"People-centric" data infrastructure & descriptive work

1. Identify emerging & critical research fields through <u>investigators, not topics</u>

2. Expand beyond faculty to focus on <u>students & trainees</u>

3. Use careers of research-trained people to <u>identify jobs & employers</u>

How do
- research investments in
- critical & emerging fields have
- concrete, documentable effects on
- jobs, workers, employers & innovation ecosystems in
- specific regions?

Flexibly & reliably address the needs of many stakeholders

Accommodate widely varying fields to provide timely, granular information

CHIPS & Science : 10 Key Technology Areas

- Artificial Intelligence
- High Performance Computing
- Quantum Technology
- Advanced Manufacturing
- Cybersecurity
- Biotech
- Advanced Energy Efficiency
- Material Science

For constituencies far beyond academia

The critical next steps in AI development should . . . improve workers' lives, positively augment human work, and help all people safely enjoy the gains and opportunities from technological innovation.

– President Biden (Executive Order on AI 10/3/2023

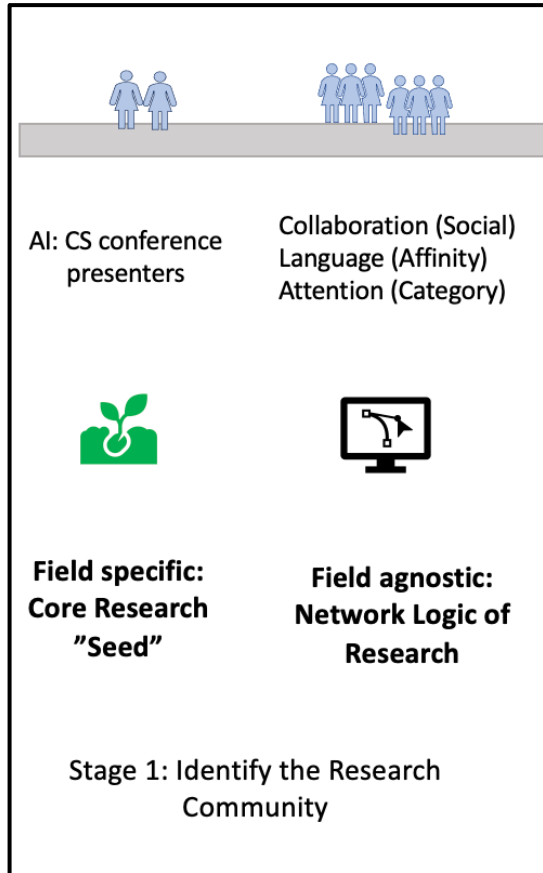# Built around existing data infrastructures & network theory
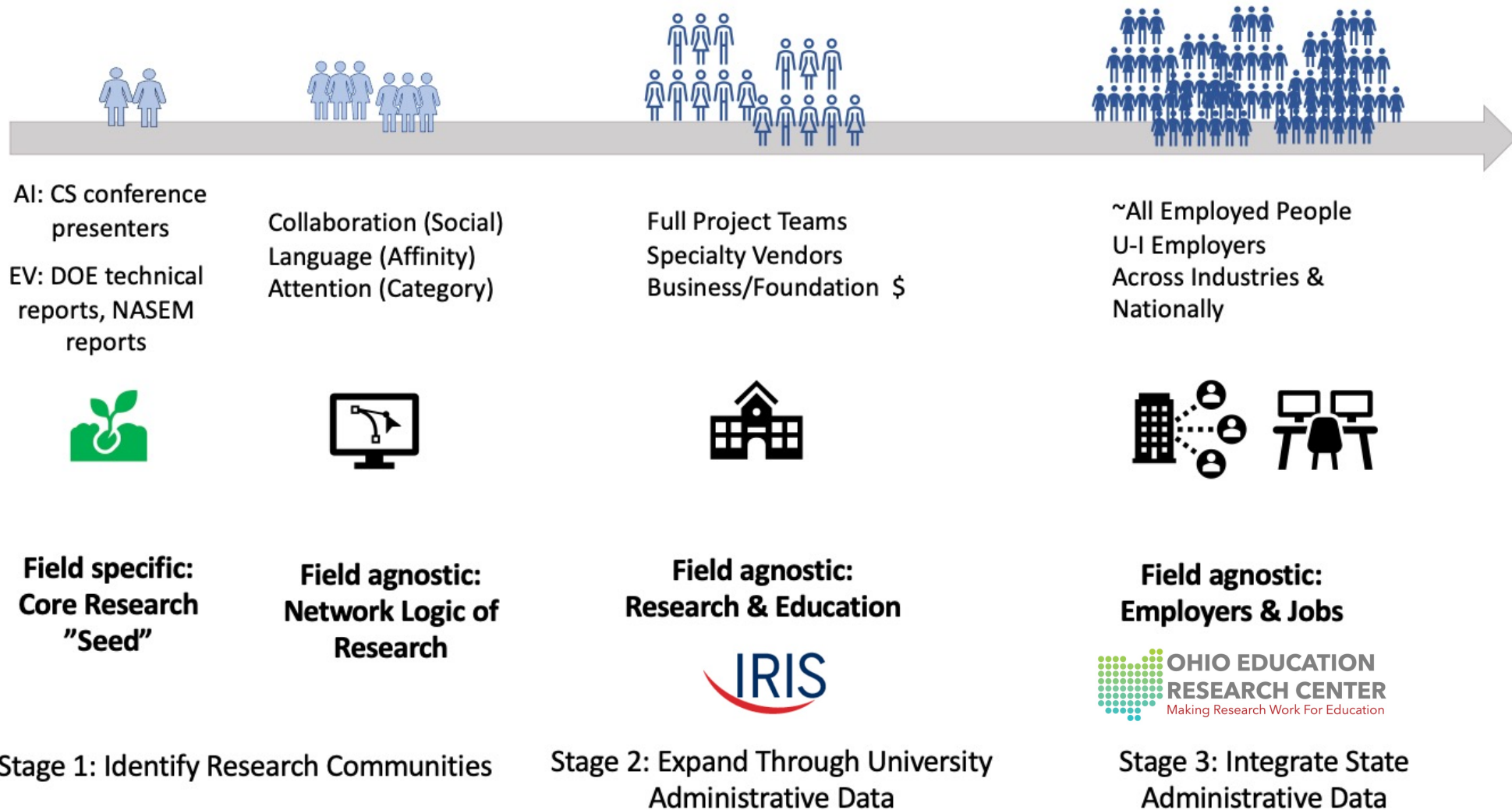
The Industries of Ideas Project will

1. <u>Build</u> a prototype measurement system for AI and Electric Vehicles (EV) in Ohio

2. <u>Describe</u> associations among research investments, jobs, employers, and innovation ecosystems in specific regions

3. <u>Report</u> findings via prototype dashboards developed with academic, state and federal stakeholders

4. <u>Plan</u> for expansion in

   > Scale – more universities, states, fields
   > Scope – additional domains and types of data
   > Usability – data/findings access, research use, training needs etc.

We need your help to accomplish 3 & 4

US researchers are a minority, but author most AI papers. 8.6% were PIs on NSF grants totaling $21.5 billion.

AI: CS conference presenters

Collaboration (Social)
Language (Affinity)
Attention (Category)

Field specific: Core Research "Seed"

Field agnostic: Network Logic of Research
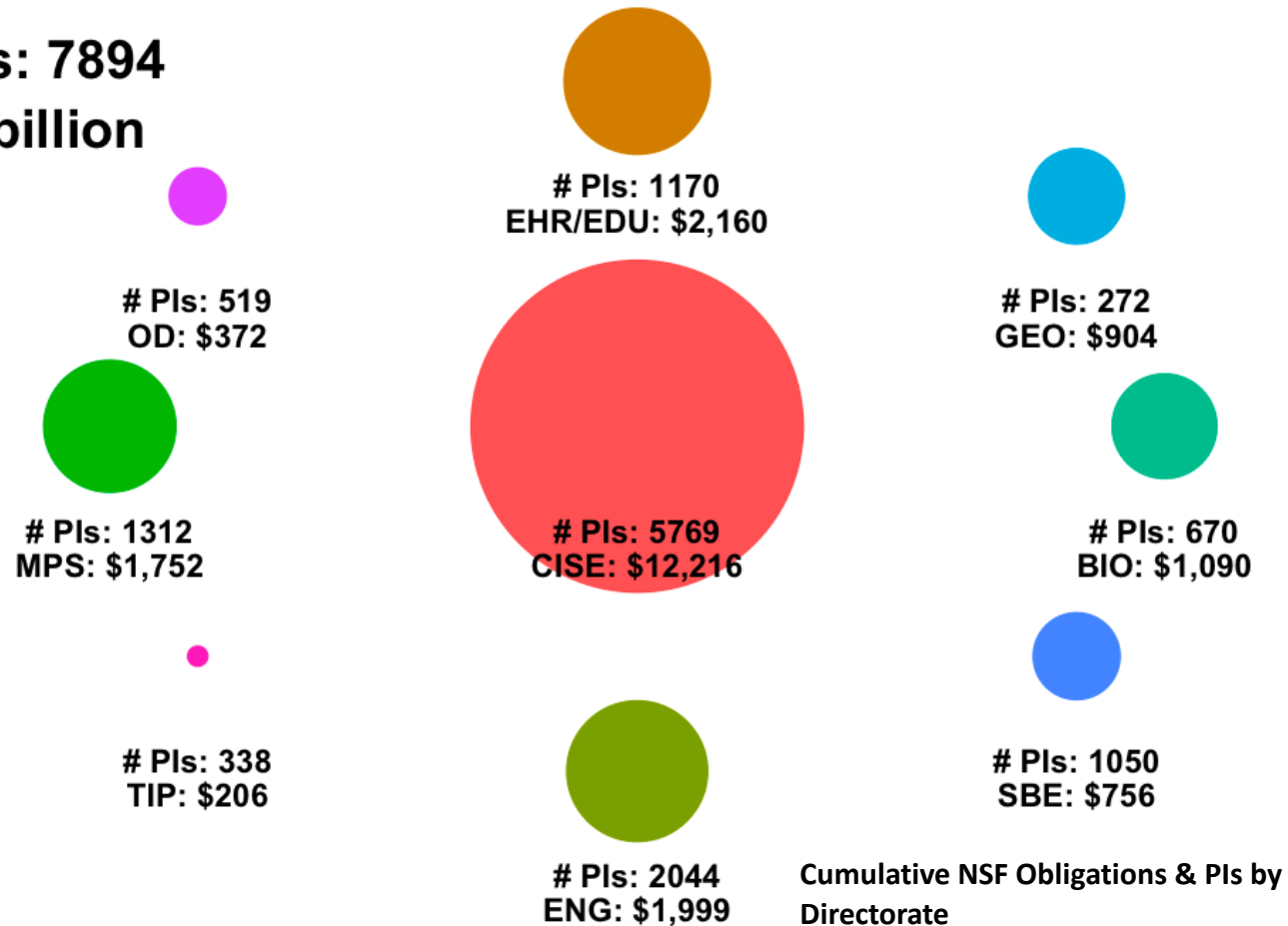
Stage 1: Identify the Research Community

- 248,460 Global Researchers
- 91,379 (36.8%) w/ US Affiliations

- 1.96 million papers
- 1.17 million (59.4%) w. US Authors

- 35,127 NSF Awards
- $21.5 billion
- 7,894 (8.6% of US, 3.2% of Total) Unique PIs

Preliminary Findings: Data are about 2 weeks old

AI-related NSF funding is highly interdisciplinary

Total PIs: 7894
$21.45 billion

PIs: 1170
EHR/EDU: $2,160

PIs: 519
OD: $372

PIs: 272
GEO: $904

PIs: 1312
MPS: $1,752

PIs: 5769
CISE: $12,216

PIs: 670
BIO: $1,090

PIs: 338
TIP: $206

PIs: 1050
SBE: $756

PIs: 2044
ENG: $1,999

Cumulative NSF Obligations & PIs by Directorate

- CISE dominates in terms of $ and PIs

- Every directorate is involved

- SBE & EHR both play important roles

- Nearly Half (48.4%) of PIs have been funded by 2+ directorates

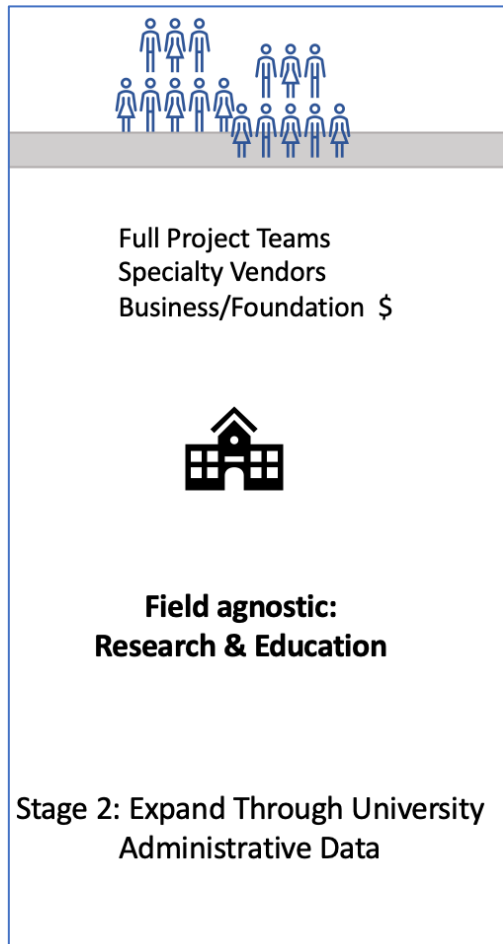Preliminary Findings: Data are about 2 weeks old

75% of US AI authors have collaborated with an NSF PI

- Academic NSF AI PIs (N = 7197) are **Rare**
  - < 8% of the US group and < 3% of the global group
- **Productive**
  - 22% of total papers, and 37% of US authored papers
- **Highly Collaborative**
 - 75% of US AI Authors who aren't NSF PIs have written papers with them

Preliminary Findings: Data are about 2 weeks old

Top 15 Universities by NSF Obligations for "AI" 2010-2023		
University	# AI Pis	Total NSF Obl. To AI Pis
Carnegie Mellon University	395	$ 1,540,616,481
University of Illinois Urbana-Champaign	267	$ 1,365,809,739
University of California, San Diego	154	$ 1,335,410,004
University of California, Berkeley	200	$ 885,548,950
Massachusetts Institute of Technology	277	< $ 835,739,903
The University of Texas at Austin	163	$ 733,226,176
Cornell University	188	$ 688,971,763
University of Washington	206	$ 659,492,752
Georgia Institute of Technology	223	$ 611,813,598
Purdue University	171	$ 608,980,497
Stanford University	206	$ 573,433,262
University of California, Los Angeles	143	$ 567,258,748
Columbia University	200	$ 486,689,189
University of Pennsylvania	144	$ 470,496,904
University of Southern California	191	$ 426,163,255

About 3100 PIs employed more than 46,000 people on their AI-related NSF grants at universities with data in IRIS
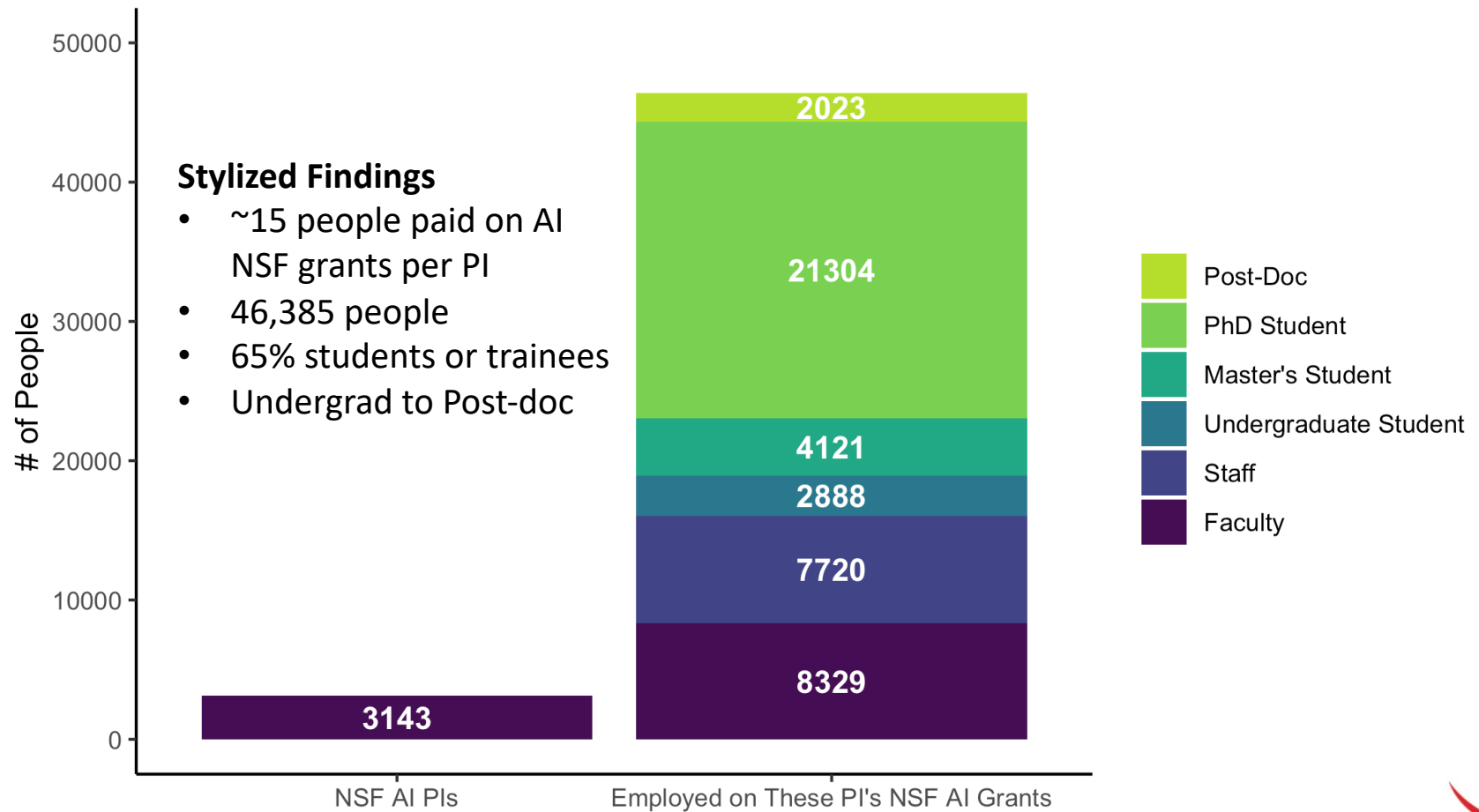
Employers "bid into" critical & emerging fields by hiring research trained people. Their industries are "touched" by relevant research investments.

~All Employed People U-I Employers Across Industries & Nationally

Field agnostic:
Employers & Jobs

Stage 3: Integrate State Administrative Data
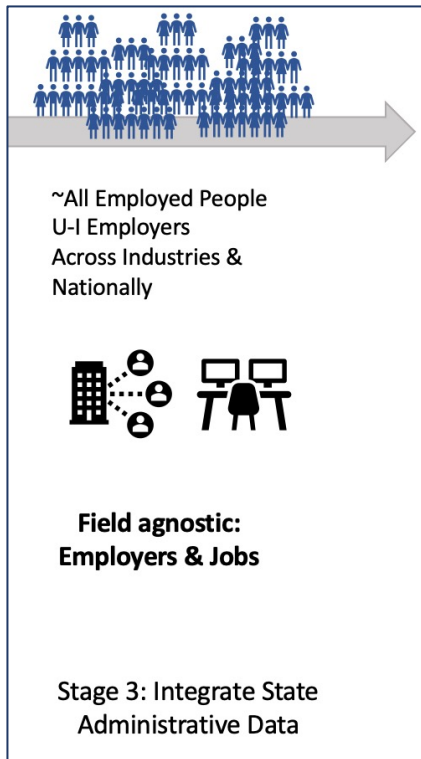
Our key assumption:

Companies employ people to develop AI research programs because

- they have a pressing business interest in AI and its applications.
- their (costly) signals of interest also indicate possible directions for their industries and competitors

Assessing the workforce characteristics of industries where company affiliates are publishing can provide early, orienting signals.
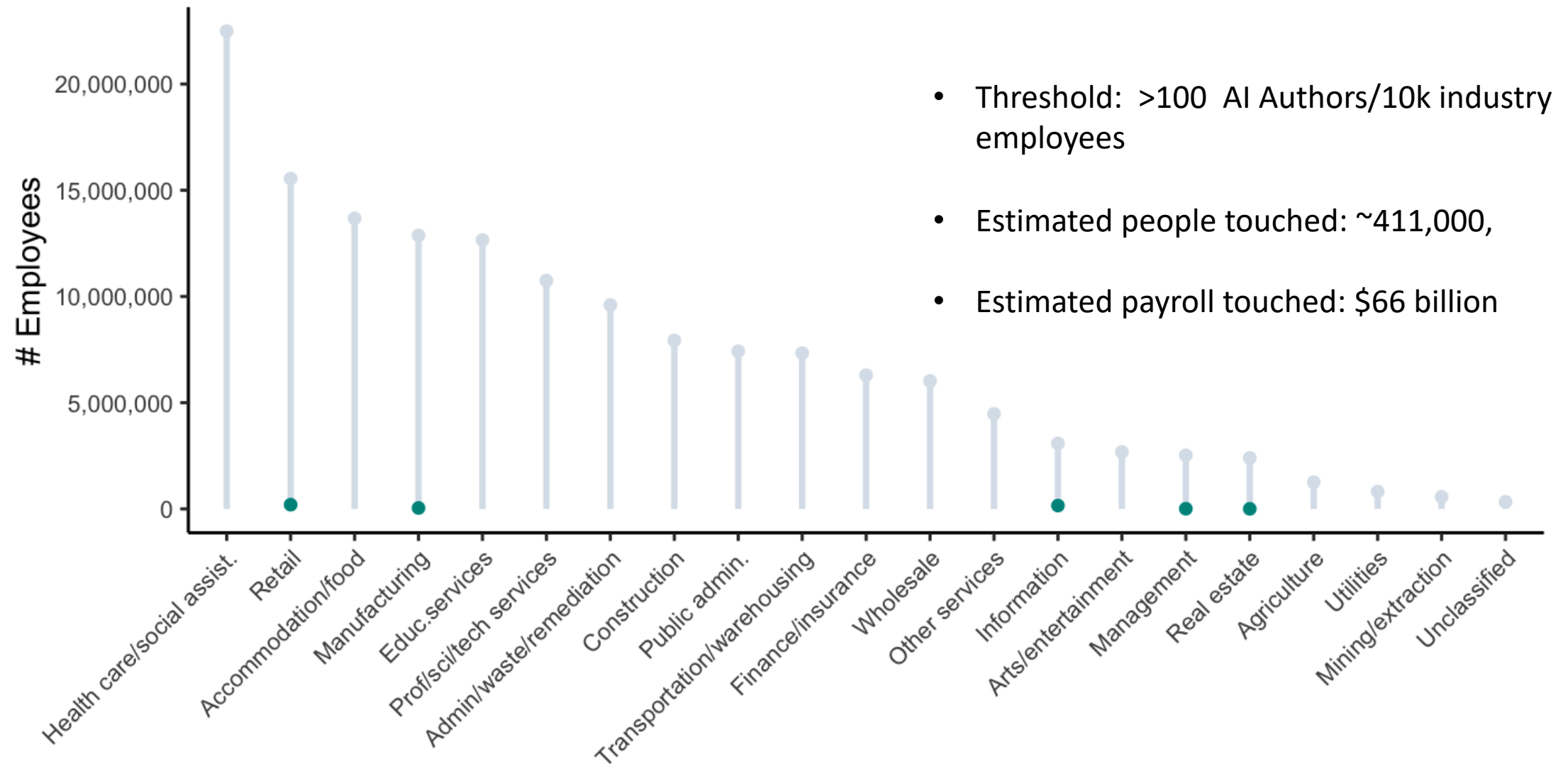
Preliminary Findings: Data are about 2 weeks old

OHIO EDUCATION RESEARCH CENTER
Making Research Work For Education

Companies that employ AI authors are an initial "tracer condition" for describing workforce implications.

Sector	Specialized Industry	AI Authors	Most Author Intense Firm
Administrative Support	Other business service centers (including copy shops)	297	Accenture
Information	Web search portals and all other information services	8955	Alphabet Inc.
Information	Wired telecommunications carriers	979	Yahoo Research Labs
Information	Television broadcasting stations	314	The Walt Disney Company
Management	Offices of bank holding companies	491	Raytheon
Manufacturing	Manufacturing and reproducing magnetic and optical media	6925	Microsoft USA
Manufacturing	Semiconductor and related device manufacturing	1943	Intel
Manufacturing	Electronic computer manufacturing	612	Apple
Manufacuring	Computer terminal and other computer peripheral equipment manufacturing	475	Hewlett-Packard
Prof/Sci/Tech Services	Computer systems design services	4111	IBM
Prof/Sci/Tech Services	Research and development in the social sciences and humanities	521	SRI International
Prof/Sci/Tech Services	Custom computer programming services	299	Kitware, Inc
Prof/Sci/Tech Services	Research and development in the physical, engineering, and life sciences	259	Battelle
Retail	All other miscellaneous retailers	2246	Amazon.com, Inc.

Preliminary Findings: Data are about 2 weeks old

AI touches ~ 411,000 workers in 5 major sectors (Narrow Estimate)

- Threshold: >100 AI Authors/10k industry employees

- Estimated people touched: ~411,000,

- Estimated payroll touched: $66 billion

 # Employees (y-axis): 0, 5,000,000, 10,000,000, 15,000,000, 20,000,000

2 Digit NAICS categories (x-axis): Health care/social assist., Retail, Accommodation/food, Manufacturing, Educ.services, Prof/sci/tech services, Admin/waste/remediation, Construction, Public admin., Transportation/warehousing, Finance/insurance, Wholesale, Other services, Information, Arts/entertainment, Management, Real estate, Agriculture, Utilities, Mining/extraction, Unclassified
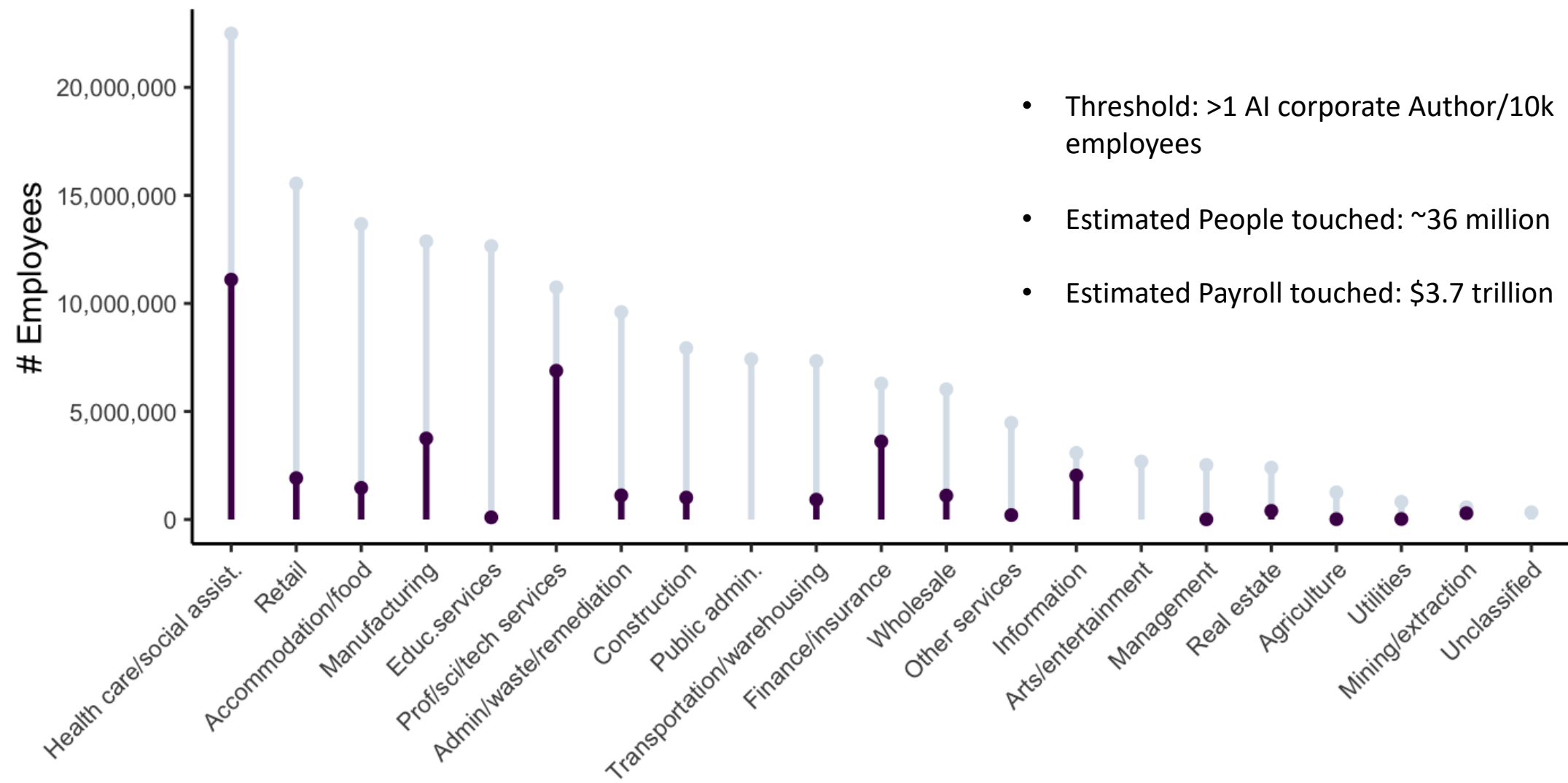
Preliminary Findings: Data are about 2 weeks old

2 Digit NAICS

Source: QCEW & Elsevier Data Compiled & Visualized by IRIS

AI touches ~ 36 million workers in 18 major sectors (Broad Estimate)
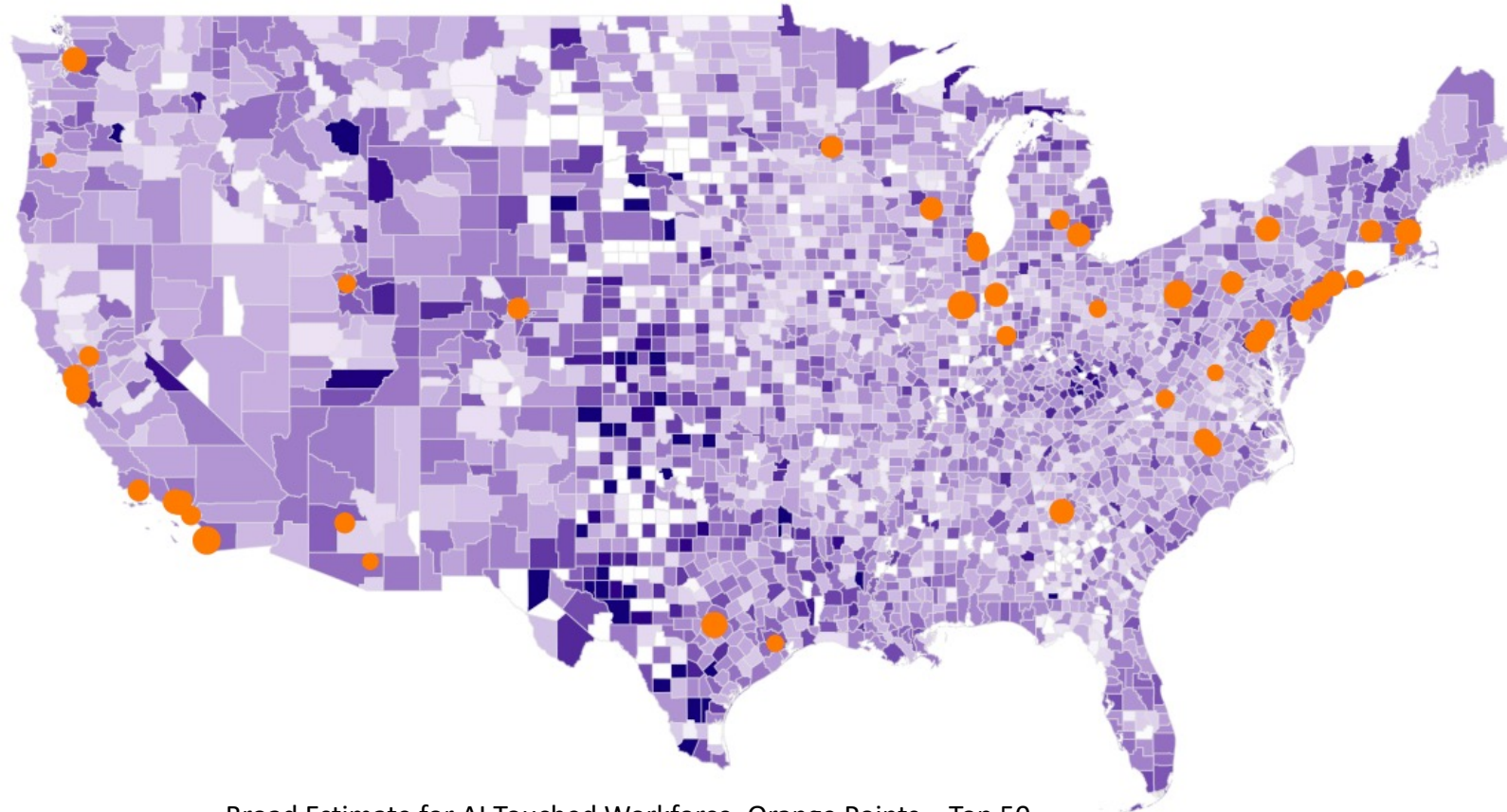

- Threshold: >1 AI corporate Author/10k employees

- Estimated People touched: ~36 million

- Estimated Payroll touched: $3.7 trillion

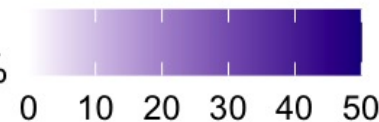Preliminary Findings: Data are about 2 weeks old

2 Digit NAICS

Source: QCEW & Elsevier Data Compiled & Visualized by IRIS

The AI touched workforce is spread across the nation cot clearly concentrated near universities

Broad Estimate for AI Touched Workforce, Orange Points = Top 50
Universities by AI-Related NSF Funding

AI as % of Total Employment, Top Coded @ 50%

0 10 20 30 40 50

QCEW & Elsevier Data Compiled & Visuzlied by IRIS

Preliminary Findings: Data are about 2 weeks old

Linking state workforce data to university administrative data will yield more accurate descriptions and increase opportunities for causal estimation to answer essential questions

AI as % of Total Employment, Top Coded @ 50%

5 10 15 20 25
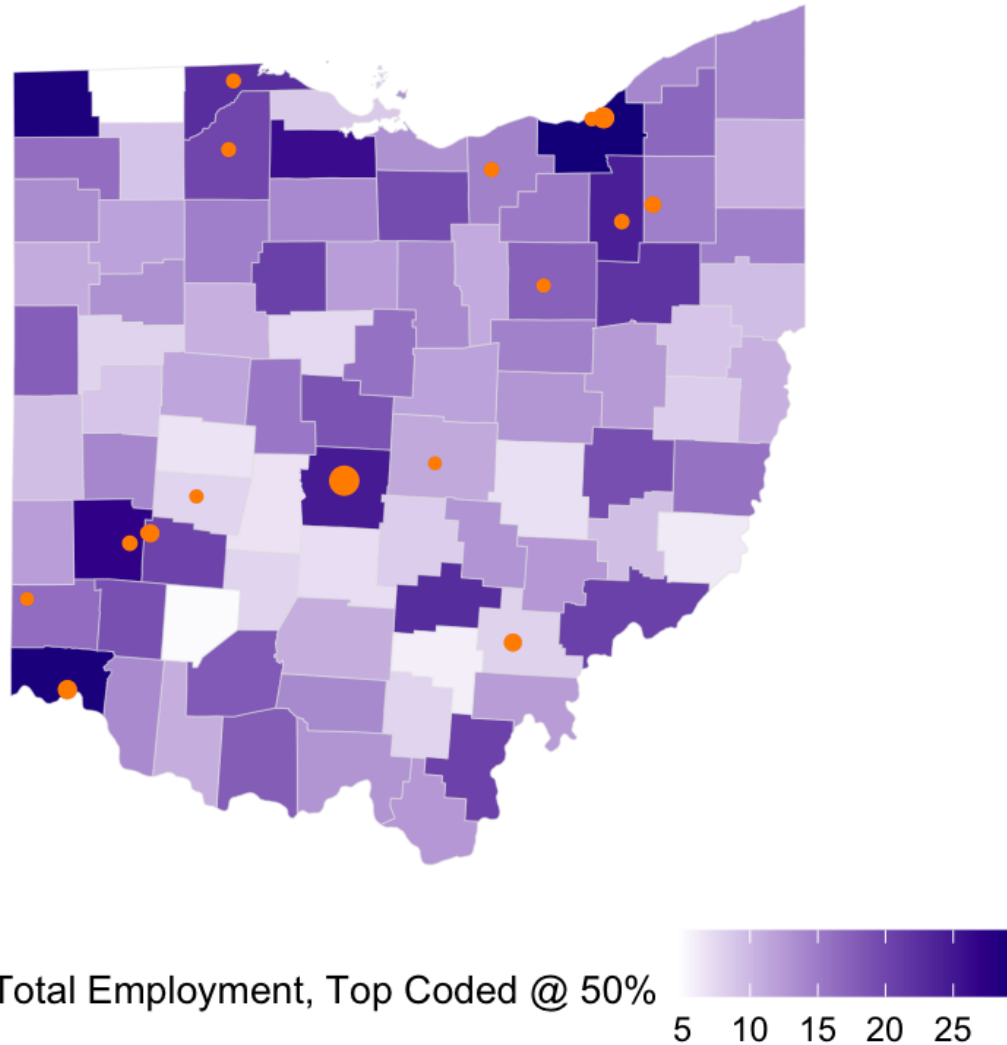
QCEW & Elsevier Data Compiled & Visuzlied by IRIS

Industries of Ideas

➢ Pilot in OH
➢ Plan & Prioritize for expansion

Consider Contributing by

➢ Identifying domain experts to help develop & validate approach
➢ Providing university leadership perspective via SSRC-led Advisory Board
➢ Engaging with IRIS to share your institution's data
➢ Informing data infrastructure design to meet social science research needs