CENTER FOR APPLIED ARTIFICIAL INTELLIGENCE

INSTITUTE FOR BIOMEDICAL INFORMATICS

Executive Brief
2025 YTD

caai.ai.uky.edu

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

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Highlights FY25

Individual Collaborators

120+

Departmental & Institutional Partners

43

LLM Factory Chat Requests since June 2024

2M+

Externally Funded Developers

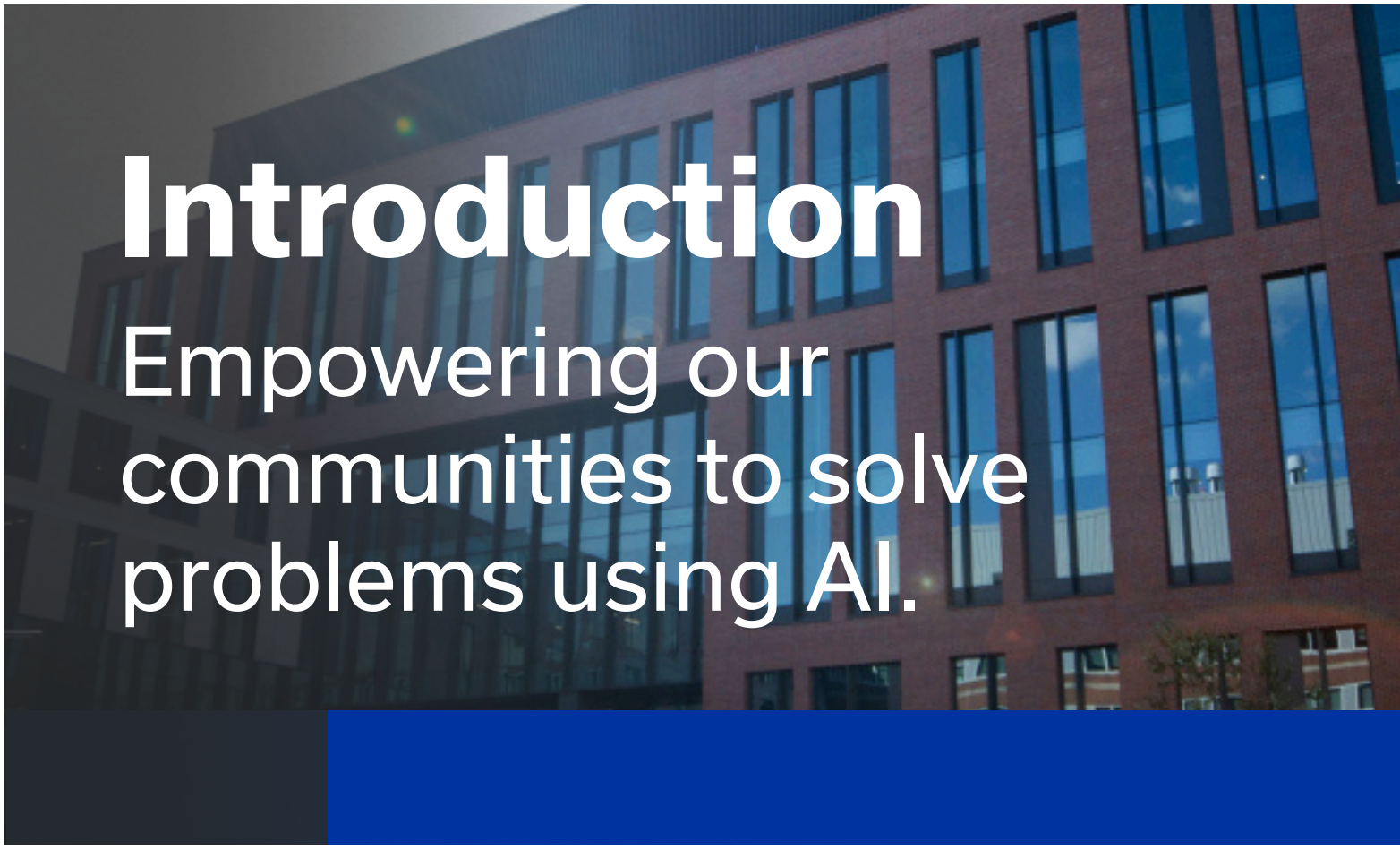
56%

AI Projects with CAAI as Lead Contributor

115

Awards with CAAI Participation

$80M



Introduction

Empowering our communities to solve problems using AI.

The Center for Applied Artificial Intelligence (CAAI) is a specialized team that empowers faculty, staff, researchers, and clinicians to use AI. Operating like a problem-solving think tank, our staff includes early- and late-career software developers, project managers, data scientists, and advisors who help collaborators overcome common AI barriers in technical expertise and access to secure compute resources. We are guided by tenets of empowering, exploring, and doing.

- We empower collaborators to apply AI in their work regardless of experience level.
- We cultivate a community of exploration to drive creative problem solving.
- We focus on doing, moving rapidly from idea to experimentation.

Without requiring technical backgrounds or costly investments, we help our collaborators quickly turn ideas into solutions that make an impact for the communities they serve. To date, CAAI has been the lead contributor on 65 AI projects, has completed 42 projects, and maintains a network of 43 partners and more than 120 individual collaborators. Our projects range from helping county extension agents statewide make research accessible to citizens through posing natural language questions, to preserving Kentucky history by using AI to transcribe 19,000 video and audio recordings, to using virtual assistants to guide patients through pre-treatment plans.

Capabilities

CAAI has extensive experience in a variety of AI technologies, including natural language processing, image and video analysis, agents, time-series modeling, and more.

Multi-Modal Models

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

Data Science & Analysis

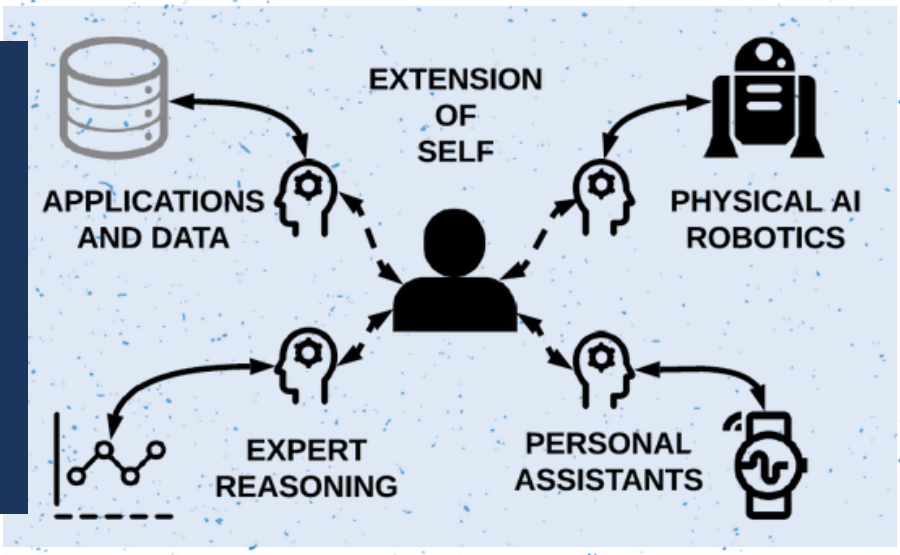
Actionable insights uncovered through forecasting, classification and AI-powered analysis.

Sensors & Robotics

Integrating robotics, natural language processing, and sensor data for physical assistance

Agentic AI

Using LLMs as agents to interpret data, make decisions, and take action, enabling humans to focus on high-value complex tasks.



Services

CAAI offers AI tools that can be self-service or as the foundation of collaboration.

CLASSIFY

A user-friendly platform that allows users to train and evaluate classification models with customizable parameters, explainability scores, and synthetic data generation.

SMARTSTATE

A mobile application that automates protocol adherence tracking and compliance reporting via virtual agents that guide users through a process, such as treatment plans or research studies.

CAT-TALK

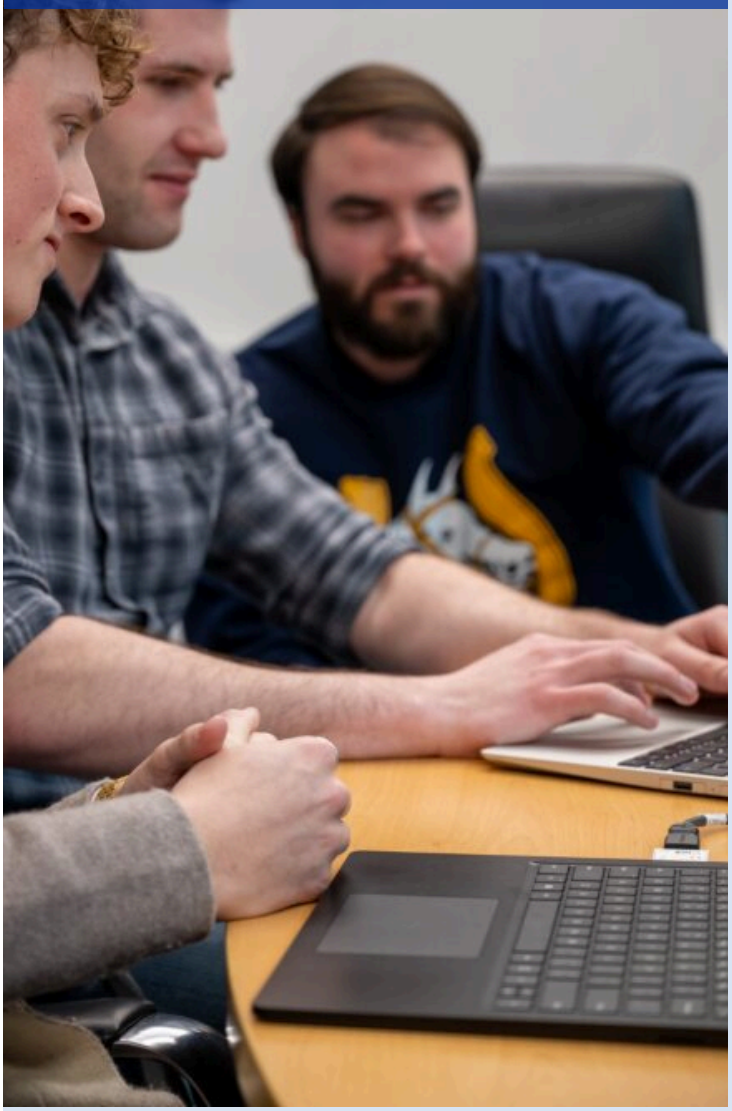
A HIPAA-compliant transcription platform that processes audio files into speaker-labeled and time-stamped transcripts, as well as summarization and theme extraction tools.

LLM FACTORY

A locally hosted environment where users can upload datasets, train adapters on base models, and access AI securely with OpenAI-compatible APIs.

Collaborators

CAAI has partnered with over 120 collaborators across 43 organizations globally.



HealthCare

University of Kentucky

ThynkHealth

KyRON

CPE Higher Education Matters

EduceLab | A DIGITAL RESTORATION INITIATIVE

Shriners Hospitals for Children

EMORY UNIVERSITY

UNIVERSITY OF LOUISVILLE

University of Pittsburgh.

UCDAVIS UNIVERSITY OF CALIFORNIA

Lextran

ASU Arizona State University

UT Health San Antonio

REDCap Research Electronic Data Capture

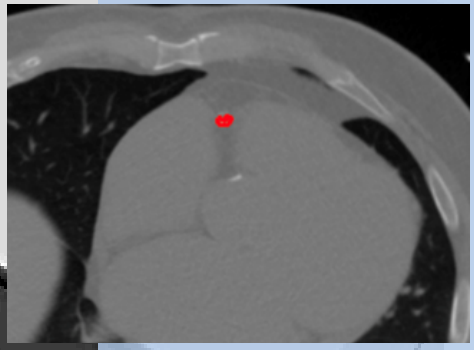
LOUIE B. NUNN CENTER for ORAL HISTORY University of Kentucky Libraries

KENTUCKY STATE UNIVERSITY

Stanford

Projects

CAAI has lead over 115 AI-focused projects.



HeartLens

Improving the Accuracy of Cardiovascular Diagnostic Tools

HeartLens uses the DINO Transformer Model to analyze CT scans, identifying and color-coding calcified areas to support radiologists in risk assessments.

RADOR

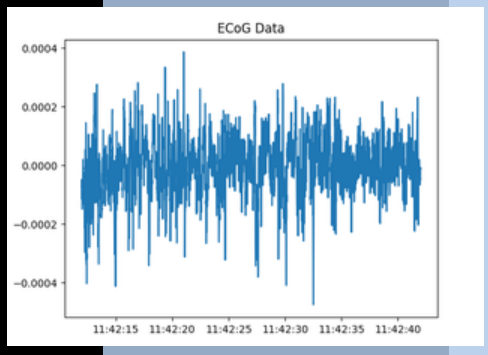
Predicting Opioid Overdoses in Real-Time

RADOR aggregates real-time EMS data, using machine learning models to forecast opioid overdose hotspots, allowing proactive resource allocation and intervention planning.

TEMI

Using Robotic Platforms in Healthcare

TEMI integrates multimodal AI models and sensors to navigate its environment, monitor patient rooms, and facilitate wayfinding.



Multi-Modal ML Framework

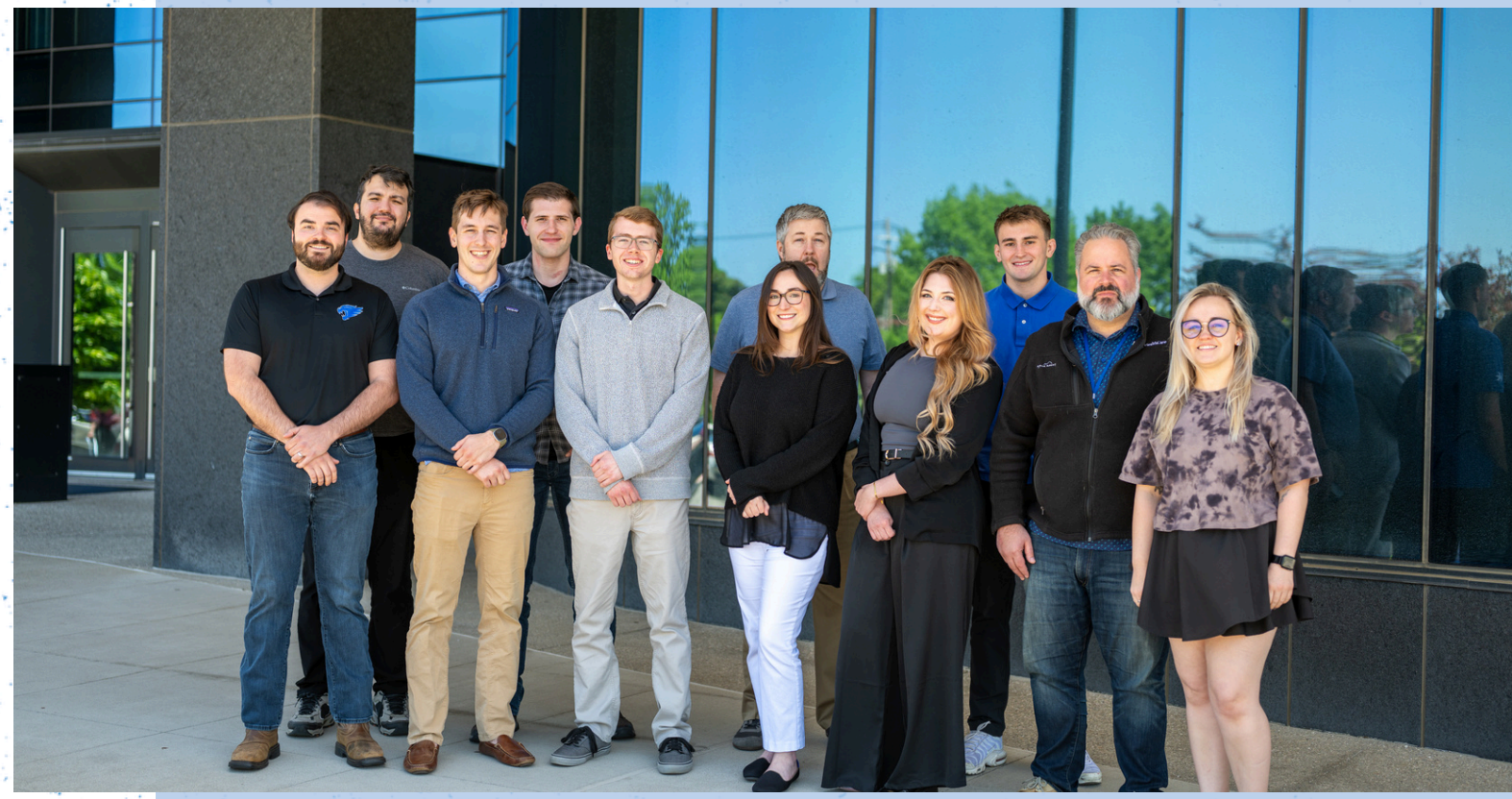
Automating Seizure Detection

Leveraging diverse data sources, this multi-modal ML framework reduces false positives and enhances the reliability of seizure detection.

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



Institute for Biomedical Informatics
Center for Applied Artificial Intelligence

Contact Us

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

ai@uky.edu **uk-ibi-caai** **@uk-caai**

Center for Applied Artificial Intelligence
Institute for Biomedical Informatics
University of Kentucky
Healthy Kentucky Research Building, Suite 360