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

# PILOT AWARDEES YR5
# 2026

https://www.pennaitech.org
funded by the National Institute on Aging Grant Nr. P30AG073105

FSU
FLORIDA STATE
UNIVERSITY

# DEVELOPING A MULTI-AGENT AI SYSTEM FOR EXPLAINING LAB RESULTS TO OLDER ADULTS

**Zhe He, PhD, FIAHSI, FAMIA**

Older adults and caregivers increasingly rely on patient portals to access laboratory results, yet these results are often presented without sufficient context—posing challenges for those with low health literacy, cognitive impairment, or limited clinical background. This problem is particularly critical for caregivers of persons living with Alzheimer's disease and related dementias (ADRD), who must interpret complex clinical data to make timely care decisions. To address this gap, our team has developed *LabGenie*, a web-based tool that provides tailored visualizations and helps patients generate questions for their providers. Building upon this foundation, the proposed A2 Pilot project will design and evaluate *Lab-Agent*, a novel multi-agent generative AI system integrated into *LabGenie* to deliver personalized, contextualized explanations of lab results for older adults and their caregivers. The system will comprise three components: a Patient-AI Agent that simulates diverse caregiver profiles to generate representative questions, a Clinical-AI Agent that uses retrieval-augmented generation (RAG) and knowledge graphs to produce context-aware explanations, and a Grader-AI Agent that performs quality assurance on factuality, readability, and clinical accuracy. Aim 1 develops and validates the multi-agent architecture using simulated clinical datasets and expert review. Aim 2 evaluates the system's acceptability, perceived trustworthiness, and usability through participatory design workshops, online experiments, and formative usability testing with ADRD and MCI caregivers. This project will advance responsible, caregiver-centered AI to enhance lab result comprehension, support informed decision-making, and promote aging in place—laying the groundwork for scalable integration with electronic health records and caregiver support platforms.

https://sites.google.com/view/labgeniefsu/ PennAITech YouTube Feature

Duke

counterforce health

# COUNTERFORCE HEALTH: AI-POWERED HEALTH INSURANCE APPEALS GENERATOR

**Kathryn I. Pollak, PhD**

Every year, millions of Americans receive insurance denial letters for healthcare services, often due to missing information or coding errors. While half of these denials are eventually overturned, very few patients (just 0.2%) attempt to appeal. Many lack the time, knowledge, or confidence to navigate the complex appeals process, which can lead to worse health outcomes and reduced trust in the healthcare system.

Counterforce Health is an innovative tool designed to change that. Using artificial intelligence, it helps patients create strong, personalized insurance appeals by analyzing denial letters and guiding users through the process. The tool incorporates medical details, generates downloadable appeal documents, and offers coaching on next steps. Future versions will include phone-based support and automated follow-ups.

Currently in use at more than 20 clinics, Counterforce Health has shown promising results, with users reporting about 40% of appeals succeeding. A pilot study at Duke Health will evaluate the tool's accuracy, usability, and effectiveness through expert reviews, patient testing, and real-world outcomes.

By simplifying a complex process, Counterforce Health aims to empower patients, reduce financial stress, and improve access to care—one appeal at a time.

https://www.counterforcehealth.org/ PennAITech YouTube Feature

# WISE Connect

## WISE CONNECT AI: PERSONALIZED LOCAL SUPPORT FOR AGING IN PLACE

**Marie Brodsky**

This study aims to develop and evaluate an AI recommendation tool designed to connect older adults (65+) aging in place with local services and resources that support healthy, independent, and engaged living. The tool will be integrated into WISE Connect, a free and accessible web platform that aggregates community programs for older adults.

For this survey-based study, a broad cohort of up to 75 older adults aging in the community in the DC Metro area will be recruited and asked to share their residential circumstances, health priorities, disabilities, transportation access, primarily language, family proximity, income level, social engagement, tech confidence, and more. Then, each participant will be shown fictitious local resources and asked to rank and evaluate them based on their perceived value.

This data will be anonymized, supplemented with existing national data, and used to train several AI models to provide relevant suggestions. The models will be trained and refined over three 3-month cycles, and the highest-performing model will be integrated into WISE Connect.

The study will result in a custom AI recommendation model tailored to the needs of older adults aging in place. This model is expected to enable personalized recommendations that improve awareness and access to relevant local resources with minimal user effort.

http://www.wiseconnect.us

PennAITech YouTube Feature

Brandeis UNIVERSITY

# EFFECTIVE DATA CURATION FOR ACCURATELY AND FAIRLY PREDICTING READMISSION FOR OLDER ADULTS

**Hongfu Liu, PhD**

Hospital readmissions—when patients return to the hospital within 30 days after discharge—are common among older adults and often preventable. These readmissions can disrupt recovery, reduce quality of life, and contribute to billions of dollars in healthcare costs each year. While artificial intelligence (AI) has shown promise in predicting which patients are at high risk, current models are often inaccurate, difficult to use in real-world settings, and may unintentionally reinforce health disparities across different populations. This project aims to improve how we predict hospital readmissions by focusing not just on the AI models themselves, but on the quality and selection of the data used to train them. Using large and diverse health datasets, including electronic health records and national research data, we will develop advanced AI tools that identify older adults at high risk of readmission.

A key innovation of this work is a "data-centric" approach that evaluates how individual pieces of data affect both prediction accuracy and fairness. This allows us to prioritize the most informative data while reducing bias that could disadvantage certain racial, ethnic, or socioeconomic groups. We will also design new training methods that balance accuracy and fairness more effectively than current approaches. By enabling earlier and more equitable identification of at-risk patients, this project has the potential to support better care planning, reduce unnecessary hospital visits, lower healthcare costs, and improve health outcomes for older adults.

https://scholarworks.brandeis.edu/esploro/profile/hongfu_liu/overview

PennAITech YouTube Feature

University of Massachusetts Amherst

# CONVERSATIONAL AI AGENTS TO SUPPORT MENTAL WELLBEING OF AD/ADRD CAREGIVERS

**Ravi Karkar, PhD**

This research project aims to develop, deploy, and evaluate Carey, an AI conversational agent designed to support the mental wellbeing of caregivers for people living with Alzheimer's disease and related dementias (AD/ADRD). The significance of this work stems from the substantial burden faced by 11.5 million AD/ADRD caregivers who provided an estimated 18.4 billion hours of unpaid care in 2023, with 74% concerned about maintaining their own health and at least one in three suffering from clinical depression. Building on formative research that analyzed online communities, evaluated AI chatbot effectiveness, and interviewed family caregivers, the team has identified key opportunities for technology to support caregivers' mental wellbeing through caregiving responsibilities, information resources, social connections, and emotional support. The platform integrates theory-driven design with evidence-based practice through three main features: interactive journaling grounded in therapeutic approaches (CBT, ACT, DBT), guided scenario-driven information addressing eight critical caregiver concerns, and persona-driven conversations incorporating real caregiver stories. The innovation lies in providing verified information through small language models built using trusted sources, combining evidence-based mental health practices with AI-powered design, and seamlessly integrating support into caregivers' daily routines. Through a six-week deployment with 35-50 caregivers, the project will assess feasibility and benefits of Carey for providing instant, accurate informational support and enhancing mental wellbeing by focusing on affect, anxiety, and loneliness. Data collection will include validated measures of acceptability (SUS, CSQ-8, IAM), potential benefits (PANAS-X, PHQ-8, GAD-7, UCLA Loneliness, RCWBS), and qualitative interviews for deeper insights. The technical approach will employ specialized Small Language Models (SLMs) for each of eight critical mental wellbeing concerns, using a mixture-of-experts architecture to classify queries and route them to appropriate expert models. The project team brings complementary expertise in human-computer interaction, computational social science, human-centered design, and clinical-community psychology, with established connections to recruitment pipelines through healthcare systems and community organizations. Upon completion, plans for translation include transitioning the app to a production environment, collaborating with healthcare partners, and making the platform publicly available to support the substantial population of AD/ADRD caregivers.

https://people.cs.umass.edu/~rkarkar/ PennAITech YouTube Feature

Penn
University of Pennsylvania

# A GENERATIVE AI CLINICAL CHATBOT TO SUPPORT APOE TESTING (GRACE)

**Angela Bradbury, MD**

Amyloid-targeted therapies are now available for patients with Alzheimer's disease (AD) and mild cognitive impairment (MCI). One step in the process of understanding if a patient is a candidate for these new therapies is APOE genotype testing. The APOE results can help providers and patients consider potential risks of treatment, but these results can also have an impact on relatives and could determine their risk for AD. While genetic testing has typically been performed with genetic professionals, known as genetic counselors (GCs), this could delay or prevent patient access to treatment. Thus, healthcare providers are sending APOE testing and returning results on their own and referring patients to GCs when a patient and family have additional questions. To address this important gap in access to genetic education, we have developed patient-centered clinical chatbots for patients and their relatives, to help them understand APOE testing and their results. In this pilot grant, we will be developing methods to use generative artificial intelligence (AI) to improve our chatbots ability to answer individual patient questions with the expectation that this will increase engagement, the user experience and increasing awareness and understanding in families impacted by AD. Through the national Penn Telegenetics program and community clinical settings, these tools will be applicable and designed for diverse real-world patients of varying health literacy and community practices in the US.

https://pc3i.upenn.edu/people/angela-bradbury/ PennAITech YouTube Feature

DexTech

# STEPAHEAD: BREAKING FREE FROM FREEZING OF GAIT WITH AUGMENTED REALITY

**Nipun Chopra, PhD**

Freezing of gait (FoG) is a debilitating symptom of Parkinson's Disease (PD) that causes sudden, brief episodes where individuals are unable to move their feet, often resulting in falls, injuries, and reduced quality of life. Despite its prevalence—impacting nearly 70% of people with advanced PD—there are few effective tools to detect and prevent FoG in real-world settings.

Our project aims to create a non-invasive, wearable software platform that uses augmented reality (AR) to detect and reduce freezing episodes. Through smart glasses equipped with spatial mapping and visual cueing, the system will identify when a person is at risk of freezing and provide real-time visual prompts to help them keep moving safely.

We will begin by refining our detection system in a laboratory and outdoor setting with healthy volunteers, simulating movements known to trigger FoG. Then, we will capture detailed walking patterns from individuals living with FoG to fine-tune our predictive models. Finally, we will test the system in a real-world assisted living facility to ensure usability, comfort, and effectiveness.

This project integrates lived experience with cutting-edge science and engineering. Our goal is to improve independence, mobility, and safety for people with Parkinson's. If successful, our approach could become a low-cost, accessible tool to support millions affected by this disabling symptom—at home or in care facilities.

https://dextechcorp.com/technologies/ PennAITech YouTube Feature

NEW YORK UNIVERSITY

# TAILORED NUTRITION - AI NUTRITION SUPPORT FOR PERSONS LIVING WITH DEMENTIA IN ADULT DAY CENTERS

**Tina Sadarangani, PhD, RN, ANP-BC, GNP-BC, FAAN, FGSA**

Malnutrition is a major but often overlooked issue among people living with dementia who attend adult day centers (ADCs). The meal or meals served at the center may be the only ones eaten in a given day for many of these older adults, making it imperative that they are nutritionally rich. Yet, most centers currently serve the same meal to all their clients, regardless of individual dietary needs or challenges. This one-size-fits-all approach can be especially problematic for people with dementia, who often require more tailored nutrition to maintain their health and well-being.

To help address this, our team is developing a new AI-powered nutrition platform that uses photos of meals to estimate what someone eats and provide personalized dietary suggestions. The platform will be integrated into CareMobi, a free mobile app designed to help families, healthcare providers, and adult day center staff coordinate care.

We will develop and test the accuracy of the platform, and then conduct a six-week study to see how feasible it is for adult day center staff to use this new platform in their day-to-day work. Staff will complete a brief survey to share feedback on how easy it was to use and whether they believe it could help them plan more nutritious, personalized meals for their clients in the future.

https://nursing.nyu.edu/w/caremobi

PennAITech YouTube Feature

WashU Medicine

# A SYNTHETIC DATA APPROACH TO CATALYZING INNOVATION IN DEMENTIA CAREGIVER SUPPORT

**Karla T. Washington, PhD**

Millions of Americans care for an aging family member or friend with Alzheimer's disease or a related dementia. These caregivers manage a wide range of responsibilities, from everyday tasks like cooking and paying bills, to complex medical care, such as administering medications, monitoring symptoms, and coordinating treatment across healthcare teams. Although caregiving can be meaningful, it is also demanding and can negatively affect caregivers' emotional and physical well-being.

To help, our team developed PISCES (Problem-Solving Intervention to Support Caregivers in Everyday Situations), a structured, evidence-based program that teaches caregivers practical problem-solving skills. Multiple clinical trials have shown that PISCES reduces caregivers' distress and improves their quality of life. To date, we have recorded hundreds of PISCES sessions between trained interventionists and caregivers. These recordings are an invaluable resource for training new providers and developing digital tools to expand access to effective caregiver support. However, privacy laws prevent us from sharing this real-world data outside of our research team.

In this pilot project, we will test the feasibility of creating a synthetic version of the PISCES dataset consisting of computer-generated text conversations that reflect the content and tone of real PISCES sessions but include no identifying information. Using advanced natural language processing and other artificial intelligence techniques, we will analyze real session data to detect key patterns and use those patterns to generate realistic synthetic examples. This project represents an important first step toward safely expanding access to evidence-based caregiver support while maintaining the highest standards of privacy and data protection.

https://medicine.washu.edu/

PennAITech YouTube Feature

UNIVERSITY OF DENVER

# AI-INTEGRATED NANOWELL BIOSENSORS FOR MULTIMODAL DETECTION OF NPD BIOMARKERS

**Reza Mahmoodi, PhD**

Early detection of cognitive impairment, including dementia, is beneficial for patients and their families because it helps them access needed care supports. Screenings for many health conditions are done in primary care, but it is difficult to do screenings for cognitive impairment in this setting. This is because the time required to do a cognitive screen can be challenging to fit into a typical primary care appointment. The goal of this project is to make it easier for primary care providers to detect early signs of cognitive impairment in real-time. We aim to develop a prediction model that uses data from the electronic health record (EHR) and video and audio from the primary care visit to estimate a patient's risk of having undetected cognitive impairment. We will build off an existing cognitive impairment prediction model called the EHR Risk of Alzheimer's and Dementia Assessment Rule (eRADAR). We will use this model to recruit Penn Medicine primary care patients to participate in a recorded research visit, where we will conduct a cognitive and physical exam. Video and audio data from these visits will be combined with the EHR data to generate new predictive models. We aim to see if the addition of video and audio data to the prediction model improves detection of conditions such as Alzheimer's disease and related dementias. This will build the basis for future work aiming to integrate the new predictive model into primary care clinics and test its effectiveness in promoting early detection of cognitive impairment.

https://ritchieschool.du.edu/about/people/reza-mahmoodi

PennAITech YouTube Feature

OLD DOMINION UNIVERSITY

# KNOWLEDGE-AUGMENTED GENOMICS TRANSFORMERS FOR MECHANISTIC LINKS TO AD DEMENTIA

**Hong Qin, PhD**

Alzheimer's disease (AD) is a progressive neurodegenerative disorder marked by cognitive decline and heterogeneous, cell-type-specific molecular changes. Extracting mechanistic insights across cohorts from large scale AD genomic data remains difficult. We propose to fine-tune a transformer foundation model for single-cell analysis (scGPT) on >4 million single-nucleus RNA-seq profiles from two deeply characterized AD resources—the Religious Orders Study and Memory and Aging Project (ROSMAP) and the Seattle Alzheimer's Disease Brain Cell Atlas (SEA-AD), while harmonizing cognitive and neuropathology measures to enable integrative modeling. Our approach embeds prior biological knowledge into the model via knowledge-guided attention masks and multimodal fusion (e.g., pathway, GWAS, and perturbation priors). We will pair model explanations (Shapley values, pathway enrichment) with conformal prediction to quantify uncertainty and flag low-confidence calls. To ensure generalizability, we will conduct cross-cohort benchmarking and external validation against classical bioinformatics baselines. The pipeline will emphasize reproducibility (open code, standardized QC, and data harmonization recipes) and deliver interpretable gene- and pathway-level hypotheses for amyloid/tau burden and cognitive impairment.

https://www.odu.edu/directory/hong-qin PennAITech YouTube Feature

Penn Nursing
University of Pennsylvania

Perelman School of Medicine
University of Pennsylvania

## Connect with PennAITech online:

https://www.pennaitech.org/news

https://www.linkedin.com/company/pennaitech/

https://www.youtube.com/@pennaitech

https://bsky.app/profile/pennaitech.bsky.social

https://www.facebook.com/pennaitech

https://twitter.com/pennaitech


funded by the National Institute on Aging Grant Nr. P30AG073105