Penn
University of Pennsylvania
Artificial Intelligence and Technology Collaboratory for Healthy Aging

Newsletter - December 2024 - Issue 10

Welcome to PennAITech

As we are entering the holiday season, we are welcoming you to our 10th newsletter of the Penn Artificial Intelligence and Technology Collaboratory for Healthy Aging (PennAITech). PennAITech, funded by the National Institute on Aging, is committed to developing, evaluating, commercializing, and disseminating innovative technology and artificial intelligence systems to support older adults and those with Alzheimer's Disease and Related Dementias. As we reflect on this year, we are thankful for the many accomplishments of our core members and awardees and the significant milestones we have reached. Our Year 3 pilot awardees are well underway with their projects; our Year 4 pilot award competition was just completed with an announcement of our awardees coming soon, and the call for Year 5 applicants is already open.

We want to highlight selected activities and resources within our Collaboratory in this newsletter. We feature PennAITech Innovation Fellows Oonjee Oh and Katherine Pitcher. PennAITech is committed to mentoring and facilitating research and educational opportunities for our Innovation Fellows. Viewership of our **PennAITech Video Library** continues to grow; our library consists of educational modules focusing on ADRD, aging, AI tools and techniques, ethical implications of research and system design for aging and persons with dementia, and many other domains covered by our PennAITech experts.

Our webinar series for this academic year 2024-2025 is also well under way; all recorded sessions are available on our YouTube channel. In this issue we learn more about Year 2 pilot awardees: Drs. Valero, Zhang and Zolnoori. We provide updates from the field and latest news. We also feature a write up from our family caregivers that have actively participated in stakeholder engagement core activities and our Summer Innovation Institute. As always, we invite you to follow our social media platforms, including our YouTube channel and reach out with any questions or suggestions. On behalf of all our faculty and staff at PennAITech we wish you happy holidays and a new year full of peace and joy!

George Demiris

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funded by the National Institute on Aging Grant Nr. P30AG073105

Meet the Team

Principal Investigators

George Demiris, PhD, FACMI

Jason Karlawish, MD

Jason H. Moore, PhD, FACMI

Aging Focus Pilot Core

Kathryn H. Bowles PhD, FACMI, FAAN

Pamela Z. Cacchione, PhD, CRNP, FAAN

The overarching goal of the Aging Focus Pilot Core is to promote the advancement of science using technology and artificial intelligence to optimize quality of life and healthcare management for older adults living in their homes independently, as well as those receiving skilled home and community-based services. This Core solicits, selects, and manages pilot studies that develop or test AI and technology applications to detect risks, predict needs, address disparities, improve access to care, and support decision making for chronic illness management and safe aging in place.

AD/ADRD Focus Pilot Core

Lauren Massimo PhD, CRNP

Dawn Mechanic-Hamilton, PhD

The overarching goal of the Alzheimer's Disease and Alzheimer's Disease Related Dementias (AD/ADRD) Focus Pilot Core is to promote the advancement of science and engineering for predictive analytics, clinical decision support, or the care of adults with AD/ADRD. This Core solicits, reviews, and supports pilot studies that develop or advance the use of AI and technology for AD/ADRD predictive analytics, clinical decision support, or the care of adults with AD/ADRD.

Meet the Supporting Core Team

Networking and Mentoring Core

The overarching goal of the Networking and Mentoring Core is to support activities intended to facilitate networking and mentoring for the awardees of the Aging and AD pilot projects, all of whom are invested in Artificial Intelligence (AI) approaches and technology for aging adults, including those with Alzheimer's disease or related dementias (AD/ADRD).
This Core organizes and supports consortium networking activities and communicates with the broader scientific community.

Marylyn D. Ritchie, PhD

Dokyoon Kim, PhD

Technology Identification and Training Core

Li Shen, PhD, FAIMBE

Ryan Urbanowicz, PhD

The overarching goal of the Technology Identification and Training Core is to use evidence from the literature, stakeholder and expert inputs to identify the technology needs of older Americans, as well as develop training activities for artificial intelligence (AI) and technology for scientists, engineers, clinicians, medical professionals, patients, policy makers, and investors.

Ethics and Policy Core

Emily Largent, JD, PhD, RN

Anna Wexler, PhD

The overarching goal of the Ethics and Policy Core is to shift the current ethics and policy paradigm by focusing on issues that arise at the intersection of aging and of AI methods and technologies for healthy aging. The Core will work in close collaboration with the other PennAITech Collaboratory Cores to address four key issues: (1) promoting the autonomy of older adults by balancing considerations of usefulness and intrusiveness; (2) protecting older adults in light of vulnerability due to cognitive and functional decline; (3) mitigating bias and addressing health disparities, such as racial disparities and urban-rural disparities; and (4) safeguarding the data privacy of older adults.

Clinical Translation and Validation Core

The goal of the Clinical Translation and Validation Core is to use the science and practice of geriatrics and gerontology to assess the feasibility and clinical utility of artificial intelligence (AI) methods for clinical decision support and of new technology for monitoring aging adults in their home. This Core provides an expert panel to assess the feasibility and clinical value of new artificial intelligence models for predictive analytics and clinical decision support and of new technologies designed to monitor aging adults and those with AD/ADRD. It provides a testbed for new technologies designed to monitor aging adults and those with AD/ADRD with an emphasis on underserved and rural populations.

Jason Karlawish, MD

Rebecca T. Brown, MD, MPH

Stakeholder Engagement Core

The overarching goal of the Stakeholder Engagement Core (SEC) is to ensure that technology solutions and AI approaches proposed and developed by the PennAITech Collaboratory are maximally adoptable by and accessible to their end users by soliciting ongoing stakeholder input and involving all key parties throughout all phases of the development and testing processes. The Core maintains a technology consortium (consisting of technology companies, startups, venture capital firms, and angel investors) that provide guidance and collaboration opportunities for pilot projects and a platform for potential dissemination and commercialization of innovative tools.

George Demiris, PhD, FACMI

Lisa M. Walke, MD, MSHA

Internal Advisory Board (IAB)

John Holmes, PhD, FACE, FACMI

The Internal Advisory Board (IAB) plays an important role in providing perspective and detailed advice and recommendations to the leadership team and the core directors. The IAB is chaired by Dr. John Holmes who is a Professor of Informatics and Epidemiology with significant experience in artificial intelligence and clinical decision support. We have assembled a team of local Penn experts representing three key areas of expertise. The first area, Biomedical Informatics and Artificial Intelligence, includes Drs. John Holmes (Professor of Informatics, AI expert), Ross Koppel (Professor of Sociology, EHR expert), Konrad Kording (Professor of Computer Science and Neuroscience, AI expert), Insup Lee (Professor of Computer Science and Engineering) and Danielle Mowery (Chief Research Information Officer). The second area, Geriatrics and Medicine, includes Drs. Mark Neuman (Anesthesiologist specializing in older adults), Matt Press (Medical Director of Primary Care), and Ramy Sedhom (Palliative Care, Geriatric Oncology, Penn Medicine Princeton Health). The third area, Home Care, includes Danielle Flynn (Director, Penn Medicine Home Health), Nancy Hodgson (Professor of Nursing), Bruce Kinosian (Division of Geriatrics), and Brian Litt (Director, Penn Center for Health, Devices, and Technology).

INNOVATION FELLOW SPOTLIGHT:

Oonjee Oh

PhD student,
University of Pennsylvania, School of Nursing
Associate Fellow,
Leonard Davis Institute of Health Economics

Tell us about your research interests. Describe some of your research projects.

My research interest lies in improving palliative and end-of-life care for seriously ill individuals and their family members. Transition to hospice would be the first theme that describes my research projects. More specifically, I am focusing on dementia caregivers' experience throughout the process of hospice decision-making and hospice transition. In addition, I am exploring the impact of a problem-solving therapy intervention and its timing on hospice caregivers' distress to provide insights on when the best timing for caregiver support in hospice would be. Utilizing AI to improve palliative and end-of-life care is another important theme that describes my research interest. In this regard, I have worked on a philosophical paper looking into the ethical dimensions of utilizing AI in palliative care. I am also conducting a project focused on exploring how dementia caregivers in hospice perceive and accept the use of AI.

How do you envision the role of AI and technologies in supporting aging?

AI can be used to improve access to palliative care for older adults. Even though the benefits of palliative care have been clearly documented, many individuals still lack the opportunity to access palliative or high-quality end-of-life. In this regard, I believe AI and predictive analytics can be used to prompt discussions about end-of-life care and contribute to ensuring that terminally ill older adults are not overlooked in receiving the care that aligns with their values and preferences.Moreover, AI may contribute to improving caregiving experiences. For instance, generative AI can be used to support caregivers' unmet information needs; it can also provide conversational support and address social isolation. Despite these opportunities, there are many ethical considerations regarding the development and deployment of AI in patient care. Patients and families may be uncomfortable with AI-generated prognoses and providers may not trust the results or be uncertain to what extent it should be integrated into patient care. Concerns surrounding the data quality and the potential harm AI can cause are also increasing. While there are many ethical questions that need to be answered, I do believe AI holds great promise to improve access to better care and quality health information.

What do you see as some of the greater opportunities and challenges for the future?

Due to the great popularity and accessibility of generative AI, such as ChatGPT, many debates have been called to discuss how to embrace this highly advanced technology. I see this as a great opportunity to think about ways to ensure the ethical use of AI in society. I am excited to see debates asking questions about whether the dataset on which the AI is based is biased and capable of perpetuating harm. I believe these ethical questions will ensure that we develop and use these advanced technologies in a socially responsible manner. Despite such increased interest in promoting the ethical use of AI, I believe there will still be practical challenges associated with deploying AI to digitally marginalized populations.For instance, older adults, who have often been excluded from discussions about technology, may feel ostracized and have negative stigma towards AI. As the use of AI becomes increasing pervasive within our society, more attention should be placed on how to make AI user-friendly for marginalized populations and more accessible for all.

INNOVATION FELLOW SPOTLIGHT:

Katherine Pitcher

PhD Student, University of Pennsylvania, School of Nursing
Predoctoral Research Fellow, New Courtland Center for Transitions and Health
Associate Fellow, Leonard Davis Institute for Health Economics

Tell us about your research interests. Describe some of your research projects.

I am an active member of the Improving Transitions and Outcomes of Sepsis Survivors (I-TRANSFER) research team. We are leveraging implementation science to enact post-acute protocols to enhance recovery and prevent rehospitalization among sepsis survivors. I am also engaged in qualitative efforts to understand discharge planning, post-acute care, and self-care decision-making among sepsis survivors. I am significantly contributing to additional implementation efforts to further describe and predict sepsis readmission in partnership with Penn Medicine. I am particularly interested in helping older adults with chronic illness, especially heart failure, navigate and/or avoid healthcare transitions and optimize their self-care. I am currently working to define "diagnostic disclosure" in order to improve patient-provider diagnostic communication, promote self-care, and enhance patient engagement.

How do you envision the role of AI and technologies in supporting aging?

I envision a future where innovative approaches to care through technology can lead to improved patient outcomes. Innovative healthcare delivery systems can help healthcare providers meet older adults where they are in the community and in their illness trajectory. Technology can be the catalyst for the development of patient-centered approaches to care, such as through remote monitoring and telemedicine. I also see AI and technology serving as skillful and informative tools supporting healthcare providers. The development of clinical decision support tools can equip clinicians with data-driven insights and recommendations concerning diagnosis and treatment decisions. The integration of AI into healthcare research and practice may allow healthcare providers to navigate complex medical cases characterized by multimorbidity with more confidence and efficiency.

What do you see as some of the greater opportunities and challenges for the future?

The transformative potential of AI and technology to improve healthcare for aging populations is a source of excitement for me! Healthcare providers and researchers can develop tailored interventions that precisely address the unique needs of each individual, optimizing treatment outcomes and quality of life. In this way, health data and predictive analytics may facilitate personalized and patient-centered healthcare in the future. The integration of remote monitoring and telehealth platforms represents an opportunity to address timely deficits in self-care and chronic disease management among older adults. These innovative technologies may also contribute to overcoming barriers to healthcare access, especially for older adults in rural or underserved areas. As we navigate the complexities of an aging population,AI and healthcare technology promises a future with accessible and feasible patient-centered care.

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Artificial Intelligence and Technology Collaboratory for Healthy Aging

CLICK HERE TO VIEW OUR 2023-2024 PILOT AWARDEES LOOK BOOK

Xina Quan

Improved algorithms for wearable, passive, noninvasive BP monitoring for seniors

PyrAmes

Soheyla Amirian

AI-powered Web Application to Analyze Knee Joint Space for Aging Population

Pace University

Rui Zhang

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Penn State University

Emily Moin

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University of Pennsylvania

Chun Lim

Mobile technology as a cognitive biomarker of Alzheimer's disease

Beth Israel Deaconess Medical Center (BIDMC)

Mohammad H. Mahoor

Building Deep Digital Twins for Prediction of AD/ADR/MCI in Older Adults

DreamFace Technologies, LLC

Ab Brody

Aliviado Dementia Care Machine Learning Algorithm Development for Caregiving

New York University

Nicholas Kalaitzandonakes

AI/ML Analyses of Mobility Changes Among Elderly Using Continuous Gait Data

Foresite Healthcare

Daniel Press

Developing a Home Cognitive Vital Sign to Detect Cognitive Changes AD

Beth Israel Deaconess Medical Center (BIDMC)

Trent M. Guess

Motor function assessment for mild cognitive impairment, frailty, and fall risk

University of Missouri

Hualou Liang

Detecting Cognitive Impairment using Large Language Models from Speech

Drexel University

Xiaopeng Zhao

MUSICARE-VR: Music Intervention with Virtual Reality for Alzheimer's Care

University of Tennessee, Knoxville

funded by the National Institute on Aging Grant Nr. P30AG073105

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CLICK HERE TO VIEW OUR 2023-2024 PILOT AWARDEES LOOK BOOK

Gary Weissman

Advancing Diagnostic Excellence for Older Adults through Collective Intelligence and Imitation Learning

University of Pennsylvania

Maria Valero

GlucoCheck: A Non-invasive & AI-assisted Blood Glucose Monitoring Device for Older Adults

Kennesaw State University

Tony C Carnes

Real-time remote monitoring of confirmed medication adherence

etectRx

Maryam Zolnoori

A speech-processing algorithm for automatic screening of African American patients with mild cognitive impairment and early dementia in home health settings

Columbia University Medical Center and VNS Health

Jane Chung

A Device Free WiFi Sensing System to Assess Daily Activities and Mobility in Low-Income Older Adults with and without Cognitive Impairment

Virginia Commonwealth University

Xinyu Zhang

Non-Intrusive, Fine-Grained In-Home Daily Activity Transcription for Alzheimer's Monitoring

University of California San Diego

Aidong Zhang

Fairness and Robust Interpretability of Prediction Approaches for Aging and Alzheimer's Disease

University of Virginia

Clara Berridge

Talking tech with dementia care dyads: Improving a self-administered tool to support informed decision

University of Washington

Sandeep Patil

Prevention of Patch Poisoning in Elderly Alzheimer's Patients

Vaaji LLC

Julie Faieta

Health App Review Tool: Connecting those Affected by Alzheimer's to Needed Technology Support

University of Pittsburgh

funded by the National Institute on Aging Grant Nr. P30AG073105

PILOT IN THE SPOTLIGHT:

KENNESAW STATE UNIVERSITY

GlucoCheck: A Non-invasive & AI-assisted Blood Glucose Monitoring Device for Older Adults

TELL US ABOUT YOUR PROJECT AND WHAT YOU HAVE DONE THIS YEAR.

Our project, GlucoCheck, focuses on developing a non-invasive, AI-powered blood glucose monitoring device tailored for seniors. Traditional glucose monitoring methods can be invasive and uncomfortable, especially for older adults, who often require frequent monitoring to manage diabetes. This year, we have made significant strides in refining the device, incorporating the MatchAll model to ensure accurate blood glucose readings across diverse skin tones, textures, and temperatures. Our team has completed initial testing and is building a diverse image database to train and test the device. Additionally, we are working with PennAITech to conduct usability studies, gathering feedback from older adults to ensure GlucoCheck is intuitive and user-friendly. The device is paired with a mobile app for easy monitoring, empowering users to manage their blood glucose independently.

PI: Maria Valero, PhD
Assistant Professor
Kennesaw State University
College of Computing and Software Engineering

Co-I: Katherine Ingram, PhD
Associate Professor
Kennesaw State University
WellStar College of Health and Human Services

Co-I: Valentina Nino, PhD
Assistant Professor
Kennesaw State University
Southern Polytechnic College of Engineering and Engineering Technology

WHAT ARE THE LONG TERM GOALS FOR YOUR RESEARCH?

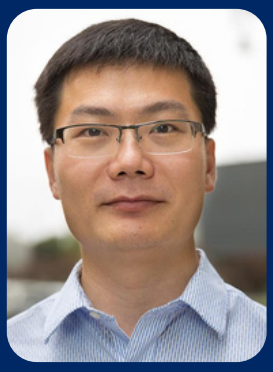
The ultimate goal for GlucoCheck is to become a widely accessible, non-invasive glucose monitoring solution that older adults can rely on to manage diabetes. We aim to further enhance the accuracy and adaptability of our device to meet the needs of diverse populations, including those with varied skin tones and conditions that may affect light-based readings. We hope that by making blood glucose monitoring more comfortable and convenient, GlucoCheck will support older adults in maintaining their independence and quality of life. Long-term, we envision GlucoCheck serving as an early-intervention tool to identify at-risk individuals before diabetes complications arise. Our next steps include seeking regulatory approval and, eventually, collaborating with healthcare systems to introduce GlucoCheck in home care and clinical settings.

HOW DO YOU ENVISION THE ROLE OF AI AND TECHNOLOGIES IN SUPPORTING AGING?

AI and technology hold incredible potential to improve quality of life for aging adults. In our work, we see AI as a tool that can help simplify health management, allowing seniors to live more independently. For GlucoCheck, AI plays a vital role in accurately predicting blood glucose levels from non-invasive measurements, making monitoring less burdensome. More broadly, AI and technology can offer solutions in areas like cognitive support, fall detection, and social engagement, addressing the unique health and social needs of aging populations. The key is designing these tools to be accessible, affordable, and adaptable to diverse populations. We believe the future of aging support lies in technology that empowers seniors with personalized, real-time health insights, helping them make proactive decisions to stay healthy and safe at home.

PILOT IN THE SPOTLIGHT:

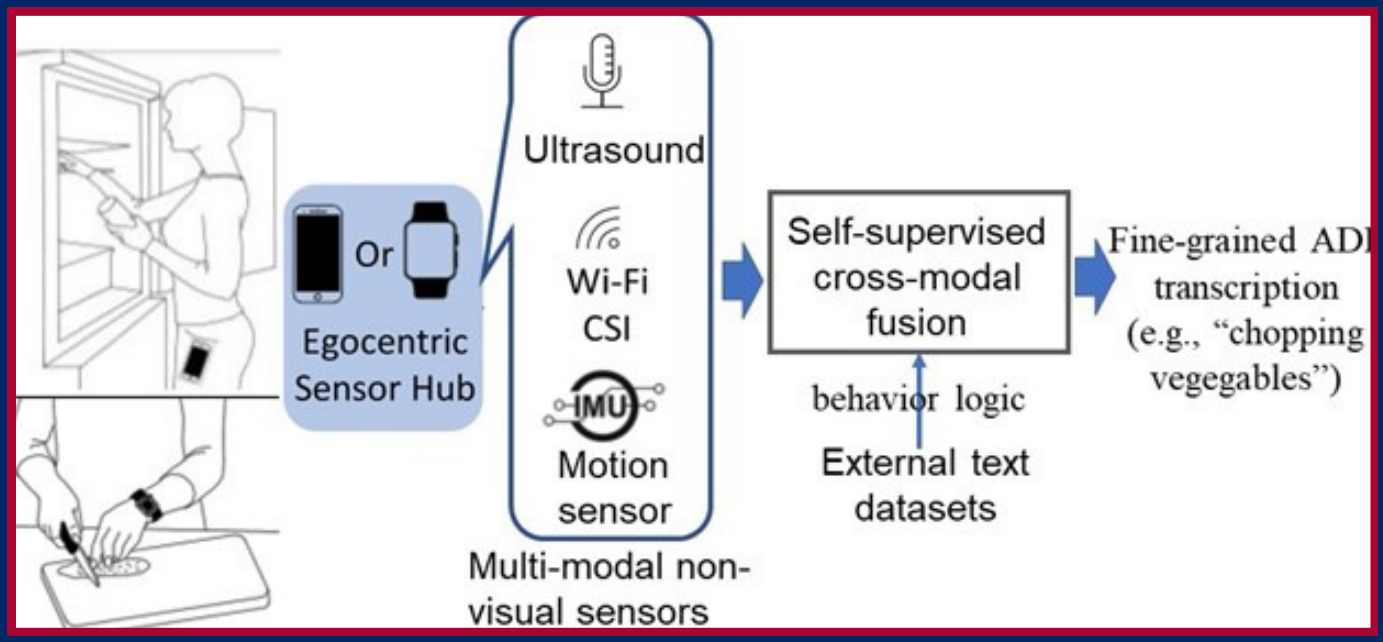
Non-Intrusive, Fine-Grained In-Home Daily Activity Transcription for Alzheimer's Monitoring



Xinyu Zhang, PhD
Professor, Electrical and Computer Engineering, UC San Diego

Ke Sun, Ph.D. candidate
Computer Science and Engineering, UC San Diego

Baicheng Chen, Ph.D. candidate
Computer Science and Engineering, UC San Diego



TELL US ABOUT YOUR PROJECT AND WHAT YOU HAVE DONE THIS YEAR.

This project aims to develop EgoADL, a system that uses non-intrusive smartphone/smartwatch sensors to sense people's activities of daily living. EgoADL builds on a novel self-supervised sensor fusion model that trains itself without user intervention. Instead of classifying among a small known set of ADLs, it directly transcribes raw multi-modal sensor signals into text logs of ADLs which can be interpreted by clinical practitioners or AI models. EgoADL is the first system to use non-visual sensors to transcribe fine ADLs (e.g., human-object interaction) with near-vision precision. To date, we have completed the preliminary design of EgoADL, with a new ADL representation method that goes beyond activity classification, along with an egocentric multi-modal fusion method to overcome the limited resolution of non-visual sensors. In addition, we have designed and implemented a multi-modal sensor data collection pipeline on a commodity smartphone. Using this data collection platform, we have collected 20 hours of labeled data and more than 100 hours of unlabeled data, which includes 230 different types of human behaviors involving 70 actions and 121 objects. The data was collected from 20 different home environments and 30 users who performed an unrestricted set of daily activities. Our preliminary evaluation shows that EgoADL achieves comparable performance with vision-based methods for the overlapped classes between the egocentric vision datasets and the EgoADL datasets. Specifically, EgoADL shows remarkable advantages in recognizing state-based behaviors with unique motion patterns or sound events.

WHAT ARE THE LONG TERM GOALS FOR YOUR RESEARCH?

EgoADL holds potential to be a consumer-grade, clinical-ready ADL logger for elder care, especially for people with AD risks.The long term goal is to translate its technological advances into clinical impacts. The logs of motor activities and changes of personal routines can help identify acute situations or diagnose onset of chronic diseases such as AD. Although the monitoring technology itself does not replace professional care or treatment, it can help automate the elder care logistics, reduce the cost, improve reliability, thus extending the amount of time a person is able to live independently. The monitoring data can be used by remote caregivers in real-time, or by healthcare practitioners to analyze and diagnose chronic disease. In the long-term, the data set can form an infrastructure for aging research, and for developing effective diagnosis and treatment for diseases such as AD and stroke. Example research driven by such data includes: (i) long-term studies to monitor the relationship between behavior/habits and health. (ii) long-term studies to identify signs and development process of diseases. (iii) developing technologies for non-intrusive detection of emergency situations associated with AD (e.g., falls, stroke, dehydration).

HOW DO YOU ENVISION THE ROLE OF AI AND TECHNOLOGIES IN SUPPORTING AGING?

AI and technologies are envisioned to play a supportive role in aging care by providing unobtrusive monitoring systems that respect privacy while enhancing safety and independence. Through everyday devices like smartphones and smartwatches, these systems can track ADLs to detect early signs of cognitive decline, identify acute situations, and monitor behavioral changes that might indicate health issues. Such technologies not only enable automation of elder care logistics and reduces healthcare costs but also provide valuable data for healthcare practitioners and remote caregivers. Furthermore, they can create essential infrastructure for aging research, facilitating long-term studies on behavior-health relationships and disease development patterns. Most importantly, these technological solutions help extend the period during which older adults can live independently while providing peace of mind to both seniors and their families.

PILOT IN THE SPOTLIGHT:

A speech-processing algorithm for automatic screening of African American patients with mild cognitive impairment and early dementia in home health settings

Maryam Zolnoori, PhD

Assistant Professor
Columbia University Irving Medical Center

TELL US ABOUT YOUR PROJECT AND WHAT YOU HAVE DONE THIS YEAR.

This year, our team advanced multiple projects focused on early detection of cognitive impairment through AI and speech processing technologies. We developed ADscreen, a speech-based screening tool leveraging phonetic, syntactic, and emotional cues, achieving high accuracy (AUC-ROC: 0.93). Additionally, we explored synthetic data generation using large language models like GPT-4, significantly enhancing detection accuracy. One of my key projects analyzed patient-nurse verbal communication in home healthcare, identifying linguistic patterns indicative of cognitive decline. By integrating this communication data with EHRs, the combined approach achieved superior performance (AUC-ROC: 90.23), compared to models built on only EHR data. We also evaluated speech transcription systems, highlighting disparities in accuracy for Black patient-nurse interactions. Together, these efforts aim to develop equitable, effective tools for early cognitive impairment screening in racially diverse populations.

WHAT ARE THE LONG TERM GOALS FOR YOUR RESEARCH?

The long-term goals of my research are centered on leveraging advanced data science methodologies to develop innovative, patient-centered solutions that address disparities in healthcare. Drawing from my interdisciplinary expertise in health and information sciences, I aim to create adaptive decision support tools that integrate diverse data sources, including speech data, clinical notes, and electronic health records, to enhance early detection and intervention for at-risk populations. My research seeks to transform routinely collected patient-clinician communication into actionable insights, enabling timely identification of conditions like mild cognitive impairment (MCI) and early dementia (ED) among racially and ethnically diverse populations. A particular focus is on designing culturally and contextually appropriate tools for minority groups, such as Black home healthcare patients. Ultimately, my work aspires to bridge technological innovation with clinical practice, reducing health disparities and improving outcomes for vulnerable populations by delivering precision-based, equitable care solutions.

HOW DO YOU ENVISION THE ROLE OF AI AND TECHNOLOGIES IN SUPPORTING AGING?

Artificial intelligence (AI) and emerging technologies hold significant promise in transforming how society supports aging populations, addressing challenges related to healthcare, independence, and quality of life. In healthcare, AI-powered tools enable the early detection of conditions such as cognitive decline, cardiovascular disease, and mobility issues by analyzing diverse data sources, including speech patterns, imaging, and physiological monitoring. These tools facilitate timely and personalized interventions, improving health outcomes and potentially reducing healthcare costs. Beyond healthcare, smart home systems and wearable devices enhance safety and independence by detecting falls, monitoring vital signs, and adjusting environmental factors. These innovations enable older adults to maintain autonomy longer, while alleviating some of the burdens on caregivers. Robotics and assistive technologies also support daily activities, preserving routines and promoting physical well-being. AI-driven virtual platforms contribute to mental and social well-being by offering cognitive training, remote social engagement, and companionship, which help reduce isolation and loneliness. To fully realize these benefits, it is essential to prioritize data privacy, equitable access, and cultural sensitivity in the development and deployment of these technologies. Addressing disparities ensures that all aging individuals, regardless of background, can benefit equitably from these advancements.

The national a2 Pilot Awards competition is hosted annually by the a2 Collective and funded by the National Institute on Aging (NIA), part of the National Institutes of Health, through the Artificial Intelligence and Technology Collaboratories (AITC) for Aging Research program. NIA has earmarked $40 million to fund technology demonstration projects that utilize artificial intelligence (AI) approaches and technology to improve care and health outcomes for older Americans, including persons with Alzheimer's disease and related dementias (AD/ADRD), and their caregivers.

The application information found here is relevant to the fifth annual a2 Pilot Awards competition, which is accepting applications from December 2 to January 15, 2025 (5 p.m. ET). To view projects selected for award in past competitions, visit our Awardees page. If you have any questions about the application process, please email us here. For any specific questions about your pilot project scope or collaborating with an AITC, we suggest that you email the AITC directly to establish a dialogue.

Office Hours:
Available December 11-19;
request a meeting slot via email:
pennaitech@nursing.upenn.edu
Please include focus of
Aging or AD/ADRD in request.

Key Dates

5th a2 Pilot Awards (2025)

Round 1	Round 1 Applications Open	Dec 2, 2024
	Q&A Webinar with AITC Leadership	Dec 9, 2024 @ 12-1 p.m. ET
	Round 1 Applications Deadline	Jan 15, 2025 @ 5 p.m. ET
	Round 1 Applications Decisions	Feb 19, 2025
Round 2 (Invite-only)	Round 2 Webinar	Mar 3, 2025 @ 12-1 p.m. ET
	Round 2 Applications Deadline (Invite-only)	Mar 31, 2025 @ 5 p.m. ET
	Round 2 Applications Decisions	Mid-May 2025
	NIA Approvals	Summer 2025
	Projects Expected to Begin	Fall 2025

“Together, We Can Go Far”

By AITC Caregiver Stakeholders Susan Jackewicz, Lily Liu and Marie Maloney

There is a wise African proverb that says: “If you want to go fast, go alone. If you want to go far, go together.” This proverb could indeed serve as the motto for the a2 Collective, which represents the Artificial Intelligence and Technologies Collaboratories (AITC) for Aging Research Program. Dedicated to helping us all live healthier, longer lives through the application of artificial intelligence (AI) and other emerging technologies, this Collective early on recognized the invaluable role played by caregivers like us who provide unpaid care for older adults in America.

In identifying promising AI-driven AgeTech projects that seek to improve health and care outcomes for our country’s aging population, the three Collaboratories (Johns Hopkins University (JH AITC), the University of Massachusetts Amherst (MassAITC), and the University of Pennsylvania (PennAITech)) have invited individuals with lived experience in caregiving to serve as Caregiver Stakeholders. The AITCs offer us caregivers a variety of opportunities to contribute: for example, speaking as panelists at the annual National Symposium and participating in virtual meetings to review the products or services presented by Pilot Awardees.

In the rapidly evolving landscape of AI and technology solutions to address the healthcare and other needs of our aging population, including persons with Alzheimer’s Disease and related dementias (AD/ADRD), a critical question emerges: How do we ensure these innovations truly address the complex realities of aging and caregiving? One key answer lies in the early integration of lived experience into the research and development process. Caregivers can help identify gaps between design and research in a lab and practical application at the community or household level.

Inviting caregivers to the table as Stakeholders to engage in dialogue with researchers helps to bridge academic theory and practical implementation. Researchers can benefit from Stakeholders’ insights gained from years – sometimes decades – of hands-on experience handling the realities of giving care for the health and well-being of one or multiple care recipient(s). And because we Stakeholders come from diverse backgrounds and have given care for loved ones with different medical diagnoses, our unique circumstances represent a broad spectrum of lived experiences.

Caregiver feedback when reviewing Awardees’ research projects can illuminate practical, real-life considerations: Will the AI-driven device account for the anxiety some AD/ADRD patients experience with unfamiliar objects? Will this device withstand daily hygiene routines? And, perhaps most important, can caregivers who are already overwhelmed with many daily tasks realistically manage another monitoring system?

Early involvement of Stakeholders allows for identification of possible problems and pain points before significant resources are invested in development. Caregiver Stakeholders who possess intimate understanding of daily care routines can help identify design features that reflect actual usage conditions rather than laboratory assumptions.

Researchers and project funders might ask, “What would you have us do?” We Caregiver Stakeholders advocate for engaging those with lived experience as early as possible at the project conception stage as well as inviting feedback along the design process and development phases. Ongoing dialogue between research teams and Stakeholders can help ensure technology adoption, decrease the possibility of abandonment in real-world settings and enhance return on investment. Establishing formal communication channels for Caregiver Stakeholder input and insights might help prevent unintended consequences in real-world settings. Continuous Stakeholder input helps to enable faster iteration and refinement of solutions.

Following stiff competition for grant funding, successful Pilot Awardees bring their talents to the a2 Collective from a variety of academic disciplines and are thought leaders in leveraging promising technology to improve health and care outcomes. To date, researchers have shared feedback that by engaging with us Stakeholders in formal and informal conversations, they have had “Aha!” moments to be addressed in current projects or future innovations.

According to the Alzheimer’s Association, almost seven million Americans aged 65 and older live with Alzheimer’s dementia today. This number will almost double by 2060. And during November 2024, National Family Caregivers Month, the Rosalynn Carter Institute for Caregivers highlighted the statistic that approximately 105 million Americans currently serve as family caregivers to someone who is aging, ill or disabled.That number will only continue to grow.

If we all want to go far in addressing these challenges, going together perfectly encapsulates the value proposition of Stakeholder integration in AgeTech research. Through this collaborative approach, we can all help to ensure that technological advances truly serve the needs of our target population and that the solutions we create together are both technically innovative and practically transformative.

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Artificial Intelligence and Technology Collaboratory for Healthy Aging

Technology solutions may prove to be useful in helping people age independently and stay safe at the residence of their choice, manage their health care needs and communicate with family members and health care providers. The *Penn Artificial Intelligence and Technology Collaboratory for Healthy Aging* (**PennAITech**) is a program that fosters innovation to support aging. **We are looking for family caregivers, namely, adults who are taking care of a loved one, relative or friend who is over the age of 65 years, to participate in our stakeholder engagement group and give us feedback about many different ideas and projects.** No previous experience with technology is necessary. We will provide remuneration at $50 per hour, and anticipate participation for up to 10 hours per year based on interest and availability.

For more information, please contact:

Email: pennaitech@nursing.upenn.edu

Phone: 215-746-8361

NEWS FROM THE FIELD

WHAT'S HAPPENING IN AI?

A new report published by the Roosevelt Institute highlights the risks of "Uber for nursing" – an industry in which artificial intelligence is being used by hospitals and other healthcare facilities to aid nurses. The report argues that such apps encourage nurses to work for less pay and fail to address work safety thus potentially jeopardizing patient wellbeing when placing nurses in clinical environments that are unfamiliar to them without sufficient onboarding or training. The report can be found here:

https://rooseveltinstitute.org/publications/uber-for-nursing/?utm_medium=referral&utm_source=share&utm_campaign=staffshare202412&utm_content=gignursing

A working paper by the Center on Regulation and Markets at Brookings projects that AI could reduce the annual U.S. budget deficit by as much as 1.5% of gross domestic product by 2044, decreasing annual budget deficits by roughly one fifth over 20 years. As the authors state: "The use of AI presents the rare — possibly unique — opportunity to expand access to health care information and services while simultaneously reducing the burden on the conventional health care system." The paper can be found here:

https://www.brookings.edu/articles/the-fiscal-frontier-projecting-ais-long-term-impact-on-the-us-fiscal-outlook/

A recent study published in JAMA Network Open examines the perspectives of Americans on employing AI in healthcare. This research is particularly relevant to radiology, where the majority of AI algorithms approved by the FDA are used. As the study authors emphasize, ensuring patient awareness has always been a fundamental aspect of ethical standards in both clinical and research settings and is at the heart of data privacy regulations and informed consent. With the expanding use of artificial intelligence across various sectors, policy models are promoting transparency through notifications as an essential element of proper AI usage. Yet, there are no solid regulations or policies for such notifications, and the dedication to transparency varies among healthcare systems. The development of policies regarding patient notifications is a crucial advancement for incorporating AI and should take into account public opinion on the technology's use in healthcare, according to the authors. To understand patient attitudes better, Jodyn Platt and her team surveyed adults receiving care at their facility in the summer of 2023. This survey included an educational video detailing the implementation of AI across healthcare, along with multiple queries regarding the participants' views on healthcare providers using such technology. The paper can be found here:

https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2827758

Key questions for health systems when drafting the LLM Playbook: LDI panel talk

Author: Oonjee Oh

The second panel of the Leonard Davis Institute of Health Economics (LDI) conference discussed the considerations for using generative artificial intelligence (AI) and large language models (LLM) to improve the delivery of healthcare. A distinguished group of panelists with expertise in health systems, law, and computer science were invited, including Julia Adler-Milstein, PhD, I. Glenn Cohen, JD, and Sanmi Koyejo, PhD. The talk was moderated by Hamsa Bastani, PhD.

"Safe, effective, ethical, and legal"

The panels were first asked about the key considerations for deploying generative AI and LLM in healthcare practice. Julia Adler-Milstein, PhD, a professor of medicine at the University of California San Francisco and the director of the Center for Clinical Informatics & Improvement Research, elaborated on AI governance from the health system's perspective. Julia asked, "What problems are we trying to solve with AI?" She emphasized the importance of "health AI steering" as it shapes how one thinks about the biggest pain points of our healthcare systems, how AI can offer the best solutions, and how to conduct a landscape assessment of the available tools. Another point raised by Julia was ongoing monitoring. "Generative AI tools are unique because the models themselves can change over time," Julia said. "We're not going to be able to have clinicians manually review AI transcripts, which we did, which we do in the pilot phase, but that just doesn't sustain on a long-term basis. So we're thinking a lot about the automated strategies for monitoring." She highlights the need for figuring out the structure and function of AI governance.

I. Glenn Cohen, JD, a professor at Harvard Law School and the director of the Petrie-Flom Center for Health Law Policy, Biotechnology & Bioethics, provided additional insights on the ethics and legal aspect of integrating generative AI into healthcare: "I think about ethics as coming in at every stage of the development of the model." He elaborated on key questions that need to be answered during the developmental stage prior to implementation, including, "Where did your data come from; did people know that your data is going to be used; how have you de-identified the data? What kind of provenance, what kind of relationship and governance do you have with data? Questions about when the model is being used. What are you telling the patients? What kinds of transparency and informed consent if necessary?"

When implementing AI in healthcare, Glenn emphasized that, "*the real ethical value of AI would be to translate even pretty mediocre physician experience to a much larger swath of the population and across the world*." New questions emerged regarding such translatability —"*How do we know if the translation to this population is appropriate for the model? How do we know if the model is good? How can we do this ongoing review? And how can centers share information without being sued for defamation or something like that, when they are saying bad things about a model which produces terrible results for their patients?" Glenn highlights the need of validating AI tools across different settings, systems, and patient populations.*

He said, “The question I always ask is, you've given me great evidence that this works. When you show me the test data set, show me that it works in my hospital and show me that I'm going to be able to learn whether it works in my hospital. And, you know, that's a much bigger challenge.”Adding a technical perspective, Sanmi Koyejo, PhD, an assistant professor of computer science at Stanford University and the Principal Investigator of Stanford Trustworthy AI Research, said, “This question of how we think about trustworthiness comes from the way we view automated systems broadly.” Introducing various study examples that demonstrate human cognitive biases when engaging with AI—whether it be over-reliance or strong distrust—Sanmi highlighted, “In the end, a lot of the gap that needs to be filled will often come down to us having a better handle on how to calibrate trust to actually what these tools are good at.”

Clinician and AI in practice

When asked about the need for training clinicians within the health systems on incorporating AI models into their practice, Julia answered, “I do think there is probably some need in some situations for training. But I don’t think that’s going to get us out of this situation.” Rather, she emphasized the need for more intuitive ways to help trigger double-checking. She stated, “My hope is that as these tools become more and more sort of ingrained, humans will build better intuition for when the models aren’t performing as expected.”

Glenn suggested, “It’s not that you acquire an AI, it’s that you hire an AI.” Considering the potential harm that could be caused while translating AI models across various settings, Glenn emphasized the need to be sensitive to all kinds of behavioral components: “It turns out that there's some differences in the way physicians use stethoscopes, but it's not that much variation. Whereas with an AI system, especially one that's complex, where judgment is required. You really want to be very thoughtful about this implementation, and you want to also measure it, because you won't know if you have a problem, if you don't look to see whether you have a problem.”

Sanmi added, “there’s going to be someone engaged in this implementation.” He then raised an interesting question on how we judge the quality of the systems— “Is it a performance improvement? So, the team of human and AI are better than the AI by itself? Or do we default to what I think we mostly do know, which is essentially we need AI to be able to do the whole thing by itself.” “We are not taking into account what the human is doing in that ecosystem,” Sanmi continued. He emphasized the need for evaluating the team of clinicians and AI and its robustness and benefits compared to humans alone.

Patients’ role in AI implementation

When discussing the transparency of AI involvement, Glenn mentioned, “There’s another stakeholder here who really is the person who has the skin in the game, which is often the patient.”

When discussing patient inclusion in committees on steering and overseeing AI, Julia said, “I think the key is not just there’s a patient, but that there’s a patient who feels like we have structured the process so that they can meaningfully contribute to it.” Julia added, “they [patients] may not feel like we’re setting them up to successfully engage,” and that “we’re not sure what the right level is that patients want to know about.”

Glenn suggested involving a group of patients who are representative of the population or a disease group that can act as community engagement boards. When engaging with these patient groups, Glenn said, “not presenting the underlying data, because I don't think that's something that most people are going to be able to do.

But the trade offs, what are the pain points? What are the pivot points? What are the things we're seeing that there's a lot of good happening here, but also some concerns. And how would you feel about that? I think that's the modal way to do it.”

Benefit for all

When asked one thing each panel would prioritize to ensure that all health systems can benefit from these technologies, Sanmi mentioned, “A lot more work on the evaluation side and understanding how people will engage with these tools.” Glenn prioritized the idea of pricing to the need rather than pricing to the market, as he states, “Not everybody can afford this.” Glenn also added the need for sharing and spreading knowledge across institutions by training the trainers and fostering talent in other institutions. Finally, Julia highlighted the importance of collaborative effort where “well-resourced institutions adopt some number of less well-resourced institutions.” She concluded, “It's part of as an academic medical center, it should be part of our mission to just help take what we've done and spread it.”

SELECTED PUBLICATIONS

WORK BY OUR TEAM

01.

Alzheimer's disease biomarkers and the tyranny of treatment.
Karlawish J, Grill JD. EBioMedicine. 2024 Oct;108:105291. doi: 10.1016/j.ebiom.2024.105291. Epub 2024 Oct 3. PMID: 39366841

02.

Improvements in Transitional Care Among Medicaid-Insured Patients With Serious Mental Illness.
Nikpour J, Langston C, Brom H, Sliwinski K, Mason A, Garcia D, Grantham-Murillo M, Bennett J, **Cacchione PZ**, Brooks Carthon JM. J Nurs Care Qual. 2024 Sep 30. doi: 10.1097/NCQ.0000000000000805. Online ahead of print. PMID: 39353401

03.

Digital Biomarkers for Neurodegenerative Disease.
Erickson CM, **Wexler A**, **Largent EA**. JAMA Neurol. 2024 Oct 21. doi: 10.1001/jamaneurol.2024.3533. Online ahead of print. PMID: 39432291

04.

Disparate and shared transcriptomic signatures associated with cortical atrophy in genetic bvFTD.
Shen T, Vogel JW, Van Deerlin VM, Suh E, Dratch L, Phillips JS, **Massimo L**, Lee EB, Irwin DJ, McMillan CT. medRxiv [Preprint]. 2024 Jul 27:2024.07.25.24310894. doi: 10.1101/2024.07.25.24310894. PMID: 39211858

05.

The ethical dimensions of utilizing Artificial Intelligence in palliative care.
Oh O, **Demiris G**, Ulrich CM. Nurs Ethics. 2024 Nov 17:9697330241296874. doi: 10.1177/09697330241296874. Online ahead of print. PMID: 39551621

06.

Exploring home healthcare clinicians' needs for using clinical decision support systems for early risk warning.
Xu Z, Evans L, Song J, Chae S, Davoudi A, **Bowles KH**, McDonald MV, Topaz M. J Am Med Inform Assoc. 2024 Nov 1;31(11):2641-2650. doi: 10.1093/jamia/ocae247. PMID: 39302103

PUBLICATIONS

07.

PAGER: A novel genotype encoding strategy for modeling deviations from additivity in complex trait association studies.
Freda PJ, Ghosh A, Bhandary P, Matsumoto N, Chitre AS, Zhou J, Hall MA, Palmer AA, Obafemi-Ajayi T, **Moore JH**. BioData Min. 2024 Oct 11;17(1):41. doi: 10.1186/s13040-024-00393-x. PMID: 39394173

08.

Cardiovascular risk according to genetic predisposition to gout, lifestyle and metabolic health across prospective European and Korean cohorts.
Moon KW, Jung SH, Do H, Son CN, Kim J, Nam Y, Yun JS, Park WY, Won HH, **Kim D**. RMD Open. 2024 Oct 8;10(4):e004552. doi: 10.1136/rmdopen-2024-004552. PMID: 39379299

09.

Social media use and mental health among older adults with multimorbidity: the role of self-care efficacy.
Nie Z, Gao S, Chen L, Yang R, Edelman LS, Sward KA, Jiang Y, **Demiris G**. J Am Med Inform Assoc. 2024 Oct 1;31(10):2210-2216. doi: 10.1093/jamia/ocae179. PMID: 38990654

10.

Interpretable deep clustering survival machines for Alzheimer's disease subtype discovery.
Hou B, Wen Z, Bao J, Zhang R, Tong B, Yang S, Wen J, Cui Y, **Moore JH**, Saykin AJ, Huang H, Thompson PM, Ritchie MD, Davatzikos C, **Shen L**; Alzheimer's Disease Neuroimaging Initiative. Med Image Anal. 2024 Oct;97:103231. doi: 10.1016/j.media.2024.103231. Epub 2024 Jun 14. PMID: 38941858

11.

Mapping rare protein-coding variants on multi-organ imaging traits.
Fan Y, Chen J, Fan Z, Chirinos J, Stein JL, Sullivan PF, Wang R, Nadig A, Zhang DY, Huang S, Jiang Z, Guan PY, Qian X, Li T, Li H, Sun Z, **Ritchie MD**, O'Brien J, Witschey W, Rader DJ, Li T, Zhu H, Zhao B. medRxiv [Preprint]. 2024 Nov 18:2024.11.16.24317443. doi: 10.1101/2024.11.16.24317443. PMID: 39606337

12.

Theory-Based Message Design for Recruitment of Underrepresented Racial/Ethnic Groups Into Alzheimer's-Focused Research Registries.
Bleakley A, Maloney EK, Hennessy M, Hull S, Harkins K, **Largent E**, Ashford M, Kwang W, Byrd DR, Nosheny R, **Karlawish J**, Langbaum JB. Health Educ Behav. 2024 Nov 19:10901981241296124. doi: 10.1177/10901981241296124. Online ahead of print. PMID: 39562850

13.

Deep learning-based approaches for multi-omics data integration and analysis.
Ballard JL, Wang Z, Li W, **Shen L**, Long Q. BioData Min. 2024 Oct 2;17(1):38. doi: 10.1186/s13040-024-00391-z. PMID: 39358793

14.

From an idea to the marketplace: Identifying and addressing ethical and regulatory considerations across the digital health product-development lifecycle.
Largent EA, **Karlawish J**, **Wexler A**. BMC Digit Health. 2024;2(1):41. doi: 10.1186/s44247-024-00098-5. Epub 2024 Jul 25. PMID: 39130168

PUBLICATIONS

15.

Improving TRansitions ANd outcomeS for heart FailurE patients in home health CaRe (I-TRANSFER-HF): a type 1 hybrid effectiveness-implementation trial: study protocol.
Sterling MR, Espinosa CG, Spertus D, Shum M, McDonald MV, Ryvicker MB, Barrón Y, Tobin JN, Kern LM, Safford MM, Banerjee S, Goyal P, Ringel JB, Rajan M, Arbaje AI, Jones CD, Dodson JA, Cené C, **Bowles KH**. BMC Health Serv Res. 2024 Oct 1;24(1):1160. doi: 10.1186/s12913-024-11584-x. PMID: 39354472

16.

Evaluating Performance and Agreement of Coronary Heart Disease Polygenic Risk Scores.
Abramowitz SA, Boulier K, Keat K, Cardone KM, Shivakumar M, DePaolo J, Judy R, Bermudez F, Mimouni N, Neylan C, **Kim D**, Rader DJ, **Ritchie MD**, Voight BF, Pasaniuc B, Levin MG, Damrauer SM; Penn Medicine BioBank. JAMA. 2024 Nov 16:e2423784. doi: 10.1001/jama.2024.23784. Online ahead of print. PMID: 39549270

17.

A review of feature selection strategies utilizing graph data structures and Knowledge Graphs.
Shao S, Henrique Ribeiro P, Ramirez CM, **Moore JH**. Brief Bioinform. 2024 Sep 23;25(6):bbae521. doi: 10.1093/bib/bbae521. PMID: 39526853

18.

Harnessing Artificial Intelligence in Multimodal Omics Data Integration: Paving the Path for the Next Frontier in Precision Medicine.
Nam Y, Kim J, Jung SH, Woerner J, Suh EH, Lee DG, Shivakumar M, Lee ME, **Kim D**. Annu Rev Biomed Data Sci. 2024 Aug;7(1):225-250. doi: 10.1146/annurev-biodatasci-102523-103801. Epub 2024 Jul 24. PMID: 38768397

19.

Transitional Care Support for Medicaid-Insured Patients With Serious Mental Illness: Protocol for a Type I Hybrid Effectiveness-Implementation Stepped-Wedge Cluster Randomized Controlled Trial.
Brooks Carthon JM, Brom H, Amenyedor KE, Harhay MO, Grantham-Murillo M, Nikpour J, Lasater KB, Golinelli D, **Cacchione PZ**, Bettencourt AP. JMIR Res Protoc. 2024 Nov 12;13:e64575. doi: 10.2196/64575. PMID: 39531274

We look forward to seeing you in Boston, MA in April 2025!

Registration details to follow soon.

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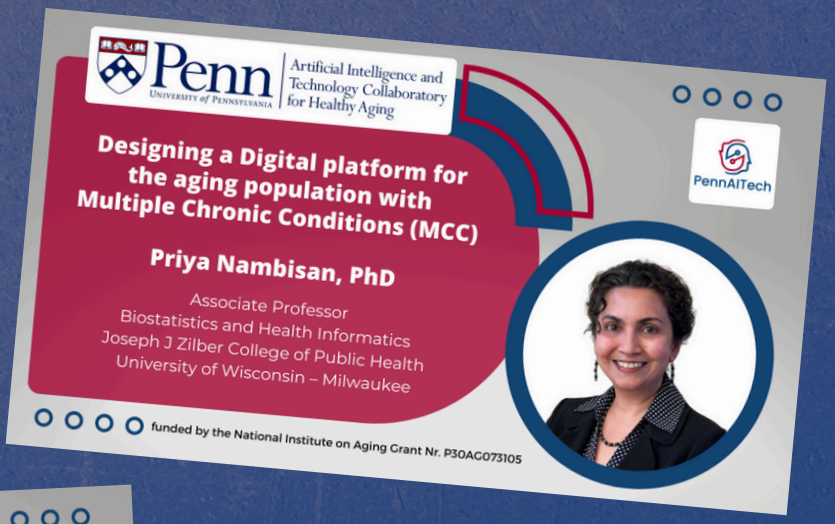
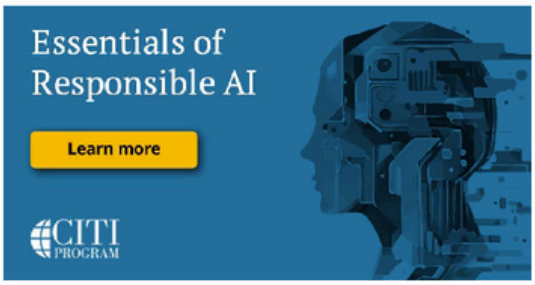


We are thrilled to announce the launch of the CITI training: Essentials of Responsible AI program, which is now available via UPenn and sponsored by PennAITech. The training is designed to help individuals explore the core aspects of establishing and operationalizing a responsible approach to AI development and use. This course is relevant for all AITC awardees and others who want to learn more about Responsible AI, Responsible AI Principles, and the AI regulatory landscape.



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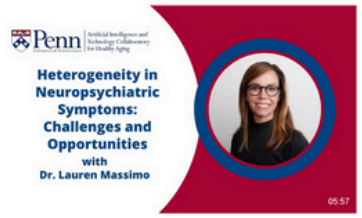

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