

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

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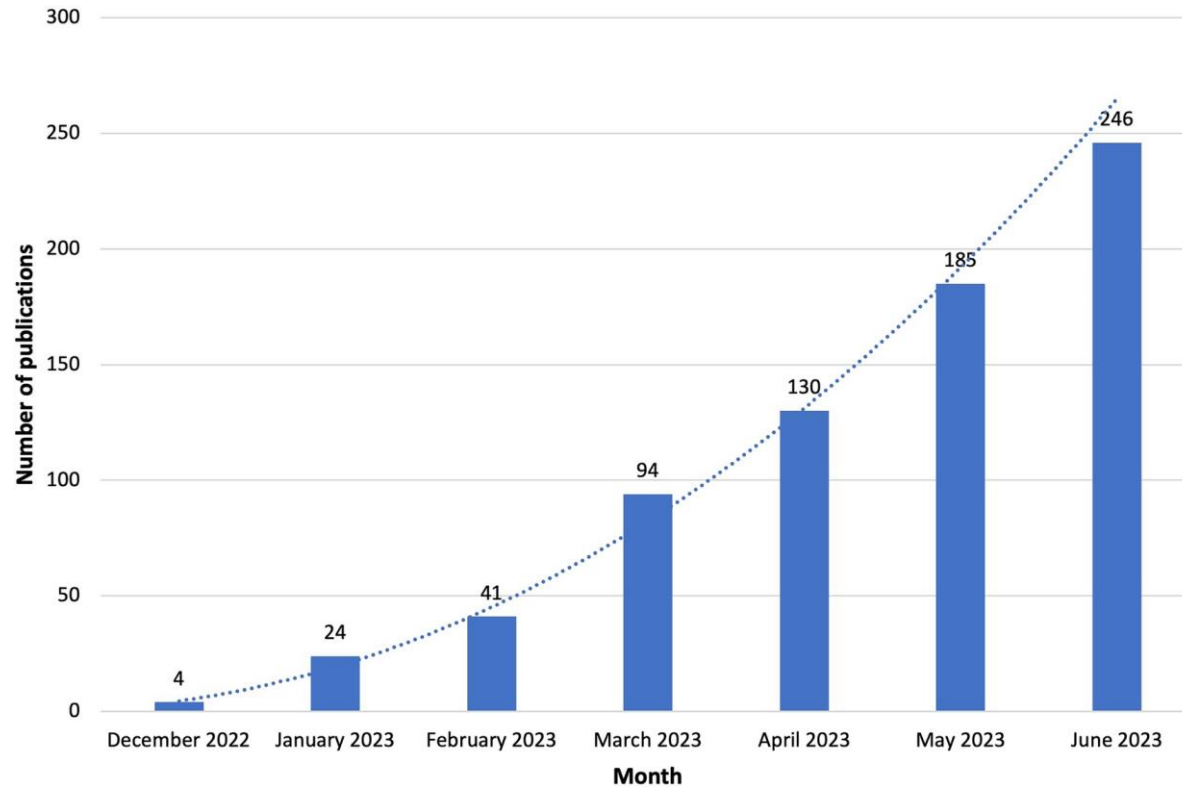
Current trends in Biomedical AI

- **Artificial Intelligence and Public Health**
- **Large Language Models** and Biomedicine, improving clinical models
- **New England Journal of Medicine – Artificial Intelligence**

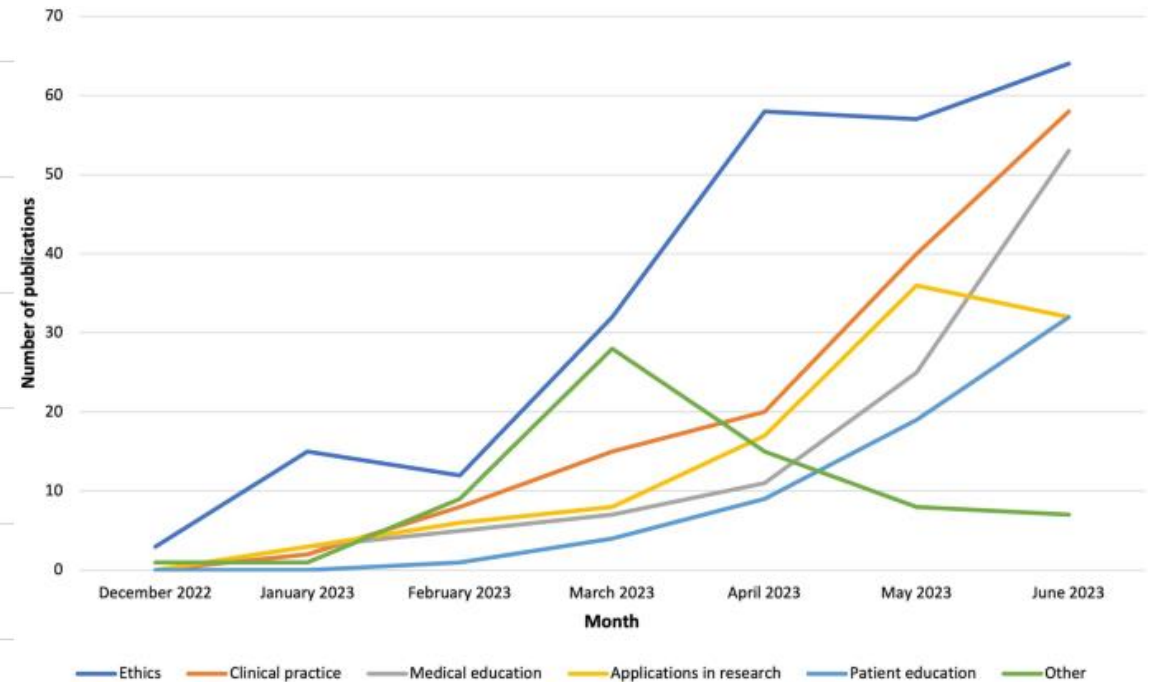


The First Months of ChatGPT

Number of ChatGPT publications over time

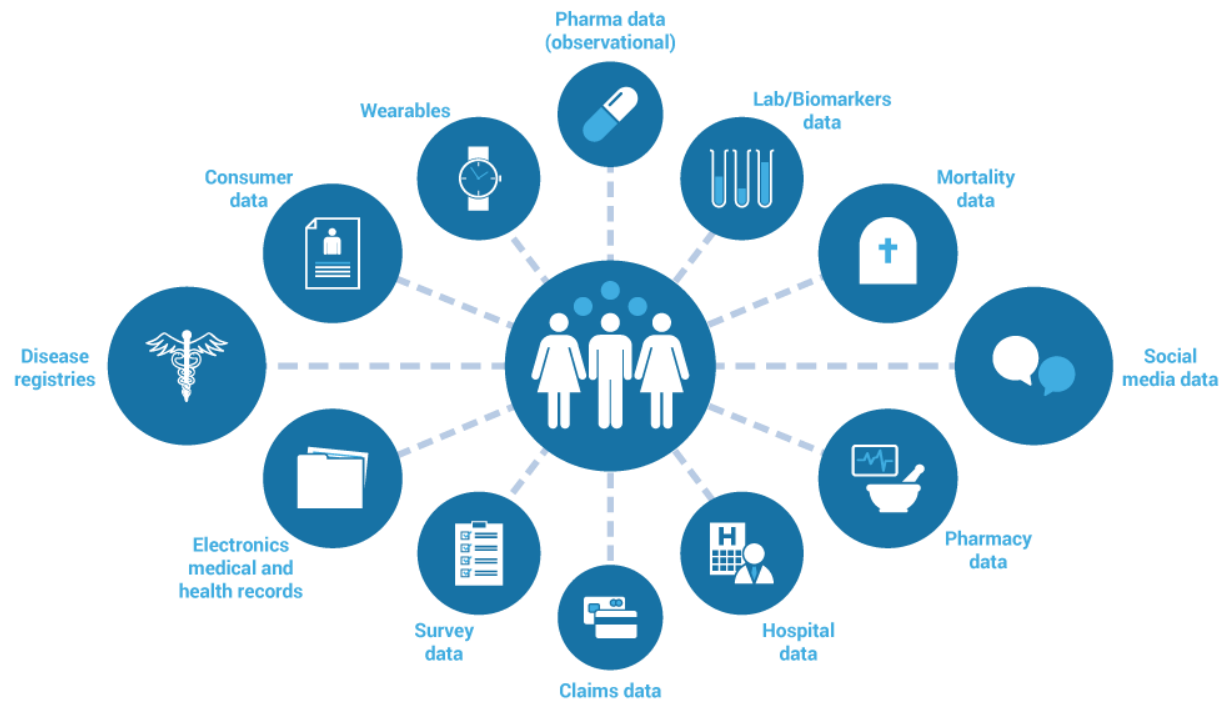


Number of publications on each topic by month



Data Science and Nursing | Current Trends

Nurses are leaders in using EHRs and in collecting Real World Data



Data Challenges

Specific data element might differ in practice and research

Data quality, accuracy, and completeness remains a challenge

Requirements of extensive data mapping, cleaning and curation

Lack of interoperability of data systems

Need for greater data science training in nursing research

Agenda

1. Promise of AI
2. Challenges in AI
3. Introduction to AIM-AHEAD
4. Current AIM-AHEAD research
5. Impact of AIM-AHEAD
6. New opportunities in AI

The Promise of AI for Medicine

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NIH Director's Blog

Whole-Genome Sequencing Plus AI Yields Same-Day Genetic Diagnoses



Dr. Francis Collins



Diagnosis of genetic diseases in seriously ill children by rapid whole-genome sequencing and automated phenotyping and interpretation

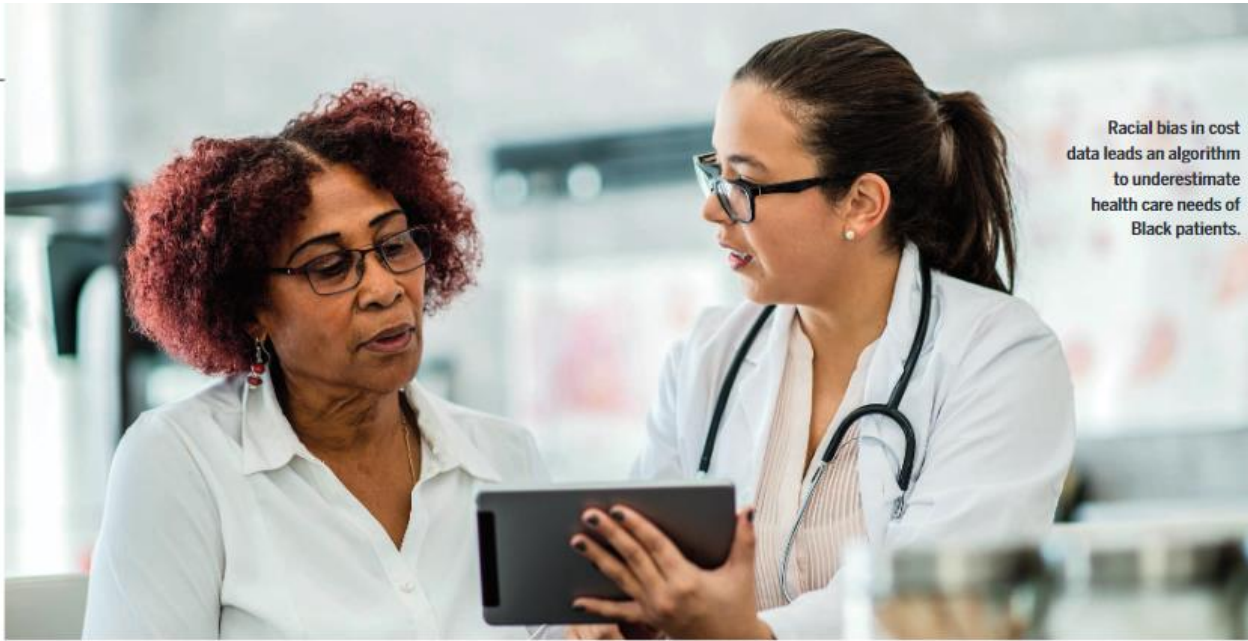
MICHELLE M. CLARK , AMBER HILDRETH , SERGEY BATALOV , YAN DING , SHIMUL CHOWDHURY, KELLY WATKINS , KATARZYNA ELLSWORTH ,

BRANDON CAMP, CYRIELLE I. KINT, [...] STEPHEN F. KINGSMORE [+52 authors](#) [Authors Info & Affiliations](#)

SCIENCE TRANSLATIONAL MEDICINE • 24 Apr 2019 • Vol 11, Issue 489 • DOI: 10.1126/scitranslmed.aat6177

AI reduces time and effort for diagnosis of rare genetic disorders in infants in the ICU and can analyze 4.5M variants associated with 13,000 genetic disorders in 5 minutes.

Racial Bias in AI



Racial bias in cost data leads an algorithm to underestimate health care needs of Black patients.

SOCIAL SCIENCE

Assessing risk, automating racism

A health care algorithm reflects underlying racial bias in society

By **Ruha Benjamin**

era, the intention to deepen racial inequities was more explicit, today coded inequities are more subtle, but no less real. Beyond the algorithm developers by constructing a more fine-grained measure of health outcomes by intention and design

nature

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NEWS | 24 October 2019 | Update [26 October 2019](#)

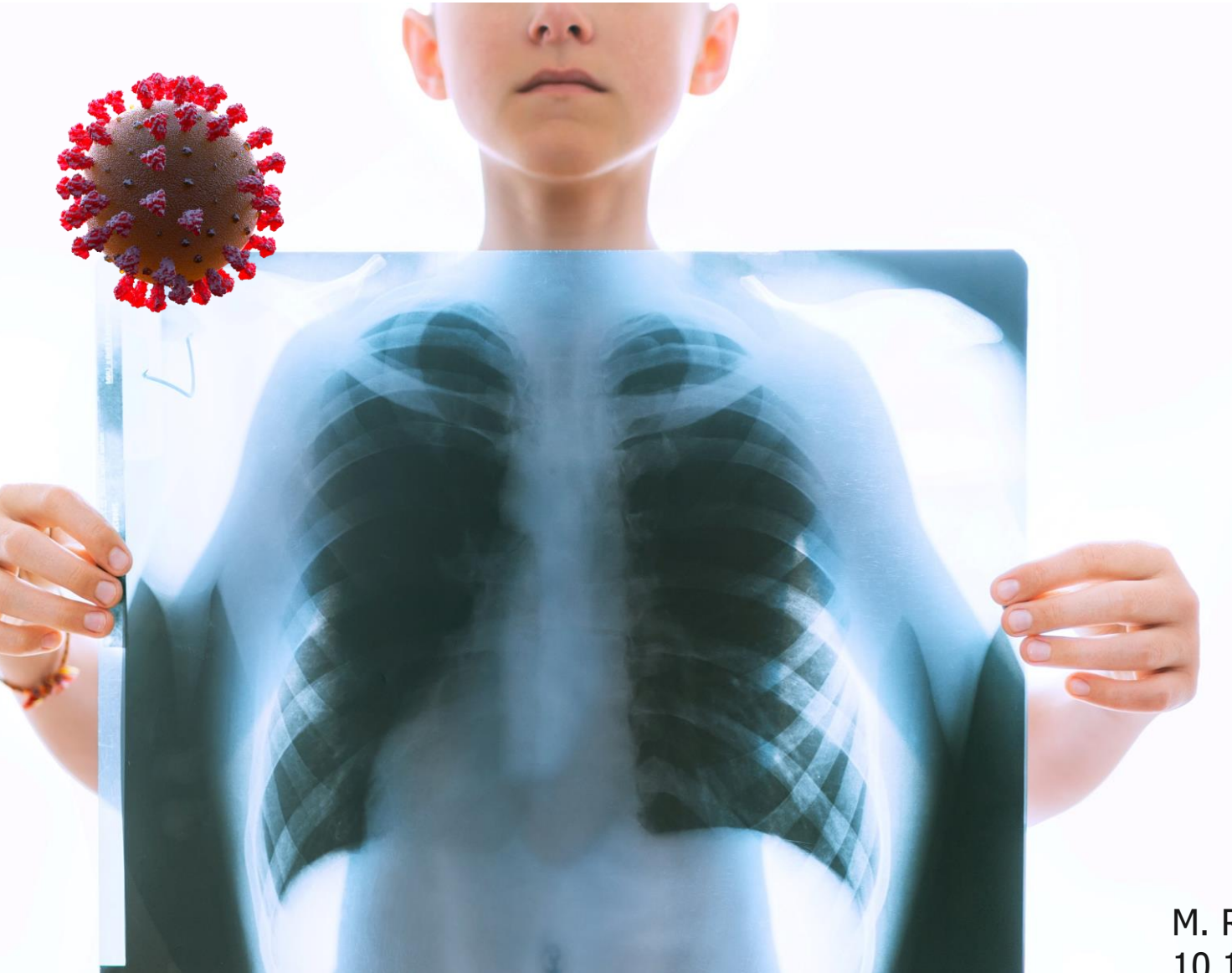
Millions of black people affected by racial bias in health-care algorithms

Study reveals rampant racism in decision-making software used by US hospitals – and highlights ways to correct it.

Heidi Ledford

R. Benjamin, *Science* (2019).DOI:[10.1126/science.aaz3873](https://doi.org/10.1126/science.aaz3873)

Age Disparities in AI



Model trained to detect COVID-19 using adult chest X-rays gave false positives in children

M. Roberts et al. Nature Machine Intelligence (2021). DOI: 10.1038/s42256-021-00307-0

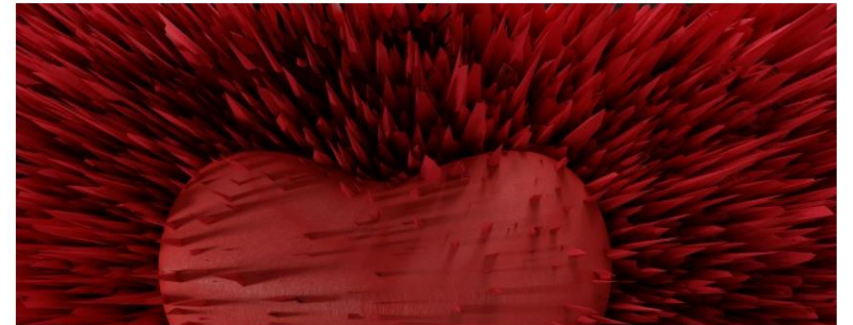
Potential Bias

- Unrepresentative data
- Bias within training data
- Bad design/asking the wrong question
- Bias in algorithm development and implementation
- Lack of diversity of researchers
- Lack of data in lived experiences, historical/cultural contexts such as social determinants of health (SODH)

POPULATION HEALTH NEWS

SDOH Improves Performance of Heart Failure Mortality Predictive Model

Researchers have found that machine-learning models that incorporate social determinants of health data perform better than traditional methods of predicting heart failure deaths among Black patients.



JAMA Cardiol. 2022;7(8):844-854.
doi:10.1001/jamacardio.2022.1900

These problems are not static

A model may work well at the time of deployment but after some time it could started to deteriorate, dropping accuracy little by little over the course of months

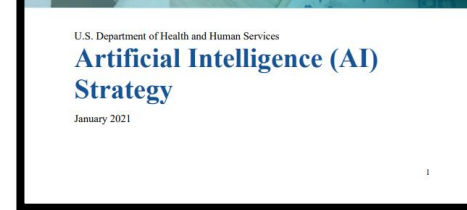
Data Shifts, changes in data distributions over time due to external influences (i.e. SDOH) change input & output data

Concept Shifts, or input and output variables change (time-dept variables), for example in health-related quality-of-life surveys.

Ethics: the forefront accelerating AI/ML



<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>

A screenshot of a Federal Register page. At the top left is the National Archives logo. The main header reads "FEDERAL REGISTER" and "The Daily Journal of the United States Government". To the right is the seal of the National Archives and Records Administration. Below this is a blue bar with "PD Presidential Document". The title of the document is "Promoting the Use of Trustworthy Artificial Intelligence in the Federal Government". Below the title, it says "A Presidential Document by the Executive Office of the President on 12/08/2020".

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

A screenshot of the White House website page for the "Blueprint for an AI Bill of Rights". The header includes "THE WHITE HOUSE" and navigation links like "Administration", "Priorities", "The Record", "Briefing Room", and "Español". The main title is "BLUEPRINT FOR AN AI BILL OF RIGHTS" with the subtitle "MAKING AUTOMATED SYSTEMS WORK FOR THE AMERICAN PEOPLE". Below the title is a large blue box with white text starting with "Among the great challenges posed to democracy today is the use of technology, data, and automated systems in ways that threaten the rights of the American public. Too often, these tools are used to limit our opportunities and prevent our access to critical resources or services. These problems are well documented. In America and around the world, systems supposed to help with patient care have proven unsafe."

A screenshot of the FDA website page for the "Artificial Intelligence/Machine Learning (AI/ML)-Based Software as a Medical Device (SaMD) Action Plan". The header includes the FDA logo and "U.S. FOOD & DRUG ADMINISTRATION". The title is "Artificial Intelligence/Machine Learning (AI/ML)-Based Software as a Medical Device (SaMD) Action Plan" and the date is "January 2021". The background image shows a person in a lab coat and mask looking at a screen displaying data.

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

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Goals

Enhance the **participation** and **representation** of researchers and communities currently underrepresented in the development of AI

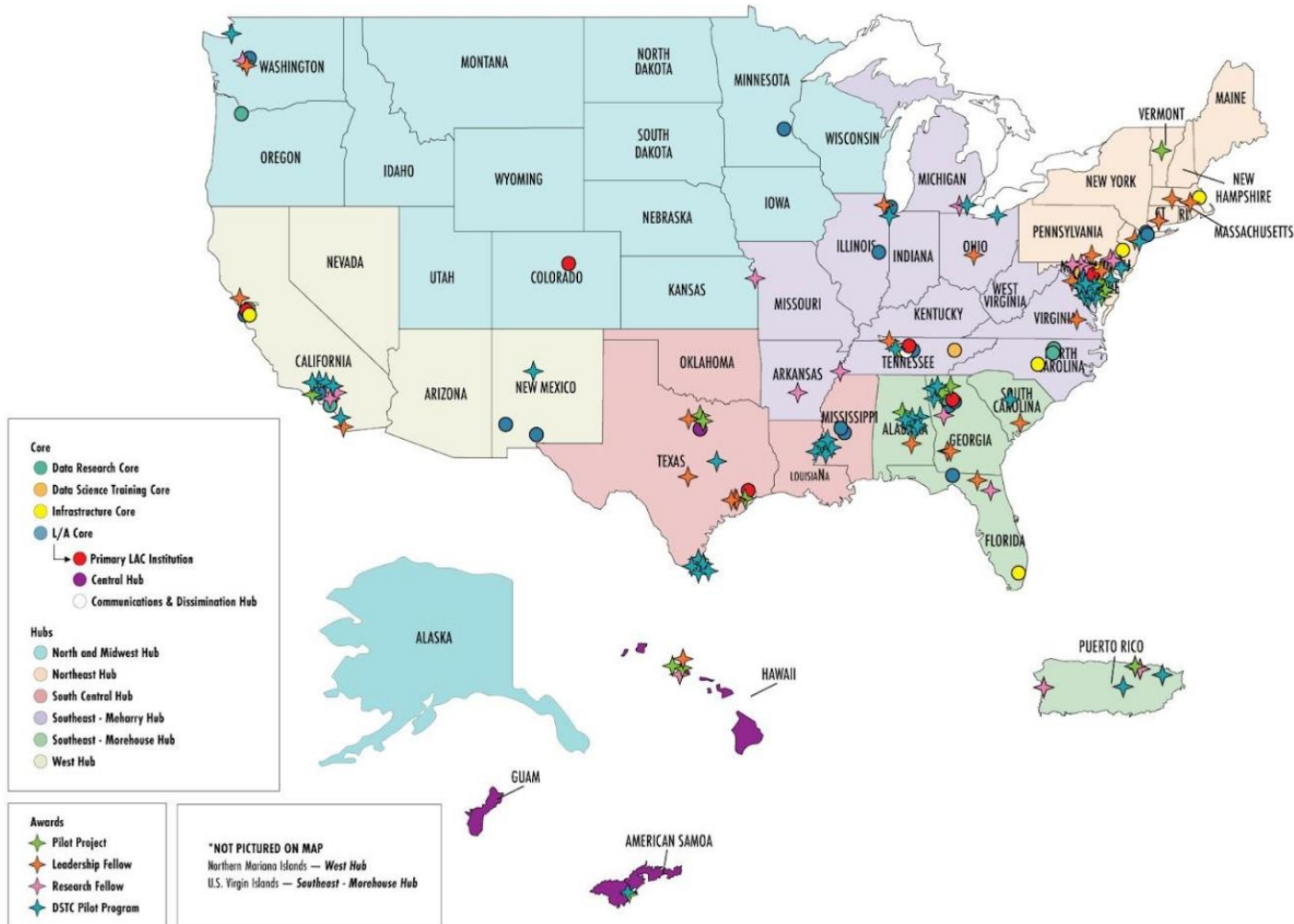
Address health disparities and inequities using AI/ML

Improve the capabilities of this emerging technology

<https://aim-ahead.net/>

AIM-AHEAD as a Consortium

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Cores

Leadership: Lead, recruit, and coordinate the AIM-AHEAD Consortium

Research: Address research priorities and needs to form an inclusive basis for AI/ML

Training: Assess, develop, and implement data science training curriculum

Infrastructure: Assess data, computing, and software infrastructure to facilitate AI/ML and health disparities research

<https://aim-ahead.net/>

A Vision based on North Stars

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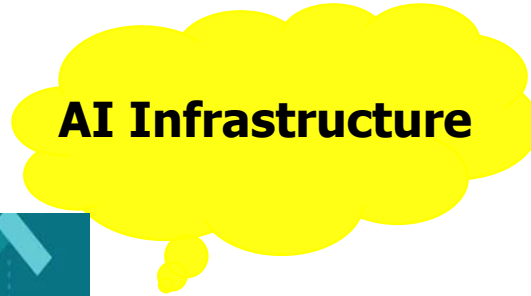
Diverse Workforce



Co-Design with Communities



AI Infrastructure



Research in health disparities in cardiovascular disease and cancer



Increase participation of underrepresented communities in AI

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Central Hub

- Make existing Papakolea community data AI/ML ready
- Integrate genomics and EHR to address lung cancer for Native Hawaiian and Other Pacific Islanders (NH/PI)
- Train Community Health Workers in delivering information about AI/ML

Southeast Hub

- Identify healthcare biases and determinants of high cancer death rates in Rural Appalachia
- Collaborate with Vibrent Health Inc, AWS, and Appalachian Clinical Translation Science Institute

West Hub

- Conduct large-scale analysis to address cardiometabolic health in American Indian/Alaska Native (AI/AN) and NH/PI patients
- Collaborate with the Los Angeles County Department of Health Services on EHR and digital health uptake among Spanish-speaking patients

North/Midwest Hub

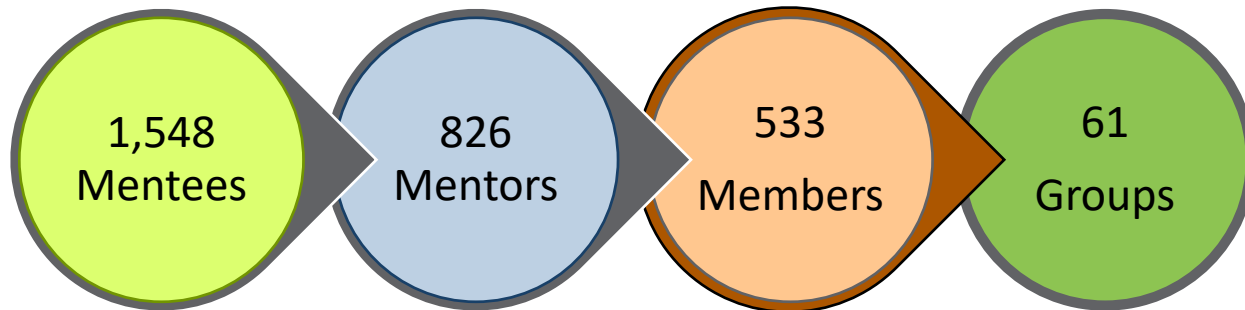
- Develop 4-year dementia risk prediction for AI/AN to improve diagnosis and care
- AI chat bot to assist AI/AN patients with a diabetes diagnosis, self-care, and management

Increase diversity in AI workforce through training & mentoring

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A virtual hub for research at the intersection of AI and health equity



Impacts

25 Graduate trainees

22 Early Career Investigators

25 Leadership Fellows

46 Healthcare Worker Fellows

Address health disparities and inequities using AI

Houston Methodist Research Institute

Dr. Amy Waterman

- ❖ Enhance the Kidney Transplant Derailers Index to Predict Transplant Drop-Out Risk for African American and Hispanic Patients
- ❖ Novel clinical- and community-level variables in multiethnic populations

University of North Texas

Dr. Suman Niranjana

- ❖ Evaluate bias in predictive and explainable ML algorithms among older adults with cancer
- ❖ Multiple data sources, SDoH, cover diverse groups, including rural populations

The University of Hawaii at Manoa

Dr. Alexander Stokes

- ❖ Address intersex under-diagnosis/under-recognition
- ❖ Mitigate bias in the application of AI/ML to intersex UD/UR

University of California, Irvine

Dr. Luohua Jaing

- ❖ Cardiometabolic risk prediction among AI/AN adults
- ❖ Increase AI/AN stakeholder active engagement and collaboration in the AIM-AHEAD Consortium

AIM-AHEAD Supported Pilot Project Developed A New Risk Assessment Model for Blood Clots in Patients with Cancer



[Ang Li et al. DOI: 10.1200/JCO.22.01542 *Journal of Clinical Oncology* 41, no. 16 \(June 01, 2023\) 2926-2938.](#)

[The National Institute of Health AIM-AHEAD \(1OT2-OD032581\)](#)

BIG DATA & ARTIFICIAL INTELLIGENCE

AIM-AHEAD's Bridge the Gap Initiative

AIM-AHEAD engages and empowers the Birmingham, AL community through the Bridge the Gap Initiative.

Participants presented their ideas for how AI/ML could be used to positively impact health topics of their choice.

[Click here to watch a video recap.](#)



"I came to learn about heart disease, **hypertension** because it runs in my family...and **cancer**.

It's been beneficial working with other people, learning to take responsibility for my health.... and **how AI can help me** with that." - **Participant**



Impact

- **Improved** participant understanding of AI
- **Helped** identify opportunities where AI could impact individual and community health outcomes
- **Increased** understanding of ethical challenges and biases that can occur within the field of AI
- **Enabled** underrepresented communities to contribute to the conversation on AI and health care

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

NOT-OD-22-065 Example Awards



Explainable AI to Improve the Trust of & Detect the Bias of AI Models

Qing Zeng, George Washington University



Genetics of Deep-Learning-Derived Neuroimaging for Alzheimer's Disease

Degui Zhi, Univ. of Texas Health Science Center



Characterizing Patients at Risk for Sepsis Through Big Data

Andre Holder, Emory University

New Opportunities in Artificial Intelligence

The activities below will introduce new opportunities to support collaborations in developing socio-technical solutions, including guidelines and principles, for ethical AI, including new technologies and methods for foundational models.



Develop social and technical solutions for ethical AI



Create and validate an approach for using synthetic clinical datasets for AI



Leverage new technologies and methods for AI and foundational models to accelerate biomedical and behavioral research



Develop new AI technologies that will enable the translation of data to knowledge



Enhance NIH capabilities in AI through partnerships across federal agencies and communities

Thank you for your time and attention today

**“Nursing needs
big data and big
data needs
nursing”**



Brennan and Bakken (2015) Journal of Nursing Scholarship

Building Sustainable Foundations for Open Software & Tools

Efforts to support open software and tools are critical to creating a modernized biomedical data ecosystem that will catalyze advances in science. For more information, access the [Council of Councils Concept Clearance Presentation](#).

OBJECTIVES

- Support **exceptional research software engineers** (non-traditional researchers)
- Make **sustainable impact** on NIH research projects
- Enhance **autonomy and career continuity** for highly-skilled software engineers working in research
- Pilot solution to **software engineering workforce challenge**
- Support projects to develop **robust, sharable, sustainable software and tools**
- Bring **software development best-practices** & emerging technologies to NIH research projects
- Foster **collaborations** between biomedical and behavioral scientists and software engineers
- Extend impact of investment by fostering **communities for open software development**