



National Institutes of Health
Office of Data Science Strategy

Preparing the Next Generation of Biomedical Research Teams for Ethical AI: Workforce & Curricula Development

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AI@NIH and Beyond



R&D



Programming



Clinical
Trials



Business
Analytics



Medical
Responses



Community

Research Opportunity Announcement!
Apply to the Advancing Health Research Through Ethical, Multimodal AI Initiative

INFORMATIONAL WEBINAR: April 19, 2024, 2-3pm EDT
LETTER OF INTENT (OPTIONAL) DUE: April 29, 2024
PROPOSALS DUE: May 16, 2024

▶ **LEARN MORE:** datascience.nih.gov/MultimodalAI
CONTACT US: ODMultimodalAI@od.nih.gov



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Artificial Intelligence/Machine Learning Consortium to Advance Health Equity and Researcher Diversity (AIM-AHEAD)

 **Bridge2AI**

Propelling Biomedical Research with Artificial Intelligence



NAIRR Pilot National Artificial Intelligence Research Resource Pilot

Allocations Call Available Resources NAIRR Secure About

The National Artificial Intelligence Research Resource (NAIRR) Pilot

The NAIRR Pilot aims to connect U.S. researchers and educators to computational, data, and training resources needed to advance AI research and research that employs AI. Federal agencies are collaborating with government-supported and non-governmental partners to implement the Pilot as a preparatory step toward an eventual full NAIRR implementation.

- Spur innovation
- Increase diversity of talent
- Improve capacity
- Advance trustworthy AI

Learn more about NAIRR Pilot | Subscribe for updates

National Artificial Intelligence Research Resource Pilot

ScHARe

Science Collaborative for Health disparities and Artificial intelligence bias REduction



Initiative 1

Multi-Disciplinary Postdoc Program for Ethical AI in Biomedical and Behavioral Research (K01)

- **Concept Clearance:** New Limited Competition
- **Objective/Purpose:** To provide support and protected time for an intensive, multi-disciplinary, supervised career development experience in ethical, responsible, and transparent AI for biomedical and behavioral research with the goal of developing the next generation of researchers ready to innovate new capabilities in this emerging field.
- **Budget** will grow from \$600,000 in FY 25 for 3 awards to \$3,000,000 in FY 29 for a steady state of 15 awards per year.
- **Award Project Period:** 3-5 years
- **Council Action:** Vote for approval of the concept for a Multi-Disciplinary Postdoc Program for Ethical AI in Biomedical and Behavioral Research

Initiative 2

Undergraduate & Graduate Curricula/Module/Training Development and Assessment for AI-Ready Biomedical and Behavioral Researchers (R25)

- **Concept Clearance:** New Limited Competition
- **Objective/Purpose:** To develop, evaluate, and disseminate curricula, module, and training opportunities for diverse groups of *biomedical and behavioral researchers* to develop the skills and competencies needed to make their data FAIR and AI-Ready; to understand the ethics challenges of AI in biomedicine; and to effectively collaborate within multidisciplinary teams for ethical, biomedical AI.
- **Budget** will grow from \$900,000 in FY 25 for 3 awards to \$2,700,000 in FY 27 for a steady state of 9 awards per year.
- **Award Project Period:** 3 years
- **Council Action:** Vote for approval of the concept for Undergraduate and Graduate Curriculum Development and Training for AI-Ready Researchers.

Initiative 3

Graduate Curricula/Module/Training Development and Assessment for AI-Ready Bioethics Researchers (R25)

- **Concept Clearance:** New Limited Competition
- **Objective/Purpose:** To develop, evaluate, and disseminate curricula, module, and training opportunities to develop the skills and competencies that *bioethics and humanities researchers* need to enhance the ethical development and assessment of AI across the data and model development path and to co-innovate new ethical biomedical AI capabilities.
- **Budget** will grow from \$900,000 in FY 25 for 3 awards to \$2,700,000 in FY 27 for a steady state of 9 awards per year.
- **Award Project Period:** 3 years
- **Council Action:** Vote for approval of the concept for Undergraduate and Graduate Curriculum Development and Training for AI-Ready Researchers.

Purpose of the Initiatives

Multi-disciplinary Post-doc Program for Ethical AI for Biomedical and Behavioral Research (K01)

Target broad pool of researchers with the goal of achieving research independence in ethical, biomedical AI

Support a portfolio of research that addresses spectrum of biomedical applications & ethical challenges across NIH mission space

Develop the next generation ethical biomedical-AI workforce ready to co-innovate new capabilities

Undergraduate & Graduate Curricula, Module, Training Development and Assessment for AI-Ready Biomedical Researchers (R25)

Re-usable educational materials needed to:

- 1) Make biomedical research data FAIR and AI Ready
- 2) Understand ethics challenges in AI
- 3) Collaborate in multidisciplinary teams

Support portfolio of activities/awards:

- Address multiple biomedical disciplines, data types, and ethics challenges
- Serve well- and lesser-resourced institutions & those focused on health disparity pops.

Enhancing the systems-wide thinking for the ethical development and assessment of AI across data and model development, for collaboratively co-innovating new capabilities in ethical AI.

Graduate Curricula, Module, Training Development and Assessment for AI-Ready Bioethics Researchers (R25)

Re-usable educational materials needed to:

- 1) Enhance ethical development of AI
- 2) Co-innovate new capabilities

Application Requirements

Multi-disciplinary Post-doc Program for Ethical AI for Biomedical and Behavioral Research (K01)

Research project to advance the ethical development of AI for biomed & behavioral research

One primary mentor (from awarded institution) and a multi-disciplinary mentoring team

Collaboration with under-represented organizations encouraged

Undergraduate & Graduate Curricula, Module, Training Development and Assessment for AI-Ready Biomedical Researchers (R25)

Specify the training materials & activities to be developed and skills & competencies targeted

Clear plan for formative & summative assessments, and disseminating educational materials (incl data & code)

Recruitment plan to enhance diversity

Target trainees with biomedical or bioinformatics backgrounds

Target trainees with ethics/humanities/law or other ethics relevant backgrounds

Invite awardees to collaborate on practicum opportunities (hands-on training) for trainees and PI meetings to strengthen connections among the cohorts

Anticipated future phases

Multi-disciplinary Post-doc Program in Ethical AI for Biomedical and Behavioral Research (K01)

PI meetings & gatherings w/ mentors & other NIH programs to create a community at the intersection of biomedical and behavioral research, AI, and ethics

Undergraduate & Graduate Curricula, Module, Training Development and Assessment for AI-Ready Biomedical Researchers (R25)

Future solicitation: tools & infrastructure development to share developed resources

Future solicitations: invite institutions to re-use curricula/modules, leverage learnings & methodologies with focused outreach to under resourced institutions

Future events and funding opportunities: invite sustainability plans & partnerships among institutions and industry to create career paths

Graduate Curricula, Module, Training Development and Assessment for AI-Ready Bioethics Researchers (R25)

Building on Workforce Landscape Study

2022 BAH FAIR/AI-Ready Data Training Landscape Assessment

In 2022, trans-NIH ODSS AI Workforce WG worked with Booz Allen Hamilton to perform a landscape assessment for training

- Specifically in the areas surrounding FAIR and AI-Ready Data in Biomedical & Behavioral Research
- **Output**
 - Learnings from interviews compiled and specific skills identified to further the overarching goal of making biomedical research data FAIR and AI-ready
- **Skills Identified (5 ethics-first competencies):**
 - Dataset documentation
 - Ontology usage & data encoding
 - Data cleaning & formatting
 - Data curation & sharing
 - AI-assisted reuse of existing datasets

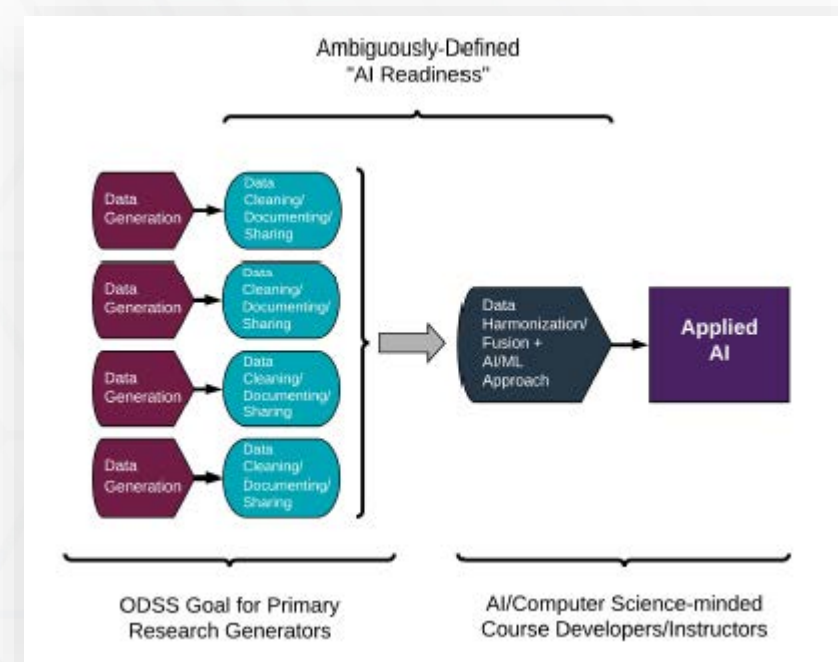


Figure 6 from 2022 BAH Report

Pilot Projects

2021: Workforce Development at the Interface of Information Sciences, Artificial Intelligence and Machine Learning (AI/ML), and Biomedical Sciences

- 24 awards
- NCI, NEI, NHLBI, NIA, NIAID, NIAMS, NIDA, NIEHS, NIGMS

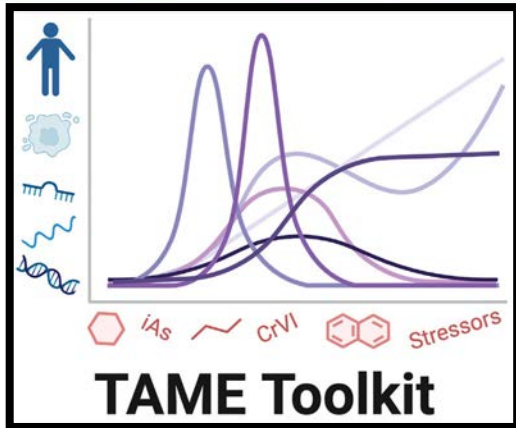
2022: Advancing the Ethical Development and Use of AI/ML in Biomedical and Behavioral Sciences

- 23 awards
- NCATS, NCI, NEI, NHGRI, NHLBI, NIA, NIAID, NIBIB, NIDDK, NIGMS, NIMH, NIMHD, NINDS

2021,2022,2023: Collaborations to Improve the AI/ML-Readiness of NIH-Supported Data

- 107 awards
- FIC, NCCIH, NCI, NHGRI, NHLBI, NIA, NIAID, NIAMS, NIBIB, NICHD, NIDA, NIDCD, NIDCR, NIDDK, NIEHS, NIGMS, NIMH, NIMHD, NINDS, NLM

Example Highlights from FY21 AI-Workforce NOSI



PI: Ilona Jaspers, The University of North Carolina at Chapel Hill

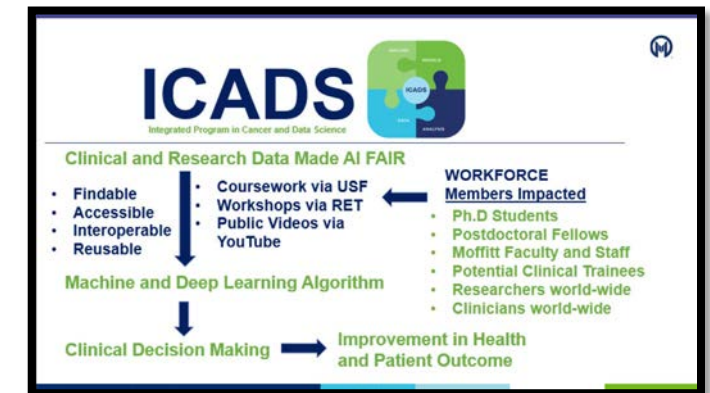
TITLE (IC): The UNC inTelligence And Machine LEarning (TAME) Training Program (NIEHS)

HIGHLIGHTS: The TAME Toolkit promotes trainee-driven data generation, management, and analysis methods specific to data in environmental health studies. Address current gaps in discipline-specific training and coding.

PI: Douglas Cress, H. Lee Moffitt Cancer Center and Research Institute

TITLE (IC): Cancer Research Workforce Development in FAIR Artificial Intelligence and Machine Learning (NCI)

HIGHLIGHTS: Training focuses on FAIR-ification and AI-Readiness; fairness and health disparities.



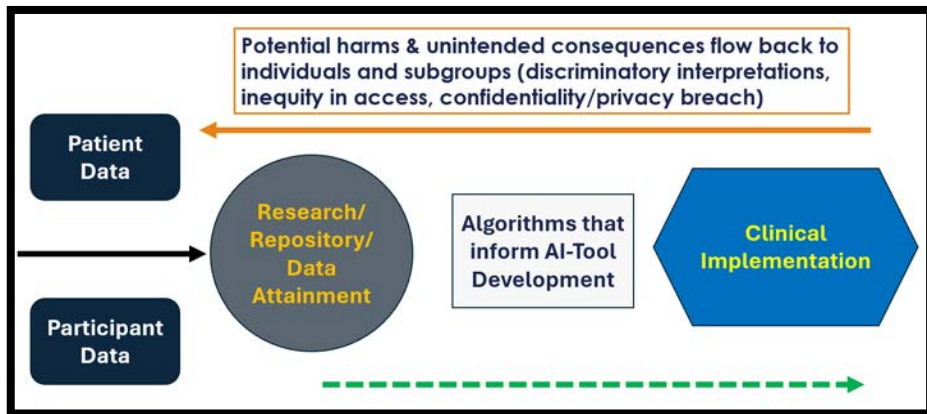
PI: Ana Patricia Ortiz, University of Puerto Rico Comprehensive Cancer Center

TITLE (IC): Preparing a workforce to apply AI/ML techniques to datasets derived from Hispanic populations to advance cancer prevention and control research (NCI)

HIGHLIGHTS: Training focuses on (1) techniques to manipulate/pre-process cancer datasets from Hispanic populations and make them FAIR & AI-Ready, (2) methods for developing ML-based models to analyze data and create predictive models for cancer diagnosis with focus on datasets from Hispanic populations.



Example Highlights from FY 22 AI-Ethics NOSI



PI: Alex Federman, Icahn School of Medicine at Mount Sinai
TITLE (IC): Natural Language Processing and Automated Speech Recognition to Identify Older Adults with Cognitive Impairment Supplement (NIA)
HIGHLIGHTS: Qualitative Examination of Patients' and Clinicians' perspectives on AI-driven Automated Screening for Cognitive Impairment

PI: Abhinav Jha, Washington University
TITLE (IC): A framework to quantify and incorporate uncertainty for ethical application of AI-based quantitative imaging in clinical decision making (NIBIB)

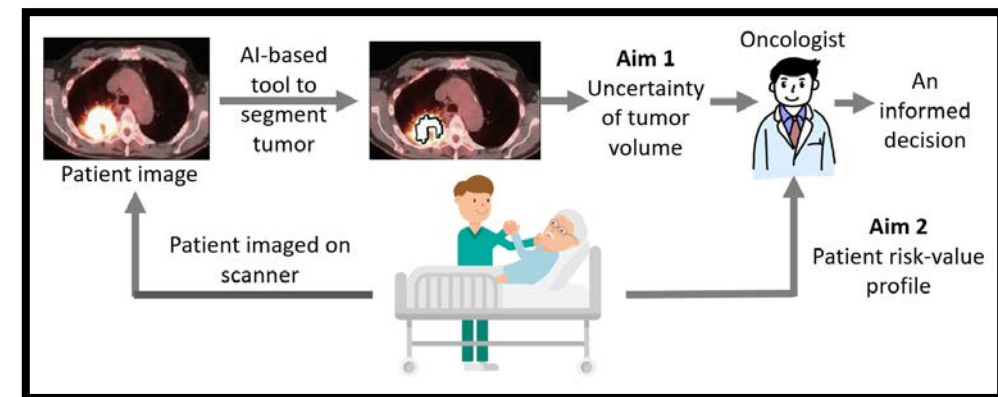
HIGHLIGHTS:

Ethical Considerations for Artificial Intelligence in Medical Imaging: Deployment and Governance

[DOI: 10.2967/jnumed.123.266110](https://doi.org/10.2967/jnumed.123.266110)

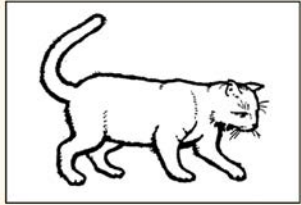
Ethical Considerations for Artificial Intelligence in Medical Imaging: Data Collection, Development, and Evaluation

[DOI: 10.2967/jnumed.123.266080](https://doi.org/10.2967/jnumed.123.266080)



Example Highlights from FY 21 AI-Readiness NOSI

Confrontation Naming Tests are key tools in diagnosing and characterizing anomia...



"Cat" Correct response!
"Cap" Phonemically related!
"Dog" Semantically related!

Key outcome: **How many** and **what type** of errors are produced?

PI: STEPHEN BEDRICK, OREGON HEALTH & SCIENCE UNIVERSITY

TITLE (IC): Towards Automatic Transcription of Post-Stroke Disordered Speech (NIDCD)

HIGHLIGHTS: Produced an AI-Ready data set of aphasic speech for use in Automatics Speech Recognition and engaged the community in Post-Stroke Speech Challenge

RESEARCH PRODUCTS:

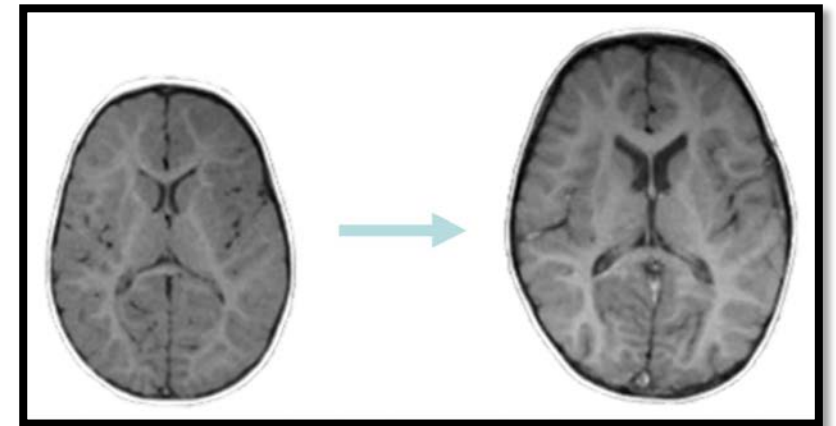
- *Tools for downloading and using the unique data set for the PSST: Post-Stroke Speech Transcription challenge.* <https://github.com/PSST-Challenge/psstdata/tree/v1.0.0>

PI: GILMORE, JOHN HORACE, UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

TITLE (IC): Rescuing Missed Longitudinal MRI Scans in the UNC Early Brain Development Study (EBDS)

HIGHLIGHTS: Developed AI methods to fill in missing brain images in cohort studies of early brain development, thereby making a complete AI-ready dataset for further analyses.

RESEARCH PRODUCTS: *Code and documentation:* <https://github.com/yoonmihong/DeepImputation>



Findings from the research communities

Observed Challenges

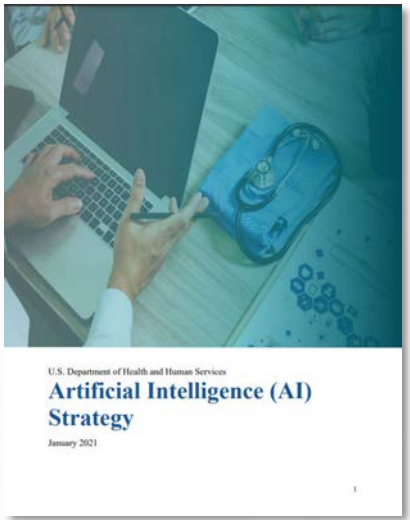
- Biomedical-AI research is not organically bringing together the needed multidisciplinary teams, with specific challenges for ethical/responsible AI practice;
- Biomedical researchers are often insufficiently trained in the AI space, with FAIR principles, ethics, responsibility/rigor, and biomedical use cases not incorporated into traditional courses offered; and
- There is a dearth of bioethicists/humanities professionals, who are critical partners and collaborators, engaged in the biomedical-AI space.

Need for training around...

- AI applications *in biomedicine* (to enable movement into practice).
- Team-based science.
- Intersection of ethics with biomedical AI.
- Enhanced pathways to partner with ethics experts.
- Improvement of AI-ready/FAIR data (generation of which begins at the research planning phase).
- Engagement and participatory practices and AI assessment

Strategic Importance

Accelerating Trustworthy AI via Strengthening the AI Workforce



OCTOBER 30, 2023

Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence

<https://www.ai.gov/strategic-pillars/advancing-trustworthy-ai/>

<https://www.hhs.gov/sites/default/files/hhs-ai-strategy.pdf>

<https://www.hhs.gov/sites/default/files/hhs-trustworthy-ai-playbook.pdf>



<https://www.federalregister.gov/documents/2020/12/08/2020-27065/promoting-the-use-of-trustworthy-artificial-intelligence-in-the-federal-government>

NIH Office of Data Science Strategy

Council Actions

- Initiative 1: Vote for approval of the concept for Multi-Disciplinary Postdoc Program for Ethical AI in Biomedical and Behavioral Research (K01)
- Initiative 2: Vote for approval of the concept for Undergraduate and Graduate Curricula/Module/Training Development and Assessment for AI-Ready **Biomedical and Behavioral** Researchers (R25)
- Initiative 3: Vote for approval of the concept for Graduate Curricula/Module/Training Development and Assessment for AI-Ready **Bioethics** Researchers (R25)