CENTER FOR APPLIED ARTIFICIAL INTELLIGENCE

INSTITUTE FOR BIOMEDICAL INFORMATICS

Executive Report
2025 YTD

caai.ai.uky.edu

Center for Applied Artificial Intelligence
Institute for Biomedical Informatics
University of Kentucky

Executive Report

2025 YTD

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Note from the Director

Dear Colleagues,

I am pleased to share with you the exciting developments at the University of Kentucky's Center for Applied Artificial Intelligence (CAAI). As we navigate the rapidly evolving landscape of Artificial Intelligence (AI), our center stands at the forefront of innovation, bridging the gap between advanced technology and translational science.

Functioning within the University of Kentucky Institute for Biomedical Informatics (IBI), CAAI is dedicated to exploring new technologies, fostering innovation, and supporting the application of AI across scientific domains. CAAI showcases the innovative ways our researchers are advancing science, how our educators are personalizing instructional methodologies, and how AI can be harnessed for administrative efficiencies and increased economic competitiveness.

The global potential of AI is undeniable, yet its success in local contexts hinges on the accuracy of community and domain representations that reflect local needs, values, and discipline-specific nuances. Ensuring that AI applications accurately depict our communities is crucial, as is protecting individual privacy within these representations, to foster trust and effectiveness.

With foundations in the highly regulated field of medicine, our data curation is systematic, and evaluations are methodical, providing the rigor required for the development of trusted AI. Unlike most AI teams we do not rely on external commercial services and the majority of our data, computational processing, and operational services are maintained within in highly secure facilities that we operate. In the upcoming year we aim to expand the AI services we have developed to additional collaborators and institutions.

Focusing on the application of AI to real-world problems requires more than an understanding of AI models. In 2025 we will focus attention on the development and implementation of AI agents, which have become increasingly popular as virtual assistants. With the rest of the AI community, we will expand the reach of AI agents into databases, applications, distributed, and physical systems, laying the foundation for what is commonly referred to as physical AI.

I invite you to join us in this exciting journey as we continue to push the boundaries of AI at the University of Kentucky and beyond.

Sincerely,

V. K. Cody Bumgardner

Contents

Website: caai.ai.uky.edu
Technical Hub Site: hub.ai.uky.edu/
Data.AI Toolkit: data.ai.uky.edu/

ai@uky.edu @uk-caai github.com/innovationcore uk-ibi-caai

Highlights FY25

43
Departmental & Institutional Partners

120+
Individual Collaborators

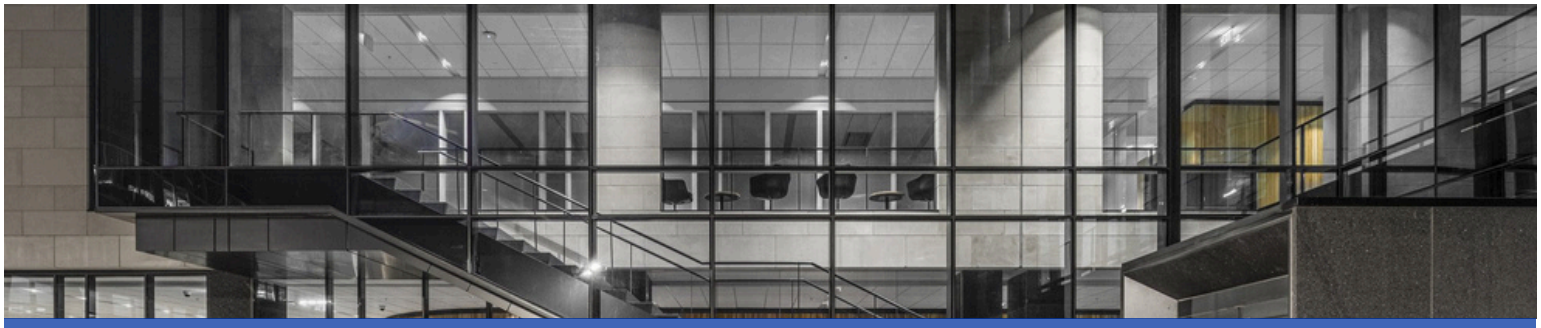
56%
Externally Funded Developer Staff FY25

65
AI Projects with CAAI as Lead Contributor

900K+
LLM Factory Chat Requests since June 2024

With participation in **$80M** of awards

across **26** fully funded projects



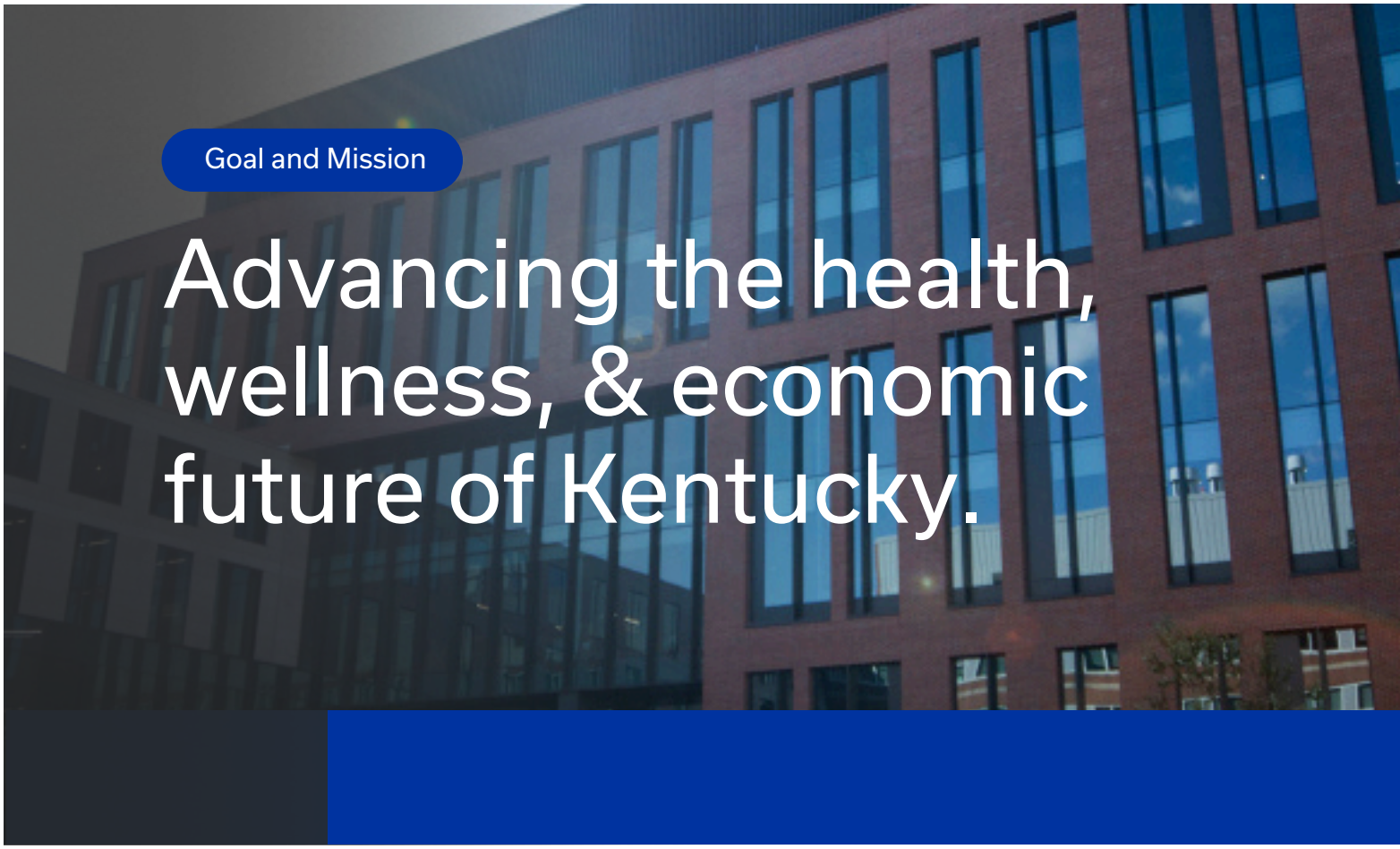
CAAI is comprised of **37** faculty/staff including **21** students

Introduction

CAAI bridges the gap between the potential of AI and its practical application to solve problems and improve outcomes.

AI is the transformative technology of our times. In recent years, AI technologies have emerged to have profound implications in a broad range of areas, from generative discovery in basic sciences, to advancements in agriculture, manufacturing, healthcare, and social sciences, to the redefining the way we work and interact with one another. The ability of AI to analyze vast amounts of data, recognize patterns, and make predictions is revolutionizing research methodologies, accelerating scientific discoveries, and reshaping industries.

With a charter to work with researchers and collaborators of all levels to develop innovative, transdisciplinary use of AI, the CAAI resides in the Institute for Biomedical Informatics, an organization facilitating data-intensive, team science across the Commonwealth; its research communities, higher education institutions, and government agencies; as well as collaborating with other institutions and researchers around the world.



Goal and Mission

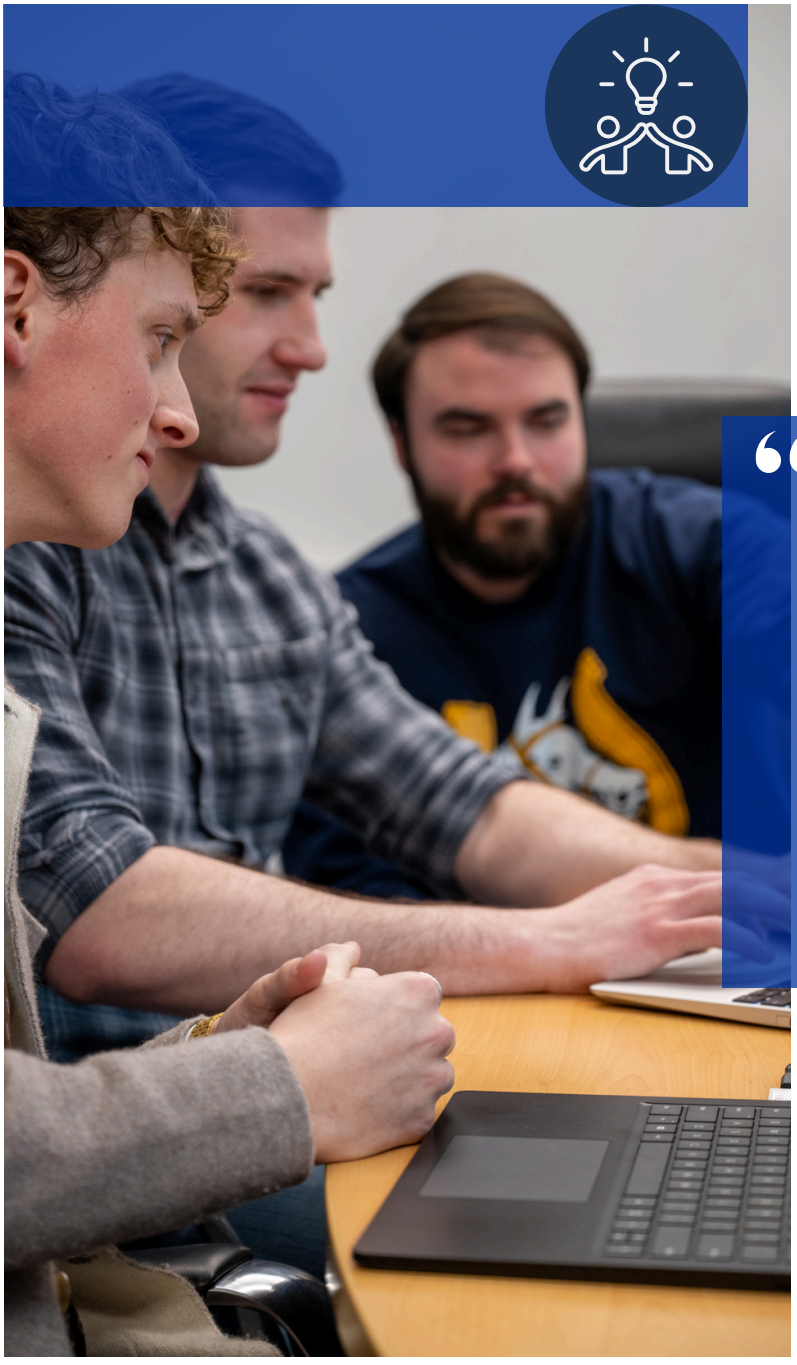
Advancing the health, wellness, & economic future of Kentucky.

The University of Kentucky's mission and vision is to advance Kentucky in every way that improves the health and quality of life for the people of the Commonwealth. Ensuring a healthy state is paramount to that goal and encompasses not only physical health – the prevention and treatment of disease, but also the well-being and economic vitality of a sustainable, skilled workforce. A healthy Kentucky also contributes to the economic growth of the country and to the advancement of research globally. CAAI believes that AI holds immense potential in the attainment of these goals.

CAAI supports UK's mission by applying AI to improve health outcomes, advance research, and develop the future workforce. Team members guide collaborators through common AI technical barriers to rapidly turn ideas into prototypes. Functioning as a technology bridge between science and engineering, CAAI develops pipelines for the repeatable and verifiable use of AI across research domains. To expand AI use cases, CAAI develops self-service tools, templated modules, and code repositories. Educational assets, including websites, online forums, videos, and workshops provide continuous learning.

Collaborators

CAAI is the Commonwealth's AI Leader



CAAI has been the lead contributor for 65 AI-focused projects across multi-disciplinary domains and a participant in 40 additional collaborations, of which 8 are external.

> My team and I engaged with the CAAI over 8 months ago to assist us in further developing AgriGuide, an AI-powered tool to generate human-quality text, answer queries, provide insights, and assist with research by harnessing the knowledge of the Martin-Gatton College of Agriculture, Food, and Environment and UK Cooperative Extension. The Center's involvement in the project has led to vastly enhanced functionality of AgriGuide through the CAAI's expertise and implementation of the most current AI models.
>
> ***CAAI has moved us forward in ways we would not have considered.***

Craig Wood

Director of UK Cooperative Extension

Martin-Gatton College of Agriculture, Food and Environment

Collaborators

Working
Together for the Commonwealth

University of Kentucky

Martin-Gatton College of Agriculture, Food & Environment | Louie B. Nunn Center for Oral History | College of Health Sciences | University Health Services | Creative Link for Advancing Digitial Health | Center for Innovation in Population Health | Department of Communication | King Library | College of Pharmacy | College of Nursing Department of Computer Science | Institutional Research, Analytics & Decision Support

College of Medicine

HealthCare

Sanders Brown Center on Aging | Internal Medicine | Office of Medical Education | Molecular & Cellular Biochemistry Department | Emergency Medicine | Engineering & Innovation in Medicine | Department of Neurology | Family & Community Medicine | Pulmonary Critical Care Unit| Spinal Cord & Brain Injury Research Center | Child Neurology | Department of Microbiology, Immunology & Molecular Genetics Cardiothoracic Surgery | Radiology | Cardiology | Intensive Care Unit

KyRON

Eastern Kentucky University | Kentucky Community & Technical College System | University of Kentucky | UK Research Computing | University of Louisville | Morehead State University | Murray State University | Northern Kentucky University | Western Kentucky University

University of Louisville

Kentucky State University

UT Health San Antonio

Lextran

Arizona State University

UC Davis University of California

ThynkHealth

REDCap Research Electronic Data Capture

Stanford

Wake Forest University

EduceLab | A Digital Restoration Initiative

CPE Higher Education Matters

Emory University

University of Pittsburgh

Louie B. Nunn Center for Oral History University of Kentucky Libraries

Shriners Hospitals for Children

Capabilities

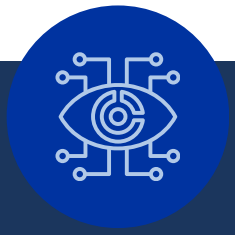
CAAI specializes in the development, management, and application of advanced AI technologies, including large language models (LLMs), computer vision, and machine learning (ML). We lead initiatives that apply AI to solve real-world problems across various disciplines. We provide resources and support to help our collaborators utilize AI technologies by building and fine-tuning LLMs to enhance natural language understanding, leveraging computer vision techniques for image and video analysis, and developing ML algorithms that improve decision-making processes.

Multi-Modal Models

Conversational AI paired with image segmentation, object recognition, classification, and robotics.

Data Science & Analysis

Actionable insights uncovered through forecasting, classification and AI-powered analysis.



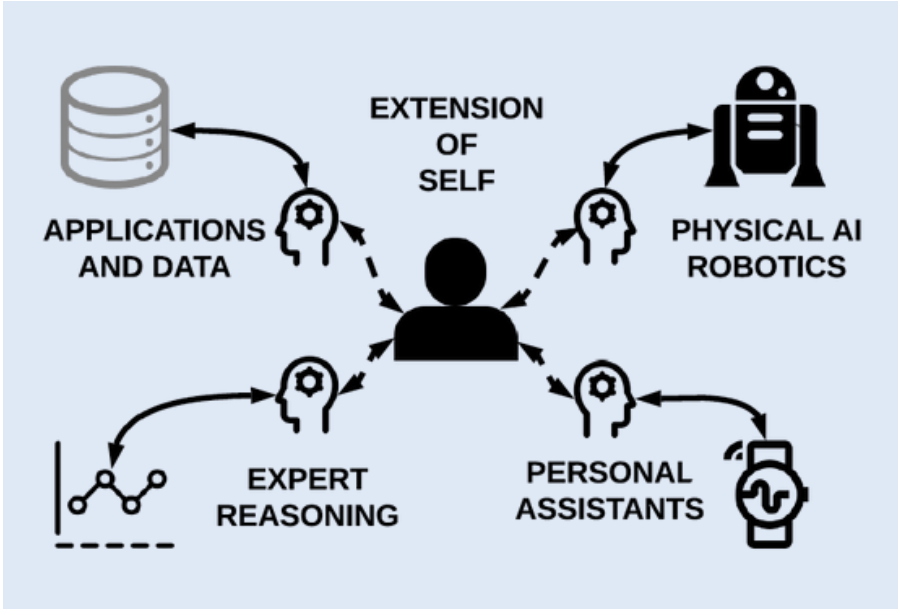
Virtual Agents & Automation

Methodical information retrieval & data processing using AI-powered software.

AI TECHNOLOGY TYPES

Agentic AI
Building the Future with AI Systems

CAAI stands at the forefront of Agentic AI development. AI agents are autonomous systems that can perceive their environment, make decisions, and take actions to achieve specific goals, often integrating tools like LLMs, APIs, or other data sources to do so. By acting as an extension of human workflows, AI agents can handle burdensome tasks by building automation and streamlining processes. CAAI's expertise in producing robust data repositories, self-service agent-ready tools, managing real-time streaming data, implementing distributed and edge computing solutions, and conducting rigorous clinical testing through agent-enabled pipelines creates a powerful foundation for the effective development, deployment, and advancement of AI agents.



AI agents function as intelligent extensions of individuals and the broader workforce, augmenting decision-making and task execution across complex systems. They operate autonomously or collaboratively to streamline labor-intensive processes, reduce administrative burden, and enhance operational efficiency. By acting on behalf of individuals and teams, AI agents enable greater focus on high-value, strategic work while ensuring consistency, speed, and scalability in routine, data-driven tasks.

Agentic AI Applications

Dynamic Task Automation for Data-Driven Systems

Healthcare:

- Personalized Health Management Agent: Proactively monitors individual health data, provides tailored guidance, manages appointments, and alerts providers to risks, acting as an adaptive health partner to achieve specific wellness goals.
- Public Health Surveillance Agent: Continuously analyzes statewide health data to detect emerging threats, model scenarios, and recommend resource allocation for public health interventions.

Agriculture:

- Autonomous Farm Management Agent: Integrates sensor data, weather, and market prices to autonomously plan and execute farming tasks (irrigation, fertilization, pest control) for maximized yield and sustainability.
- Agricultural Supply Chain Agent: Proactively monitors logistics from farm to market, anticipates disruptions, and refines routes and storage to ensure efficiency and reduce waste.

Manufacturing:

- Autonomous Production Line Agent: Oversees production by predicting equipment failures, scheduling maintenance, adjusting robotics based on quality control, optimizing workflow for efficiency and quality.
- Resource Allocation & Planning Agent: Analyzes facility-wide data to optimize production schedules, material procurement, and energy usage, adapting dynamically to changing conditions.

Education & Workforce Development:

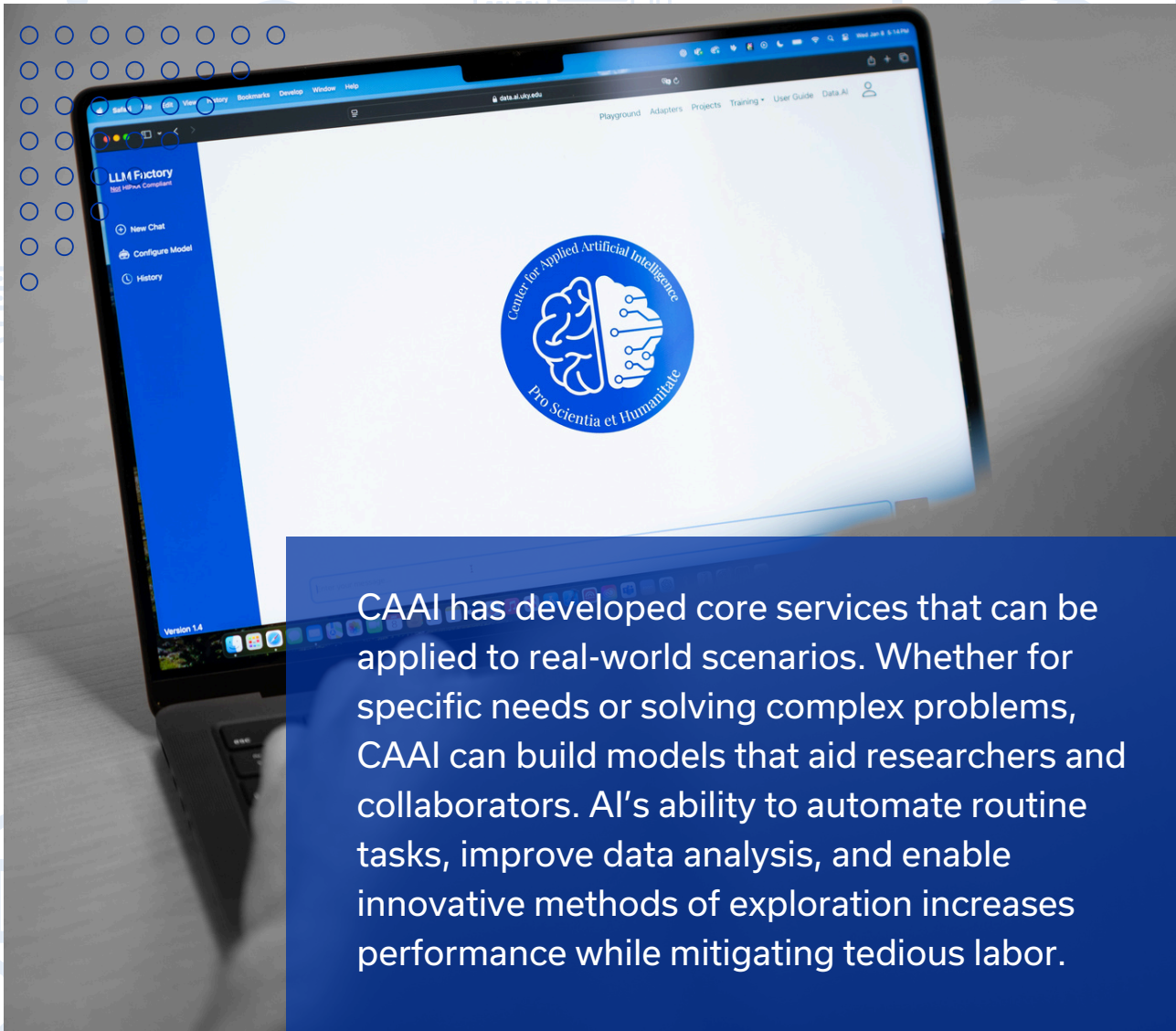
- Personalized Learning & Career Agent: Assesses individual goals to dynamically create and manage personalized learning paths, curate resources, and guide users toward relevant educational or career opportunities in Kentucky.
- AI Research Assistant Agent: Accelerates research by parsing literature, summarizing findings, suggesting experimental designs, managing data, and assisting in drafting research outputs.

A few projects exploring agentic AI:

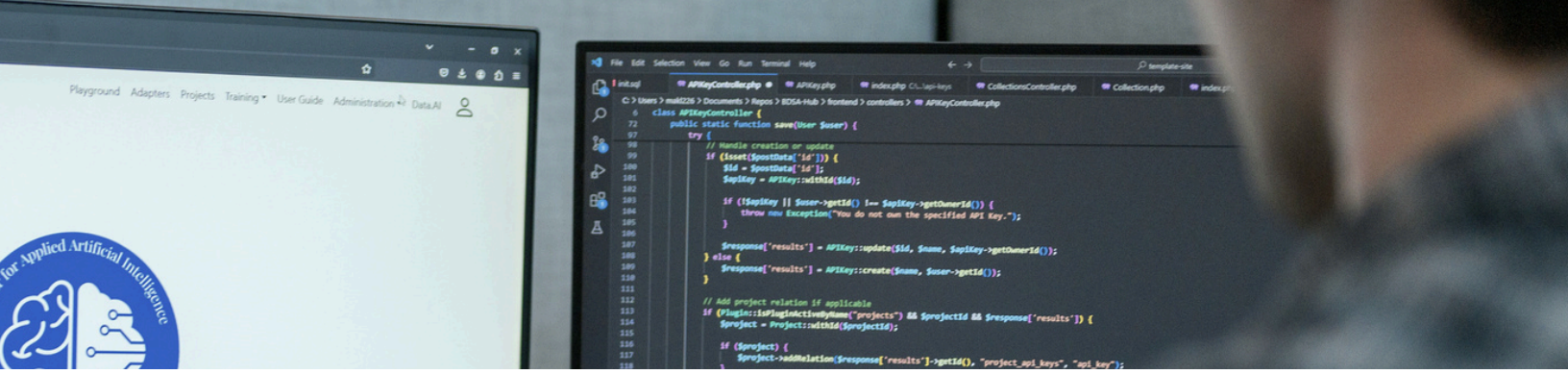
- *Virtual Lab Assistant:* Multi-agent system for research data, software development, and agent-based research project development
- *Knowledge Graph Explorer*: Agentic search, query, and exploration of large complex datasets
- *HL7 FHIR (EPIC) Explorer:* Agentic gateway to EMR data functioning as patients and providers
- *SmartState Systems*: Automate patient/research participant information gathering, conversation, and assessment useing text messages and chat

Services

CAAI provides core services to support research and innovation.



CAAI has developed core services that can be applied to real-world scenarios. Whether for specific needs or solving complex problems, CAAI can build models that aid researchers and collaborators. AI's ability to automate routine tasks, improve data analysis, and enable innovative methods of exploration increases performance while mitigating tedious labor.



CAAI Services

LLM Factory

Democratizing Access to Secure Large Language Models

Accepted Paper
Klusty, M. (2025, March 11). Institutional Platform for Secure Self-Service LLM Exploration. AMIA Informatics Summit

LLMs require significant investments in compute infrastructure, as well as specialized technical knowledge. The potential to advance research through the use of LLMs are restricted due to availability of resources and data security. CAAI's LLM Factory provides a secure, locally hosted platform where users can upload their own datasets, train adapters by layering data on a base model, privately configure and explore models, and expose models to external, OpenAI compatible API. LLM Factory supports the latest multi-modal and advanced reasoning models. The system offers researchers a free and secure alternative to public, commercially available LLM services.

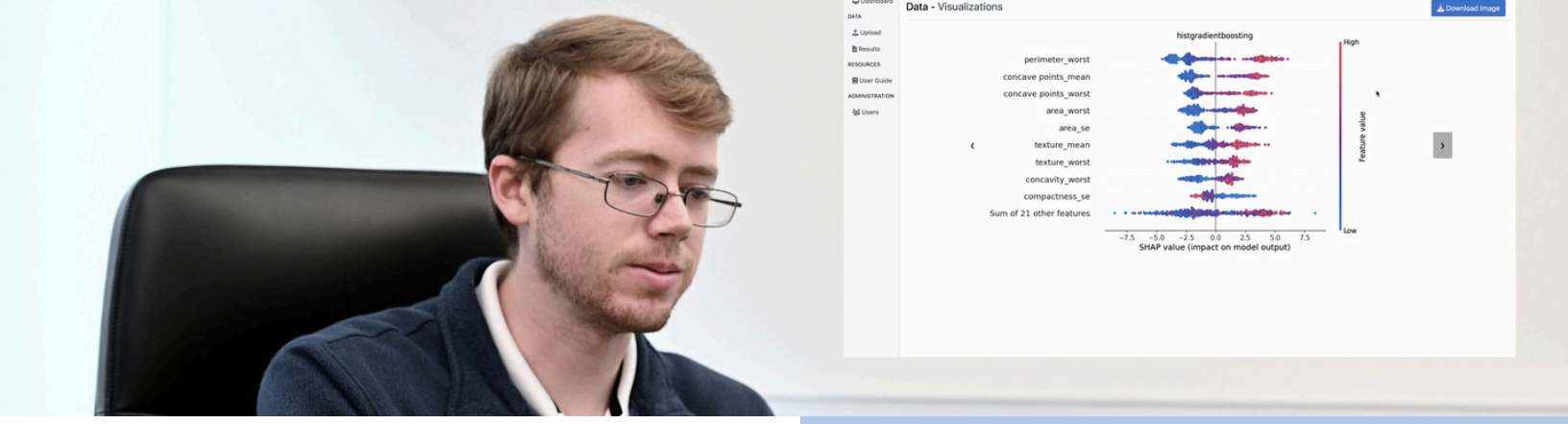
Key features of LLM Factory:

- Users can control, flexibility, and security without a programming or technical background
- Researchers can train models with the assurance data is secure in a NIST-compliant facility
- Open AI industry-standard API endpoints provides interoperability with other libraries, tools, and systems
- CAAI staff offer support to users working on the platform independently

A few of the many experimental projects supported by LLM Factory include:

- *One Good Choice*: A tool that encourages healthier decisions, developed with University Health Services and the College of Health Sciences.
- *Synthetic Personas*: Conversational AI agents that make remote training interactive, in collaboration with the Center for Population Health and Creative Link for Digital Health, as well as an application for the Office of Medical Education.
- *CELT Look-Up Tool*: Enables conversational navigation of CELT's resources and website.

hub.ai.uky.edu/llm-factory/



CAAI Services

CLASSify

Published Paper

Mullen, A. D., Armstrong, S. E., Talbert, J., & Bumgardner, V. C. (2024). CLASSify: A Web-Based Tool for Machine Learning. AMIA Summits on Translational Science Proceedings, 2024, 364. https://pmc.ncbi.nlm.nih.gov/articles/PMC11141843/

Making Machine Learning Accessible for Clinical Staff

Clinicians often produce large amounts of data and classifying it is key to gaining insights or identifying trends that could lead to improvements in patient care. However, classifying data is a time-consuming process and leveraging AI to address this challenge typically requires technical expertise. CLASSify simplifies machine learning (ML) by providing an easy to use web-based platform where users can train and evaluate ML classification models on any tabular data.

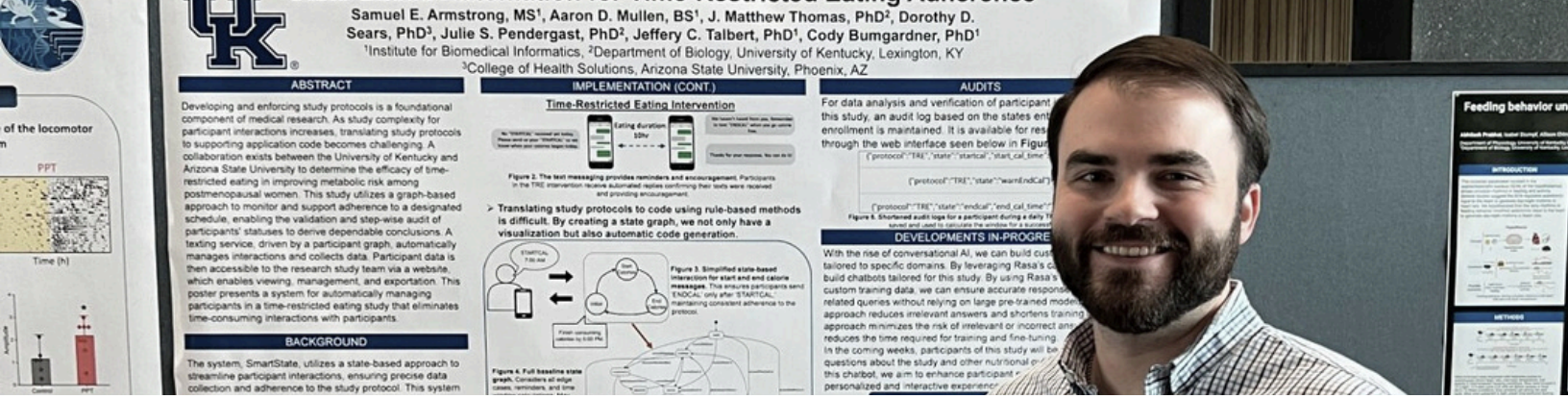
Key features of CLASSify:

- Requires no technical expertise
- Customizable training parameters
- Results in tables or visualizations
- Synthetic data generation to bolster imbalanced class labels or create new datasets
- Explainability scores for deeper insights
- Easy model comparison for faster decision-making

A few of the many experimental projects supported by CLASSify include:

- College of Medicine researcher evaluating immune responses in people with dementia.
- Institutional Research, Analytics & Decision Support office predicting who will apply to UK using admissions data.
- College of Pharmacy researcher predicting patient risk for medication non-adherence and poor vascular risk factor control using claims and EHR data.
- College of Medicine researcher studying muscle-specific microRNA-1

hub.ai.uky.edu/classify/



CAAI Services

Accepted Paper & Presentation
Armstrong, S., et. al (2025, March 12). SmartState: An Automated Research Protocol Adherence System. AMIA Informatics Summit

SmartState

Reducing Researcher Workload & Improving Participant Compliance with Study Protocols

Enforcing study protocols and ensuring participant compliance is vital but often requires costly software or manual effort. To address these challenges, CAAI developed SmartState, an automated protocol adherence platform that improves compliance and streamlines manual processes. Virtual agents are used to guide participants through protocols, send email/text reminders, and document progress.

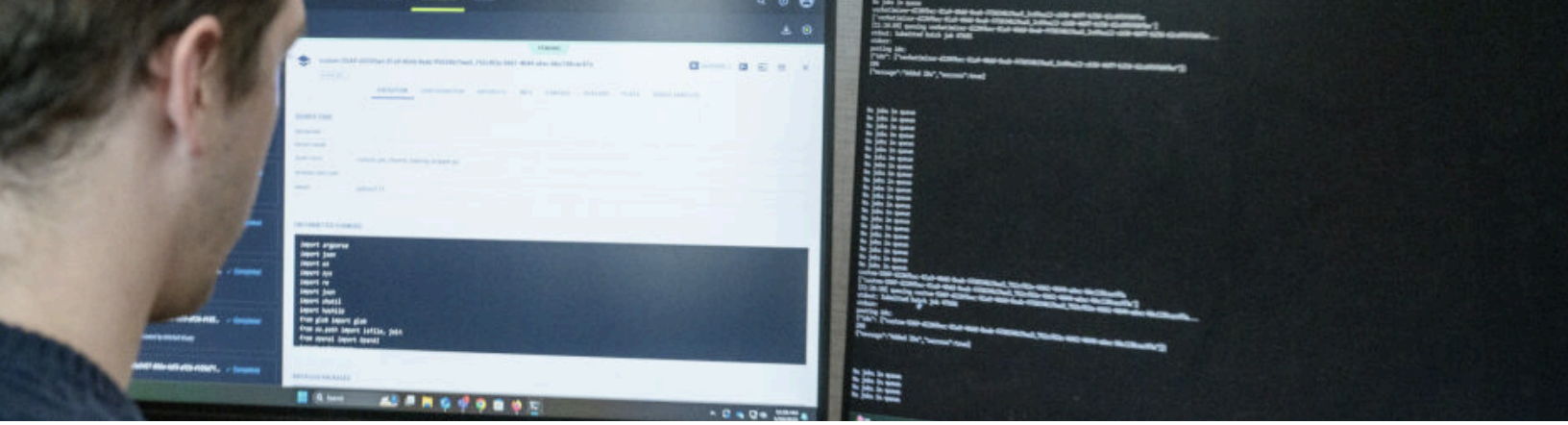
Key features of SmartState:

- Automated participant management reduces researcher workload with tools to track interactions, collect data, and prevent protocol deviations
- AI-powered communication enables natural language interactions to simplify participant engagement and data extraction
- Real-time updates send timely prompts and record responses to ensure compliance
- Web-based administration provides researchers with seamless access to logs, reports, and messaging utilities
- Scalability supports large studies with detailed audit trails to resolve disputes and enhance accountability

Clinical Research projects currently using SmartState:

- Time-Restricted Eating Intervention in Normal and Cognitively Impaired Postmenopausal Women
- Time-Restricted Eating and Sleep Intervention in College Students
- Optimization of Preoperative Treatment & Interactive Medical Assistance for Learning Cardiothoracic Surgery (OPTIMAL CT)
- Plant-Based Diet for Diabetes Prevention (PDDP)

caai.ai.uky.edu/model-based-programming-for-research-protocols/



CAAI Services

Accepted Paper & Presentation
Logan, W. V., et. al (2025, March 13). Toward Automated Clinical Transcriptions. AMIA Informatics Summit

CAT-Talk

Using AI to Drive Innovation in Medical Transcription

The increasing demand for administrative documentation in healthcare takes time away from patient care and contributes to staff burnout. Commercially available transcription services often struggle with complex medical conversations, come with high costs and pose data security concerns. CAT-Talk, CAAI's web-based transcription platform, addresses these challenges by providing accurate, speaker-labeled, time-stamped transcriptions from audio and video recordings. CAT-Talk significantly reduces the time spent on manual transcription, giving clinicians more time to focus on patient care.

Key features of CAT-Talk:

- Fast, accurate transcriptions with error flags for rapid human verification
- Integration with other LLM tools for summarization, theme extraction, and highlighting key takeaways
- Hosted on secure, UK-owned NIST-53, HIPAA-compliant infrastructure with data encrypted at rest and in transit
- Customizable tools tailored to clinicians' needs

A few of the many experimental projects currently supported by CAT-Talk:

- *SpeakEZ*: Transcribing interviews from UK's Nunn Center for Oral History.
- *Medical Transcriptions*: Transcribing and summarizing synthetic patient-provider conversations.
- *Translation Tools*: Supporting a UK History professor in transcribing and translating Turkish interviews to English.

hub.ai.uky.edu/transcription-services/

Projects

Applied AI solutions improve productivity & revolutionize data potentials.

> *I have been collaborating with CAAI for the past six months to develop the SpeakEZ system, which I have envisioned for several years, but had no way to implement. That is, until I connected with CAAI. I do not exaggerate when I say my* ***collaboration with CAAI has changed everything for my center.***

Doug Boyd

Director, Louie B. Nunn Center for Oral History

University of Kentucky Libraries

Funded Research

HealthCare

Funded
EXCEL Research Initiative

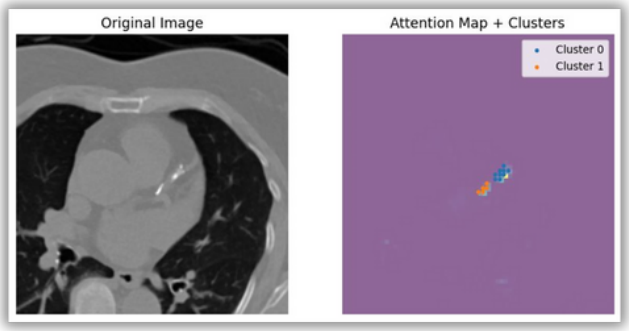
HeartLens

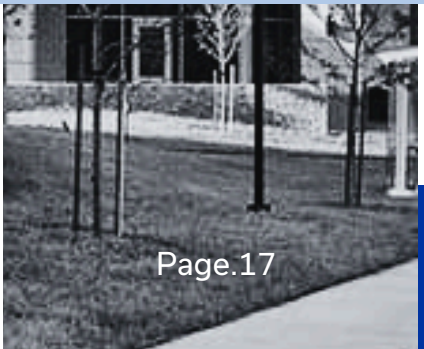
Improving the Accuracy of Cardiovascular Diagnostic Tools

Coronary artery calcification (CAC) scoring helps assess cardiovascular disease severity but relies on radiologists manually reviewing CT scans to identify small, easily overlooked calcium deposits. This process is critical for early detection and intervention but is prone to human error. Through an EXCEL Research Committee effort, HeartLens is a collaborative project involving the UK Divisions of Radiology & Cardiology, the Department of Computer Science, and CAAI. The goal of Heartlens is to develop an AI-based tool to assist radiologists in reviewing CT scans, detecting CAC, and informing cardiologists' diagnostic and treatment decisions. Early detection of calcification enables more timely, less invasive interventions.

HeartLens uses the DINO Transformer Model, a computer vision AI applied to identify patterns in CT scans without requiring manual labeling. By analyzing UK and Stanford University datasets, the model extracts and highlights calcified areas in coronary arteries, color-coding them by severity to aid clinical review. These visual cues support tasks such as classification and segmentation and can integrate with LLMs to enhance diagnostic accuracy. Beyond CAC scoring, the tool has potential applications for detecting other heart conditions and the long-term goal is to make it available as a web-based tool within CAAI's self-service platform, CLASSify. This would streamline clinical decision-making, improve early disease detection, and foster further research.

***HeartLens** has the potential to detect calcium deposits in the heart earlier, leading to timelier interventions and less invasive and aggressive patient treatment options.*





caai.ai.uky.edu/heartlens/

Funded Research

NIH National Institutes of Health
R01DA057605-01
R01DA057605-01S1
R01DA057605-01S2

RADOR

Rapid Actionable Data for Opioid Response in KY

Opioid use disorder (OUD) remains a persistent public health crisis and epidemic. In Kentucky, 79% of drug overdose fatalities involve opioid substances. Efforts to reduce opioid overdoses and support opioid overdose control and prevention are often limited by delays in data availability, fragmented data systems, and varying local needs. To address this challenge, the Rapid Actionable Data for Opioid Response in Kentucky (RADOR-KY) team is building a statewide surveillance system to provide real-time data for effective opioid crisis management.

By aggregating Emergency Medical Services (EMS) response data at multiple geographical levels, RADOR-KY forecasts opioid overdose incidents, enabling state and local agencies to allocate resources and target interventions proactively. This predictive approach helps identify areas with rising overdose risks, ensuring timely responses that could reduce fatalities and improve patient outcomes.

CAAI provides key research support through machine learning and forecasting methods, enhancing the system's ability to deliver accurate, actionable insights. RADOR-KY's scalable system allows for ongoing improvements in data quality and responsiveness, offering valuable support in addressing Kentucky's opioid crisis.

RADOR-KY
Rapid Actionable Data for Opioid Response
University of Kentucky

Presented at

APHA
American Public Health Association
For science. For action. For health.

Harris, D. (2024, Oct. 29). Responding to evolving public health data needs: Building rapid actionable data for opioid response in Kentucky. https://apha.confex.com/apha/2024/meetingapp.cgi/Paper/554240

National Institutes of Health
5R21NS131903-02
5R01NS079507-10
5R01NS079507-09

Funded Research

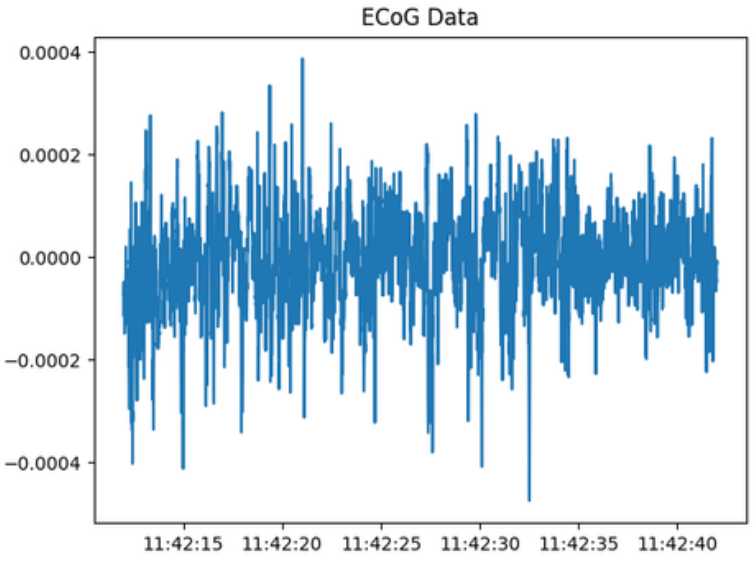
Multi-Modal ML Framework

Automated Seizure Detection

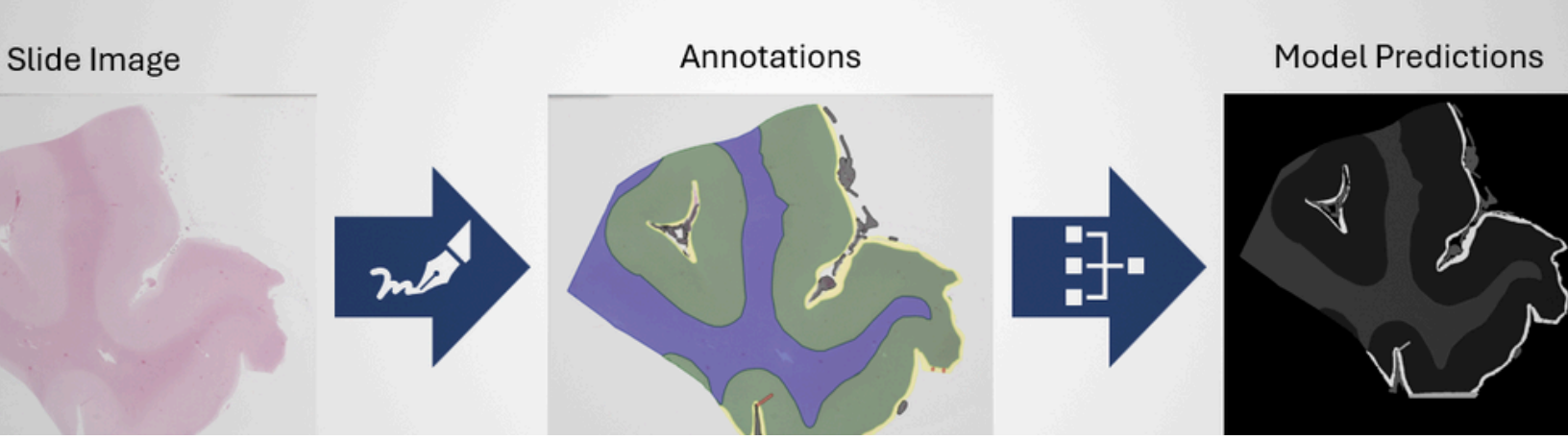
Seizure detection in epilepsy research faces significant challenges due to class imbalances, where non-seizure periods vastly outnumber seizure events, leading to high false-positive rates with traditional methods. To address this, CAAI developed a multi-modal machine learning framework that integrates data from multiple sources to enhance detection accuracy:

- Electrocorticography (ECoG) readings
- Piezoelectric motion sensor data
- Video recordings

By leveraging diverse data sources, it reduces false positives and enhances the reliability of seizure detection. Additionally, the system enables automated, continuous monitoring of laboratory animals, improving the efficiency of epilepsy studies and supporting more robust research outcomes.



caai.ai.uky.edu/multi-modal-machine-learning-framework-for-automated-seizure-detection-in-laboratory-rats/



Funded Research

NIH National Institutes of Health
U24NS133945-01
U24NS133949-01

Brain Research & Diagnostic Platform

Internationally Federated Platform for AI Research and Diagnostics

The development of AI and ML models for neuropathology is often hindered by the scarcity of high-quality, well-annotated training data. Insufficient data makes it challenging to train robust models, resulting in suboptimal performance and impeding progress in research.

The Brain Digital Slide Archive (BDSA) project aims to address these challenges by enabling the integration of AI into neuropathology. BDSA is an international collaboration of research institutions, working to design a federated system for sharing neuropathology slide images and annotations. The project focuses on developing tools that facilitate seamless sharing of slide images between partner institutions and streamline the annotation process. These annotated datasets will inform AI models capable of accurately segmenting and detecting anomalies in neuropathology images, thereby accelerating research and innovation in the field.

The methodologies and tools developed through the BDSA project have applications far beyond neuropathology. The same federated systems and AI-powered approaches can be adapted for use in other domains that rely on large-scale image analysis and annotation, such as oncology, radiology, and other areas of medical imaging. Addressing foundational challenges in data sharing and annotation, the BDSA project has the potential to drive AI innovation across a broad spectrum of disciplines.

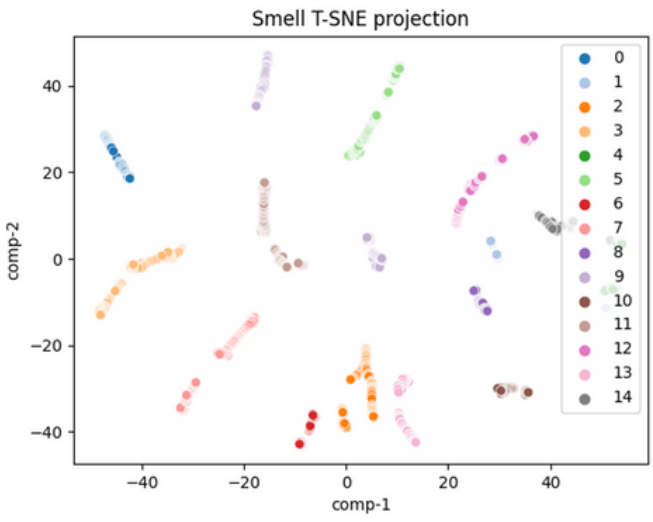
Funded Research

Environmental Monitoring

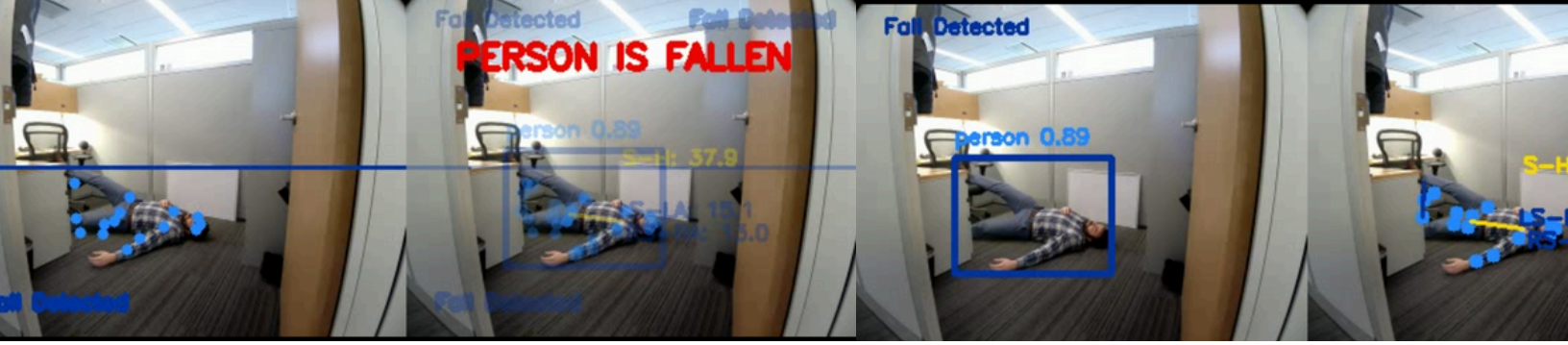
Robotic Sensing Platforms

Physical AI, also known as embodied AI, involves AI systems controlling and learning from physical hardware like robotic arms, mobile robots, and medical devices. In healthcare, this can include surgical robots that learn to perform precise procedures, rehabilitation robots that adapt to each patient's needs, and personal health assistants to passively monitor health data and actively assist patients.

CAAI has integrated a smell sensor with our "Temi" robot, enabling it to gather scent data across 64 smell channels, which can be used to identify specific odors in real-time. By combining Temi's mobility with this advanced smell detection, the robot can monitor environments such as assisted living homes or hospital floors, identifying unexpected gases or abnormalities. In assisted living settings, for example, Temi can track bodily waste functions and alert care staff to potential issues. Additionally, the real-time temperature and humidity monitoring feature offers valuable insights in temperature-sensitive environments, like hospital floors, allowing for timely alerts when conditions deviate from the norm.



https://hub.ai.uky.edu/temi-the-robot-who-could-smell/



Experimental Research

Reasoning Robots

LLM Powered Health Assistants

CAAI has integrated multi-modal AI models, robotic platforms, and sensor devices, to bring AI into the physical world. Our Temi robot is capable of navigating complex environments like hospitals to assist in patient way finding and patrol patient rooms. Making use of onboard devices, the robot allows models to see, speak, and listen. Additionally, Temi streams live video feeds processed by models to detect when individuals have fallen, adding to it's ability to effectively monitor clinical environments.

Powered by LLM Factory, Temi engages in natural conversations and responds to user requests during patrols. The LLM serves as the robot's brain, managing goals and choosing the correct actions based on the environmental context. By leveraging new foundational models, Temi's reasoning capabilities and autonomous decision-making capabilities are continuously improving. Through the establishment of LLM-driven robotic control systems, CAAI is paving the way for the clinical use of low-cost humanoid robots, which are anticipated to be available in late 2025 and reach mass availability in 2026.

Experimental Research

Forecasting Emergency Departmental Arrivals

Applying AI to Support Operational Decision-Making

The Emergency Department Prediction project utilizes patient arrival data from the University of Kentucky's Chandler and Good Samaritan hospitals. Through this data, CAAI can determine an accurate count of how many walk-ins the emergency departments (EDs) at each location see each day. The goal of the project is to accurately forecast the number of walk-in patients that will arrive at each ED in a given day, up to a week in advance. With these predictions, informed decisions could be made by hospital staff to determine, for example, how many transfer patients to accept on that day to avoid overwhelming the hospital or the staffing needs in the ED that day.

The forecasting is performed using a Temporal Fusion Transformer model architecture, which is a deep learning method specifically built for time series forecasting. This model can learn from previous trends in the data to create forecasts for future arrivals. It can use temporal relationships between the data to identify trends and patterns. For example, over the course of an average week, the number of ED arrivals will follow a regular pattern over each day of the week that can be modeled and forecasted into the future. Additional variables, called covariates, can also be used to improve the prediction accuracy. For example, we use local weather data, such as temperature and precipitation, as these factors have also been found to be associated with changes in ED arrivals. By leveraging these forecasting capabilities, the Emergency Department Prediction Project supports proactive resource planning in emergency healthcare settings.

Multi-Modal

AI-Ready Data Trusts

Multi-modal AI applications present several challenges, including the processing, storage, and distribution of large, protected datasets across distributed computational resources. CAAI develops, deploys, and operates AI-ready data platforms to manage and process multi-modal data (genomics, imaging, signal, and tabular information) across multiple locations. Using an agent-based system coupled with open-source automated machine learning (ML) and review tools allows not only dynamic load-balancing and cross-network operation, but also the development of research and clinical AI models using the data managed by the platform.

PROVIDED RESOURCES

Slide Image
High-resolution slide images stored in open formats, with associated image metadata

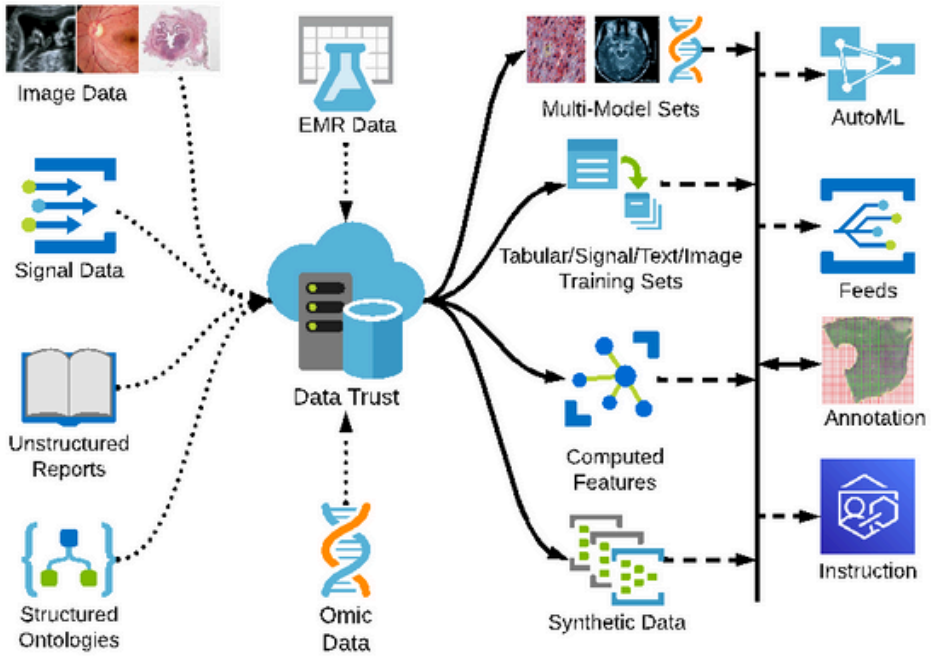
Case Reports
Slide gross details and corresponding final reports

Associated Ontologies
Slide SNOMED and ICD codes

Image Analysis
Slide, tile, and cell-level metrics derived from image analysis

AI Models
Software and templates to apply common deep learning models for Natual Language Processing (NLP) and image analysis will be provided

Data Management Tools
Data query methods, tools to build training sets, and support for common data transfer tools



https://pubmed.ncbi.nlm.nih.gov/37350884/

Agentic AI

PubMed Literature Agent

Uncovering University of Kentucky Studies that “Meet People Where They Are”

UK is committed to research that embodies the "meet people where they are" healthcare principle, which involves providing empathetic care in settings such as patients’ homes, encampments, or other non-traditional environments. To support this principle, UK aims to identify evidence-based literature published by UK researchers that reflects this approach. However, traditional database searches that rely on metadata tags and keyword matching often fall short when addressing nuanced and non-standardized concepts.

CAAI has developed a solution that leverages artificial intelligence agents with LLMs to improve searching the PubMed database. The agent uses tailored prompt engineering to focus an LLM on specific parts of the text, using deep semantic analysis for contextual alignment.

From the initial filtered dataset of 2,997 articles, the model identified 227 studies utilizing non-traditional outreach methods or delivery of healthcare in unconventional locations. By contextualizing research methods within the specified principle, the agent significantly improved the precision of the extracted information, resulting in a more targeted set of results. The inclusion of selection rationale in the standard output allows a top-level view for quicker human evaluation. The deployment of this AI-driven approach has potential to revolutionize literature search practices, particularly in identifying studies that prioritize health equity through non-traditional outreach methods. Furthermore, the methodology can be adapted for broader applications where nuanced contextual understanding is critical for information retrieval.

Experimental Research

OPTIMAL CT

Optimizing Patient Adherence to Pre-Surgical Treatment

Beta blockers and other medications administered prior to cardiovascular surgery have been shown to reduce adverse outcomes for patients. The Society of Thoracic Surgery maintains a publicly available database of adherence rates across the country. Nationally, 94% of patients take their prescribed medications 24-hours prior to surgery, however, for University of Kentucky Healthcare patients, that number decreases to 78.3% across a 3-year period. This gap highlights an important opportunity for improvement.

In collaboration with UK Healthcare, CAAI is developing OPTIMAL CT, a solution that uses virtual assistants and messaging to help patients follow pre-surgical treatment plans and enhance engagement. The intention is to virtually guide patients through a treatment plan to improve beta-blocker medication compliance.

Powered by CAAI's SmartState platform, OPTIMAL CT monitors patient progress through specific phases of the prescribed per-surgical treatment plan. The system automates communication through text and email reminders and uses natural language processing to record patient responses in real-time, storing all interactions in a secure database.

Additional long-term objectives include developing a repeatable process and solution that could be applied to other common preoperative patient issues such as discontinuance of blood thinners, oral antibiotics administration, or wound site bathing.

https://caai.ai.uky.edu/optimal-ct/

Experimental Research

CMS Star Quality Investment Optimizer

Supporting Strategic Investments in Healthcare Quality Improvement

The Center for Medicaid and Medicare (CMS) STAR rating system is a quality measurement framework that assigns hospitals a rating from 1 to 5 stars based on 48 different quality measures across five categories: mortality, safety, readmission, patient experience, and process measures. This rating system has significant financial implications for hospitals through Medicare payment adjustments in programs like the Hospital Readmission Reduction Program (HRRP) and the Hospital Value Based Purchasing Program (HVBP), while also influencing public perception and patient choice.

The CMS Star Quality Investment Optimizer system standardizes and weighs these measures to create a single, easy-to-understand rating that helps patients compare hospitals and make informed healthcare decisions. This project includes the development of a Python-based calculator tool that significantly improves the speed of existing SAS-based calculations, allowing for high-speed simulation of the scoring impacts of hypothetical strategic investments. The tool allows hospitals to input their statistics and receive detailed analysis of their performance, including the impact of individual measures on their overall score. The presentation also analyzes the University of Kentucky's specific performance, identifying key negative and positive features affecting their rating, and demonstrates how a 10% improvement in certain metrics could significantly impact their score.

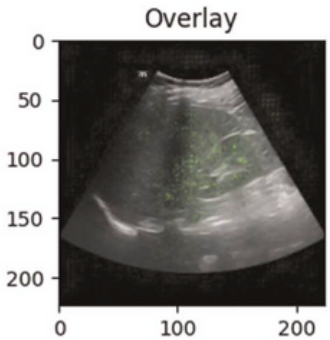
data.cms.gov/provider-data/topics/hospitals/overall-hospital-quality-star-rating

Experimental Research

FAST Ultrasound

AI Assisted Evaluation of Focused Assessment with Sonography in Trauma

The focused assessment with sonography in trauma (FAST) is an ultrasound protocol used by over 96% of trauma 1 medical centers to identify the location of life-threatening hemorrhage in a hemodynamically unstable trauma patient. This project provides an AI model to assist in interpretation of the FAST examination abdominal views, as it pertains to adequacy of the view and accuracy of fluid survey positivity. FAST images were acquired from the UK Chandler Medical Center, a quaternary care level 1 trauma center with more than 3,500 adult trauma evaluations. The model can detect positivity and adequacy of FAST examinations with 94% and 97% accuracy, aiding in the standardization of care delivery with minimal expert clinician input. This work demonstrates AI as a feasible modality to improve patient care imaging interpretation accuracy and demonstrates its value as a point-of-care clinical decision-making tool.



Published Paper

Levy, B. E. MD, MPH; Castle, J. T. MD, PhD; Virodov, A. MS; Wilt, W. S. MD; Bumgardner, V.K. PhD; Brim, T. DO; McAtee, E. DO; Schellenberg, M. MD, MPH; Inaba, K.i MD; Warriner, Z. D. MD. (2023) Artificial intelligence evaluation of focused assessment with sonography in trauma. *Journal of Trauma and Acute Care Surgery* 95(5):p 706-712, | DOI: 10.1097/TA.0000000000004021

pubmed.ncbi.nlm.nih.gov/37165477/

Experimental Research

Extubation Readiness in Preterm Infants

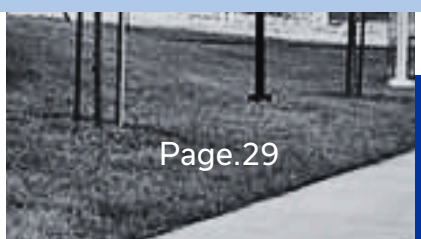
Clinical Decision Support from Time Series Signal Data

Machine learning analysis has the potential to enhance prediction accuracy of extubation readiness in preterm infants while utilizing readily available data streams from bedside pulse oximeters and ventilators.

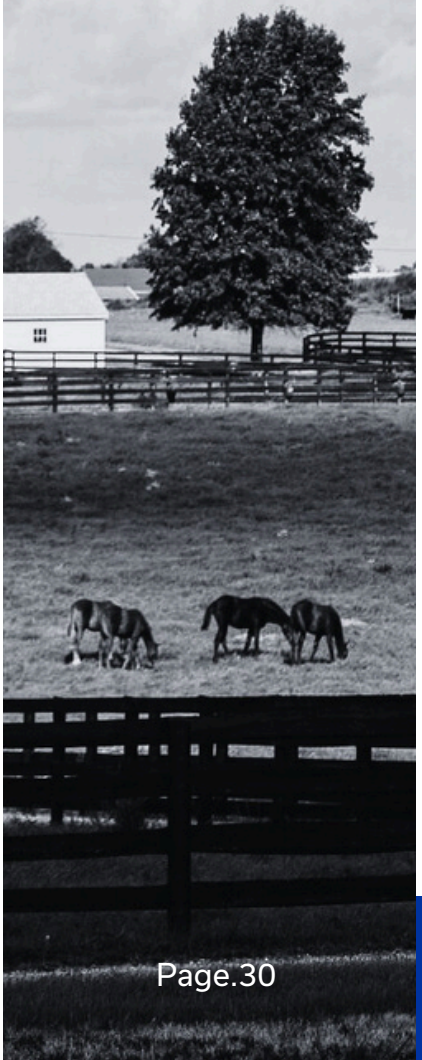
The objective of this study was to predict extubation readiness in preterm infants using machine learning analysis of bedside pulse oximeter and ventilator data. This observational study used prospective recordings of oxygen saturation (SpO2) and ventilator data from infants <30 weeks of gestation age. Research pulse oximeters collected SpO2 (1 Hz sampling rate) to quantify intermittent hypoxemia (IH). Continuous ventilator metrics were collected from bedside ventilators. Data modeling was completed using unbiased machine learning algorithms. Three model sets were created using the following data source combinations: (1) IH and ventilator (IH + SIMV), (2) IH, and (3) ventilator (SIMV). Infants were also analyzed separated by postnatal age (infants <2 or ≥2 weeks of age). Models were compared by area under the receiver operating characteristic curve (AUC).

A total of 110 extubation events from 110 preterm infants were analyzed. Infants had a median gestation age and birth weight of 26 weeks and 825 g, respectively. Of the 3 models presented, the IH + SIMV model achieved the highest AUC of 0.77 for all infants. Separating infants by postnatal age increased accuracy further achieving AUC of 0.94 for <2 weeks of age group and AUC of 0.83 for ≥2 weeks group.

Published Paper
Brasher, M., Virodov, A., Raffay, T. M., Bada, H. S., Cunningham, M. D., Bumgardner, C., & Abu Jawdeh, E. G. (2024). Predicting Extubation Readiness in Preterm Infants Utilizing Machine Learning: A Diagnostic Utility Study. *The Journal of pediatrics*, 271, 114043. |DOI: 10.1016/j.jpeds.2024.114043



pubmed.ncbi.nlm.nih.gov/38561049



CAAI Services

AGRiGUIDE

Agriculture AI Development

The Cooperative Extension Service, part of the University of Kentucky Martin-Gatton College of Agriculture, Food, and Environment, is designed to extend resources, services, and research-based knowledge to farmers, communities, and families across the state. Working in collaboration with the College and Extension Service, CAAI provides an LLM to help Kentucky's ~300 extension agents and citizens they support find relevant information, navigate the different College of Agriculture websites and databases, and provide answers to questions in a conversational manner.

Leveraging Retrieval-Augmented Generation (RAG) techniques, CAAI can easily create vector datastores from papers, PDFs, webpages, and data sets to retrieve the nearest semantically related and contextually relevant documents for a particular search query. The LLM can then use these records to enhance the prompt by giving it the relevant context needed to answer queries in a fashion that is consistent with the information stored in the vector datastore. The result is a more informed generative response.

Additional experimental projects utilizing RAG techniques include:

- *AI-Aided Diagnostic Tool*: Helping clinicians group individuals based on symptoms and labs, improving triage efficiency
- *Graduate Studies Lookup*: Assisting Directors of Graduate Studies by quickly answering questions with information from the graduate school manual
- *KyStats*: Enabling educators to conversationally explore and gain insights from large educational datasets

caai.ai.uky.edu/agriculture-ai-development/

The Team

CAAI promotes an environment and culture of experimentation, exploration, and career development.

The 37 members of CAAI include high school, undergraduate and graduate students, as well as entry-level and seasoned professionals. Roles within the department include marketing communications, user experience, program and technical management, and software development. CAAI thrives by fostering collaboration between early-career and late-career professionals, creating a dynamic environment where new thinking and seasoned expertise intersect. This blend of diverse skill sets and experience enhances creativity, drives innovation, and increases complex problem solving capabilities while bolstering a culture that mentors and accelerates growth for all.

Since 2021, CAAI has supported **8** undergraduate students, **6** high school students, and has **7** staff members currently enrolled in graduate STEM programs.

The Team

CAAI Leadership

Cody Bumgardner, PhD

Director, CAAI

Assistant Dean, Artificial Intelligence & Data Science, UK College of Medicine
Division Chief for Pathology Informatics Senior Fellow for Innovation, Kentucky Council On Postsecondary Education (CPE)
Co-Director of the UK AI in Medicine Alliance

Doctor of Philosophy, Computer Science, University of Kentucky
Bachelor of Science, Computer Engineering, University of Kentucky

As a computer scientist in medicine, Cody Bumgardner's primary interest is in the advancement of distributed systems, high-performance computing, and artificial intelligence (AI) in healthcare. Prior to his current appointment, he held several technology leadership positions including Director of Enterprise Systems and Development, Chief Technology Architect, and Director of Research computing. In addition to a twenty-year career in technology architecture and operations, he has led numerous research efforts including international research federations in privacy-preserving data collection, contract support of national research infrastructure, and the development of clinical and research data management systems across laboratory, imaging, and genomic domains. He enjoys working on innovative projects at the intersection of AI, medicine, and distributed computing.

Jeffery Talbert, PhD

Director, Institute of Biomedical Informatics

Associate Director, UK Center for Clinical and Translational Science
Deputy Director, Rural and Underserved Health Research Center

Doctor of Philosophy,
Texas A & M University
Master of Arts,
Texas A & M University
Bachelor of Science,
Texas A & M University

Dr. Talbert is Professor and Division Chief in Biomedical Informatics at the UK College of Medicine. He is the Director of the Institute for Biomedical Informatics, a campus-wide interdisciplinary home for biomedical informatics across the University. Since 2014, he has been an Associate Director of the UK Center for Clinical and Translational Science (CCTS) and is the Deputy Director of the Center for Rural and Underserved Health Research. These leadership positions in University-wide, interdisciplinary research centers facilitate identifying and developing research teams focused on clinical interventions, health services research, and public health informatics using large administrative and clinical databases. His research specialization is public health informatics focused on the intersection of evidence-based policy and health care outcomes. Current research projects focus on big data approaches to reducing substance use disorder and designing analytic approaches to improve health outcomes for state Medicaid programs. His long-term career objective is to use big data informatics approaches to identify innovative policy solutions to prevent and treat substance use disorders. He has over 29 years of experience in health research, including serving as a research fellow for the US Congress, as a faculty member in Public Policy, Public Health, Pharmacy, and Medicine.

The Team

CAAI Leadership

Ken Calvert, PhD

Advisor - Research and Industry

Doctor of Philosophy, Computer Sciences,
University of Texas at Austin
Master of Science, Computer Science,
Stanford University
Bachelor of Science, Computer Science and Engineering,
Massachusetts Institute of Technology

Dr. Calvert is a distinguished computer scientist with a strong foundation in both academia and industry. He currently serves as an Advisor at CAAI, consulting on strategic initiatives and mentoring staff. From 1979 to 1984, Dr. Calvert was a member of Technical Staff at Bell Laboratories in Holmdel, New Jersey. He served as a faculty member in the College of Computing at Georgia Tech from 1991 to 1998. In 1998, he joined the UK faculty, where he became Department Chairperson in 2007. Recognized for his contributions to the field, Calvert was named a Fellow of the Institute of Electrical and Electronics Engineers in 2012. From 2016 through 2019, Dr. Calvert served at the National Science Foundation in the position of Division Director for the Division of Computer and Network Systems, in the Directorate for Computer and Information Science and Engineering. In that capacity he was responsible for a $230M annual research budget, including research programs in Networking, Computer Systems, Secure and Trustworthy Cyberspace, Cyber-Physical Systems, Smart and Connected Communities, Education and Workforce Development, and other priorities. Born and raised in Kansas City, Missouri, he has established a legacy of leadership and innovation in computer science.

Doyle Friskney, EdD

Advisor - Academic Technology

Doctor of Education, Educational Leadership,
Morehead State University
Master of Education, Educational Administration,
Xavier University
Bachelor of Arts, Education,
Thomas Moore College
Bachelor of Science, Education,
Cincinnati Bible Seminary

Dr. Friskney is leader in educational technology at the UK with a distinguished career spanning over 30 years. He currently serves as an Advisor at CAAI, advising on strategic initiatives and mentoring staff. As an administrator at UK, he oversaw critical initiatives such as designing advanced learning spaces, implementing statewide higher education networks, and integrating technology into the academic and administrative systems. In addition to his administrative leadership, Dr. Friskney has been an adjunct faculty member in the College of Communication and Information, where he has taught courses in leadership and entrepreneurship. Dr. Friskney is passionate about advancing access to quality education and fostering innovation in higher education. He enjoys mentoring students and collaborating across disciplines to create transformative educational experiences. He is dedicated to lifelong learning and exploring new applications of AI to revolutionize teaching and research.

The Team

CAAI Leadership

Melissa Rowe

Advisor - Technology Industry

Bachelor of Science, Marketing and Finance,
Georgetown College
Bachelor of Arts, Fine Arts,
University of Kentucky

Melissa Rowe serves as an industry advisor consulting on strategic initiatives and mentoring staff. With 30 years of experience in the technology industry, she has worked for start-ups, mid-sized companies, and large global corporations, including Amazon Web Services, Salesforce, and Dell. She has served in a variety of leadership and individual contributor roles throughout her career, encompassing business development, marketing, strategic planning, and product development. With a career focus on the public sector, she has subject matter expertise in health, human services, unemployment, workforce, and economic development. Melissa's superpower of seeing opportunity and patterns in complexity has enabled her to develop first to market solutions, new businesses, and key partnerships across her career. A fifth generation from Kentucky's Appalachian region, she is passionate about bringing economic and health equity to all people regardless of their geographic location, gender, ethnicity, or socio-economic status.

Caner Özcan

Advisor - Visiting Professor

Doctor of Philosophy, Computer Engineering,
Karabük University
Bachelor of Science, Computer Engineering,
Yıldız Technical University

Dr. Caner ÖZCAN was born in Karabük in 1986 and completed his primary, secondary and high school education in the same city. In 2008, he graduated from Yıldız Technical University, Department of Computer Engineering. In 2015, he completed his PhD studies and graduated and started to work as a faculty member at Karabük University, Department of Computer Engineering in January 2016. In 2017, with the support of Tübitak, he worked as a visiting professor at Purdue University in the USA for 10 months. His main research interests include image processing, machine learning, deep learning and remote sensing. He is a field editor in Jestech journal and a referee in many field journals and projects. Within the scope of Deneyap Technology Workshops, he prepared Software Technologies course contents and books for middle and high school students. In 2020, he received TUBITAK BIGG Entrepreneurship support and founded the artificial intelligence company named SimurgAI in Karabük University Technopark. He is a member of IEEE (2012-) and SPIE (2014-) scientific organizations. He provides consultancy services to various institutions in the fields of software, image processing and artificial intelligence. After September 2023, he worked as the Coordinator of Karabuk University Scientific Research Projects Coordination Unit for 10 months. He continues to work as a faculty member at Karabuk University Software Engineering Department. As of July 2024, he continues his research on AI in the field of health as a visiting professor at the University of Kentucky for 12 months with the support of Tübitak.

The Team

Program & Data Management Communications

Caroline Leach

Data Management Specialist

Bachelor of Science, Physics and Astronomy,
University of Denver

With a background in physics and experience in start-ups, ed-tech, and the non-profit world, Caroline brings an understanding of complex systems and offers an interdisciplinary perspective. As a Data Management Specialist, she explores and evaluates the potential of Large Language Models for educational and training applications. She collaborates closely with talented researchers, faculty, and engineers to develop innovative AI solutions. Highly organized with strong communication skills and educational expertise, she also writes documentation and supports promotional efforts. Currently pursuing her Master's in Data Science at the University of Kentucky, Caroline is deepening her expertise in data-driven approaches and advanced AI methodologies. Being part of the CAAI team places her at the intersection of innovation and impact, and she finds it rewarding to help people develop and implement innovative AI technology.

Emily Collier

Data Management Specialist

Master of Science, Library Science,
University of Kentucky
Bachelor of Fine Arts, Art History,
School of the Art Institute of Chicago

Emily has a background in digital archiving and data preservation. She was a key implementor in developing the UK Web Archiving Program in the Special Collections Research Center (SCRC), authoring technical manuals, policies, and procedures that established the program as a now essential part of the SCRC. She has presented this work internationally, and published articles advocating the value of web archiving to educational institutions. She has also taught for the College of Communication at UK and is currently an educator for the Society of American Archivists. With a strong foundation in project management, public speaking, and data management/preservation, Emily assists in various areas within the CAAI, collaborating with researchers, engineers, and other university members to develop AI solutions with an eye towards preserving gathered data for future access needs.

The Team

Program & Data Management Communications

Kristen Hankins

Project Specialist

Master of Arts, Art History,
University of Louisville
Bachelor of Arts, Arts Administration,
University of Kentucky

Kristen Hankins is a Project Specialist with an academic foundation in the arts. Kristen earned a Master of Arts in Art History, with a thesis on the impact of André Breton's French Surrealism on American animation and film. Before pursuing graduate studies, Kristen obtained a Bachelor of Arts in Arts Administration, complemented by minors in Art History and Music Theory/History. This multidisciplinary education allows the development of a comprehensive understanding of curation and management skills that are transferable within all fields. As a Project Specialist, Kristen excels in facilitating effective communication within complex experimental initiatives, navigating uncertainties, understanding the dynamic needs of each project, and cultivating a collaborative environment that drives ingenuity.

Harrison Whaley

Content Strategist

Harrison is passionate about serving people through technology and media. He draws upon his experiences as a business owner of his company ThePhaseTwo Media to approach problems from various angles. Harrison aims to deliver content that yields results. Photography and videography are specializations of his. From weddings to real estate, Harrison has captured it all. CAAI's successful media presence can be attributed to Harrison's efforts. He has collected many hours of footage for tutorial videos of CAAI's tools. Working directly with software developers and the general public, he showcases the work CAAI develops clearly and unambiguously. Harrison continuously brings fresh ideas to the table and has a keen eye for detail.

The Team

Engineering & Data Science

Samuel Armstrong

Senior Software Engineer, Technical Lead

Master of Science, Computer Science,
University of Kentucky
Bachelor of Science, Computer Science,
University of Kentucky

Samuel is the Technical Lead for the CAAI and a part-time Ph.D. student in Computer Science. Since the center's inception in 2023, he has been actively involved in nearly every project, contributing to advancements in AI applications within healthcare. He began as an undergraduate intern at the Institute for Biomedical Informatics (IBI) under Dr. Cody Bumgardner. His early work focused on genomic data analysis and developing text-to-speech and audio-to-text applications. After graduating, he transitioned to a staff position as a programmer, where he played a critical role in research projects exploring the application of AI in medicine. When the Center was launched, Samuel was promoted to Technical Lead. In this role, he directs the efforts of a team of developers and undergraduate interns, contributing directly to the success of the Center's projects and advancing the application of AI across Kentucky. Samuel's research focuses on the intersection of AI and healthcare. His paper, "SmartState: An Automated Research Protocol Adherence System," was recently accepted by the American Medical Informatics Association. This project is a key milestone in his academic journey and underscores his commitment to advancing AI-driven solutions for real-world challenges.

Aaron Mullen

Software Developer

Bachelor of Science, Computer Science,
University of Kentucky

Aaron began working in the department that would become CAAI as an undergraduate intern. He worked throughout his junior and senior year until becoming a full-time staff member upon graduation. He is now pursuing a Master of Science in Data Science. Throughout his time at CAAI, he has worked in a variety of fields, such as website development, machine learning, and data visualization. He specializes in and has worked on projects in data science and machine learning methods like classification and time series forecasting. He has contributed to multiple CAAI projects, such as CLASSify, an online tool for easily performing machine learning classification and data analysis. He also works with the Rapid Actionable Data for Opioid Response in Kentucky (RADOR-KY) team to build forecasting models to predict future opioid overdose trends for different areas of the state of Kentucky.

The Team

Engineering & Data Science

Vaiden Logan

Software Developer

Bachelor of Science, Computer Science, University of Kentucky

Vaiden is a Computer Engineering graduate from the University of Kentucky, currently pursuing a Master of Science in Computer Science. He focuses on LLMs, the DGX computing cluster, CAT-Talk, and LLM Factory. Previously, Vaiden worked on the FABRIC project in the Computer Science department, where he contributed to setting up a Named-Data Networking (NDN) network to move high-energy physics data. Vaiden's expertise lies in computer networking and he has extensive experience collaborating with computer scientists and data scientists. He is currently focused on leveraging LLMs for summarization tasks and designing systems that integrate AI for a variety of applications.

Noah Perry

Web Developer

Bachelor of Science, Computer Science, University of Kentucky

Noah has a background in software development, web service management, and data science. He is currently pursuing a doctoral degree in Computer Science. At UK he studied covering a range of material from algorithm design, web and UI/UX design, and more. He works for the CAAI working primarily on website development and data science. Noah works with the Endless Forms group to work on establishing accessible medical standards for explanatory graphics through the Graphic Design Ontology and graphics compiled using its standards. He also works in data analysis with the All of Us Research Program and with UK Hospital in analyzing quality care metrics and patient care outcomes. Additionally, he works with the REDCap data capture platform to expand its capability, integrate CAAI platform software with the application, and assist others in using the platform.

The Team

Engineering & Data Science

Mitchell Klusty

Software Developer

Bachelor of Science, Computer Science,
University of Kentucky

Mitchell is currently pursuing a Master of Science in Computer Science. While completing his Bachelor of Science, Mitchell earned a Cybersecurity certificate from UK, thus gaining a strong foundation in secure systems design and analysis. As a software developer at CAAI, Mitchell's knowledge of security is imperative to the operations of the department. In addition to cybersecurity, he continues to specialize in the development and application of Large Language Models (LLMs). He is the designer and lead developer of LLM Factory, CAAI's innovative self-service LLM tool that empowers researchers and university members to leverage AI solutions efficiently. Mitchell's passion for LLMs and his expertise in cybersecurity add value to CAAI.

Matthew Mosely

Systems Professional

Foreign Service Institute,
U.S. Department of State
United States Navy

Matthew's primary interest is aiding others to push the boundaries of AI in healthcare. His current role is to assist with providing the resources and tools that researchers need by leveraging advanced technologies in AI and computation in general. In previous roles at UK, he oversaw the infrastructure used by the Center for Computational Sciences for 8 years and was a part of the Information Technology Services Network group for 3 years. Prior to UK, he was a Systems Integrator for the U.S. Department of State (DoS) and was responsible for upgrading the computer networks at U.S. Embassies and Consulates around the world as part of the Global IT Modernization project (GITM). GITM locations included: Moscow, Baghdad, Ciudad Juarez, Budapest, Matamoros, Kolonia, Majuro, and Kabul. Matthew served in the Navy prior to DoS where he trained as an Electronics Technician specializing in communications systems and later cross trained as an Information Systems Technician before honorably finishing his 6-year commitment. All of Matthew's endeavors have been influenced and guided by a keen interest and deep affection, that he has held since he was 8 years old, towards all things that operate on zeros and ones.

The Team

Engineering & Data Science

Caylin Hickey

Cloud Engineer

Bachelor of Science, Computer Science,
University of Kentucky

Caylin started working for UK as a student in late 2011 documenting websites for the College of Nursing and later as an intern for the UK IT Enterprise Architects team. Upon his graduation in 2013, he began working for UK IT full time. In late 2015 his group was approached to help automate genomics processing for UK Healthcare running private, proprietary pipelines. This became clinically functional over the following years and in 2017 he transitioned to UK Healthcare, first on a grant for the Department of Pathology and later as an employee of the Clinical Lab. He has started and assisted with several projects related to genomics, digital pathology, clinical laboratory methods, tracking systems, and routine data manipulation. He started working with CAAI helping with management of the DGX cluster and other various *nix system administration troubleshooting. He is a motivated problem solver, taking on projects to refine and improve functionality or expand features.

Mahmut Gokmen

Software Engineer

Master of Science, Computer Science,
University of Kentucky
Bachelor of Science, Computer Science,
University of Kentucky

Mahmut Gokmen is currently a PhD student at UK. His role primarily involves finding solutions to challenges in the medical imaging domain using deep learning techniques and AI models. Currently, he is working on vision models, which allows him to apply various image processing and analysis techniques across different domains, including CT scans, pathology, and MRI. His main contribution lies in bridging and integrating these diverse research areas with the latest advancements in machine learning and AI to produce meaningful and impactful results. His career began with microchip programming skills after graduating from university. He worked in research and development departments in the industry, and a few years later, decided to become a research assistant in Turkey to advance his research interests. Now, he is studying for his doctoral degree at UK. He excels at understanding and designing deep neural networks and AI models and dedicated an entire year to analyzing and designing AI models without any distractions, significantly enhancing his expertise.

Institute for Biomedical Informatics
Center for Applied Artificial Intelligence

Thank You

Center for Applied Artificial Intelligence
Institute for Biomedical Informatics
University of Kentucky
Healthy Kentucky Research Building, Suite 360
https://caai.ai.uky.edu/

Contributors:

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