



# AI And Alzheimer's Disease

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**PROMOTE** the progress of science

**ADVANCE** the national health, prosperity, and welfare

**SECURE** the national defense

## Is AI a Magic Bullet for AD research?



- NO, but it can have a huge impact.
- AI can be used to advance research.
- Requires teams with expertise in AI are working with AD researchers.



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## Areas for AI in AD Research

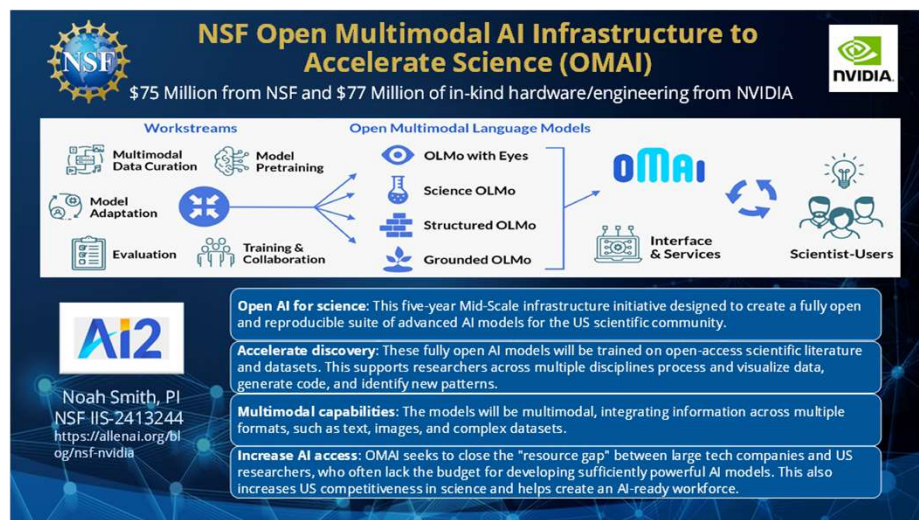


- AI can help in:
  - Multimodal analytics
  - Predictive models
  - Hypotheses generation
  - Automated evaluation
  - Data generation
  - Patient communication
  - Caregiver support
  - + more



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## Multimodal Analytics (AI for Science)



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## Multimodal Analytics

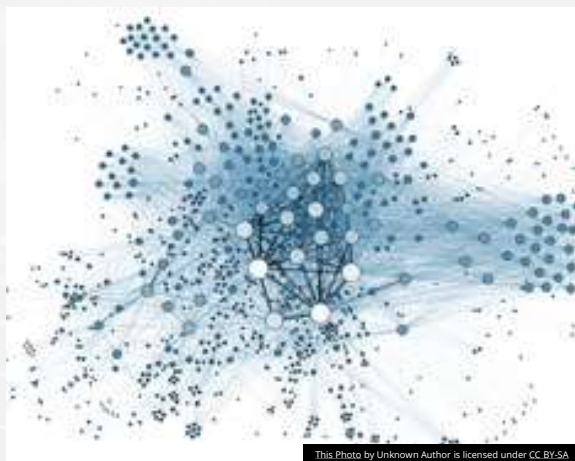


- Deep learning and machine learning
  - Looking for relationships in data
  - Bringing together multi-modal data to explore new possibilities
  - This approach can target models for identifying:
    - Disease trajectories
    - New targets and pathways
    - Outcomes



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# Predictive Modeling



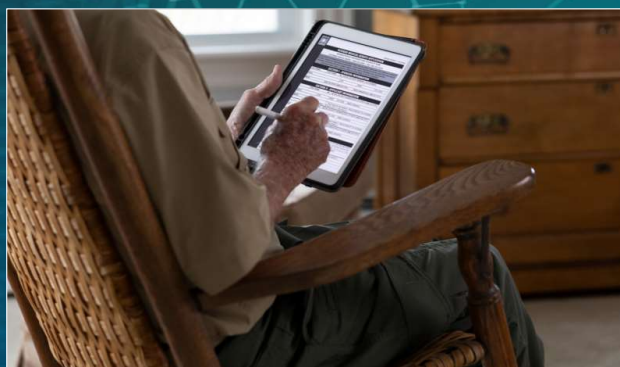
**Predictive modeling is not new, but it is changing.**

- AI can generate models based on large amounts of data quickly. This includes both structured and unstructured data.
  - Data can include:
    - Basic research (biological, neuroscience, etc)
    - Imaging data
    - Clinical information
    - Pharmacological data
    - Digital data
- Digital twins extend the prediction models into causal models.

## Predictive Modeling – Digital Biomarkers



- AI can use data from digital devices to generate predictive models based on data from daily living.
  - Biological signals
  - Movement/activity
  - Screen activity
  - Driving
  - Etc.



The myth of digital biomarkers in Alzheimer's disease: how to make them a reality

R Au, KA Gifford, IC Paschalidis, P Wighton, M Levin... - Current Opinion in Psychiatry, 2026 8

## Hypotheses Generation



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- AI can be used as a tool for hypotheses generation
  - This can be based on:
    - Existing literature
    - Existing data
    - Methods and models from other areas
- Not replacing human idea generation - augmenting it.

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## Automation in Research



### Use AI for the research process

- Programable Labs
  - Develop experimental protocols
  - AI continuously evaluates the data and terminates experiments that are not performing
- Clinical trial participation
  - Automated identification of candidates



NSF News

### NSF to invest in new national network of AI-programmable cloud laboratories

A funding opportunity to test, scale and demonstrate new methods and tools that advance automated science and engineering, drive discoveries and innovations, and strengthen U.S. leadership in science and technology

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## Data Generation



- Data generation is a specialty of AI
  - Identify patterns in the data and then replicate it
- Synthetic data is not perfect, but can aid in generating new testable questions
  - If done well, also reduces the privacy issues around PII

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## Patient Communication



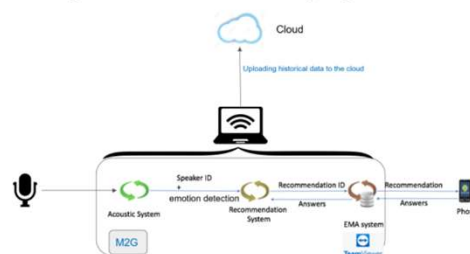
- AI can create tailored conversations for patients that can learn user preferences (i.e., system, provider, patient) over time.
  - Research in human-centered design helps generate usable information and understand reactions to the information
  - Systems can be trained to take feedback and adapt
  - Guardrails ensure the type and quality of information released

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## Caregiver Support



- AI can support a new generation of research and tools to support caregivers
  - Communication can be tailored
  - Synthesis of real-time resources
  - Real-time analysis to identify patterns that may be hard to identify by humans (e.g., triggers for emotions)
  - Unobtrusive safety monitoring



A room microphone listens for voice identification. A neural network then detects auditory patterns of emotion.

Link Lab at the University of Virginia

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## RESEARCH

## Foster the Next Generation AI Breakthroughs



### ADVANCE FUNDAMENTAL AI RESEARCH

Needed to address unanswered questions in AI technology and AD to open new frontiers



### ACCELERATE AI-DRIVEN DISCOVERY

To address challenges in AD science, engineering, and education



### EXPLORE ECONOMIC AND SOCIETAL IMPACTS OF AI

To help the nation better harness the opportunities it will bring



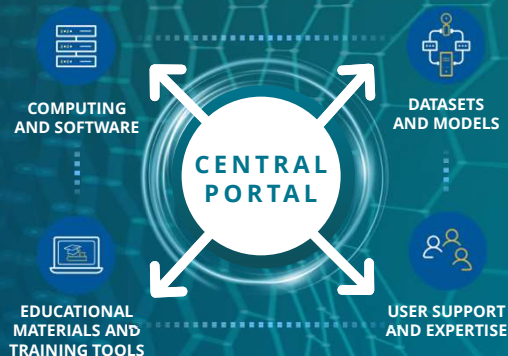
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# NAIRR VISION

## National Goals

- Accelerate AI and AI-powered discovery and innovation
- Expand the US AI R&D workforce and train the next generation of AI researchers and educators
- Increase integration and use of world-class public and commercial AI resources
- Advance public trust in AI

## Envisioned NAIRR Architecture



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# NAIRR HIGHLIGHTS



Developing Reliable Agents for Automating Complex Digital Tasks

PI: Balasubramanian, Stony Brook



Investigating Security Issues in Instruction-Tuned Large Language Code Models

PI: Hei, University of Louisiana



A Foundation Model for the Earth Surface Mineral Dust Source Investigation (EMIT) Instrument

PI: S. Crowell, LumenUs Scientific, Oklahoma



Agricultural Pest Identification with Robustness Guarantees

PI: Ganapathysubramanian, Iowa St.



COURSE: AI-Enabled Data Visualization Interfaces Institution: University of California, Berkeley

Educator: Carl Boettiger

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Thank you



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