

# Research Security & Risk Management

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Laboratory Programs, NIST

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Information Technology Laboratory, NIST



# Artificial Intelligence Risk Management Framework (AI RMF 1.0)

# WHAT IS THE AI RMF?

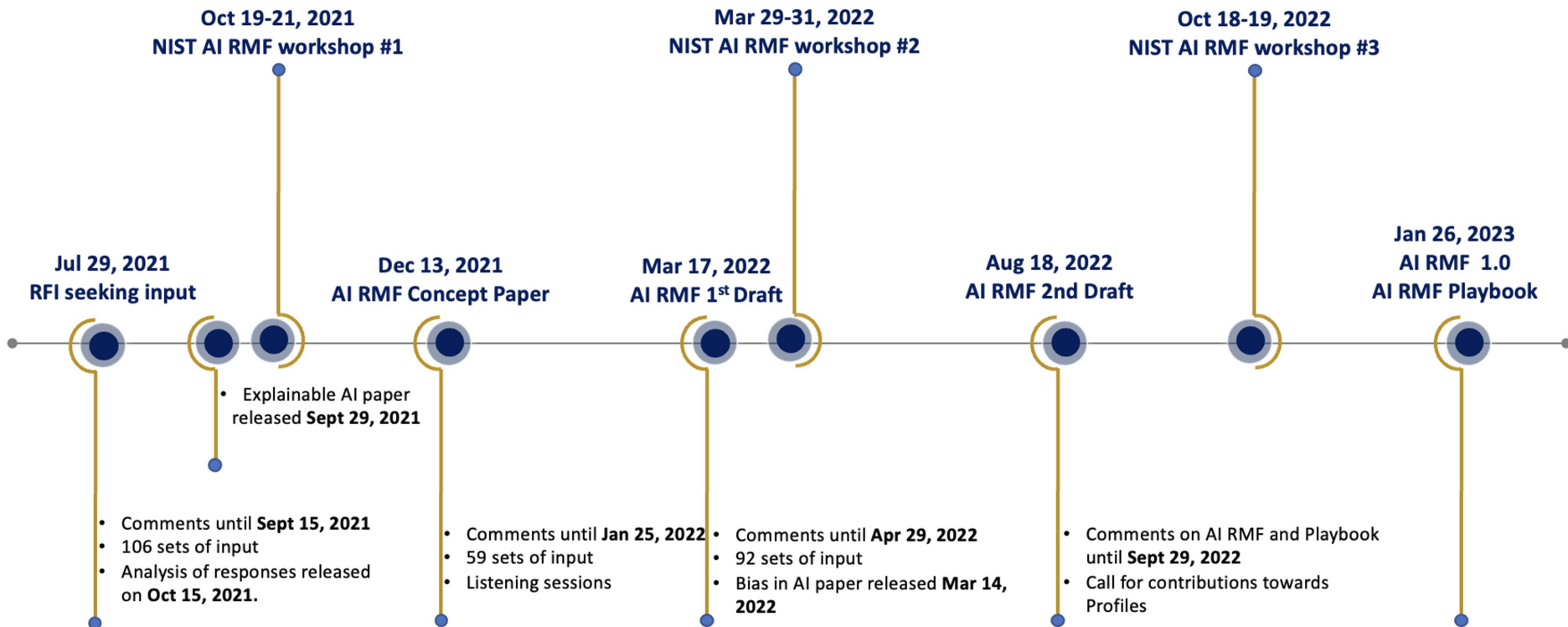
Voluntary resource for organizations designing, developing, deploying, or using AI systems to manage AI risks and promote trustworthy and responsible AI

**Rights-preserving**

**Flexibly Applied**

**Measurable**

# THE PATH TO AI RMF 1.0



- **AI systems:** engineered or machine-based system that **generates outputs such as predictions, recommendations, or decisions** influencing real or virtual environments and operating with varying levels of autonomy.
- **Risk:** composite measure of an event's probability of occurring and the magnitude or degree of the consequences of the corresponding event. The impacts, or consequences, of AI systems can be **positive, negative, or both** and can result in **opportunities or threats**.

# AI RISKS AND TRUSTWORTHINESS

NIST

Safe

Secure &  
Resilient

Explainable &  
Interpretable

Privacy-  
Enhanced

Fair - With Harmful  
Bias Managed

Valid & Reliable

Accountable  
&  
Transparent



**Risk  
measurement**



**Risk  
tolerance**

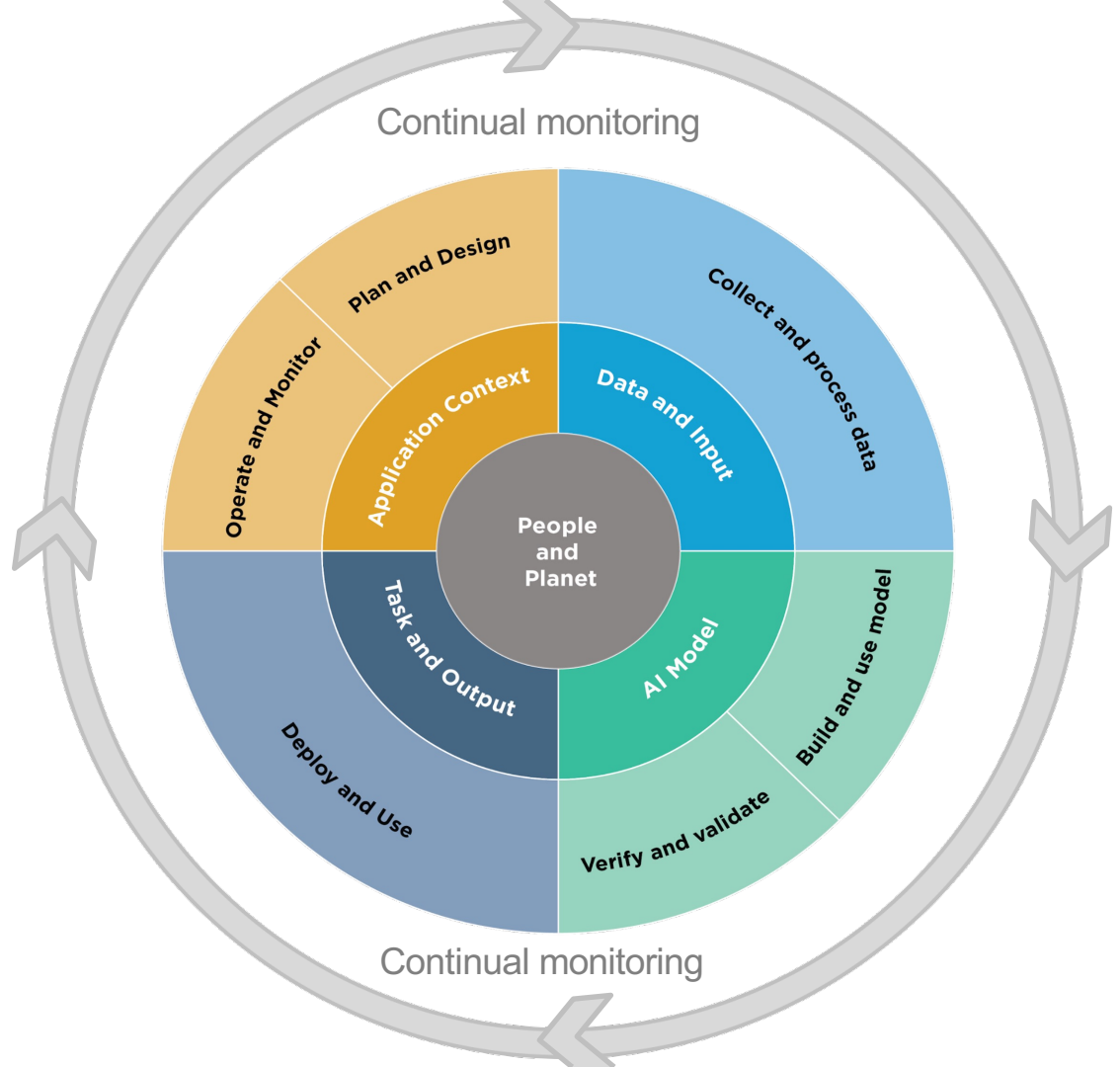


**Risk  
prioritization**



**Risk  
integration &  
management**

# AUDIENCE: AI LIFECYCLE AND AI ACTORS





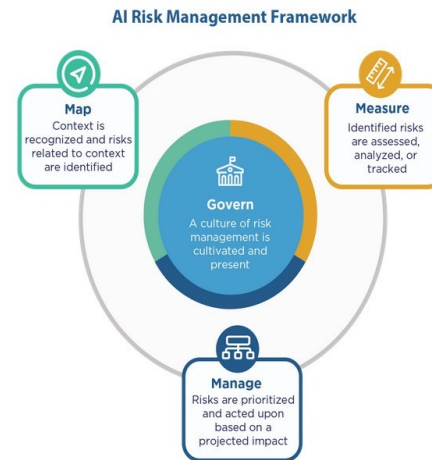


# NIST AI RMF Playbook

The Playbook provides suggested actions for achieving the outcomes laid out in the [AI Risk Management Framework](#) (AI RMF) [Core \(Tables 1–4 in AI RMF 1.0\)](#). Suggestions are aligned to each sub-category within the four AI RMF functions (Govern, Map, Measure, Manage).

The Playbook is neither a checklist nor set of steps to be followed in its entirety.

Playbook suggestions are voluntary. Organizations may utilize this information by borrowing as many – or as few – suggestions as apply to their industry use case or interests.



## Download the NIST AI RMF Playbook

- Playbook PDF
- Playbook CSV
- Playbook Excel
- Playbook JSON

# AI RMF PROFILES

Implementations of the AI RMF functions, categories, and subcategories for a specific setting or application based on the requirements, risk tolerance, and resources of the Framework user.



**Use-case profiles;** e.g., hiring or fair housing

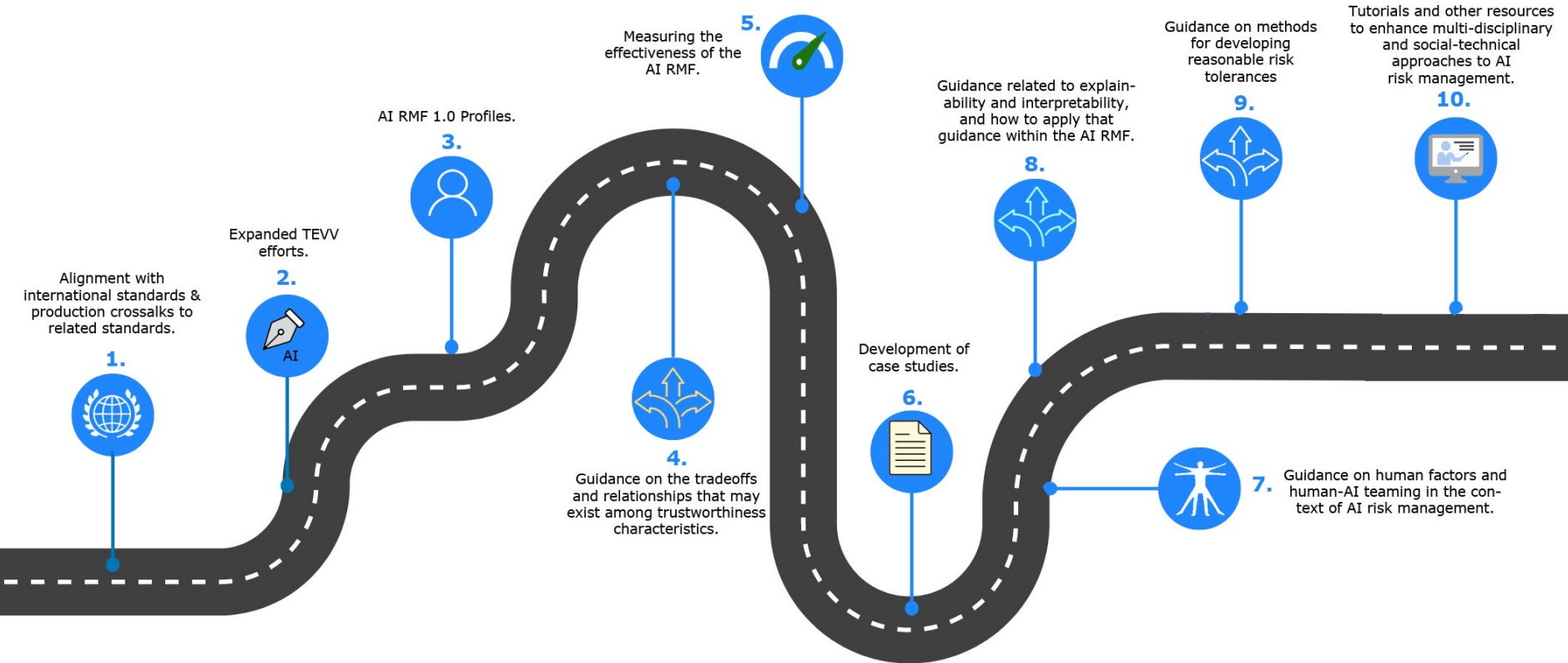


**Temporal profiles;** e.g., current state vs. the target state



**Cross-sectoral profiles;** e.g., large language models, cloud-based services or acquisition

# What's next?



# NIST TRUSTWORTHY AND RESPONSIBLE AI RESOURCE CENTER



<https://airc.nist.gov/>



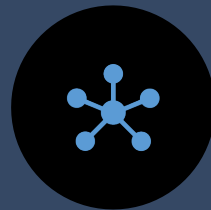
**AI RMF  
PLAYBOOK**



**AI RMF  
PROFILES**



**AI RISK  
GLOSSARY**



**AI STANDARDS  
TRACKER**



**AI METRICS  
HUB**



**...AND MORE**

# FOR MORE INFORMATION...

NIST



[www.nist.gov/itl/ai-risk-management-framework](https://www.nist.gov/itl/ai-risk-management-framework)

<https://airc.nist.gov/>



[AIframework@nist.gov](mailto:AIframework@nist.gov)

# Federal AI Landscape

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Edwina Manyeh

Tech Hubs Deputy Director  
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Dr. Bruce Kramer

Program Director  
National Science Foundation

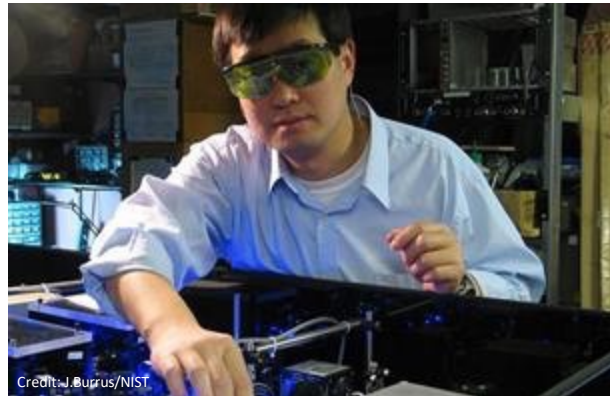


# AI Innovation Lab

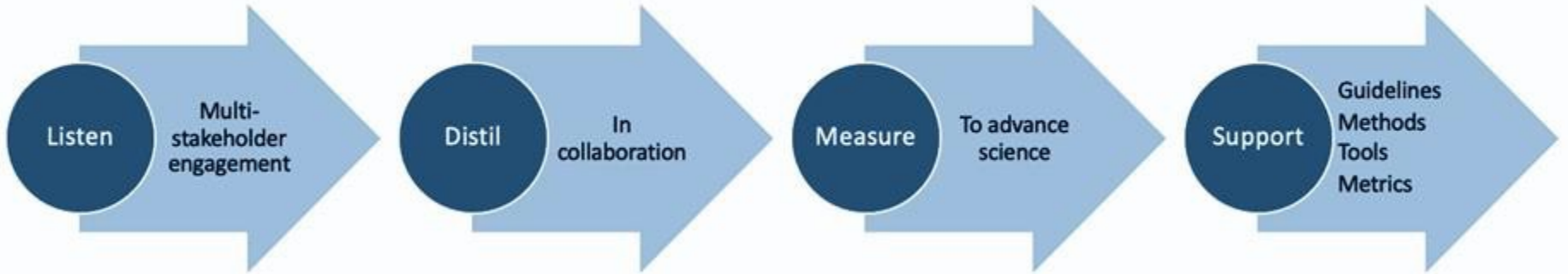
Elham Tabassi, Chief AI Advisor



To promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life



NIST helps industry develop valid, scientifically rigorous methods, metrics and standards.



# NIST AI Risk Management Framework and Resources



[NIST AI RMF: A voluntary resource for organizations designing, developing, deploying, or using AI systems to manage AI risks and promote trustworthy and responsible AI](#)



AI system trustworthiness can be defined in terms of well-understood characteristics.

Safe

Secure &  
Resilient

Explainable &  
Interpretable

Privacy-  
Enhanced

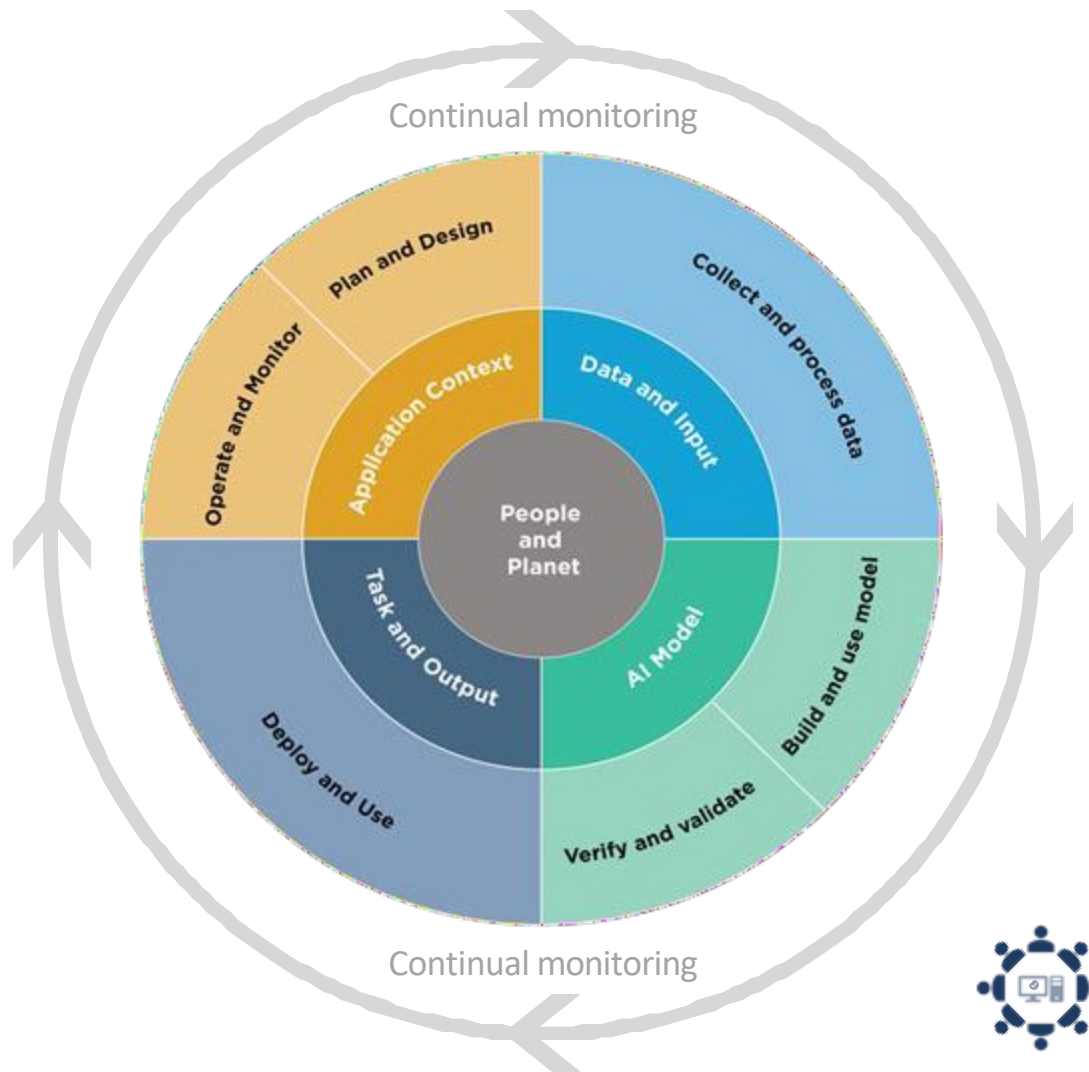
Fair - With Harmful  
Bias Managed

Valid & Reliable

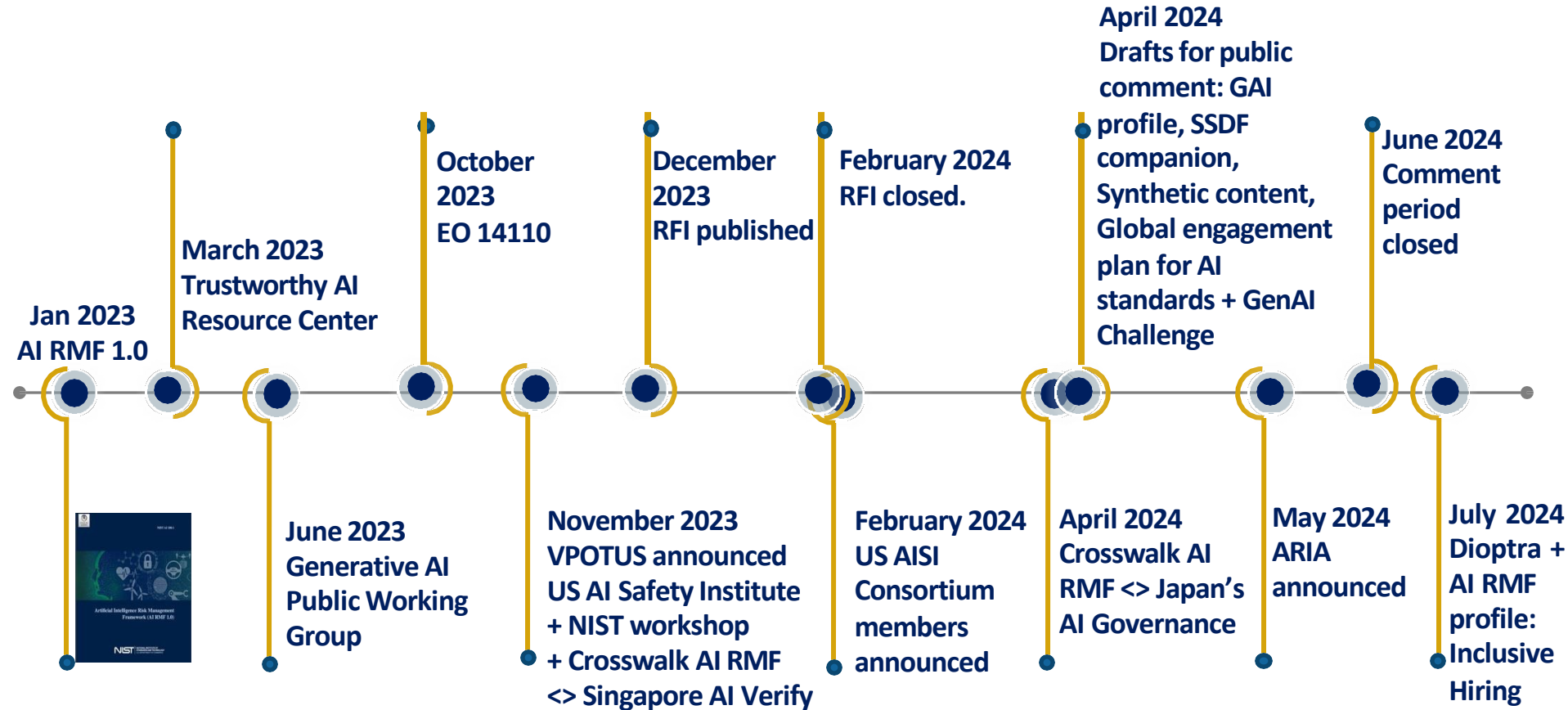
Accountable  
&  
Transparent



Beyond the system, a culture of responsible practice and use must pervade activities across the entire AI lifecycle.



# Major Achievements and Announcements Since 2023



# NIST Due Dates Under Executive Order 14110

- Submit report on synthetic content authentication to OMB and NSC

**June 26, 2024**

- Publish AI RMF for GAI
- Publish Secure Software Framework for GAI and dual-use models

**July 26, 2024**

- Publish guidelines on the efficacy of differential-privacy-guarantee protections

**October 29, 2024**

- Publish guidance for synthetic content authentication

**December 24, 2024**

**January 26, 2025**

- Launch initiative to create guidance/benchmarks for evaluating and auditing AI capabilities
- Provide test environments
- Publish red-teaming guidelines
- Initiate engagement with industry and relevant synthetic nucleic acid sequence providers
- Publish synthetic content authentication report
- Publish a plan for global engagement on promoting and developing AI standards

- Submit a report to the President on priority actions taken pursuant to the Global engagement on standards plan

# Artificial Intelligence Safety Institute Consortium (AISIC)

AISIC brings more than 280 leading AI stakeholders together to develop science-based and empirically backed guidelines and standards for AI measurement and policy, laying the foundation for AI safety across the world.

AISIC working groups sustain, scale,  
and implement E.O. elements

Risk Management for  
Generative AI

Synthetic Content

Capability Evaluations

Red-Teaming

Safety & Security



# Assessing Risks and Impacts of AI

A compelling set of scenarios will aim to explore risks and related impacts across three levels of testing: model testing, red-teaming, and field testing.

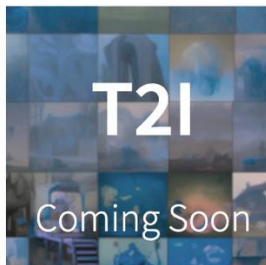
Team: **Reva Schwartz (Lead)**

Jonathan Fiscus, Kristen K. Greene, Craig Greenberg, Afzal Godil, Kyra Yee, Razvan Amironesei, Theodore Jensen (Feds)

Rumman Chowdhury (associate), Gabriella Waters (PREP), Patrick Hall (associate), Shomik Jain (pathway),

# Evaluating Generative AI Technologies

A NIST evaluation program to support research in Generative AI technologies.

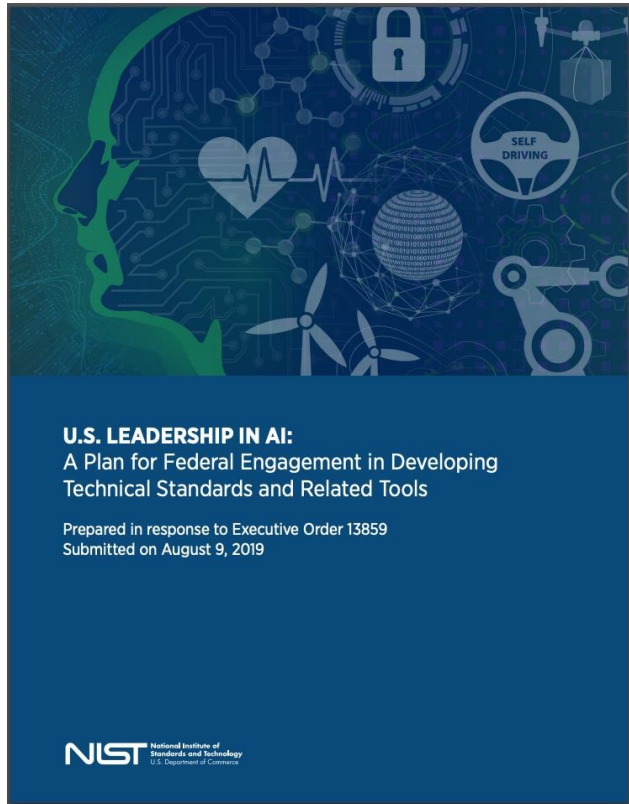


Team: **Yooyoung Lee (Lead)**

George Awad, Kay Peterson, Peter Fontana (Feds)

Lowen DiPaula (pathway student),

Seungmin Seo (associate)



## Maintaining American Leadership in Artificial Intelligence

A Presidential Document by the Executive Office of the President on 02/14/2019

### PUBLISHED DOCUMENT

Executive Order 13859 of February 11, 2019

### Maintaining American Leadership in Artificial Intelligence

By the authority vested in me as President by the Constitution and the laws of the United States of America, it is hereby ordered as follows:

### DOCUMENT DETAILS

Printed version:  
PDF

Publication Date:  
02/14/2019

Agency:  
Executive Office of the President



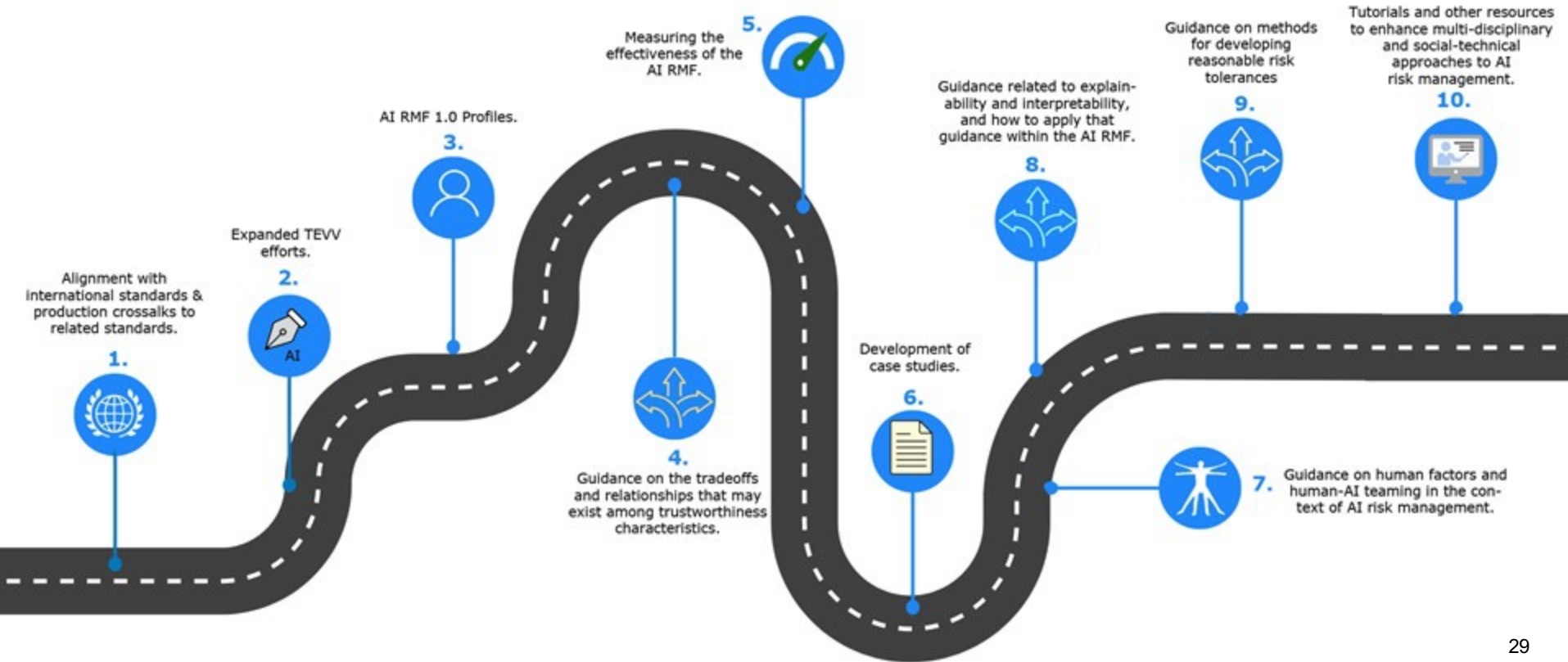
NIST works across government and with industry to identify critical standards development activities, strategies, and gaps



NIST is coordinating in part through the Interagency Committee on Standards Policy (ICSP) AI Standards Coordination Working Group



# A roadmap of future work was released along with the AI RMF in January.



# NATIONAL ARTIFICIAL INTELLIGENCE ADVISORY COMMITTEE (NAIAC)

The National Artificial Intelligence Advisory Committee (NAIAC) advises the President and the White House on the intersection of AI and innovation, competition, societal issues, the economy, law, international relations, and other critical areas.

Since first convening in May 2022

- ▶ 70+ experts interviewed across 26 public sessions
- ▶ 18 Recommendation reports/memos
- ▶ 6 Findings, including explainer documents and FAQs
- ▶ 2 Committee Statements
- ▶ 2 Annual Reports

The Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence operationalized many of NAIAC's recommendations.

## WHAT'S AHEAD

NAIAC will continue to offer recommendations and insights as a committee, in public stakeholder panels and in the activity across five working groups:

**AI Education & Awareness**  
**International Collaboration**  
**AI Futures – Preparedness, Opportunities,  
and Competitiveness**  
**Safety, Trust, and Rights**  
**AI in Work and the Workforce**

Additionally, the NAIAC Subcommittee on AI and Law Enforcement has introduced three distinct working groups:

**Performance, Evaluation and Bias; Processes;  
Identification and Surveillance Set**

# Click, Connect, Collaborate!



[www.nist.gov/itl/ai-risk-management-framework](http://www.nist.gov/itl/ai-risk-management-framework)

[airc.nist.gov](http://airc.nist.gov)

[ai-challenges.nist.gov](http://ai-challenges.nist.gov)

[ai.gov/naiac](http://ai.gov/naiac)



[AIFramework@nist.gov](mailto:AIFramework@nist.gov)

[ai-inquiries@nist.gov](mailto:ai-inquiries@nist.gov)



# National Science Foundation AI Initiatives

## NIST AI for Resilient Manufacturing USA Institute Proposers Day

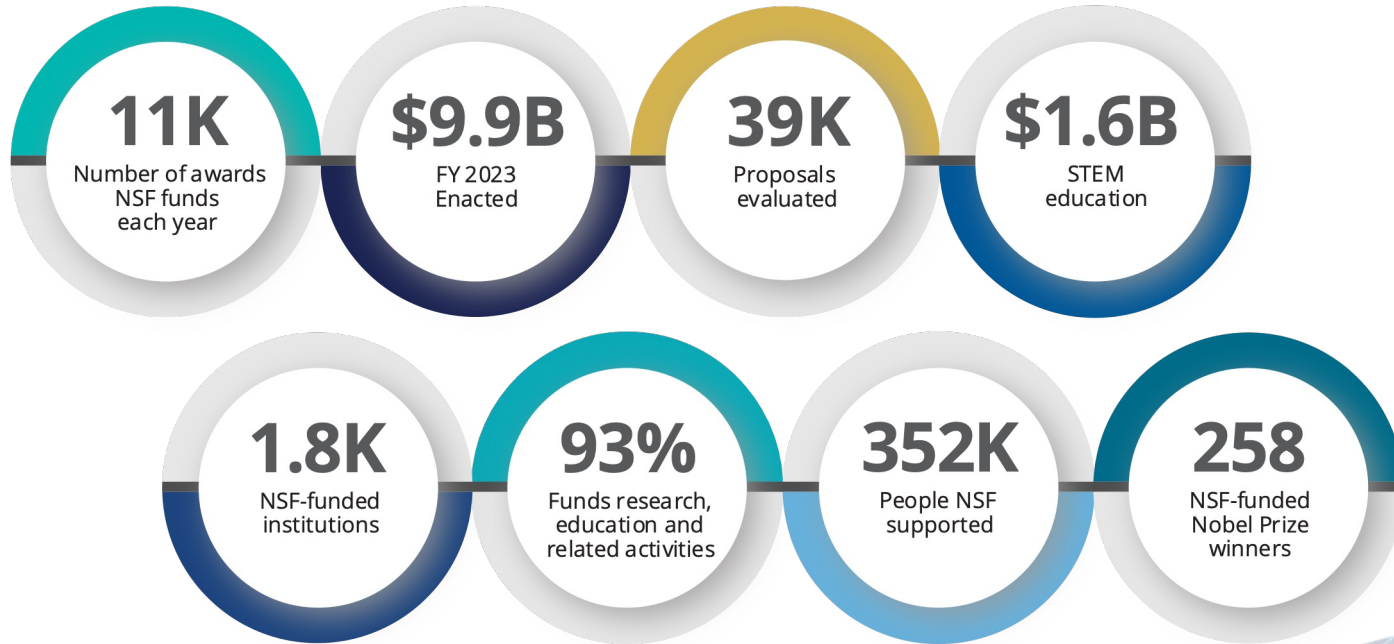
Gaithersburg, Maryland

August 20, 2024

Bruce Kramer  
Senior Advisor, ENG/CMMI



# NSF Vision: A nation that leads the world in science and engineering innovation, to the benefit of all, without barriers to participation



# Leveraging NSF Programs

- **NSF 24-014** – DCL: Advancing Fundamental Research and Education in Advanced Manufacturing with the Objectives of the Manufacturing USA Institutes. \$35M since 2017.
- **NSF 24-525**: Future Manufacturing, \$100M+ since 2020.
- **NSF 21-598**: Advanced Technological Education (ATE) Program – world class technician education. National Applied Artificial Intelligence Consortium (NAAIC), Miami Dade College, \$2.8M, August 2024.
- **NSF 21-013**: INTERN Program – Graduate-level internships in your Institute or member companies.



# The National Artificial Intelligence Research Resource (NAIRR)

- Aims to implement a shared national research infrastructure for responsible discovery and innovation in AI, <https://nairrpilot.org/> .
  - Presidential Executive Order 14110 on Safe, Secure and Trustworthy Development and Use of AI, October 2023.
  - Spur Innovation, Increase Diversity of Talent, Improve Capacity, and Advance Trustworthy AI.
  - 13 Agencies + 25 companies including Amazon, AMD, Google, HP, IBM, Intel, Meta, Microsoft, NVIDIA, OpenAI, and Palantir.



# National AI Research Institutes, NSF 23-610.

- \$20M (~4M/year) over 5 years
- Foundational and use-inspired AI research
- Innovation in AI education and workforce development
- New partnership development

## AI Institutes and Funding Partners



## A network of networks



### Facilitator and Resource Center

- Directory of Institute contacts
- Advice on partnership inquiries

Learn more about AI Institutes at <https://aiinstitutes.org>



# 25 Active Institutes

- 2020: First cohort of Institutes (5 NSF, 2 USDA/NIFA)
- 2021: Second cohort of Institutes (9 NSF, 2 USDA/NIFA)
- 2023: Third cohort of Institutes (6 NSF, 1 USAD/NIFA)

**AIVO**: <https://aiinstitutes.org>

Link to all awards: [NSF Award Search](#)



# NSF-led National AI Research Institutes Program

 **\$140M**

**2020**

**7 Institutes**

**3 Funding Partners**

DHS, USDA/NIFA

## Tracks

- Trustworthy AI
- Foundations of Machine Learning
- AI-Driven Innovation in Agriculture and the Food System
- AI-Augmented Learning
- AI for Accelerating Molecular Synthesis and Manufacturing
- AI for Discovery in Physics

 **\$220M**

**2021**

**11 Institutes**

**5 Funding Partners**

DHS, USDA/NIFA, Accenture, Amazon, Google, Intel

## Tracks

- Human-AI Interaction and Collaboration
- AI for Advances in Optimization
- AI and Advanced Cyberinfrastructure
- AI in Computer and Network Systems
- AI in Dynamic Systems
- AI-Augmented Learning
- AI-Driven Innovation in Agriculture and the Food System

 **\$140M**

**2023**

**7 Institutes**

**5 Funding Partners**

DHS, DOD, Education, NIST, USDA/NIFA, IBM

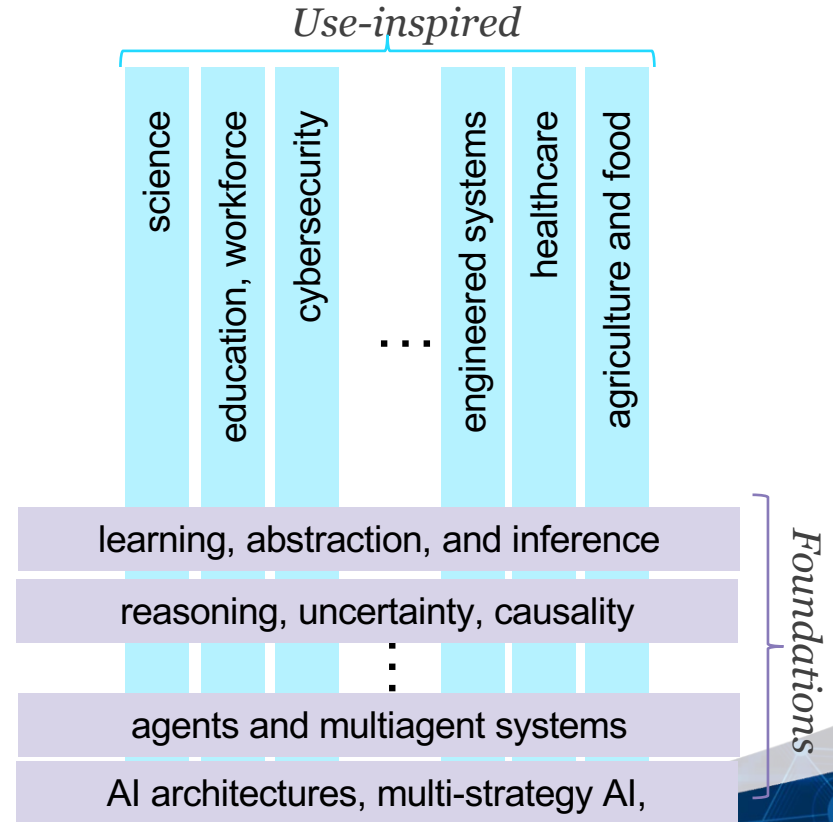
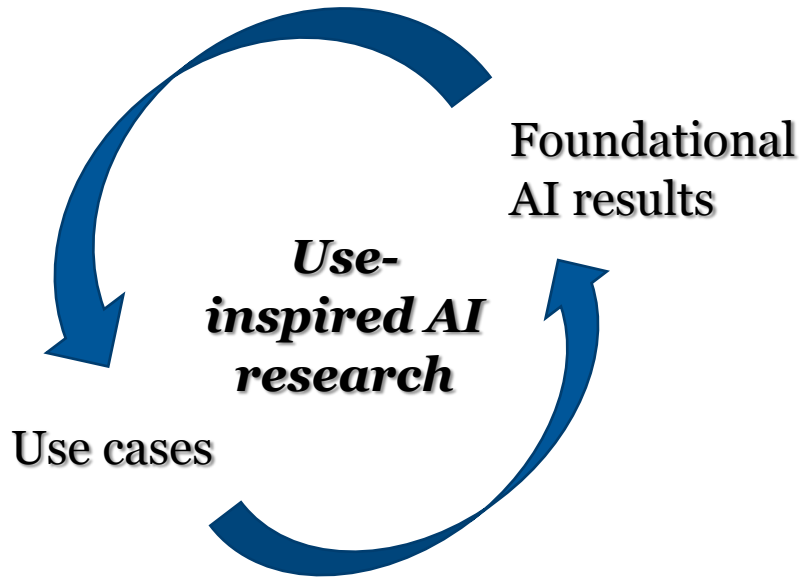
## Tracks

- Intelligent Agents for Next-Generation Cybersecurity
- Neural and Cognitive Foundations of Artificial Intelligence.
- Climate Smart Agriculture and Forestry
- AI for Decision Making
- Trustworthy AI
- AI-Augmented Learning to Expand Education Opportunities and Improve Outcomes





# Foundational and Use-Inspired AI Research



# Trustworthy AI for Supply Chains

## challenges

- ▶ lack of downward/upward visibility
- ▶ volatility of just-in-time systems
- ▶ environmental impact of e-commerce
- ▶ lack of synchronization with manufacturing
- ▶ disparate service levels

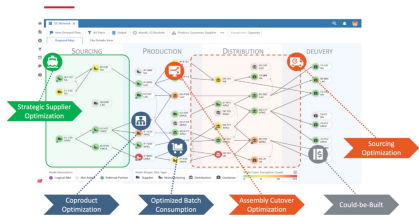
## new realities and expectations demand a new vision



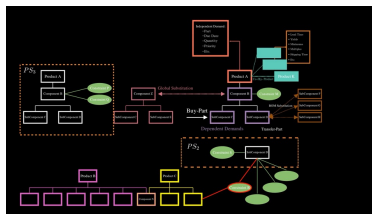
## a new vision

- ▶ end-to-end modeling and optimization
- ▶ managing risk and volatility
- ▶ integrating supply chains and manufacturing
- ▶ eliminating waste through reverse supply chains
- ▶ designing fair supply chains

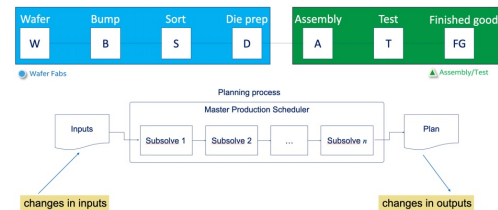
## modeling methodology



end-to-end optimization

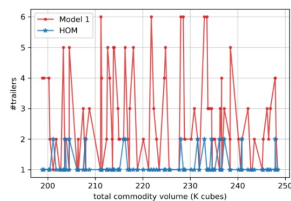


at scale

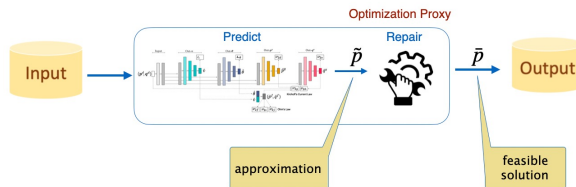


with real-time risk assessment

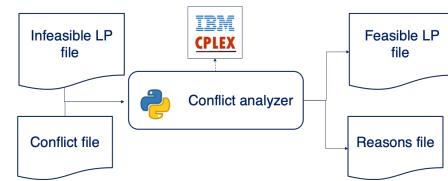
## enabling technologies



downstream/upstream forecasting



real-time optimization by fusing AI and OR



explanations for planners/operators



# What to do

- NSF Award Search: find university-based partners, <https://www.nsf.gov/awardsearch/> .
- Create a formal protocol for working with colleges and universities.
  - NSF 23-054 - DCL: Research on Integrated Photonics Utilizing AIM Photonics Capabilities is a good model.
- Propose a National Artificial Intelligence Research Institute, NSF 23-610.

**Your University Members Know NSF's Programs!**







# Tech Hubs Program Overview

Edwina Manyeh  
Tech Hubs Deputy Director

August 20, 2024

# Tech Hubs Vision

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The Tech Hubs Program aims to **strengthen U.S. economic and national security** by investing in geographically diverse regions across the country with the potential to become globally competitive in the next decade to ensure the **technologies, industries, and jobs of the future start, grow, and remain in the United States.**

# Tech Hubs Funding

	LEGISLATION	FUNDING	
Authorization	CHIPS and Science Act	\$10 billion	
Appropriations	FY 2023 Omnibus	\$500 million	\$541 million appropriated
	FY 2024 Consolidated Appropriations Act	\$41 million	

# What is a Tech Hub?

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- *Tech Hubs Designation is an endorsement of a Tech Hub's plans to supercharge its technology industry, create jobs, and strengthen U.S. economic and national security.*



**Regional Ecosystem**



**Core Technology Area**



**Commercial Leadership Potential**

# Investing in Tomorrow

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*The U.S. government has vetted Tech Hubs' project portfolios and endorses Designees as strong candidates for investment. We believe each Hub will:*

**1**

Strengthen U.S.  
**economic  
security**

**2**

Strengthen U.S.  
**national  
security**

**3**

Have the potential  
to become **globally  
competitive** in the  
next decade

**4**

Ensure the  
**technologies,  
industries, and jobs  
of the future** start,  
grow, and remain in  
the U.S.

# Regional Investment, Global Opportunity

*Through regional, place-based investments, Tech Hubs are equipped to deliver scaled global production in these critical technological areas:*



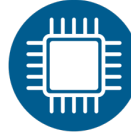
Enabling Safe and Effective **Autonomous Systems** (3)



Accelerating Our **Energy Transition** (5)



Maintaining Our **Quantum Edge** (2)



Regaining Leadership in **Semiconductor Manufacturing** (4)



Advancing **Biotechnology**:  
Drugs and Devices (6)



*Strengthening Our **Critical Minerals Supply Chain** (2)*



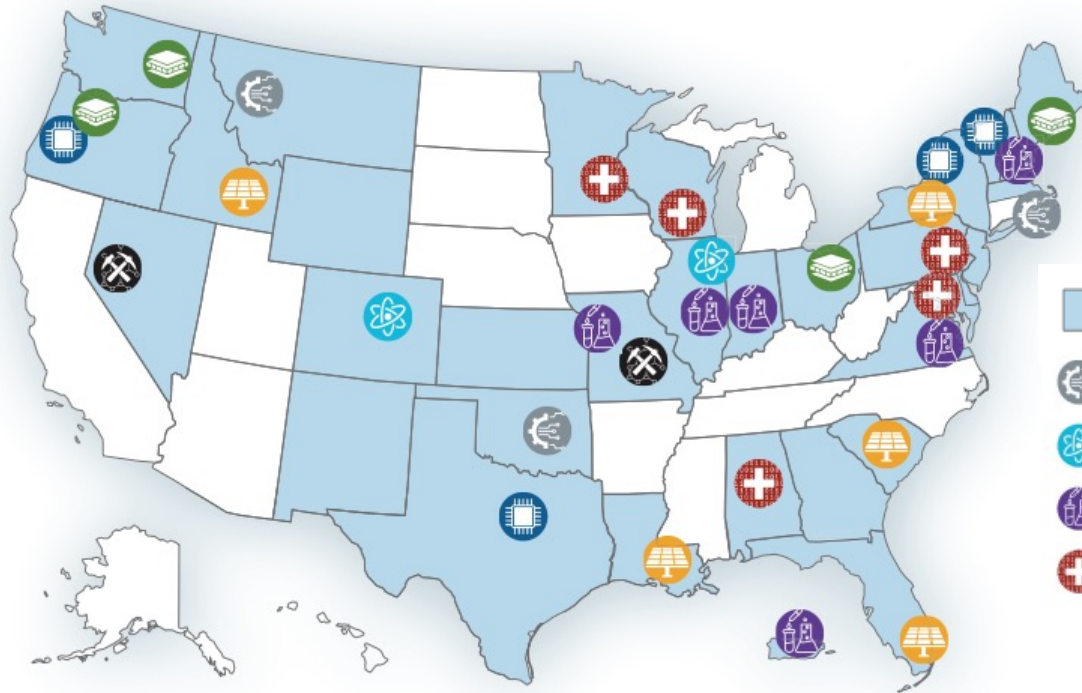
Advancing **Biotechnology**:  
Precision and Prediction (5)



Growing the Future of **Materials Manufacturing** (4)



# Our Program



## Geographic Reach

- 45 States + Puerto Rico
- 640 Counties





# Tech Hub Highlights: Safe Autonomous Systems

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**Headwaters Hub** (*Montana*): led by Accelerate Montana, aims to become a global leader in **smart, autonomous, photonic remote sensing technologies** with **\$41 million** in Tech Hubs awards serving Montana.

Headwaters hub integrates remote sensing systems with advances in embedded processors that **have built-in AI and machine learning (ML) capabilities** to develop and deploy smart photonic sensing systems coupled with autonomous systems to address critical defense, resource management, and disaster prevention needs.



# Tech Hub Highlights: Safe Autonomous Systems

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**Ocean Tech Hub** (*Massachusetts, Rhode Island*): led by the Rhode Island Commerce Corporation, seeks to develop, test, and commercialize **emerging maritime artificial intelligence / machine learning-enabled robotics and sensors**.

This Tech Hub is building emerging maritime AI-/ML-enabled robotics and sensors while leveraging its unique coastal assets—including seven commercial ports and shallow and deep ocean access—to establish **manufacturing environments for rapid prototype testing and technology delivery** to meet growing commercial demand.



# Tech Hub Highlights: Safe Autonomous Systems

**Tulsa Hub for Equitable and Trustworthy Autonomy (THETA)** (*Oklahoma*): Led by Tulsa Innovation Labs, THETA aims to become a global leader in **developing and commercializing autonomous systems** for use cases ranging from agriculture and pipeline inspections to regional transportation with **\$51 million in Tech Hubs awards**.

**THETA** emphasizes the development of **unmanned aircraft systems (UAS) and counter-UAS (CUAS), AI, and cybersecurity technologies** to allow society to realize the maximum benefit of complex autonomous systems without compromising safety, security, privacy, or public trust.



# Tech Hub Highlights: Biomanufacturing

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**Advanced Pharmaceutical Manufacturing (APM) Tech Hub** (*Virginia*): Led by the Commonwealth Center for Advanced Manufacturing, APM seeks to accelerate the growth, innovation, and sustainability of the **U.S.-based advanced pharmaceutical manufacturing industry** to re-shore safe and affordable medicines via innovative hybrid and continuous flow manufacturing technologies.

This includes **accelerating active pharmaceutical ingredient manufacturing processes by leveraging AI-/ML-based systems.**



# Tech Hub Highlights: Biomanufacturing

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**PRBio Tech Hub** (*Puerto Rico*): Led by the Puerto Rico Science, Technology and Research Trust, PRBio aims to advance the region as a global leader in biotechnology through **fast-tracking the discovery, development, manufacturing, and supply of next generation biotechnology and medical device products** to detect, treat, and cure diseases and ailments.

PRBio enabling digital capabilities—e.g., **AI/ML, robotics, 3D printing, and advanced 4.0 factory manufacturing**—to fast-track the discovery, development, manufacturing, and supply of next generation and disruptive products that detect, treat, and cure diseases and ailments.



# Tech Hub Highlights: Biomanufacturing

**Birmingham Biotechnology Hub (Alabama):** The Birmingham Biotechnology Hub, led by Southern Research Institute, aims to become a global leader in **drug, vaccine, and diagnostics development** by applying artificial intelligence (AI)-driven biotechnology to increasing diverse representation in clinical genomic data and clinical trials.

**AI and representative data is used to develop drugs, vaccines, and diagnostics** that address the unique needs of underrepresented patient segments, improve diagnostic accuracy and drug efficacy, reduce timelines to develop new drugs and vaccines, enable rapid response to emerging health threats, and improve health outcomes of diverse patients at home and abroad.



# Tech Hub Highlights: Biomanufacturing

**Greater Philadelphia Region Precision Medicine Tech Hub** (*Pennsylvania, Delaware, Maryland, New Jersey*): Led by the Ben Franklin Technology Partners of Southeastern Pennsylvania, aims to become a global leader in **end-to-end precision medicine** weaving together disparate technology applications—**biotechnology, medical technology, genomics, synthetic biology supported by AI/ML, robotics, and more**—to deliver new ways to **diagnose, prevent, and treat disease**, increasing evidence-based technology applications that improve morbidity and mortality and decrease health disparities.





# Tech Hub Highlights: Biomanufacturing

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# Tech Hub Highlights: Biomanufacturing

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**Minnesota MedTech Hub 3.0** (*Minnesota, Wisconsin*): Led by the Minneapolis Saint Paul Economic Development Partnership, aims to position Minnesota as a global center for **“Smart MedTech”** by integrating **artificial intelligence (AI), machine learning, and data science into medical technology**, allowing for regional information-sharing and innovative collaboration.



# Tech Hub Highlights: Biomanufacturing

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**Wisconsin Biohealth Tech Hubs** (*Wisconsin*): Led by BioForward Wisconsin, aims to position Wisconsin as a global leader in **personalized medicine**, an emerging healthcare approach that **tailors tests, treatments, and therapies informed by a patient's unique genetic code**, medical record, and environment to guide decisions about tests, treatments, and therapies tailored for them with AI/ML techniques. Wisconsin Biohealth has received **\$49 million** in Tech Hubs awards to serve Wisconsin.



# Tech Hub Highlights: Energy Transition

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**Gulf Louisiana Offshore Wind Propeller (Louisiana):** Led by Louisiana State University, aims to transition Louisiana's energy economy from its legacy of oil and gas to **offshore wind and renewable energy**.

This Tech Hub **connects AI into the Hub's energy infrastructure, port and shipbuilding network**, and local workforce to establish a domestic offshore wind supply chain and expand harvestable offshore wind sites.



# Tech Hub Highlights: Materials Manufacturing

**American Aerospace Materials Manufacturing Tech Hub** (*Washington, Idaho*): Led by American Aerospace Materials Manufacturing Center, aims to develop new domestic supply chains to meet the immediate demand **for high-rate production of advanced composite aerostructures** in defense and commercial markets. This work incorporates **automation, robotics, AI, and sophisticated tooling into aerospace workforce training**.

# Additional Resources

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EDA also supports resources and programs to help regions execute, build and more easily connect with each other to learn, test and pursue entrepreneurial and innovative approaches to sustainable economic growth and prosperity.

## ■ Tools and Resources for Economic Developers

- [National Economic Research and Resilience Center](#) (*Argonne National Labs*)
  - Data dashboards for economic resilience, economic development capacity, program eligibility
- [Inclusive Recovery Tool Kit](#) (*New Growth Innovation Network*)

## ■ New Investments in America's Economic Development Infrastructure

- [Economic Recovery Corps](#)
- [Communities of Practice](#)
  - TBED, EDDs, RLFs, Indigenous, Coal, Manufacturing Communities and more.



# Questions & Contact Info

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## Tech Hubs Program Office

techhubs@eda.gov

## Tech Hubs Online

techhubs.gov



# Questions & Answers



# Key Dates

Milestone	Date
<b>NOFO Published</b>	July 22, 2024
<b>Informational Webinar</b>	July 25, 2024
<b>Proposers Day</b>	August 20, 2024 (today)
<b>Concept Papers due</b>	September 30, 2024
<b>Proposal Invitation</b>	November 2024
<b>Full Proposal Due</b>	January 2025 (deadline will be specified in the invitation to submit Full Proposals)
<b>Selection Announcement &amp; Anticipated Award</b>	Spring 2025

# Questions

Answers to Frequently Asked Questions can be found on the OAM website:  
<https://www.nist.gov/oam/ai-resilient-manufacturing-institute-competition>



[ManufacturingUSA@nist.gov](mailto:ManufacturingUSA@nist.gov)  
Subject line: “AI for Resilient Manufacturing”



All questions regarding the Funding Opportunity should be submitted via email.

# Informal Teaming Discussions



**Purpose:** To provide a networking opportunity to support the formation of effective proposal teams

- Participants can build off of the earlier “Teaming for a Great Proposal” session
- Suggested topics are based on earlier discussions
- Federal employees are excluded from teaming conversations

# Suggested Process

- Each table will be given a suggested topic for discussion.
- Attendees are welcome to stay at their table or move around.
- Please be sure to introduce yourselves.
- Space is also available in the bistro area outside the main room and on the adjoining patio.
- Event will end promptly at 5:00 pm.

# Suggested Table Topics

RED	AI Engineering Skills
PINK	Manufacturing Processing Engineering Skills
ORANGE	Supply Chain
YELLOW	AI Safety and Security/Risk Management/Regulatory Expertise
BLACK	Hardware & Equipment
GREEN	Education/Workforce Convening Skills
DARK BLUE	Relationship Development
LIGHT BLUE	Strategic Thinking and Data Infrastructure
PURPLE	Business Management Skills
WHITE	Teaming and Human Computer Interactions
* STAR *	Primary Applicants

Participant  
List



Teaming List

