IRIS: Making university data about research a national public good

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IRIS History

Founded in 2015 in the wake of the American Recovery and Reinvestment Act (ARRA)

Co-Founders

Julia Lane
NYU

Bruce Weinberg
OSU

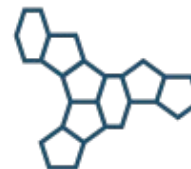**Founding vision:**

Need for **new data & evidence**

Responsive **university-owned & operated** platform

Unique opportunities in university **administrative** data
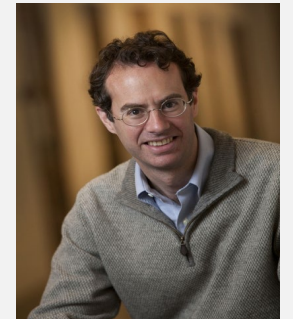
Transparent & research-based data architecture

Leverage the power of **aggregation**

IRIS Makes Individual University Data a Collective National Resource

Members

- Submit HR, Sponsored Projects & Expenditures Data
- Support Infrastructure
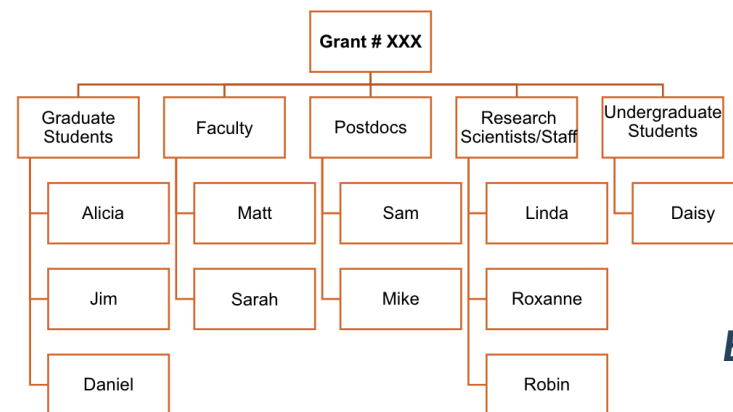- Collaborate to Define Needs
- Provide Oversight

IRIS

- Augments data with 60+ sources = UMETRICS
- Collaborate to Identify and Meet needs
- Provides Member Support
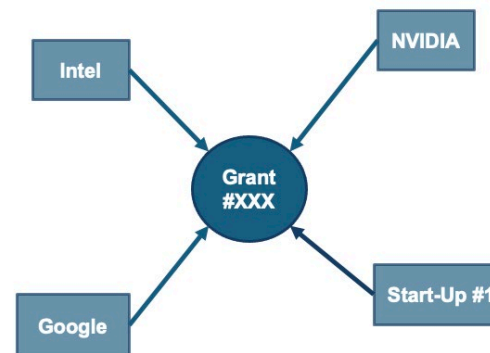- Provides Research Access & Support

UMETRICS Yields

- Institutional Reports & Dashboards
- Aggregate Reports & Dashboards
- Secure Research Data (550+ users, ~150 institutions)

Key for Today

Grant # XXX

Graduate Students	Faculty	Postdocs	Research Scientists/Staff	Undergraduate Students
Alicia	Matt	Sam	Linda	Daisy
Jim	Sarah	Mike	Roxanne	
Daniel			Robin	

Every person paid on *every* grant

Intel — NVIDIA — Grant #XXX — Google — Start-Up #1

Every purchase from of goods & services for research

Linked to employment, business, science, and technology outcomes

Students & Trainees are a Key Vector for Impact

Where do research-trained, grant-employed students get jobs?
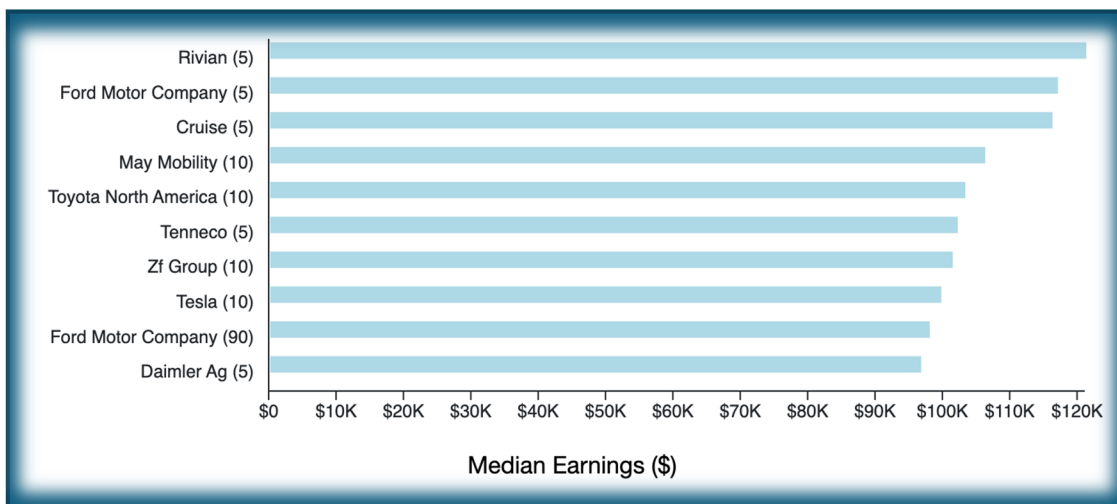*(IRIS Employee Report)*

> *"Universities produce both papers and people. People with specialized problem-solving skills are the essential input into the discovery process, most of which takes place in the private sector."*
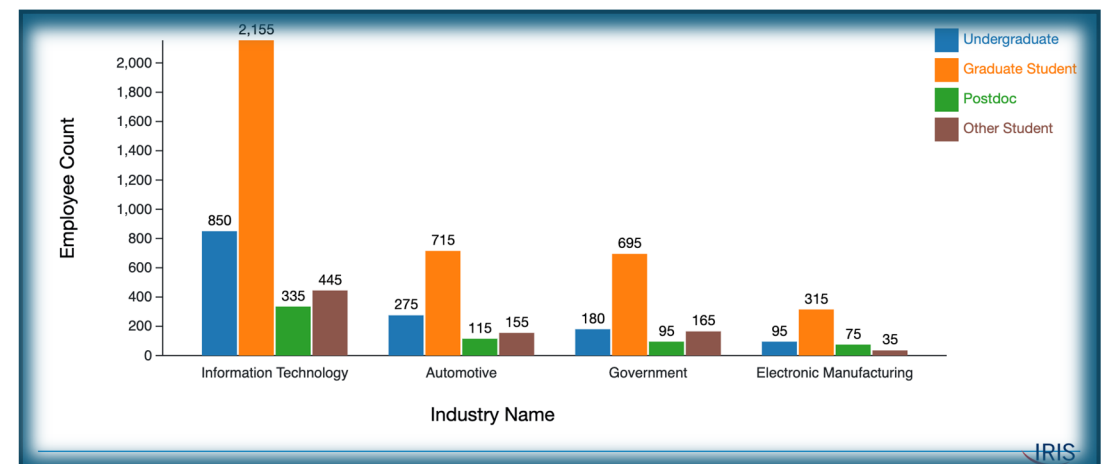> - Paul Romer (2019)

➢ **All over the country (37% still in MI)**
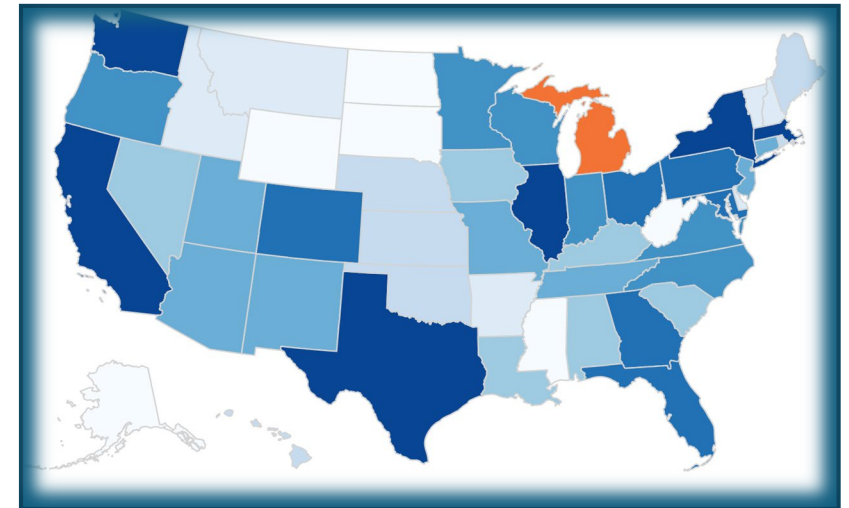
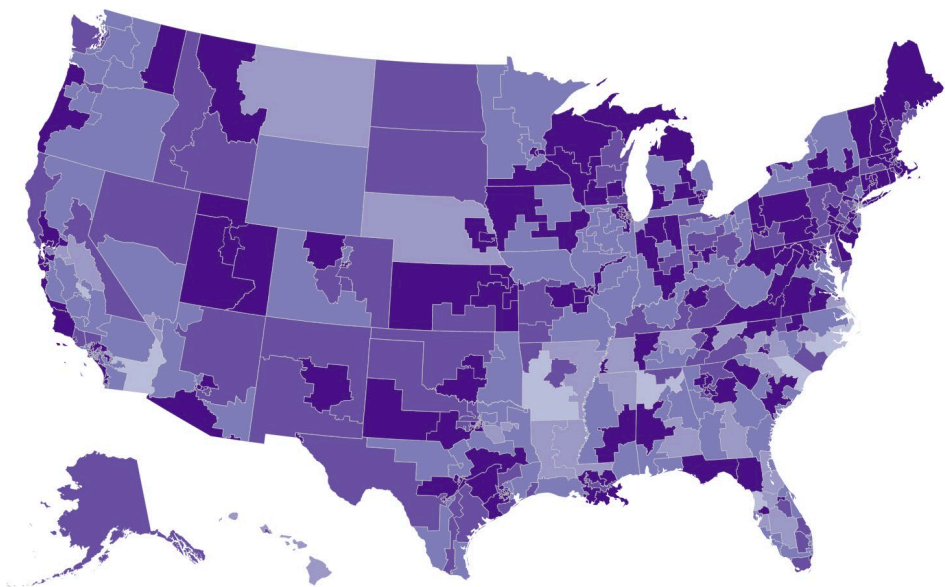➢ **Making good money at employers you know**

➢ **Across the economy**

Purchases & hiring → short term economic & community effects

➤ *2019-2022, Federal Grants bought $13 billion of research supplies from businesses*

Top Industry (NAICS) Sectors Receiving Research Spending from IRIS Member Universities, 2020-2022

Industry (NAICS Code)	Amount
Educational Services (61)	$1.86B
Manufacturing (31-33)	$918.89M
Professional, Scientific, and Technical Services (54)	$654.72M
Health Care and Social Assistance (62)	$411.55M
Public Administration (92)	$126.68M
Other Services (except Public Administration) (81)	$111.88M
Wholesale Trade (42)	$107.47M

Manufacturing ~$920 million

➤ **In every congressional district**
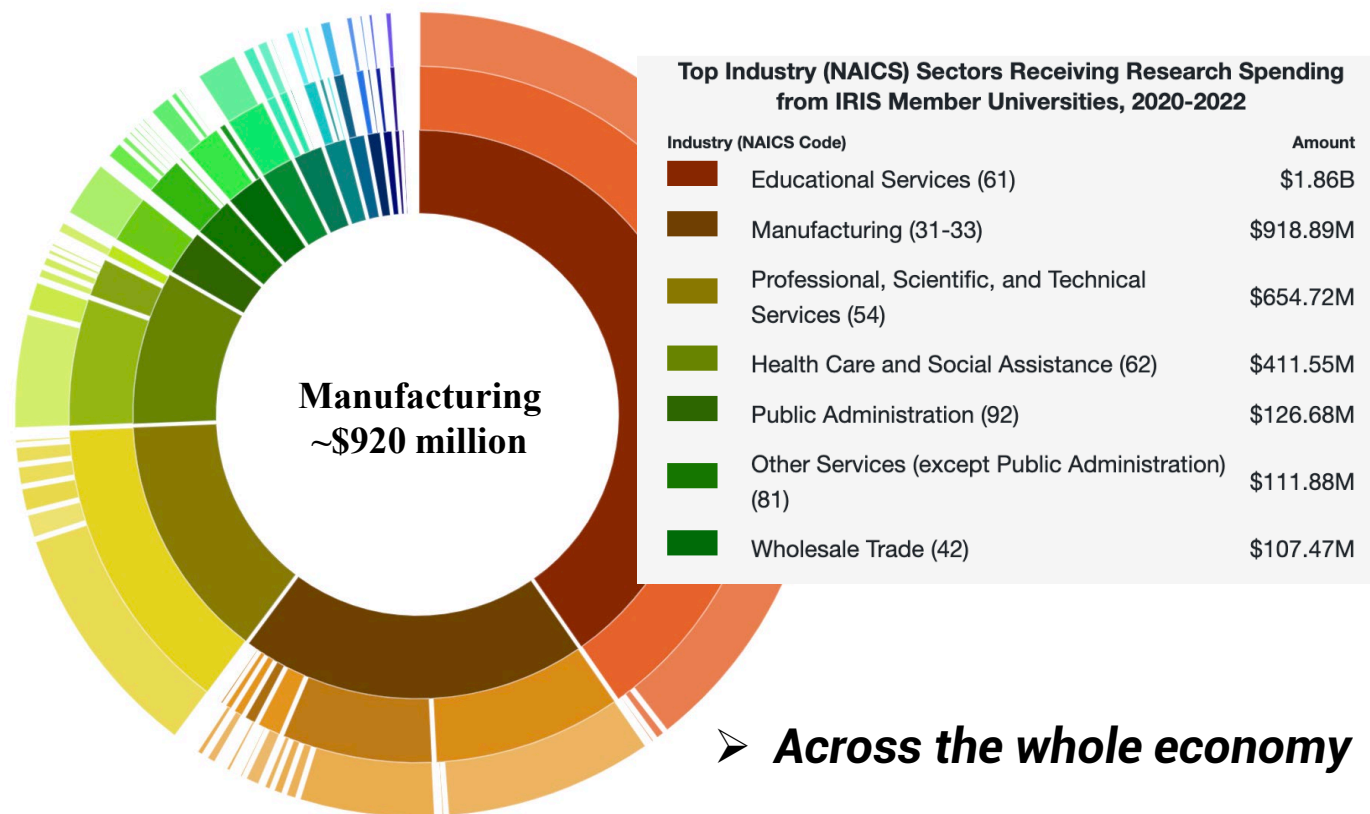
➤ *Across the whole economy*

(IRIS Spending Report, IRIS Vendor Report)

Why are such things important?

The Future of Federal Research Investment is Uncertain

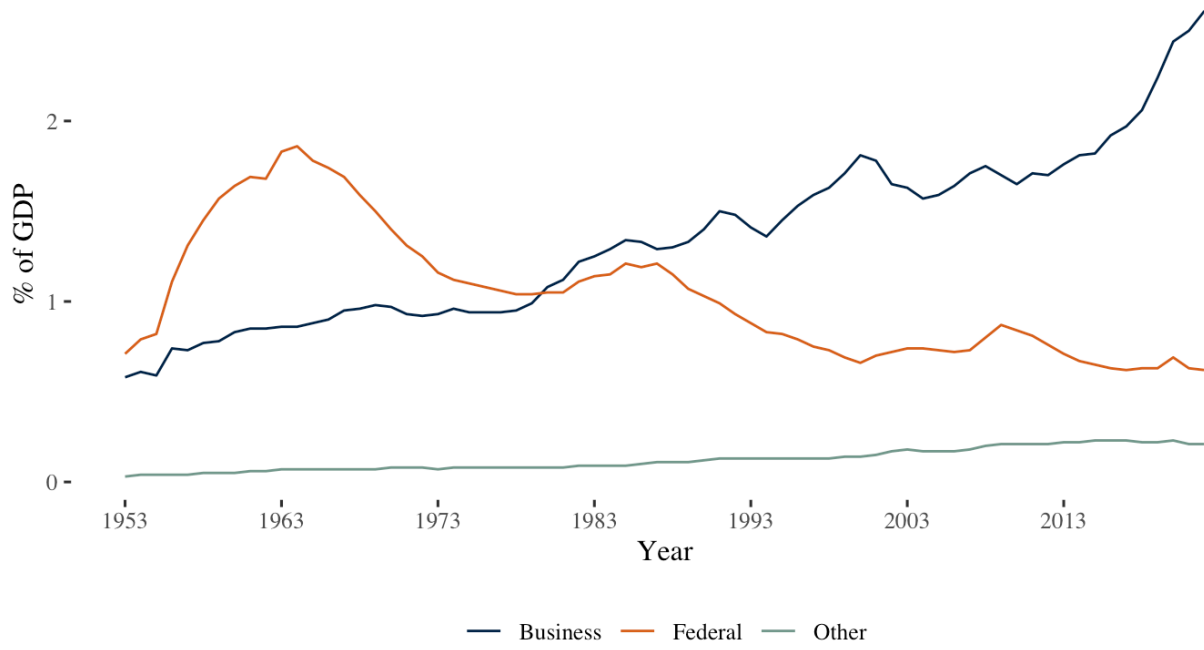R&D Funding as a % of GDP, by Funder: 1953-2022

Source: NSF-NCSES

SCIENCEINSIDER | FUNDING

Major budget cuts to two high-profile NIH efforts leave researchers reeling

Drop in 21st Century Cures Act funding will slow BR... All of Us projects

30 APR 2024 · 5:10 PM ET · BY JOCELYN KAISER

Researchers 'Shocked and Disappointed' After NSF Budget Cuts

May 02, 2024

Despite the CHIPS and Science Act's authorization to double the Natio... Foundation's budget b... Congress reduced the agency's budge... year.

CONGRESS

How Congress defanged Biden's big science push

Congress has fully funded the CHIPS and Science Act's subsidies for chipmakers. But lawmakers are poised to slash the budgets of federal agencies driving future scientific and technological advances.
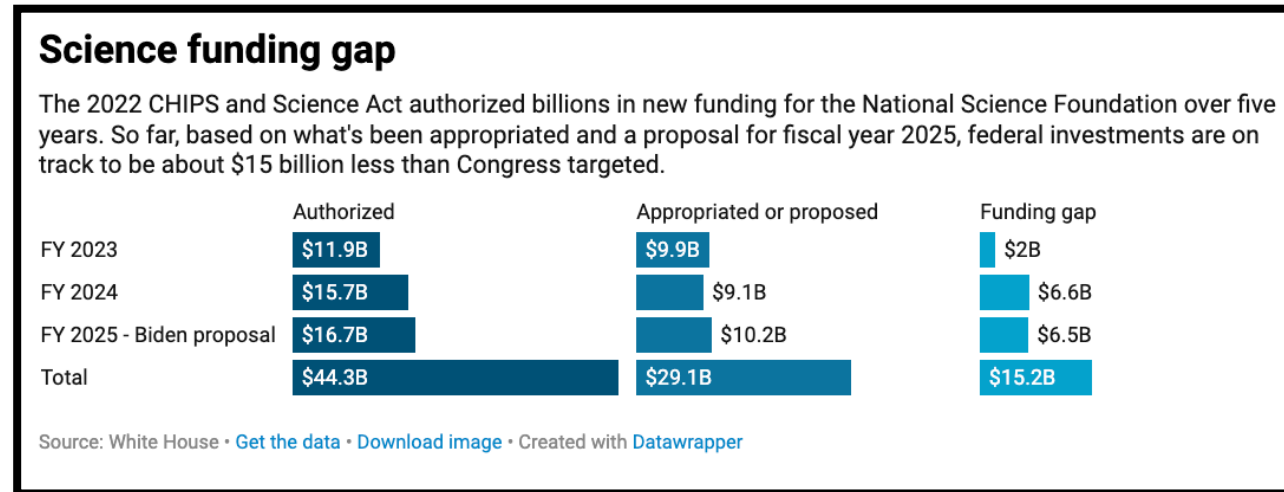
SCIENCEINSIDER | FUNDING

Biden's lean science budget could mean tough choices for agencies

President abides by tight spending cap in his 2025 request to Congress

11 MAR 2024 · 7:05 PM ET · BY JEFFREY MERVIS

Fewer $ ≠ Less Scrutiny or Lowered Expectations

If President Biden gets everything he requested for FY 25, the "science"
part of Chips & Science will be **$15.2 billion behind authorized levels.**

Science funding gap

The 2022 CHIPS and Science Act authorized billions in new funding for the National Science Foundation over five years. So far, based on what's been appropriated and a proposal for fiscal year 2025, federal investments are on track to be about $15 billion less than Congress targeted.

	Authorized	Appropriated or proposed	Funding gap
FY 2023	$11.9B	$9.9B	$2B
FY 2024	$15.7B	$9.1B	$6.6B
FY 2025 - Biden proposal	$16.7B	$10.2B	$6.5B
Total	$44.3B	$29.1B	$15.2B

Source: White House • Get the data • Download image • Created with Datawrapper

. . . But still have:

- **Expectations for Impact**
- **Measurement & Reporting Mandates**
- **Research Security & Compliance Requirements**

Diminished, Uncertain Federal Investment Begins a Bad Trajectory

JOURNAL ARTICLE

Cutting the Innovation Engine: How Federal Funding Shocks Affect University Patenting, Entrepreneurship, and Publications

Tania Babina, Alex Xi He, Sabrina T Howell, Elisabeth Ruth Perlman, Joseph Staudt

The Quarterly Journal of Economics, Volume 138, Issue 2, May 2023, Pages 895–954, https://doi.org/10.1093/qje/qjac046

Published: 09 January 2023   Article history ▾

NYU, Columbia, U Maryland

Scientific Talent Leaks Out of Funding Gaps[*]

Wei Yang Tham[†]   Joseph Staudt[‡]   Elisabeth Ruth Perlman[§]
Stephanie D. Cheng[¶]

February 13, 2024

Harvard

Federal Funding Declines Drive

- Publishing ⬇
- Entrepreneurship ⬇
- Industrial Support ⬆
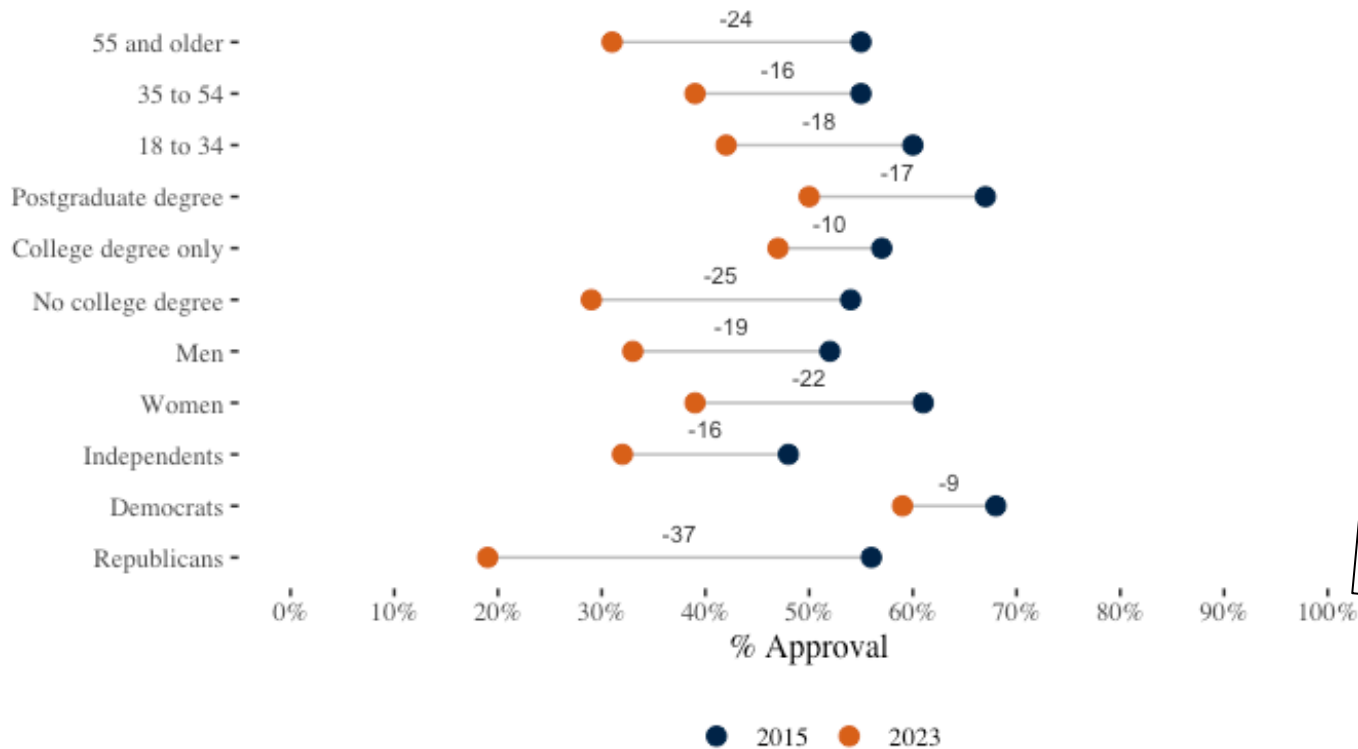- Patenting ⬆
- Patents lower impact & corporate-owned

Federal Funding Interruptions Drive

- doctoral students & post-docs
- out of research
- out of the country

As yet another deadline looms, a divided US House stumbles closer to a federal shutdown: 5 essential reads

Published: November 13, 2023 8:33am EST

U.S. Speaker of the House Mike Johnson arrives for a GOP meeting at the Capitol on Nov. 7, 2023. Drew Angerer/Getty Images

We are bleeding credibility & trust is low

Change in Approval of Higher Education, 2015 to 2023

		2015	2023	Change
55 and older				-24
35 to 54				-16
18 to 34				-18
Postgraduate degree				-17
College degree only				-10
No college degree				-25
Men				-19
Women				-22
Independents				-16
Democrats				-9
Republicans				-37

% Approval

● 2015 ● 2023

Source: Gallup

The New York Times

The Next Battle in Higher Ed May Strike at Its Soul: Scholarship

Cases involving Stanford, Harvard and M.I.T. are fueling skepticism over the thoroughness of research — even from the academic world's...

Jan 14, 2024

THE WALL STREET

EXCLUSIVE

Flood of Fake Science Forces Multiple Journal Closures

Wiley to shutter 19 more journals, some tainted by fraud
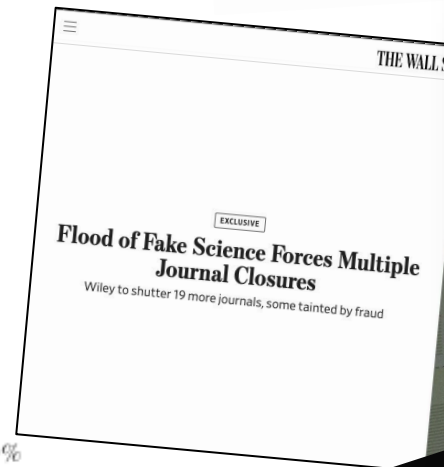
CNN Health   Life, But Better   Fitness   Food   Sleep   Mindfulness   Relationships

Americans' trust in science declining, Pew survey says

By Giri Viswanathan, CNN
6 minute read · Published 10:00 AM EST, Tue November 14, 2023

We must speak clearly to today's concerns
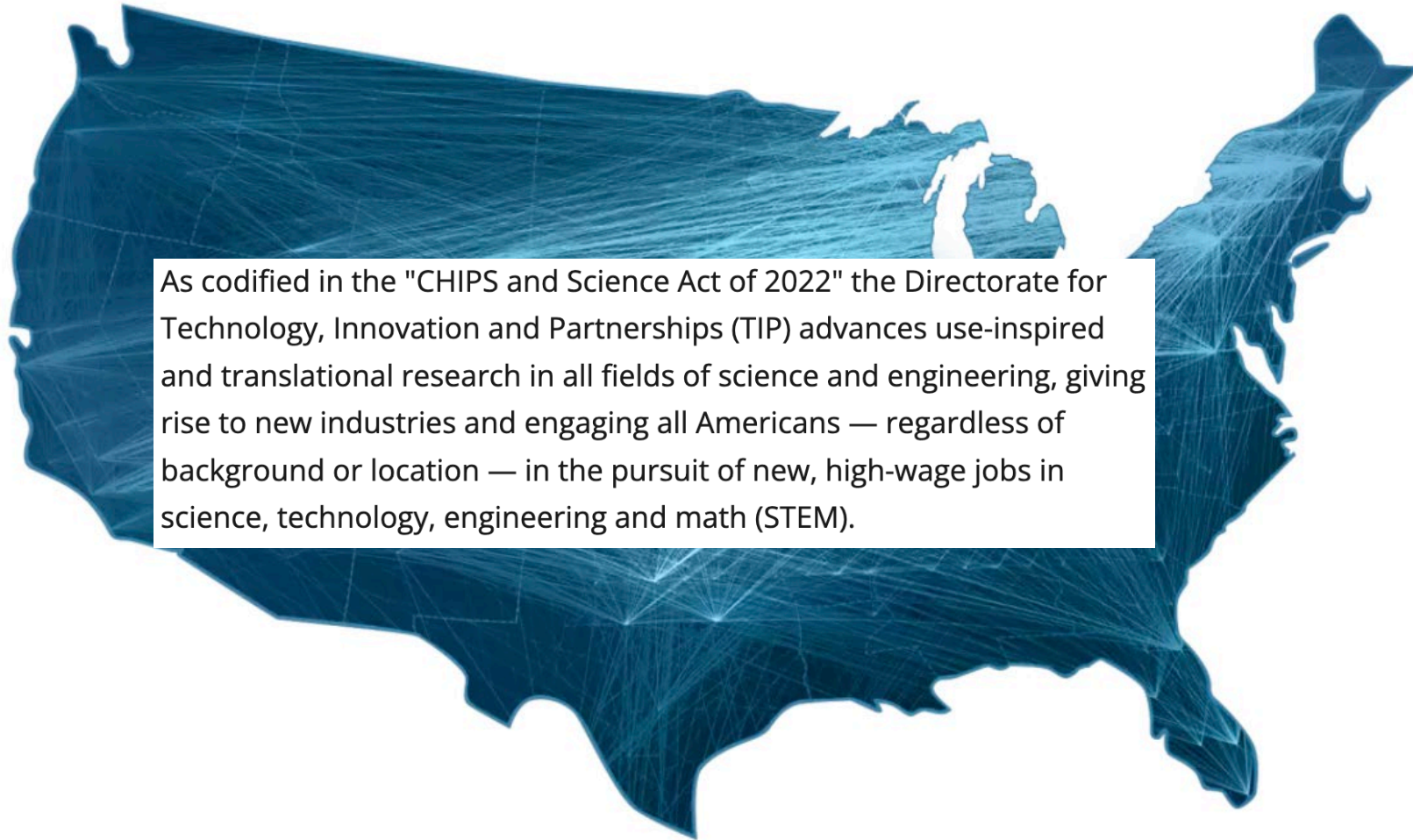
As codified in the "CHIPS and Science Act of 2022" the Directorate for Technology, Innovation and Partnerships (TIP) advances use-inspired and translational research in all fields of science and engineering, giving rise to new industries and engaging all Americans — regardless of background or location — in the pursuit of new, high-wage jobs in science, technology, engineering and math (STEM).

High Expectations

+

Low $

+

Low Trust

▐▐
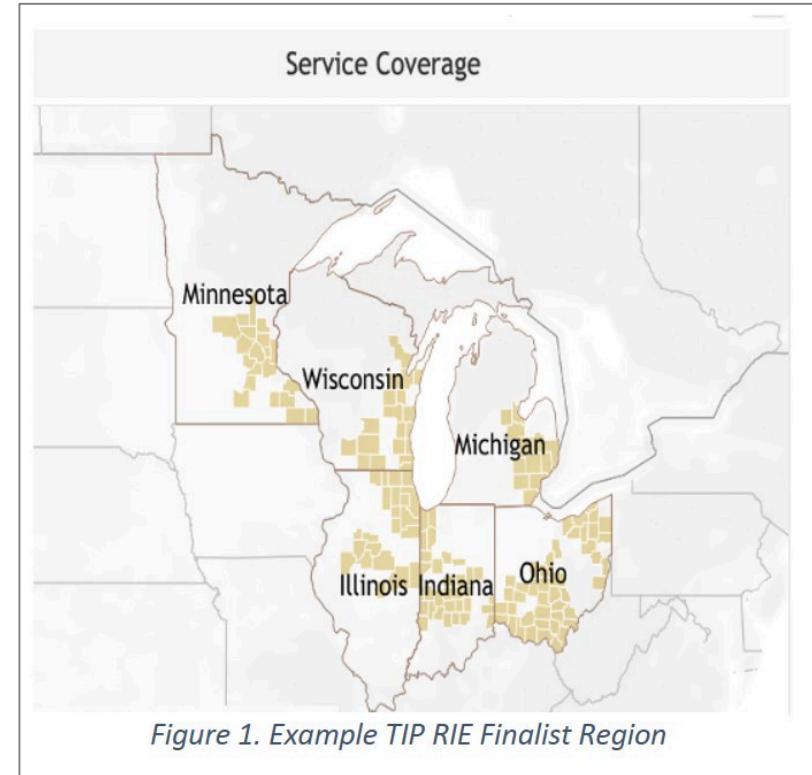
It is a hard story to tell well

New measurement mandates with high stakes

Science investments → jobs for (in principle) any combination of industries and counties over time

CHIPS & Science : 10 Key Technology Areas
- Artificial Intelligence
- High Performance Computing
- Quantum Technology
- Advanced Manufacturing
- Cybersecurity
- Biotech
- Advanced Energy Efficiency
- Materials Science

Service Coverage

Minnesota
Wisconsin
Michigan
Illinois Indiana Ohio

Figure 1. Example TIP RIE Finalist Region

Neither "fields" nor "industries" as traditionally classified

Requires granularity, collaborative governance & flexibility absent from current measurement systems

A proven infrastructure to respond

NSF launches pilot to assess the impact of strategic investments on regional jobs

October 26, 2023

University – State Partnerships are an Engine of Innovation

Pilot & Prototype

- AI & Electric Vehicles (EV) in Ohio
- Prototype data system
- User-centered design to produce measures & presentations

Expansion Plans

- <u>Scale</u> – bring new states and universities into the initiative
- <u>Scope</u> – identify high priority needs for additional types of data (e.g. higher ed, skills) and measures
- <u>Technology</u> – identify needs to make system as *accessible & valuable* as possible.

FROM THE LABORATORY TO THE LABOUR MARKET — HOW AI IDEAS SPREAD

With artificial intelligence (AI) labs attracting millions of dollars in public funding, tracking the impact of this investment on the private sector and the broader economy is a key challenge.

Stage 1: identify

Academics who present at AI conferences can be identified. On the basis of a list of presenters at 21 major AI conferences, a subset of researchers who also received government grants yielded a 'seed set' — more than 7,800 principal investigators (PIs).

PI
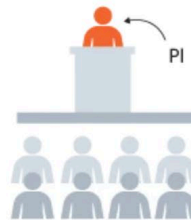
Stage 2: expand

These PIs interact with research staff, and with vendors who supply lab equipment. These interactions were captured through university administrative data.
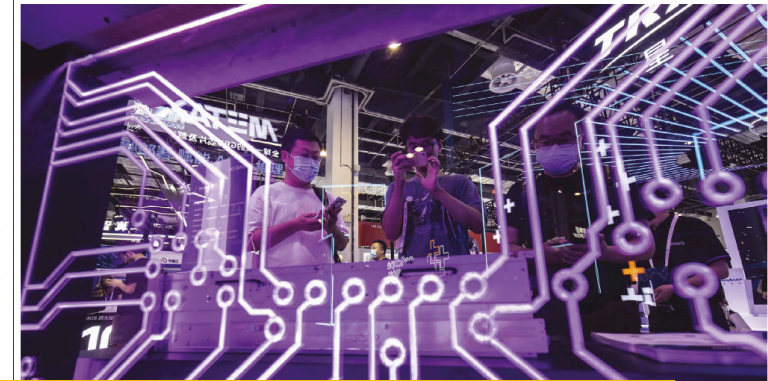
Students   Researchers   Vendors

Stage 3: integrate

Those who leave an academic lab — after a stint as a student or staff researcher — and then seek employment in the private sector can be identified through state employment records.
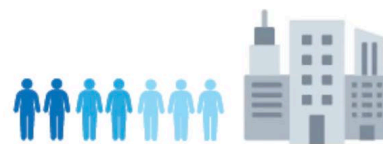
©nature

"AI can also be defined as what AI researchers do." - AI 100-Year Study Committee

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Comment

QILAI SHEN/BLOOMBERG/GETTY

How to track the economic impact of public investments in AI

By Julia Lane, Jason Owen Smith & Bruce A. Weinberg

National statistics systems should recognize the researchers whose ideas drive artificial-intelligence applications, not just machines and factory outputs.

Government spending on artificial intelligence (AI) is surging worldwide. In the United States, for example, the federal government invested more than US$3 billion in the 2023 fiscal year and an influential US taskforce — the National Artificial Intelligence Research Resource (NAIRR) — recommended channelling at least $2.6 billion more to public-funded research over an initial six-year period[1]. The private sector is pumping even more into AI research, spending hundreds of billions of dollars each year[2]. The stakes are high.

Why is AI research a priority for public funding? Governments are betting on investments in innovative emerging industries such as AI as a means to transform their economies and generate sustained job growth. But with limited public resources, it's crucial that these bets are well placed — and informed by data and evidence. That is the only way to maximize the return on public AI investments and steer the trajectory of AI towards serving the public.

However, quantifying spending in frontier areas of research and innovation — let alone the return on such spending — is notoriously difficult. Most national and state statistics systems are ill-equipped to track how investments in AI work their way through the economy because the companies and individuals who are driving the deployment of emerging AI tools are dispersed across a variety of conventional industrial sectors.

The existing statistical classification framework, the North American Industry Classification System (NAICS), was modified in 2022 to add a single category for AI activities: AI research and development laboratories (see go.nature.com/4ayvk5a). In February, Adam Leonard, the chief analytics officer at the Texas Workforce Commission in Austin, applied the new NAICS classification to Texas data and found a mere 298 AI research and development firms employing just 1,021 workers in total[3]. The real workforce involved in AI-related activities, meanwhile, is likely to be much larger and spread across multiple industry sectors, ranging from hospitality and health care to oil exploration.

Similar challenges relating to the quantification of research spending and estimating the size of the current workforce plague other emerging industries, such as robotics and electric mobility. Indeed, some scholars have postulated that about four-fifths of the economies of some advanced countries can
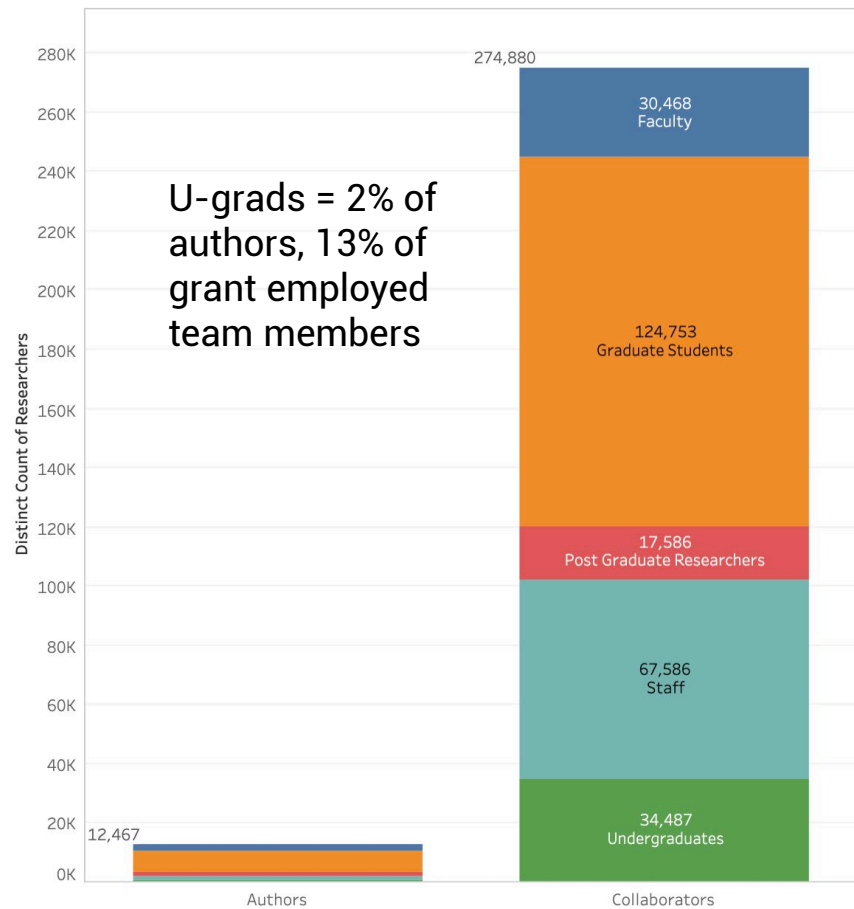
AI Authors

**Grant employed
Students
Trainees
Staff**

**IRIS AI author linkage finds ~22:1 grant employees to authors –
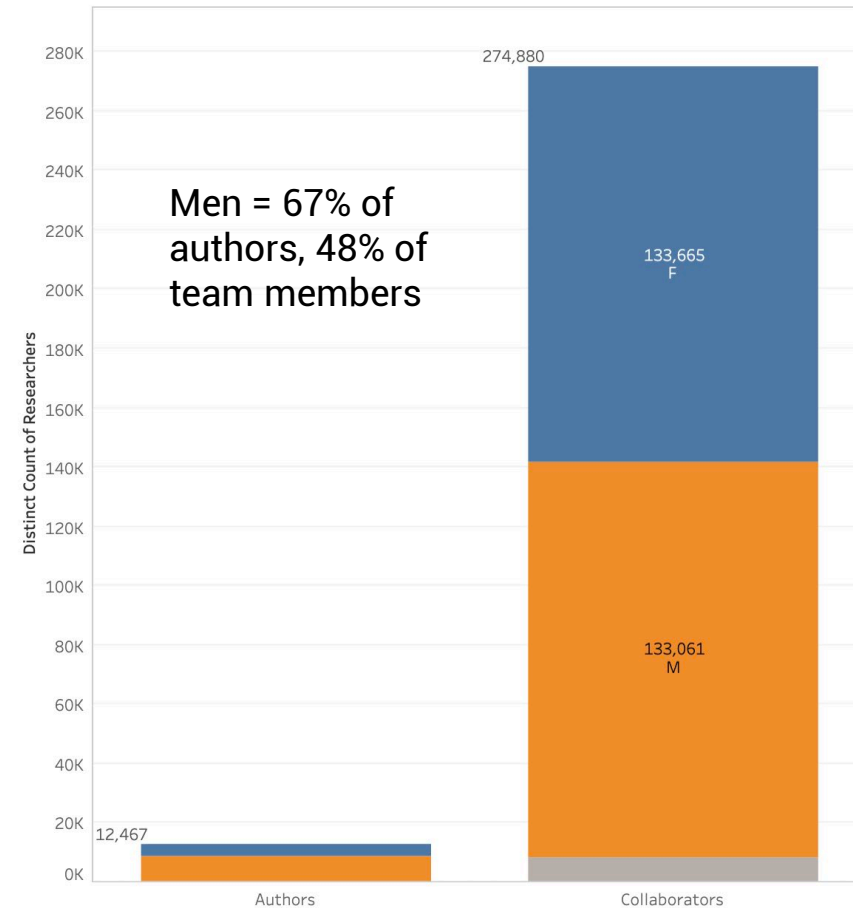ALL these research-trained people can be linked to state wage records**

*This slide contains preliminary data
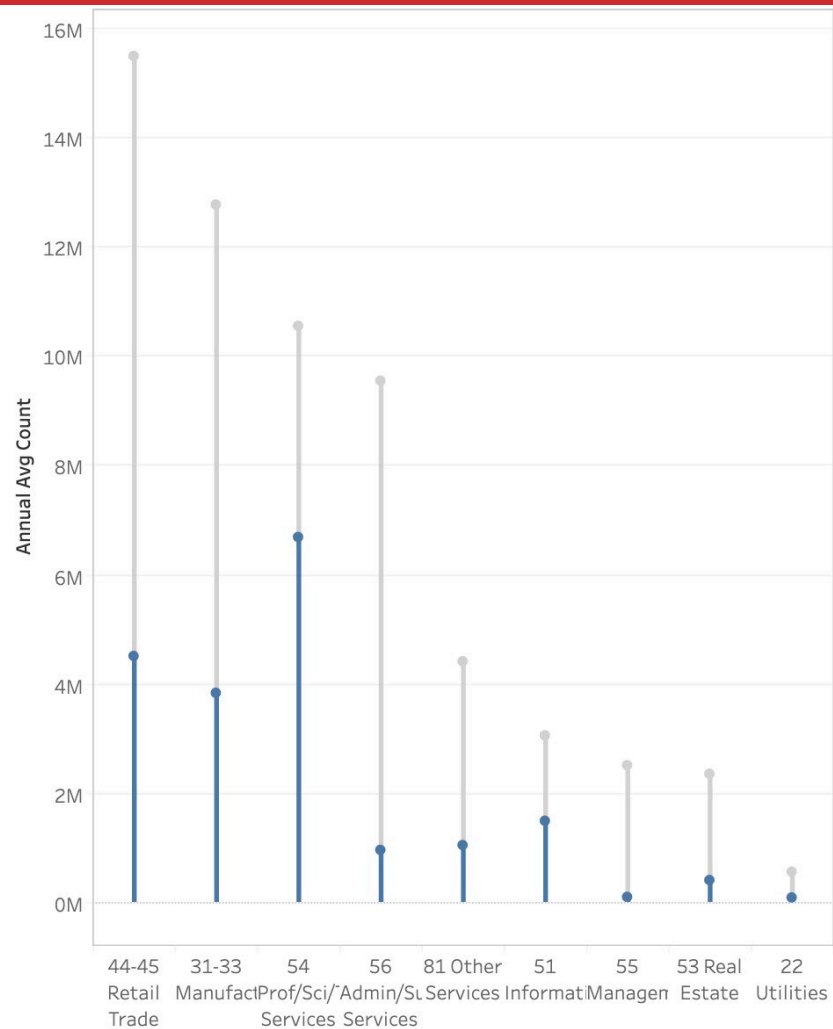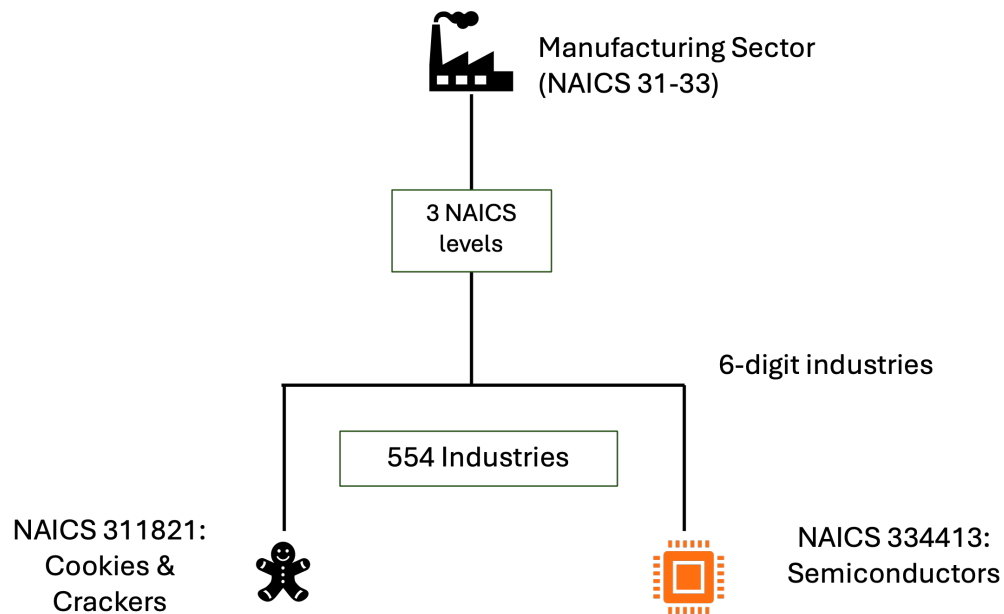
AI research teams at participating universities

U-grads = 2% of authors, 13% of grant employed team members

274,880

30,468
Faculty

124,753
Graduate Students

17,586
Post Graduate Researchers

67,586
Staff

34,487
Undergraduates

12,467

Distinct Count of Researchers

Authors

Collaborators

Non-author collaborators outnumber authors 22:1*

* This slide contains preliminary data

Men = 67% of authors, 48% of team members

274,880

133,665
F

133,061
M

12,467

Distinct Count of Researchers

Authors

Collaborators

Non-author collaborators are much more gender balanced than authors*

Hiring indicated employers' technology engagement (Public Data)

Manufacturing Sector (NAICS 31-33)

3 NAICS levels

6-digit industries

554 Industries

NAICS 311821: Cookies & Crackers

NAICS 334413: Semiconductors

2022, ~19 million jobs in 9 sectors meet 100 author/10k employee threshold

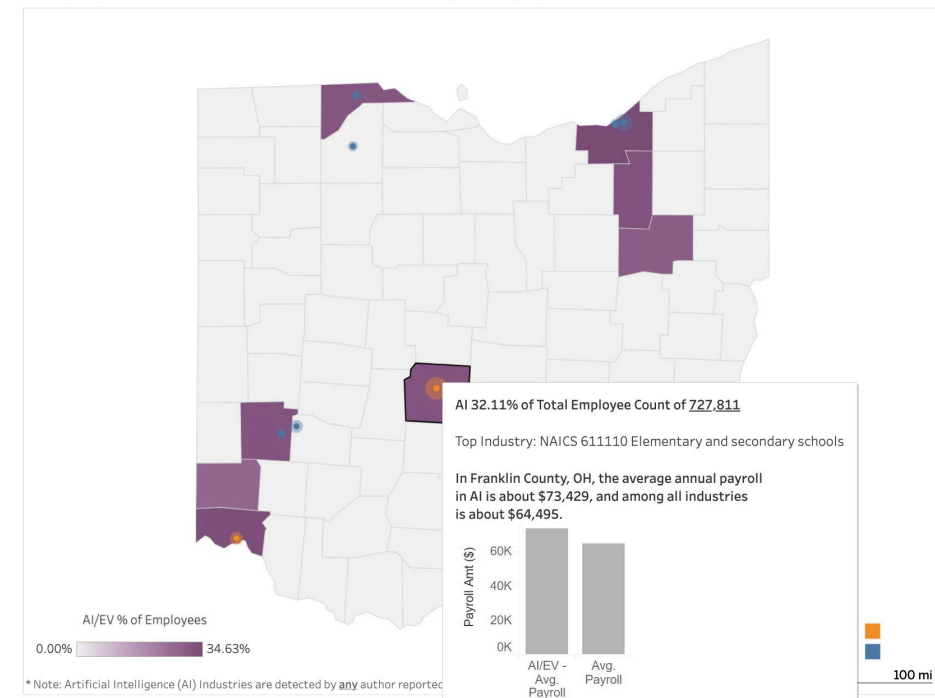* This slide contains preliminary data

AI-related jobs and employers cluster near NSF investments (Public Data)

At the end of October, more detailed information about jobs and employers based on <u>direct linkages</u> from UMETRICS to state unemployment insurance (U-I) wage record data in Ohio
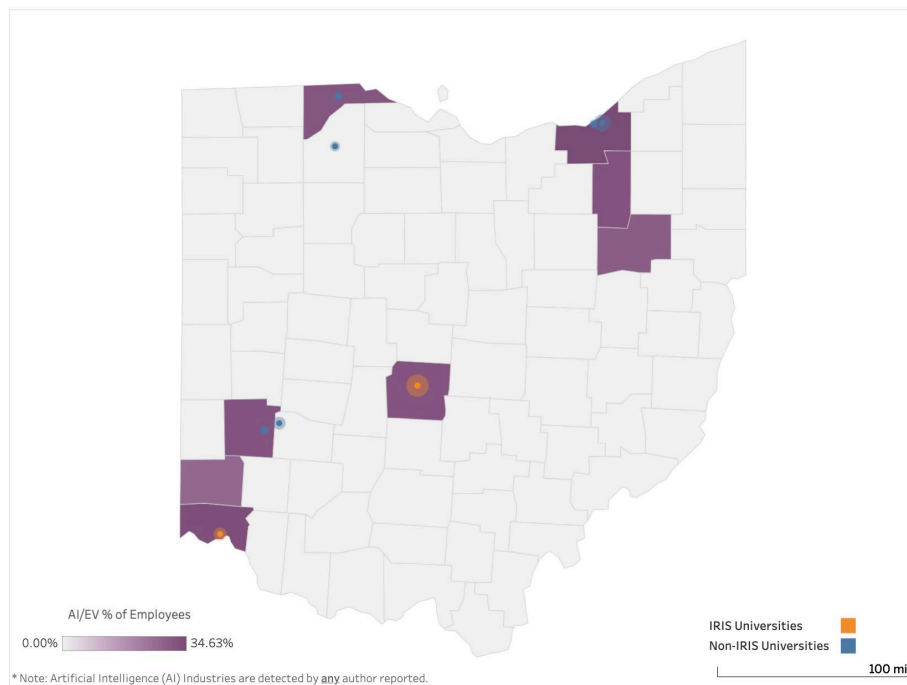
% of private sector AI research-intensive industry jobs, 2022, in counties with more than 100k total employees

AI 32.11% of Total Employee Count of <u>727,811</u>

Top Industry: NAICS 611110 Elementary and secondary schools

In Franklin County, OH, the average annual payroll in AI is about $73,429, and among all industries is about $64,495.

AI research-intensive industry jobs pay better than same sector non-AI research-intensive jobs

* This slide contains preliminary data

Thank you & questions

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