** Bellarmine University, Jefferson Community and Technical College, Simmons College of Kentucky, University of Louisville (AI Innovation Consortium, Center for Digital Transformation, Envirome Institute)
- **Business:** FirstBuild, GE Appliances/Haier, Greater Louisville Inc., Humana, Kentucky Federation for Advanced Manufacturing Education, Kentucky Manufacturing Career

Center, Louisville Healthcare CEO Council, Thrive Center, TechFirst

- **Entrepreneurs:** Louisville Entrepreneurship Acceleration Programs (LEAP), Amplify, Story Louisville, and several local founders
- **Civic:** AMPED, Evolve502, Louisville Urban League, LouTechWorks, Metro United Way

Notwithstanding this rich institutional landscape, Louisville has yet to fully marshal its emergent AI-relevant assets toward a specific, shared vision for competitive and inclusive growth.

In a 2019 report, Deloitte identified 20 "global cities of AI innovation, integration and application."<sup>9</sup> They include many well-recognized global capitals of commerce and finance (e.g., New York, London, Tokyo, Shanghai) and technology (Silicon Valley, Stockholm, Tel Aviv, Singapore). But they also include emerging hubs that are combining supportive inputs and policies to carve out competitive niches in the data economy, including Amsterdam, Berlin, Dallas, Dublin, and Montreal. Notably, many have received significant financial support from their national governments to develop and connect their unique AI assets.

City- and region-level efforts to assess local assets and claim a space in the AI economy (such as a recent initiative in Stockton, Calif.) reflect a growing awareness that national-level AI strategies can provide useful frameworks, but cannot ensure the level of execution that local coalitions of trusted partners ultimately make possible.<sup>10</sup> The Louisville Future of Work Initiative and the analysis offered in this report offer a roadmap for the region to capitalize more fully on its institutional assets, thereby creating a distinctive, authentic, and inclusive niche in a fast-growing part of the 21st century economy.



## 2. Innovation: Louisville lags most peer metro areas in simple measures of AI innovation capacity.

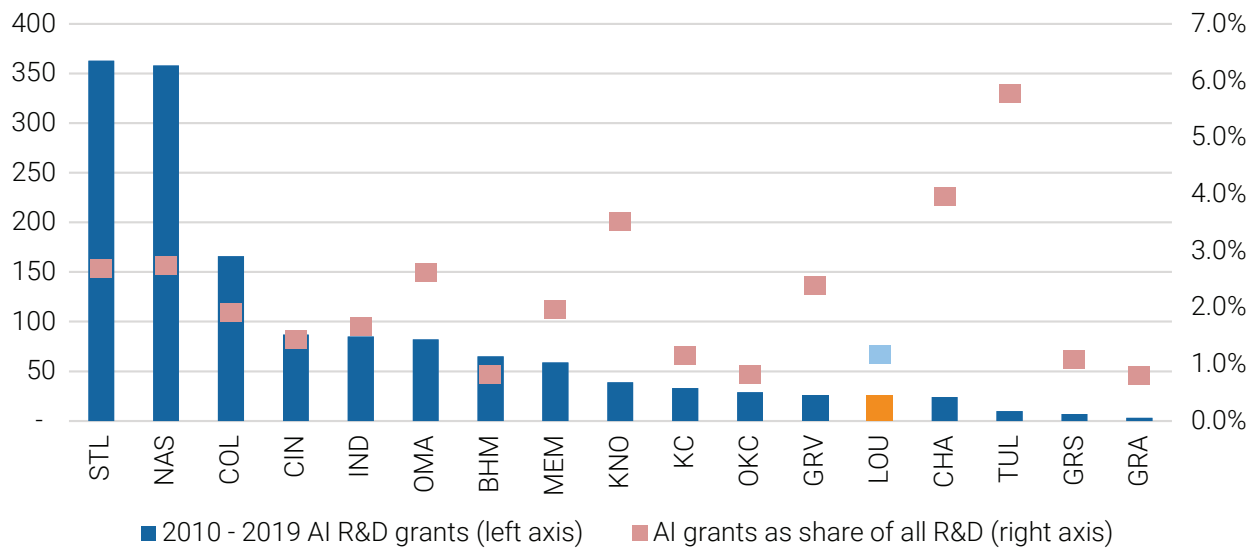
A region's academic assets and innovation capacity can enable the development and deployment of new technologies that position it as an AI *producer city*. Universities often act as super-catalysts, providing talent, establishing R&D labs, attracting finance, and facilitating knowledge sharing. A region's ability to attract federal support to institutions engaged in AI-related research and the success of its inventors in patenting AI technologies provide two indications of regional AI innovation capacity.

**2A. Federal funding** to universities and other research institutions for AI-related research and development can undergird a vibrant AI innovation ecosystem. For its part, Louisville received 26 AI-related grants from the federal government between 2010 and 2019 (Figure 1). Federal agencies, including the National Science Foundation (NSF) and the National Institutes of Health (NIH),

have funded a significant number of AI-related medical research projects in Louisville; many are in morphology, a branch of biology relating to the form and structure of organisms. Within the region, the University of Louisville received 90% of these federal awards. Yet in both the number of AI grants attracted and their share of all R&D grants (just over 1%), Louisville trails most of its peer regions.

**2B. Patenting activity** can indicate a region's capacity to develop AI innovations with potential commercial applications, which can yield new or expanding businesses in the AI economy. AI patenting is not yet truly widespread; patenting in machine learning, for instance, grew rapidly from a small base starting only in the mid-2010s.<sup>11</sup> To date, Louisville has not been a major source of AI-related patents in the United States. The region recorded only one AI-related patent between the years of 2010 and 2019, lagging all peer cities for which data were available (Figure 2). To be sure, not all valuable AI-related applications result in patents, but the lack of such activity in Louisville over the past decade suggests an underdeveloped AI innovation ecosystem relative to peers.

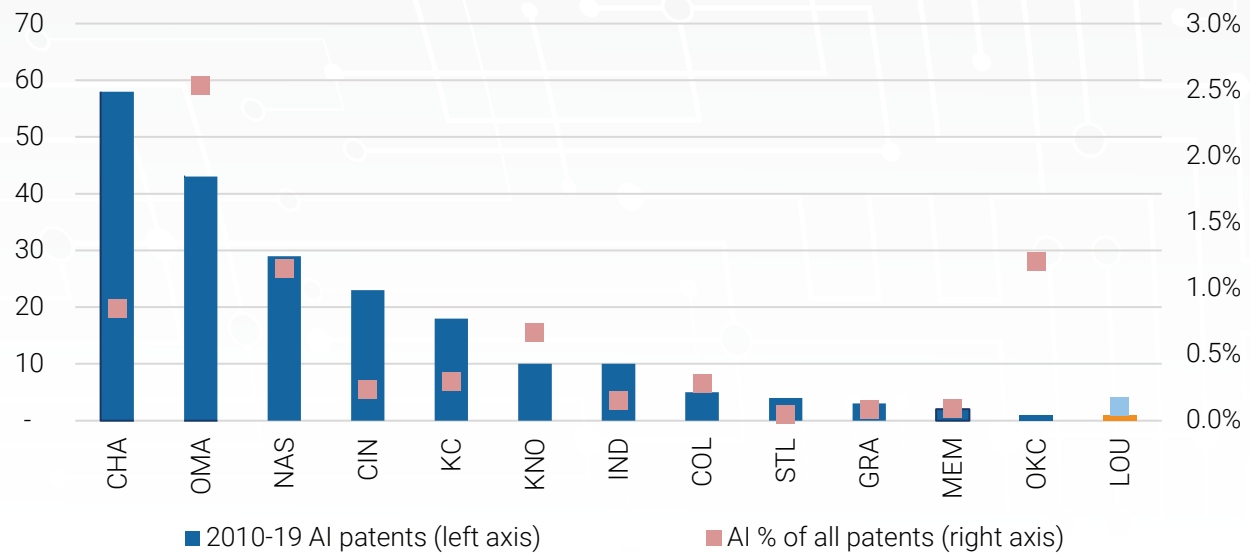
**Figure 1. Louisville has received relatively few AI-related federal research grants**  
AI-related federal R&D, 2010-19



Source: Brookings Analysis of USPTO.

**Figure 2. Louisville is not a major source of AI-related patents**

AI patents, 2010-19



Source: Brookings analysis of STAR Metrics data. Data unavailable for BHM, GRS, GRV, TUL.

### 3. Talent: Louisville has yet to cultivate a deep supply or demand of AI talent, but it has a sizable “data economy” workforce on which to build.

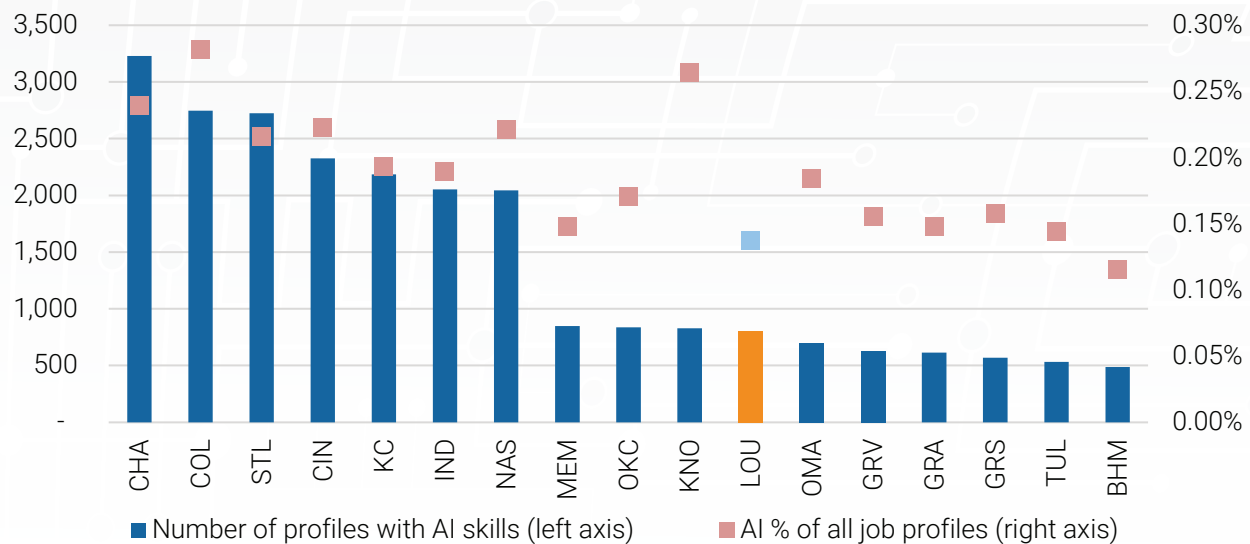
Human capital—the stock of knowledge, skills, expertise, and capacities embedded in the labor force—is of critical importance in developing and adopting AI technologies. The availability of AI talent and the level of AI readiness in the workforce can take many forms. Beyond roles with clear AI competencies such as data scientists, successful AI deployment often requires teams of people that include: technical specialists who know the structure of underlying data and how to manipulate them; subject matter experts who understand core business needs; and project managers who can coordinate these cross-functional teams. Available

data on labor supply (workers and their skills) and labor demand (from employers) offer some clues as to Louisville’s AI talent standing, and the degree to which the region is poised to grow equitable opportunities in the data economy.

**3A. Workers with AI skills** provide one measure of the relevant talent supply to support an AI economy. Relevant skills are captured in “job profiles” compiled from online resumes and similar sources by private data provider Emsi, and feature key phrases such as “unsupervised learning,” “neural networks,” “natural language processing,” and “speech recognition.” Emsi identifies 802 job profiles in Louisville in 2019 that feature such AI skills— lower than most of its peer cities (11th out of 17), though similar in magnitude to Knoxville, Tenn., Memphis, Tenn., and Oklahoma City. Among its peer regions, Louisville had the second-lowest percentage (0.14%) of total job profiles that identified AI skills (Figure 3).

**Figure 3. Louisville has fewer workers with AI skills than most peer regions**

Job profiles with AI skills, 2019



Source: Brookings analysis of Emsi.

Workers with AI skills are widely distributed among local firms in Louisville, with two exceptions: Humana and the University of Louisville, together, employ nearly one in five of the region’s skilled AI workers (Figure 4). Since 2015, 72 job profiles with AI skills were linked to Humana, while 66 were linked to the University of Louisville. Firms in the advanced manufacturing cluster, such as Samtec, Material Handling Systems, and General Electric, also employ significant AI talent in the region. Graduates of the University of Louisville account for 31% of Louisville-area workers with AI skills, followed by the University of Kentucky (7%) and Indiana University Southeast (3%).

**3B. Job postings that require AI skills** provide a close-to-real-time measurement of AI talent demand from local companies, and suggest the extent to which companies are adopting AI technologies. Among its peer cities, both absolute (total postings) and relative (AI share of all postings) demand for AI skills in Louisville ranked rather low in 2019, with 678 job postings seeking AI skills (12th of

the 17 metro areas)—equivalent to just 0.24% of total jobs posted (13th of the 17 metro areas) (Figure 5). In this respect, while new job postings for AI skills could greatly multiply the number of current AI positions in the local economy, it is not clear whether the requisite skills currently exist among the local labor force, nor whether the rate of growth implied by these postings would help Louisville stand out among competitor regions also demanding these skills.

**3C. Data economy skills** reflect a wider set of competencies that may indicate Louisville’s preparedness to adopt new AI technologies. These skills relate to the collection, processing, and analysis of data in a variety of contexts, and feature keywords such as “data,” “mathematics,” “statistics,” “software,” and “computer.” While workers with these skills are not necessarily trained in the core tools and techniques associated with AI, they possess adjacent capabilities that could serve as the foundation for an AI-ready workforce.

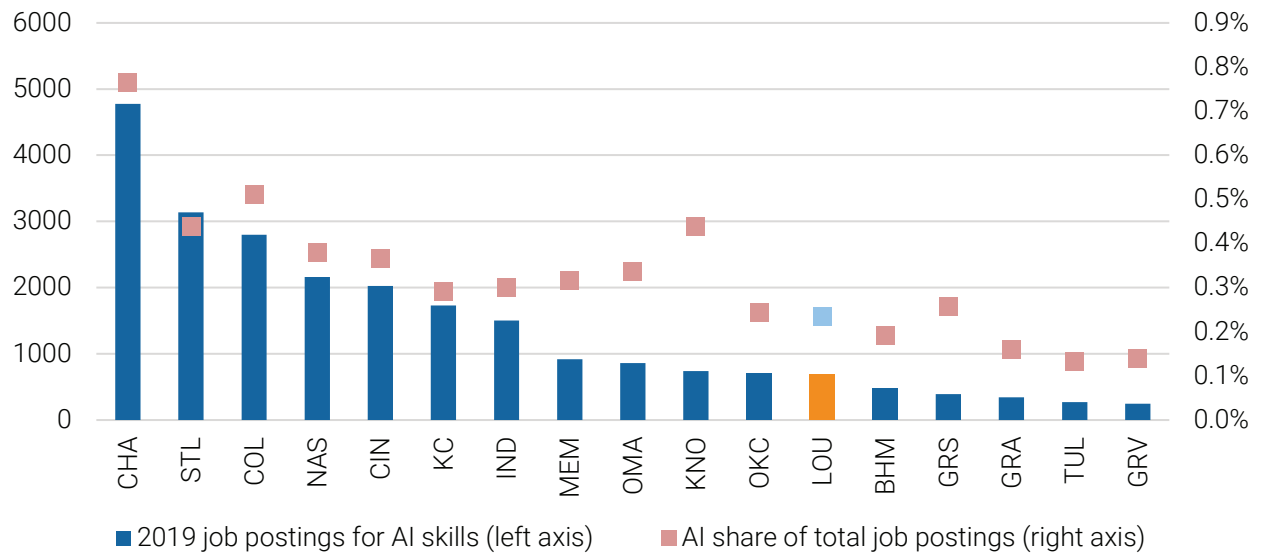
**Figure 4. Top firms in Louisville employing workers with AI skills, since 2015**

Firms	AI job profiles	% of total AI talent
Humana, Inc.	72	9.9%
University of Louisville	66	9.1%
Samtec, Inc.	9	1.2%
Material Handling Systems Inc	8	1.1%
Indiana State University	7	1.0%
General Electric Company	7	1.0%
Norton Healthcare, Inc.	6	0.8%
Cognizant Technology Solutions Corp.	6	0.8%
Tata Consultancy Services, Ltd.	5	0.7%
Kindred Healthcare, Inc.	5	0.7%
Jefferson County Public Schools	5	0.7%

Source: Brookings analysis of Emsi.

**Figure 5. Louisville's businesses do not currently exhibit high demand for AI skills**

AI job postings and share of total job postings, 2019



Source: Brookings analysis of Emsi.

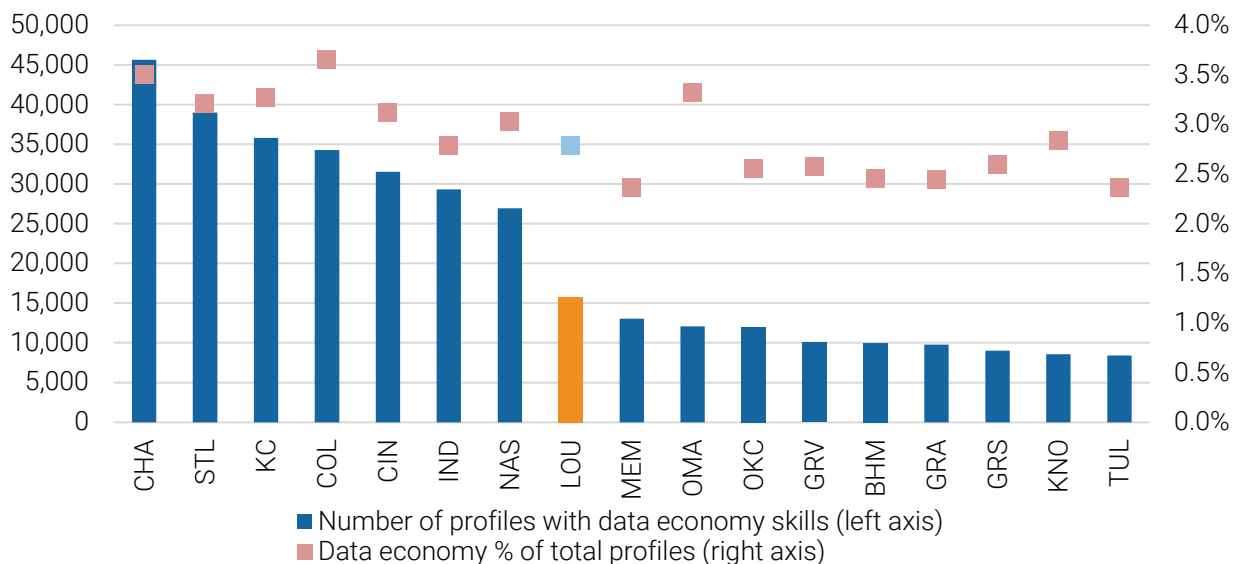
According to Emsi, there were about 15,700 profiles in the Louisville area that declared data-economy-related skills since 2015, accounting for 2.8% of the metropolitan area’s total profiles (Figure 6). This puts Louisville closer to the average of its peers than is the case for its AI-specific skill measures.

Humana is by far the largest employer of data economy talent in the Louisville region, followed by educational institutions (JCPS and the University of Louisville), UPS, and General Electric. Other health care companies such as Kindred and Norton also employ dozens of data economy professionals. So, too, do food and beverage companies such as Kroger, Papa John’s, Yum! Brands, and Brown-Forman. In general, it seems that major firms headquartered in Louisville across a range of sectors use data economy skills to drive complex decisionmaking across their businesses (Figure 7). This points to a strong foundation for driving deeper AI awareness and skills adoption across Louisville’s most prominent economic anchors.

**3D. Data economy equity** reflects the degree to which participants in the local data economy demographically represent the community at large. In Louisville and its peer cities, this is most relevant with respect to the Black population, which represents 15% of the Louisville-area workforce, but has historically faced exclusion from the jobs and industries most closely associated with the data economy. Statistics regarding the demographic profile of workers in specific local data economy jobs are limited, but one available proxy is the population that reports employment in “computer and mathematical occupations” on the Census Bureau’s American Community Survey. Those occupations overlap closely with many of the jobs captured in the “Data economy skills” section above.

One way to benchmark the participation of Black workers in local data economies is through an “equity ratio.” This ratio expresses the share of Black individuals employed in data economy occupations against the share of all individuals employed in such occupations. Values over 1.0 indicate that

**Figure 6. Louisville has an average supply of talent in the data economy relative to its peers**  
Job profiles with data economy skills and % of total job profiles since 2015



Source: Brookings analysis of Emsi.

**Figure 7. Humana is the largest employer of data economy talent in Louisville**

Company	Profiles	Share of total
Humana Inc.	1,988	12.6%
Jefferson County Public Schools	358	2.3%
University of Louisville	354	2.3%
United Parcel Service, Inc.	169	1.1%
General Electric Company	149	1.0%
Charter Communications, Inc.	118	0.8%
Insight Communications Company, Inc.	98	0.6%
Appriss Inc.	94	0.6%
Kindred Healthcare, Inc.	92	0.6%
Norton Healthcare, Inc.	89	0.6%
The Kroger Co.	73	0.5%
E.ON UK PLC	67	0.4%
CompuCom Systems, Inc.	65	0.4%
Tata Consultancy Services Ltd.	65	0.4%
TEKsystems, Inc.	63	0.4%
Papa John's International, Inc.	62	0.4%
Yum! Brands, Inc.	57	0.4%
AT&T Inc.	55	0.4%
Amazon.com, Inc.	51	0.3%
U.S. Department of the Army	51	0.3%
Brown-Forman Corporation	50	0.3%
Farm Credit Mid-America	50	0.3%

Source: Brookings analysis of Emsi.

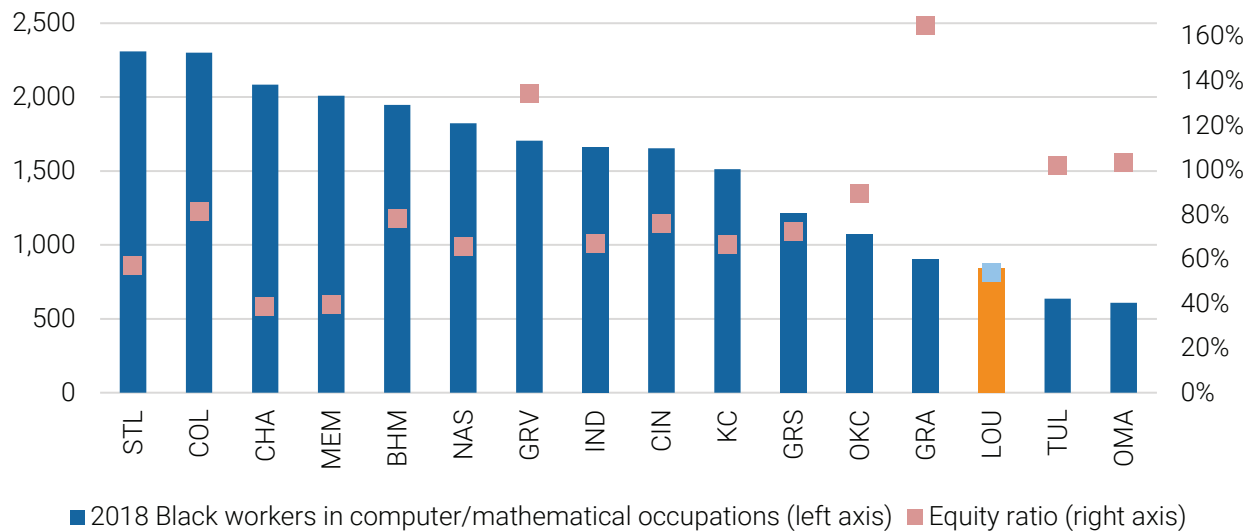
the metro area's Black workers are *more likely* than workers overall to be employed in computer and mathematical occupations, while values under 1.0 reflect that Black workers are underrepresented in those jobs. In this respect, the ratio indicates not only the diversity of the local data economy's current workforce, but also how successfully over time it has promoted Black students' and workers' preparation for—and access to—those positions.

On this count, Black workers in Louisville are more underrepresented in the local data economy than Black workers in most peer cities (Figure 8). While 1.4% of all workers in Louisville are employed in computer and mathematical occupations, the same is true for less than 1% of the region's Black workers. The resulting disparity is larger than all but two of Louisville's peer cities. If Black Louisvillians were employed in these occupations in accordance with

their share of the local workforce, nearly twice as many of them would work in the data economy.

Moreover, the smaller size of Louisville's data economy relative to many peers means that its ecosystem of Black professionals is also relatively small. In metro areas with similar levels of data economy underrepresentation for Black workers—Charlotte, N.C., Memphis, Tenn., Nashville, Tenn., and St. Louis—roughly 2,000 or more Black individuals are employed in these occupations, versus fewer than 900 in Greater Louisville. Even in regions such as Tulsa, Okla. and Omaha, Neb.—where fewer Black individuals overall work in the data economy—they are proportionally represented in those occupations. This points to a significant challenge and imperative for Louisville to address inequitable access to data economy opportunities as it builds out an AI-readiness strategy.

**Figure 8. Black workers are more underrepresented in Louisville's data economy than in most peer regions**  
Black workers in computer/math occupations and equity ratio, 2018



Source: Brookings Analysis of American Community Survey data. Equity ratio represents share of Black workers in computer/math occupations relative to share of all workers in those occupations. Data unavailable for KNO.

#### 4. Industry specializations: Louisville's strong clusters differ in the intensity and growth of their AI/data economy orientations.

The talent indicators above provide clues about the overall supply and demand for AI and data economy skills in the Louisville area, as well as some of the most prominent employer sources of AI talent in the region. But those supply and demand dynamics may have greater value for regional growth and prosperity in some corners of Louisville's economy than others.

Specifically, Louisville's ability to become a more prominent AI hub will rest in large part on the capacity of companies and workers in its **strong industry clusters** to adopt productive and responsible AI technologies. Accordingly, this section analyzes occupational and talent demand dynamics in several of Louisville's strong clusters (advanced manufacturing, business services, biomedical, health care, and transportation and

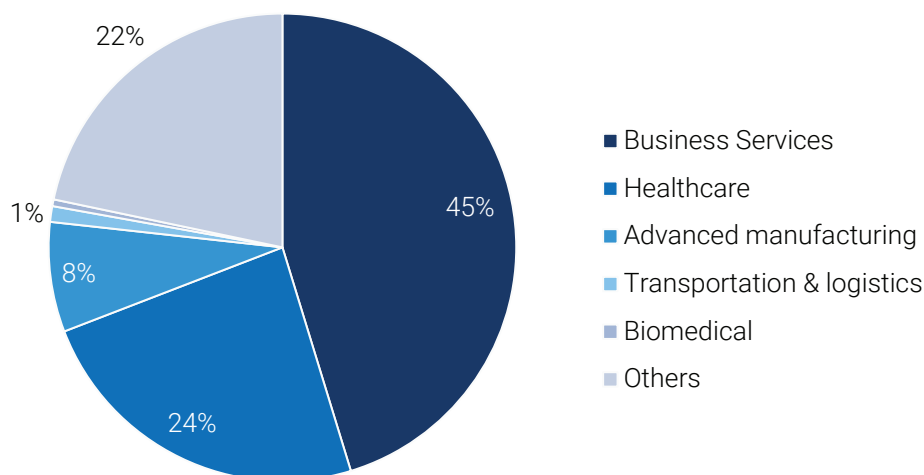
logistics) as compared to averages for its peer regions and the United States as a whole.

**4A. AI job postings by industry** suggest that nearly half the recent demand for AI skills has come from employers in Louisville's business services sector, with roughly twice as many postings as in the next largest sector, health care (Figure 9). Notably, a diversified set of industries outside Louisville's strong clusters accounted for more than one in five (22%) of the region's AI job postings in 2019.

Although business services companies—including a range of consulting, legal, and financial services firms—accounted for the largest share of AI talent demand in 2019, at the individual firm level, health care companies Humana and Anthem led all others in Louisville (Figure 10).

**4B. Data economy occupations**—those most likely to employ the data economy skills described in the previous section—provide another indication of the degree to which Louisville's strong industry clusters are positioned to adopt AI technologies, or

**Figure 9. Nearly half of Louisville's demand for AI talent comes from the business services cluster**  
AI job postings by priority business cluster, 2019



Source: Brookings analysis of Emsi.



**Figure 10. Top Louisville recruiters of AI-related occupations by jobs posted in 2019**

Company	Unique Postings, Dec 2018 - Dec 2019
Humana, Inc.	100
Anthem, Inc.	38
GE Appliances, a Haier Company	22
PricewaterhouseCoopers LLP	21
eFinancialCareers, Inc.	16
Genscape, Inc.	15
Locum Leaders, Inc.	14
Youth Villages, Inc.	10
KiZAN Technologies, LLC	10
Material Handling Systems, Inc.	10
Technology Consulting, Inc.	10
Deloitte LLP	10

Source: Brookings analysis of Emsi.

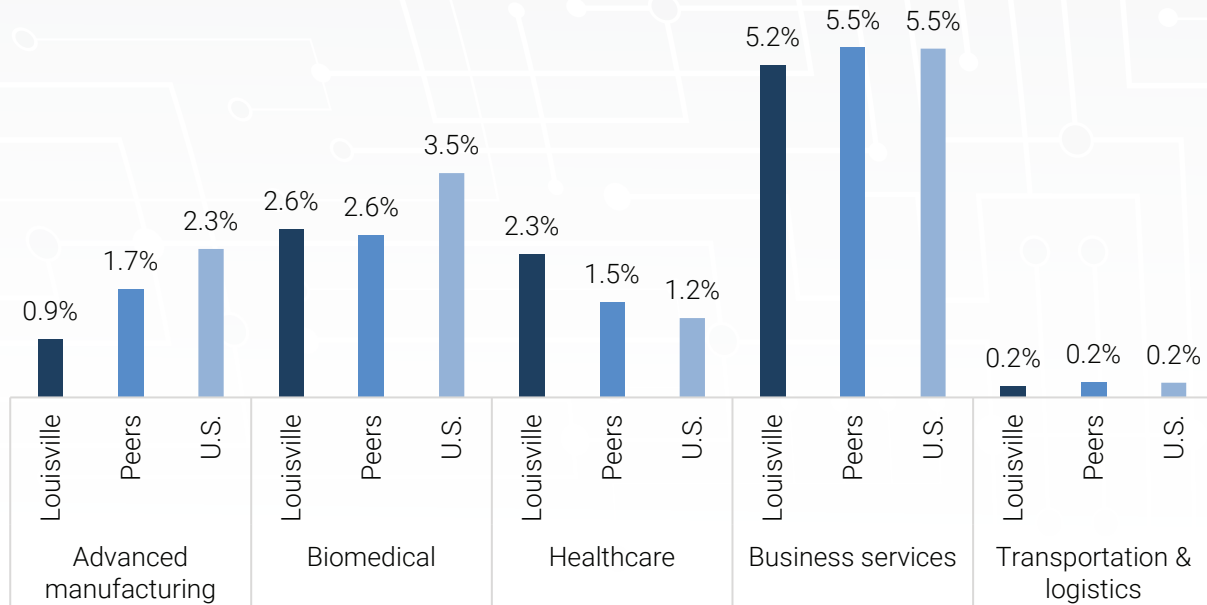
otherwise be exposed to potential disruption. How these clusters in Louisville compare to the same industries in benchmark cities and national averages on employment of data economy professionals suggests whether Louisville is potentially ahead or behind the AI adaptation curve.

Overall, data economy occupations represent the highest share of jobs in Louisville’s business services (5.2%), biomedical (2.6%), and health care (2.3%) industry clusters (Figure 11). Advanced manufacturing (0.9%) and transportation and logistics (0.2%) have much lower shares of these occupations. Compared to its peer metro areas, Louisville’s business services and biomedical industries employ similar shares of data economy workers, but Louisville’s health care cluster appears

to be significantly more data-economy-oriented than the same industry in peer cities (1.5%) or nationally (1.2%). This likely reflects the presence of major health care headquarters functions in Louisville—functions for which data economy skills are typically highly relevant. By contrast, Louisville’s advanced manufacturing cluster appears *less* likely to employ data economy professionals (0.9% of jobs) than similar clusters in peer cities (1.7%) or nationally (2.3%).

The growth of data economy occupations in Louisville’s strong clusters from 2015 to 2019 tells a somewhat different story. In this light, Louisville’s business services and advanced manufacturing clusters have slightly outperformed peer city and national averages, with 16.6% growth in data

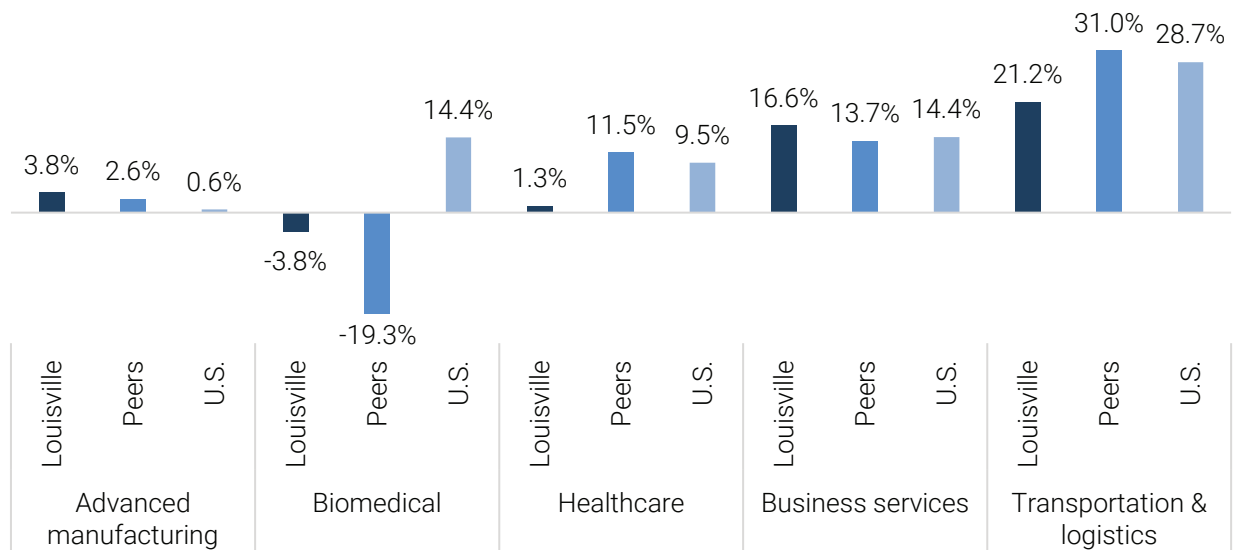
**Figure 11. Louisville's health care cluster is more data-economy-oriented, and its advanced manufacturing cluster less data-economy-oriented, than clusters in peer metro areas**



Source: Brookings analysis of Emsi.

**Figure 12. Data economy occupations have grown in four of Louisville's strong clusters**

Percent change in data economy occupations by cluster, 2015-19



Source: Brookings analysis of Emsi.

**Figure 13. Top recruiters of data economy occupations, by jobs posted in 2019**

Company	Unique Postings, Dec 2018 - Dec 2019
Humana Inc.	662
Anthem, Inc.	609
eFinancialCareers, Inc.	236
Revature	163
PricewaterhouseCoopers LLP	155
CyberCoders, Inc.	122
Computer Task Group, Inc.	112
Kforce Inc.	110
Baptist Healthcare System, Inc.	106
Appriss Inc.	104

Source: Brookings analysis of Emsi.

economy jobs over the four-year period. However, its health care cluster saw relatively anemic growth in data economy occupations (1.3%) even as those jobs grew by 11.5% in health care sectors in peer cities (Figure 12). And even as data economy positions expanded in Louisville's transportation and logistics sector, they expanded faster elsewhere. These trends suggest that while Louisville may maintain some competitive niches in which it is better poised to adopt AI technologies than other cities, it may be evolving less rapidly in other areas, potentially placing those clusters and jobs at greater near-term risk for competitive disruption.

Nevertheless, in 2019, health care companies remained the top recruiters of data-economy-related occupations, followed by business services firms (Figure 13). Some other leading companies on the list are staffing agencies (e.g., CyberCoders, Inc., Computer Task Group, Inc.) that source data economy talent for a range of industries.

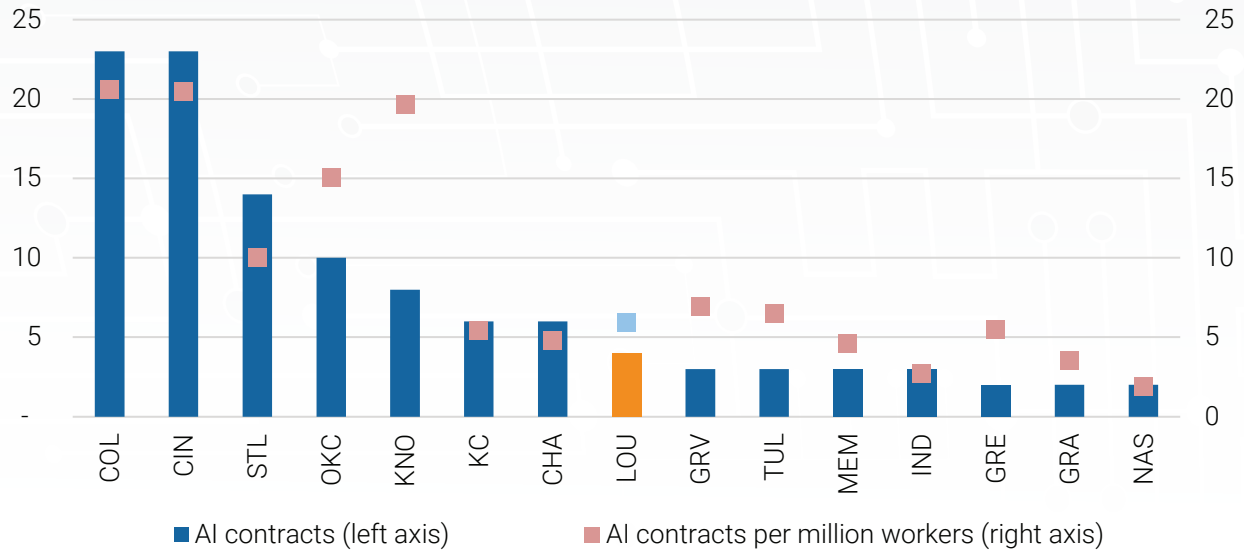
## 5. Financial capital and startup ecosystem: Louisville is growing as a magnet for investment, but its AI ecosystem remains small.

The availability of financial capital from private and public sources attracts talent and companies looking to develop and scale new technologies. In turn, the strength of that local ecosystem in the AI/data economy space forms a critical input to any city's potential emergence as a hub.

**5A. Federal AI contracts:** Data on government spending transactions on AI projects provides one measure of public investment. The federal government awarded four AI-related grants to Louisville institutions between 2010 and 2019. That ranked Louisville eighth among 15 peer cities by number of federal AI contracts per million workers (Figure 14).

**Figure 14. Louisville has received an average number of AI contracts from the federal government compared to its peers**

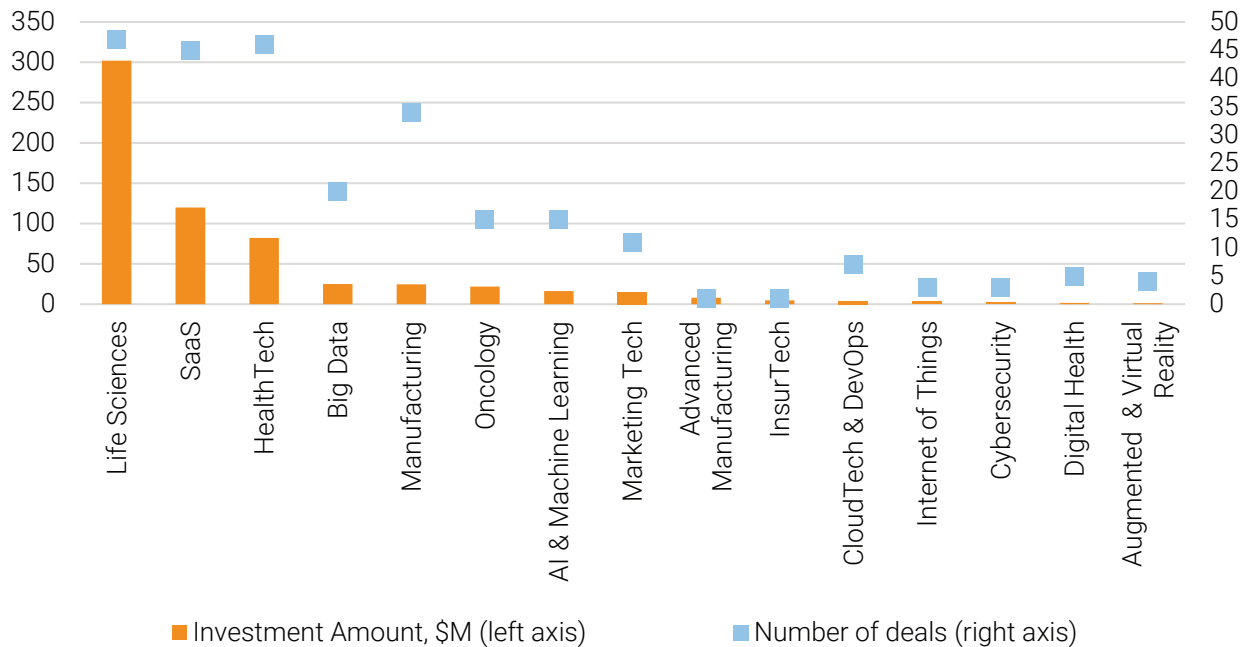
AI federal contracts, 2010-19



Source: Brookings analysis of Stanford HAI data. Data unavailable for BHM and OMA.

**Figure 15. Louisville has attracted a significant amount of venture capital investment in priority industries since 2010**

Venture capital investment by industry vertical, Louisville, 2010-current



Source: Brookings analysis of Pitchbook data.

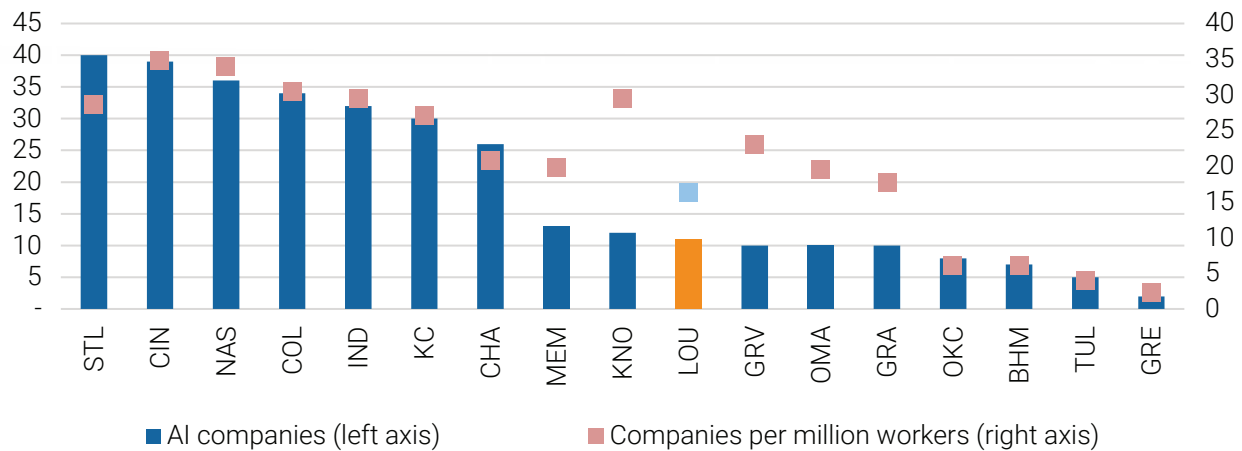
**5B. Venture capital (VC)** provides resources to startup companies with high potential for growth. According to Greater Louisville Project analysis, venture capital investment in Louisville increased dramatically from 2017 to 2019, but Louisville ranks only in the middle of the pack (seventh) over the last decade in total VC investment per capita.<sup>12</sup> However, firms in Louisville’s priority industries have attracted significant capital since 2010. In particular, Louisville’s health sector has attracted \$302 million across 47 deals in life sciences, and \$82 million across 46 deals in health tech (Figure 15).

**5C. Companies** specializing in AI-related technologies represent an additional indicator of local ecosystem strength. Crunchbase, a crowdsourced directory of technology-related

companies, offers some insight into the breadth and depth of such companies in U.S. metro areas. While it does not necessarily provide an exhaustive count of such companies, Crunchbase is useful for benchmarking otherwise similar places on indicators of tech entrepreneurial activity. As of the end of 2019, Crunchbase listed 11 Louisville-area companies that report an “industry vertical” related to AI, such as robotics, machine learning, facial recognition, or speech recognition. This placed Louisville near the middle of its peers, though somewhat closer to the bottom on a per-worker basis. Not surprisingly, Louisville-area AI companies in Crunchbase were more likely to list health care and biotechnology among their key verticals than companies in peer metro areas.

**Figure 16. 2019 AI job postings**

Local technology companies using AI, 2019



Source: Brookings analysis of Crunchbase data.

# IMPLICATIONS

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As Louisville strives to recover from the COVID-19 recession, local leaders have coalesced around a vision of creating a more prosperous and just future for all Louisvillians, particularly those most impacted by the pandemic and racial injustice.<sup>13</sup> The creation of the Louisville Future of Work Initiative in 2019 has provided the city and region with a head start toward building higher-quality, more equitable economic opportunities in fields that can contribute meaningfully toward that vision.

However, as this benchmarking analysis demonstrates, Louisville must be realistic and strategic about how to position itself in the fast-developing AI/data economy, many elements of which continue to cluster in larger technology hubs. Even comparing Greater Louisville to its regional peers in the Midwest and Southeast indicates that it lags several “mid-tech” markets in many dimensions of AI innovation, workforce readiness, entrepreneurship, and equity.

Nevertheless, Louisville continues to stand out for its rich set of institutions and culture of collaboration that could—with added focus, purpose, and investment—help it become a stronger hub for opportunities in AI and the data economy.

We summarize the benchmarking analysis above as follows:

- Louisville is not currently positioned to become a significant *producer* of AI technologies. It lags its peer metro areas in most AI-specific innovation and talent indicators. Of course, those metro areas, in turn, lag domestic AI hubs such as San Francisco, Boston, New York, Seattle, and Los Angeles on AI innovation, talent, and startup ecosystems by a substantial degree. In this regard, Louisville’s position is not surprising; the intense clustering and “platform” aspects of the AI economy mean that relatively few places will drive the bulk of early stage AI-related development.
- Louisville does, however, punch at its weight in terms of its *data economy* orientation, as measured by the supply of local talent with and business demand for a wider set of skills related to data, statistics, mathematics, and software. This seems to reflect the influence of a diverse set of local headquarters companies in business services, health care, and food and beverage, suggesting that the region has significant private sector assets that can enable AI *adoption and deployment* at greater scale.
- But not all of Louisville’s strong clusters are growing in their data economy orientation; local health care and transportation and logistics sectors appear to lag their counterparts elsewhere in the growth of data-economy-related occupations. Efforts to maintain the competitiveness of those clusters and the high-value jobs they provide in the local economy—especially outside the very largest companies and institutions—may rest on accelerating much wider adoption of cutting-edge technologies, and, in turn, facilitating companies’ access to a diverse workforce with the requisite capabilities.
- Venture capital investment in the Louisville startup community is rising, although the metro area still ranks in the middle of the pack on a per capita basis. While a large share of this investment remains directed toward life sciences companies, a growing number of deals in the health tech space suggest future efforts could build upon an entrepreneurial data economy ecosystem connected to one of the metro area’s strong clusters.



Photo credit: Louisville Forward

- Efforts to make Greater Louisville a stronger and more inclusive data economy hub must contend with a deeper level of local racial exclusion than exists in most peer metro areas. Black workers in Louisville are heavily underrepresented in computer and mathematical jobs, reflecting historically high levels of residential, educational, and occupational segregation. In this respect, Louisville has even more work to do than other cities to ensure that its future technology economy is more racially equitable.

These takeaways from the benchmarking analysis point to three key areas in which Louisville-area leaders should deepen focus and investment to facilitate a technologically enabled, broad-based, and racially equitable recovery from the COVID-19 recession.

### **Broaden and diversify Louisville's AI talent pipeline**

Most importantly, Louisville must continue to scale and diversify pathways to data economy skills and careers. A region's success in seizing opportunities in AI and the data economy depends

more on the skills and ingenuity of its residents than on any other factor. Louisville needs more people who are prepared to work at all levels of the data economy, so that the region can seed new enterprises, help existing businesses transition, and attract new good jobs from elsewhere. As a midsized market, Louisville needs more of this talent in part to distinguish itself from other cities. Just as importantly, it needs more diverse technical talent that represents the whole of the Louisville community, so that local investments in advancing the data economy also advance equity.

Success will require not only diversifying the types of young people who pursue AI-related education and careers, but also creating a wider set of pathways into those opportunities than have conventionally been offered (i.e., four-year computer science degrees). In the higher education arena, for instance, Louisville-area colleges and universities are evaluating how their required curricula might incorporate more applied coursework in place of conventional math requirements, ensuring that graduates from diverse disciplines gain exposure to relevant data economy skills and concepts.

Several efforts are taking shape within Jefferson County Public Schools (JCPS), which has already launched a systemwide effort to ensure that all students demonstrate applied digital skills, as evidenced by possessing an industry-recognized certification or digital badge. JCPS is now working with the Louisville Future of Work Initiative and local employers to expand co-op opportunities for high school seniors in digital fields. The new ID+ Academy offers JCPS students an educational pathway in informatics, exposing them to data and design for empowering communities, exploring identity, and solving problems for industry.<sup>14</sup>

Efforts are also growing to ensure that training programs and career pathways to the data economy better engage members of historically excluded communities. JCPS, via Central High School—which serves a predominantly Black student population—is partnering with Bellarmine University on the Butterfly Project, a “data science for social justice” program that provides Bellarmine and Central High students with data science skills related to jobs, justice, education, health, and housing.<sup>15</sup> New public and philanthropic investments are backing organizations such as AMPED and the Louisville Central Community Center to engage young people in their technology upskilling and job placement programs.<sup>16</sup>

These initiatives to develop a larger and more diverse pipeline to the data economy are taking shape against the backdrop of a recession that has displaced tens of thousands of Louisvillians from jobs. In response, the Louisville Future of Work Initiative’s COVID-19 Reskilling Initiative is connecting these individuals to free short-term training programs in the in-demand data economy fields of data analytics, digital marketing, software engineering, and user experience design.

Many of these efforts to build Louisville’s tech talent pipeline are nascent or motivated by the specific circumstances of the pandemic recession and renewed attention in 2020 to historical racial injustice. Scaling and sustaining them over the longer term—including ensuring strong connections

to local employers and deeper reach into communities of color—will be critical to Louisville’s success in the data economy. Critical, too, will be an increasing emphasis on developing specific AI-related skills (e.g., in data management and algorithm development) that can signal Louisville’s emerging proficiencies in that space.

### **Support AI adoption and adaptation in Louisville’s businesses**

Alongside a significant push to build an AI-ready next-generation workforce, Louisville leaders must also support the technological advancement and adaptation of its existing businesses and workers in an AI age. As the benchmarking analysis demonstrates, many jobs in Louisville involve the collection, processing, and analysis of data in a variety of contexts, reflecting the region’s prominence in business services and headquarters functions. However, Louisville lags most peer regions in employing and seeking workers with AI-specific skills. Today, just two local firms/institutions (Humana and the University of Louisville) account for nearly 20% of AI-specific talent in the Louisville region. Even across a wider set of occupations associated with the data economy, strong local health care and biomedical clusters are trailing peer and/or national averages in recent growth.

Part of the way forward involves building a stronger local ecosystem involving startups, larger companies, and supporting civic institutions committed to using data in new ways to solve business challenges. The necessary ingredients are clearly present in Louisville in lifelong wellness and aging, as evidenced by a growing number of technology startups in that space receiving funding, a data-economy-rich workforce across many of the region’s most prominent health care companies, and several complementary industry and research organizations. While the AI benchmarking data shows major corporations such as Humana and Anthem already embracing these new technologies, opportunities likely exist to accelerate their progress and that of many mid-sized firms in the region through stronger partnerships with local tech



startups and the research community. In this regard, the recent pivot of Louisville Entrepreneurship Acceleration Programs (LEAP) to focus in the health care space, including by integrating with the Louisville Healthcare CEO Council (LHCC) and the University of Louisville's Office of Research and Innovation, is an exciting development that potentially merits deeper focus and investment.

While Louisville has the assets to bet big on AI and the data economy in the health realm, it should not overlook the need and potential for transformation in its other prominent clusters, particularly business services, transportation and logistics, and advanced manufacturing. As a next step, regional leaders might investigate whether they could best enable such transformation through sector-specific organizations, or whether cross-cutting strategies focused on adopting AI and data economy tools and developing associated talent could serve multiple strong local clusters. Helping to tell the stories of companies that have made the journey and providing companies with information and resources on where they can turn to plot their own course represent low-cost and fruitful first steps. Here, a commitment to equity demands that such efforts feature the experiences and expertise of women- and minority-owned businesses to fully support their success in Louisville's wider technological transformation.

### **Develop and market Louisville's AI niche in the broader region**

Finally, as noted at the outset, the Louisville Future of Work Initiative was established with the goal of making Louisville a premier midsized city for opportunities in AI and data innovation. As the Initiative's work has progressed, other cities in the wider region have embraced similar goals and/or begun to mount notable strategies of their own. Nearby metropolitan areas such as Indianapolis and Nashville, Tenn. are emerging as prominent midsized regions for innovation, talent, and entrepreneurship in AI and the data economy. With the rise of remote work in the pandemic and more coastal companies seeking to distribute

their operations to lower-cost markets, these regions could be on the precipice of a new wave of technology-fueled growth.

Rather than compete for this talent and investment with their larger Midwestern and Southeastern neighbors, Louisville leaders should consider how they might join forces in a "super-regional" hub for AI and the data economy. Specifically, each of these regions has complementary specializations in health care and the life sciences economy, with world-class corporate and research anchors: Eli Lilly (pharmaceuticals) and Indiana University/Purdue University in Indianapolis, Humana (insurance) and University of Louisville in Louisville, and HCA (hospital management) and Vanderbilt University in Nashville. They lie along a 300-mile stretch of Interstate 65, with Louisville located roughly halfway between Indianapolis and Nashville.

No single one of these metro areas alone possesses the scale and assets of a true AI producer city like Boston, San Francisco, or Seattle. Together, however, they could strategically share an AI-enabled workforce, supply chain, and research assets in health care and life sciences. For instance, universities across the three regions might develop joint educational and/or research initiatives in AI and health; their regional chambers could develop shared programming to educate local middle-market health care businesses and "matchmake" them with AI solutions providers; or their leading health care corporations could explore coordinated procurement of AI-related training for their incumbent workforces.<sup>17</sup> Such visible steps could enable Indianapolis, Louisville, and Nashville to position themselves more prominently on the national and global technological stage, and thereby create hundreds of new businesses and thousands of high-quality job opportunities. Leading corporations, universities, and governments across the three markets should initiate exploratory discussions around whether and how these three regions could "collaborate to compete" in a fast-growing part of the AI and data economy.

# ENDNOTES

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