CAIR QUARTERLY

ON THE COVER: Attendees from the 2024 CAIR Colloquium memorialize the event with a group selfie. **Coverage starts on pg. 6.**

Happy Birthday CAIR!

Director's Note from Dr. Metin Gurcan

With great pride and excitement, I invite you to celebrate a significant milestone with us: CAIR's first anniversary!

Our center, founded on October 1, 2023, has quickly grown into a vibrant community of close to 400 members dedicated to advancing healthcare through the transformative power of artificial intelligence. I warmly invite you to join us on **Thursday, December 5th, from 4–6 p.m. EST at Wake Forest Biotech Place** for an afternoon of food, games, and fellowship as we reflect on our achievements and look forward to the year ahead.

Reflecting on our inaugural year, CAIR's accomplishments are many and meaningful. Our members have demonstrated excellence across a wide range of initiatives.

WHAT'S INSIDE

News & Notes

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We're Throwing a Party – and You're Invited!

The Wake Forest Center for Artificial Intelligence Research (CAIR) was established in October of 2023, and we're marking our one-year anniversary with a special celebration on **Thursday, December 5th** from 4–6 p.m. EST at Wake Forest Biotech Place. **All CAIR members are invited!** There will be plenty of food, games, and other activities, so please join us for a fun afternoon as we reflect on our center's progress and look forward to the year ahead! **Register here.**

WAKE FOREST CAIR

Anniversary Celebration

Wake Forest Biotech Place

DEC | 5th | 2024

Have you seen?

The Wake Forest Clinical and Translational Science Institute is now on LinkedIn!

Follow CTSI

Have you heard?

CAIR Director Metin Gurcan, PhD, appeared on the **Northwest AHEC Healthcare Insights** podcast for a wide-ranging interview. In the episode, he covers his early work in medical imaging and shares his perspective on the future of AI in healthcare.

Listen Here

FOLLOW @wakeforestai

To stay updated on CAIR research, events, and more!

We have hosted numerous workshops and seminars, including events that focused on the intersection of clinical, industrial, and research communities, fostering collaborative relationships and new avenues for innovation. Our annual **CAIR Colloquium** brought together leaders and experts from diverse fields to share cutting-edge advancements in AI and healthcare, solidifying CAIR's role as a hub for thought leadership and discovery.

Education has remained a cornerstone of our mission. We launched the AI in Action (AI-IA) seminar series, which **now offers Continuing Medical Education (CME) credits** – a significant step in ensuring the continued professional development of our community. These seminars have connected us with global experts, deepening our collective understanding of AI's role in healthcare transformation.

We are also proud of our efforts to inspire and empower future leaders in AI. The formation of the Future of Artificial Intelligence Research (FAIR) student chapter has created new opportunities for students to engage meaningfully with our work. Together, we organized **a successful build-a-thon** focused on developing AI-driven mental health solutions, demonstrating the power of collaboration and creativity in tackling critical healthcare challenges.

Metin Gurcan, PhD

We have forged strong collaborations with the Wake Forest Critical Illness, Injury, and Recovery Research Center, the Wake Forest Center for Remote Health Monitoring, and Northeastern University's Institute for Experiential AI exemplified by joint research initiatives and pilot awards to improve patient care and health outcomes.

We have awarded pilot grants and travel awards to support groundbreaking projects and enable our researchers to present their work. Our pilot awards have catalyzed innovative research projects, and our travel grants have provided opportunities for early-career researchers and trainees to share their findings with the broader scientific community. These investments in our members' work exemplify our commitment to fostering impactful, real-world applications of AI in healthcare.

A shared commitment to collaboration, discovery, and positive change in healthcare has marked the first year of CAIR. From the success of our workshops and seminars to the meaningful research initiatives supported through grants and awards, every achievement underscores the strength and dedication of our community. As we embark on our second year, I am optimistic and energized by the possibilities ahead.

I encourage all CAIR members to stay engaged with our activities, participate in upcoming events, and continue contributing to our shared mission of transforming healthcare through AI innovation. Your passion and dedication are the driving forces behind our success. I look forward to celebrating our collective achievements with you on December 5th and to continuing our journey of innovation and impact together.

Warmest regards,

Dr. Metin Gurcan
Director, Center for Artificial Intelligence Research
Senior Associate Dean, Artificial Intelligence
Wake Forest University School of Medicine

CAIR Plans for 2025 – and Beyond – at Annual Faculty Retreat

Leaders from across Wake Forest University provide valuable insights and help CAIR chart its future

THE WAKE FOREST CENTER FOR ARTIFICIAL INTELLIGENCE RESEARCH marked its one-year anniversary in in October, prompting reflection of the center's growth at its annual faculty retreat, held Wednesday, Nov. 6 at the historic Graylyn Estate in Winston-Salem, NC.

The half-day gathering allowed CAIR faculty and staff to collaborate with leaders from across Wake Forest University, who offered valuable insights toward helping the center achieve its long-term objectives.

The event began with CAIR's junior faculty members – **Da Ma, PhD**, **Arezoo Movaghar,**

PhD, **Mohammad Moghimi, PhD**, and **Ibrahim Karabayir, PhD** – sharing overviews of their innovative research programs and how they are contributing to the center's mission of reducing health disparities and improving outcomes.

Amol Joshi, PhD, MS, MBA, Associate Professor at the Wake Forest School of Business, then led attendees in a strategic planning session. He stressed the importance of crafting a well defined strategy statement and encouraged CAIR's faculty to determine how the center can advance the broader research priorities of Wake Forest University.

At the end of his talk, attendees formed small groups to identify the objectives, scope, and competitive advantages of CAIR, helping faculty members develop a shared vision for growth.

Meredith Adams, MD, MS, FASA, FAMIA, an Associate Professor of Anesthesiology at WFUSM and CAIR faculty member, then gave a presentation about the center's real-world impact. "Real innovation happens" when research meets implementation science, Dr. Adams said, citing the byproducts of CAIR's research in many areas from biomedical technology to pharmaceuticals to healthcare policymaking.

Faculty members left the retreat feeling energized about the possibilities ahead, but also fully aware of the challenges that come with them.

"CAIR is just a newborn. There is a lot of growth ahead of us, and that is really exciting," said **Metin Gurcan, PhD**, the center's founding director. "We know there is a lot of work to do in order to achieve that growth, but we are eager to build on our accomplishments from the past year and are looking forward to everything that our second year as an academic research center will offer."

Amber Brooks, MD, an Associate Professor of Anesthesiology at WFUSM, engages with Dr. Joshi during an intermission.

From left: CAIR faculty members Umit Topaloglu, PhD, Dr. Meredith Adams, and Oguz Akbilgic, PhD

From left: CAIR faculty members Brian J. Wells, MD, PhD, Da Ma, PhD, and Ibrahim Karabayir, PhD, team up for a strategic planning exercise.

Dr. Metin Gurcan Elected Fellow of American College of Medical Informatics

Metin Gurcan, PhD, the founding director of CAIR, was elected a Fellow of the American College of Medical Informatics (ACMI), a Bethesda, MD-based organization comprised of individuals who have made significant and sustained contributions to the field of medical informatics.

Dr. Gurcan, along with 24 other elected Fellows, was formally inducted into ACMI on Nov. 10 at a ceremonial dinner during the 2024 American Medical Informatics Association Annual Symposium, held in San Francisco.

According to ACMI, Fellows represent "excellence from academia, government and industry and are the best and brightest stars in our field demonstrating thought leadership, stellar experience, and established scholarship."

Dr. Metin Gurcan's induction into ACMI recognizes his lifelong dedication to advancing biomedical informatics.

Dr. Gurcan's new **ACMI biography** states that his "contributions to biomedical informatics are extensive and impactful. His pioneering research, technical innovations, dedication to education, and leadership underscore his qualifications. His work has advanced the field and paved the way for future generations of informaticians, making him a deserving candidate for this prestigious recognition."

Fellows are eligible to use the designation FACMI, indicating they are an elected Fellow of ACMI.

Dr. Gurcan, who founded CAIR in October 2023, is a Professor in the Section of General Internal Medicine at the Wake Forest School of Medicine. He also serves as the school's Senior Associate Dean of Artificial Intelligence.

CAIR salutes Dr. Gurcan on this outstanding honor and looks forward to his continued contributions to the field of medical informatics, both through his innovative research and leadership within our center. 🛡️

Paul Thompson, PhD

Joseph Rigdon, PhD, and Olivia Gilbert, MD

Andinet Enquobahrie, PhD

Ryan McGinnis, PhD

Fatemeh Tavakoli

Adam Moses and Bradley Rowland Jr., MD

2024 CAIR COLLOQUIUM COVERAGE

CAIR's Annual Colloquium Focuses on Collaboration Between Clinical, Research, and Industrial Communities

Attendees hear from a diverse group of experts who seek to elevate AI applications in all arenas of healthcare

By Jesse Burkhart and Emma McKnight

WHEN IT COMES TO MENTAL health care for children, there's much room for improvement. **Ryan McGinnis, PhD**, the director of the [Center for Remote Health Monitoring](#) at the Wake Forest University School of Medicine, will be the first to tell you that. He focused on this issue during his keynote presentation at the Center for Artificial Intelligence Research's 2024 Colloquium, held Thursday, Sept. 12 at the Wake Forest Biotech Center.

"There's a distinct need for mental health screening in young children," Dr. McGinnis said, noting that 20% of children have an anxiety or depressive disorder, but only 3% of children ages 0-6 years old receive treatment. "There's a high cost for letting them go that long without treatment.

There's an increased risk for adolescent mental health problems, substance abuse, and suicide, so we really need new approaches for mental health screening in young children."

As a potential solution, he pointed to instrumented mood inductions, which are short behavioral tasks designed to press children for specific responses. Those responses can then be captured with wearable sensors and mobile phones – and that's where AI comes in.

Southern California's Mark and Mary Stevens Neuroimaging and Informatics Institute.

Dr. Thompson discussed how discriminative, explainable, and generative AI are being used to detect diseases and enhance medical images to reveal pathologies not visible before. He cautioned, however, that "care is needed" and said developers must "model site, scanner, and dataset confounds" to avoid biased results and reduced generalizability.

An expert panel discussion followed two keynote presentations at the 2024 CAIR Colloquium. From left: Andinet Enquobahrie, PhD, Dr. McGinnis, Dr. Thompson, Santosh Mohan, and Heather Alger, PhD.

"You can use AI to combine biomarkers to form digital phenotypes" for childhood-internalizing disorders, Dr. McGinnis said, pointing out that machine-learning models trained on data from instrumented mood inductions can detect such disorders with about 80% accuracy – a rate on par with clinical assessments.

Dr. McGinnis' insightful talk was preceded by a keynote from **Paul Thompson, PhD**, the Associate Director of the University of

Dr. Thompson is also the Director of the ENIGMA Consortium, a global alliance of 2,500 scientists in 47 countries who conduct large studies of 30 major brain diseases. At the end of his talk, he invited attendees to **join ENIGMA**, which welcomes a variety of researchers and presently has 50 active working groups.

Clips from Dr. McGinnis and Dr. Thompson's talks can be found on the **Wake Forest AI YouTube page**.

Synergies and Stipends

In the event's final hour, Drs. McGinnis and Thompson participated in an expert panel that explored opportunities for collaboration between the clinical, research, and industrial communities. They were joined by **Andinet Enquobahrie, PhD**, the Senior Director of Medical Computing at software developer Kitware; **Santosh Mohan**, Vice President of Innovation at Advocate Health; and **Heather Alger, PhD**, Senior Director of Clinical Development at medical equipment maker Anumana.

The panelists were asked to discuss a variety of topics, including key challenges in transitioning AI models developed in academic settings to real-world industrial applications, and how developers of AI technologies can involve patients and the community with respect to implementation.

Following the expert panel, CAIR Director **Metin Gurcan, PhD**, presented two travel grants.

Da Ma, PhD, Assistant Professor of Gerontology and Geriatric Medicine at WFUSM, was the recipient of the Early-Stage Investigator Award. **Usman Afzaal**, a PhD candidate at the Virginia Tech-Wake Forest School of Biomedical Engineering and Sciences, was the recipient of the Trainee Award. Both will receive a $1,500 prize for either presenting at an AI-related scientific conference or enrolling in an AI certificate program. 🛡️

Flash-Talk Sandwich

In between the two keynote presentations, four brief talks were given, ranging from novel AI applications in research to implementation in clinical settings. The talks were chaired by CAIR faculty member **Oguz Akbilgic, PhD**.

"30DEAC-HF-30-Day EMR Automated Calculator for HF Readmissions" by Olivia Gilbert, MD, Assistant Professor of Cardiovascular Medicine at WFUSM and Joseph Rigdon, PhD, Assistant Professor of Biostatistics and Data Science at WFUSM

"Deep Learning Based Brain Aging Estimation Captures Sex-Dependent Cardiometabolic Risk Factors" by Fatemeh Tavakoli, a health informatics PhD candidate at UNC-Charlotte

"Transformative Academic-Industry Collaborations: How ITK, 3D Slicer, and MONAI Revolutionized Medical Imaging Research" by Andinet Asmamaw Enquobahrie, PhD, Senior Director of Medical Computing at Kitware

"AI in Operations: Current State and Future Opportunities" by Bradley Alan Rowland Jr., MD, Clinical Instructor, Hospital Medicine at WFUSM and Adam Moses, Program Director I, Internal Medicine Administration at Atrium Health Wake Forest Baptist

Da Ma, PhD

Usman Afzaal

Dr. Mostafa Rezapour Named Assistant Professor of AI at WFIRM

Mostafa Rezapour, PhD, who spent the past two years as a CAIR research fellow, has started a new role as an Assistant Professor of Artificial Intelligence at the Wake Forest Institute for Regenerative Medicine (WFIRM).

Dr. Rezapour served as a research fellow at CAIR since the summer of 2022. In this role, he applied statistical, mathematical, and AI methodologies to various healthcare research projects in order to improve diagnoses and identify biomarkers in areas such as genomics, bone fractures, lower extremity injuries, medical imaging, and COVID-related problems. His work led to multiple peer-reviewed publications and a provisional patent, demonstrating the real-world impact of his efforts.

Mostafa Rezapour, PhD

Beyond his research, he dedicated himself to mentoring PhD students and numerous interns from Wake Forest and other institutions. He played an instrumental role in CAIR's educational outreach, organizing and speaking at AI workshops that were designed for undergraduate and graduate students.

Dr. Rezapour earned his PhD in applied mathematics from Washington State University. From 2020-2022, he served as a teacher-scholar postdoctoral fellow at Wake Forest University in the Department of Mathematics and Statistics, where he taught courses including calculus, linear algebra, and differential equations. He also possesses a strong background in Python, MATLAB, R, SAS, JavaScript, PHP, and C/C++ programming.

Since joining Wake Forest, Dr. Rezapour has significantly enhanced the scientific community and the training of future AI researchers and practitioners. CAIR congratulates Dr. Rezapour on his appointment with WFIRM and looks forward to his continued efforts in advancing AI applications in healthcare.

Dr. Arezoo Movaghar Among WFUSM Researchers Awarded $100K Grant for Lupus Study

Researchers from the Wake Forest School of Medicine received a $100,000 grant to investigate the quality-of-life trajectories for adolescents with lupus, with the goal of developing better care and intervention strategies .

Giya Harry, MD, MPH, an associate professor of pediatrics at WFUSM, is the principal investigator of the project, which is jointly funded by the Childhood Arthritis and Rheumatology Research Alliance (CARRA), based in Washington, D.C., and the Arthritis Foundation, based in Atlanta. Her research team includes **Arezoo Movaghar, PhD**, a WFUSM assistant professor of pediatrics and CAIR faculty member, who is serving as the project co-investigator. Their research is titled, "Two-Year Trajectories of Health-Related Quality of Life Among Adolescents Newly Diagnosed with Systemic Lupus Erythematosus."

According to the researchers, patients with lupus experience a wide range of health problems that can significantly impact their quality of life. The decline in quality of life is reported to be more pronounced in patients from underserved communities, who frequently face challenges in accessing care and interventions.

Dr. Giya Harry   **Dr. Arezoo Movaghar**

In this study, the researchers will analyze data from the CARRA network registry to identify factors that predict or modify these trajectories. Specifically, they will examine sociodemographic variables, social determinants of health, and disease characteristics, among other factors.

Insights gained from this analysis, the researchers say, will assist in the development of more effective preventive care and interventions for patients. Additionally, understanding these potential modifiers will provide critical information about vulnerable populations, which can be instrumental in shaping more equitable care policies.

CARRA and the Arthritis Foundation jointly awarded more than $1.6 million in research grants for 2024.

PhD Student Delanie Lynch Capitalizes on CAIR Travel Award

Thanks to a CAIR travel grant, **Delanie Lynch**, a biomedical engineering PhD student at the Wake Forest School of Medicine, trekked across the northern border to put her research on display for a who's-who gathering of experts in musculoskeletal research.

Lynch received the grant for an innovative application of machine learning and automated image analysis to explore muscle and bone health within ongoing clinical trials. She recently put that travel award to good use by attending the Annual Meeting of the American Society of Bone and Mineral Research (ASBMR), held in Toronto from Sept. 27–30, where she presented her work during the event's poster session, which drew many prominent figures in the field of bone, mineral, and muscuolosketal research.
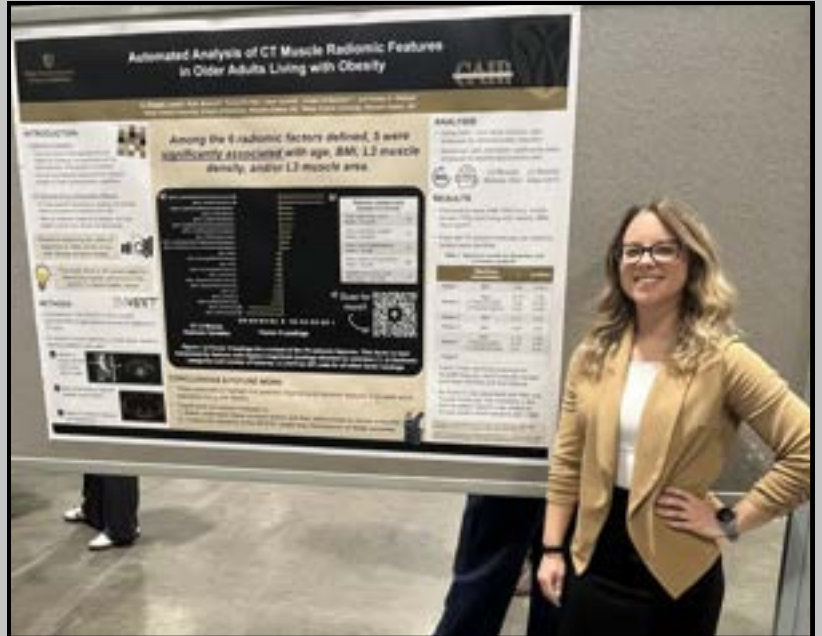
Delanie Lynch displayed her research at ASBMR's Annual Meeting and made valuable connections as a result.

In addition to sharing her findings and future research with leading experts in the field, Lynch was able to connect in-person with many of WFUSM's collaborators at other institutions who have been involved in their multi-site clinical trial work.

She also attended a specialized user event for the high-resolution peripheral quantitative computed tomography (HR-pQCT) scanner, exchanging knowledge and techniques with other researchers working on advanced image interpretation and analysis.

"Cumulatively, the experience strengthened my current knowledge of the musculoskeletal research field and provided me with lots of connections to continue advancing myself as a researcher in this arena," Lynch said.

CAIR Mentee Claims 3rd Place at WFUSM's Medical Student Research Day

Sean Catley, a student at the Wake Forest School of Medicine, earned third place overall at the school's Medical Student Research Day for an AI-driven project that was completed under the mentorship of CAIR researchers.

Sean Catley (right) worked closely with mentor Dr. Metin Gurcan to carry out his award-winning project.

Catley's project, titled "Artificial Intelligence Enhanced Otoscopy – A Rated Approach to Image Generation (RatedStitch)," aimed to enhance the digital otoscope as a diagnostic tool. Throughout the project, he received guidance from CAIR Director **Metin Gurcan, PhD**. He also worked closely with **Aaron Moberly, MD**, of Vanderbilt University Medical Center, and **Seda Camalan, PhD**, who recently completed a two-year stint as a postdoctoral researcher at CAIR and now serves as a Research Associate at Mayo Clinic Rochester in Mankato, MN.

RatedStitch sought to improve upon a framework called SelectStitch, which is designed to enhance the diagnostic capabilities of otoscope videos by creating high-quality composite images of the eardrum.

RatedStitch employed a novel approach for creating these composite images. Catley, with the help of Dr. Gurcan, Dr. Moberly, and Dr. Camalan, rated the digital otoscope video frames based on the clarity of the eardrum, selecting those with the highest clarity for combination and comparing the results to SelectStitch.

The researchers found that RatedStitch composites often showed improved field of view and image clarity compared to SelectStitch. Overall, the researchers determined that rating frame significance for selection can enhance composite image quality, potentially improving diagnostic accuracy and efficiency.

For Catley, the experience of working with seasoned medical-imaging researchers was formative. "Although I had previous experience working in laboratory teams, witnessing the scientific process in a high-tech medical setting significantly enriched my education," he said. "It offered me a glimpse into the future possibilities in medicine."

CAIR Accepting Applications for Inaugural Collaborative Innovation in AI Award

CAIR is accepting applications for its **Collaborative Innovation in AI Award**, which will fund cutting-edge AI medical research that involves an industry collaborator.

The creation of this pilot award was announced at the 2024 CAIR Colloquium held in mid-September. The award will fund one project up to $40,000, to be spent within a 12-month project period.

The Collaborative Innovation in AI Award is open to all faculty with a rank of instructor or higher from Wake Forest University and/or Advocate Health. Research teams must include CAIR members and industrial collaborators who will provide in-kind support.

Funding for this inaugural pilot award will be granted in two phases. In the first phase, one-half of the requested budget will be awarded ($20,000 max). Upon submission of an extramural grant proposal, the remainder of the budget will be awarded ($20,000 max).

Successful proposals will clearly state:

• How to create, evaluate, or implement medical science and AI tools and algorithms

• A rationale for local relevance and potential for generalizability

• Translational roadblocks that the proposed project will address and the anticipated benefits of overcoming them with AI

• A reasonable project plan that is feasible to complete in the project period

Key dates:

Full Application Deadline	December 13, 2024
Selection of Awardees	January 13, 2025
Project Start Date	February 3, 2025
Latest Project End Date	February 2, 2026

To request the full application procedures, email CAIR@wakehealth.edu.

CAIR's AI-IA Seminar Series Receives Accreditation from WFUSM

Wake Forest CAIR's "Artificial Intelligence in Action" (AI-IA) seminar series, which features leading AI health experts from around the world, is now accredited by the Wake Forest School of Medicine (WFUSM).

CAIR holds at least one AI-IA seminar per month featuring an expert who presents on a timely topic related to AI applications in medicine. All AI-IA seminars are now accredited for attendees to receive a maximum of 1.0 AMA PRA Category 1 Credit(s). WFUSM is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

Seminar attendees who wish to claim credit for their attendance must use the **Northwest Area Health Education Center** (AHEC) SMS texting attendance system.

AI-IA Speakers in January:

January 13, 2025
Jaime Lynn Speiser, PhD
Associate Professor of Biostatistics and Data Science
WFUSM

January 15, 2025
Christie Coughlin, JD
Professor of Law
Wake Forest Law

Attendees must text a unique, five-character code – provided by CAIR prior to the start of each seminar – to (336) 793-9317 in order to receive continuing education (CE) credit. Attendees have from 10 minutes before the seminar start time until 5 minutes after the seminar end time to send the code.

Attendees with an AHEC account may simply text the code to the number provided and confirm their attendance. Those without an AHEC account may create one here: **https://northwestahec.wakehealth.edu/.** Entering the mobile number you will use to confirm your attendance will save you steps the first time you record attendance.

For more information on claiming CE credits via text messaging with AHEC, visit: **https://northwestahec.wakehealth.edu/smshelp**. Questions related to claiming CE credits for Wake Forest CAIR AI-IA seminars can be emailed to CAIR@wakehealth.edu.

Invitation to Contribute to AI Research Project Inventory

As part of Wake Forest CAIR's ongoing efforts to highlight and support the diverse and innovative work being undertaken in our community, we are compiling an inventory of AI research projects at Advocate Health (including Aurora Healthcare, Advocate Healthcare, and Atrium Health) and Wake Forest University School of Medicine.

What Is an "AI Research Project"?

An AI research project encompasses any research initiative that involves developing or applying AI technologies.

This includes, but is not limited to, projects focusing on machine learning, deep learning, AI algorithms, computer vision, natural language processing, robotics, and AI applications in various disciplines. The aim is to understand, augment, or create systems that exhibit some form of human-like intelligence or autonomous decision-making.

To ensure that your project is included in this inventory and to foster collaboration and awareness within our community, we kindly ask you to complete **this questionnaire**. The questionnaire seeks to gather essential information about your project.

Please complete the questionnaire as soon as possible. Your contributions are invaluable, and we believe that this inventory will serve as a vital resource for fostering collaboration, securing funding, and showcasing our collective achievements in AI research. 🛡️

Recent Events

⭐ Joint Pilot Collaboration with Wake Forest CIIRRC ⭐

Wake Forest CAIR partnered with the Wake Forest Critical Illness, Injury and Recovery Research Center (CIIRRC) to host a Joint Pilot Collaboration Event on Aug. 29. Researchers from both centers shared insights through brief presentations, highlighting novel AI and machine-learning applications in critical care.

Dr. Samuel P. Carmichael II

Presentations included:

- **"Applications of Artificial Intelligence to Improve Patients' Health Outcomes"** by Arezoo Movaghar, PhD, Assistant Professor of Pediatrics

- **"Machine Learning Modeling of Risk Factors Predicting Post Surgical Bowel Obstruction"** by Samuel P. Carmichael II, MD, Assistant Professor of Trauma Surgery

- **"Wearable and Noninvasive Medical Microsystems on Flexible Substrates"** by Mohammad Moghimi, PhD, Assistant Professor of Biomedical Engineering

- **"Summitting the Mountain: AI Chest Pain Risk Stratification"** by Simon A. Mahler, MD, MS, Professor of Emergency Medicine

- **"Electrocardiographic Artificial Intelligence (ECG-AI) Driven Insights: Predicting Cardiovascular Outcomes and Expanding Remote Monitoring"** by Ibrahim Karabayir, PhD, Assistant Professor of Internal Medicine, Cardiovascular Medicine

- **"Prediction of Acute Exacerbations of COPD Based on Algorithmic Evaluation of Home Non-Invasive Ventilator Waveforms"** by William Hemsley Merwin III, MD, Pulmonary Disease and Critical Care Medicine Fellowship

At the conclusion of the event, CAIR Director **Metin Gurcan, PhD**, and CIIRRC Co-Director **Daniel Clark Files, MD**, announced a jointly funded pilot award of $30,000 to be spent within a 12-month project period. CAIR is excited to join forces with CIIRRC on this grant and looks forward to the impactful research that will result from our partnership.

For a quick **event recap**, head over to our YouTube channel and watch the highlights! 🛡️

Recent Events

⭐ 2024 Mental Health Rewired ⭐

Wake Forest CAIR and the Wake Forest Center for Remote Health Monitoring (CRHM) have teamed up to host "Mental Health Rewired," a build-a-thon designed to bring increased and innovation to mental health.

The three-week event kicked off on Tuesday, Oct. 29 at Wake Forest Biotech Place in Winston-Salem, NC. Participants consisting of undergraduate and graduate students gathered to hear insightful talks and explore three case studies that illuminated key mental health challenges.

After a social icebreaker (with complimentary Mellow Mushroom pizza), participants formed teams of 3-4 members to design and build digital solutions aimed at enhancing mental

Laika Simeon-Thompson, MD, and Cody Benoit, MD, deliver a presentation on AI in psychiatry.

health support. Each team will have a dedicated mentor, who will help define the project scope and, if necessary, assist in procuring real-world data.

The teams will present their completed projects at the build-a-thon's closing event on Tuesday, Nov. 19. Judging and an awards presentation will follow. 🛡️

CRHM faculty member Ellen McGinnis, PhD, (middle) meets two student participants.

Dheeraj Kairamkonda, a Research Engineer at CRHM, presents a case study.

2024 *Artificial Intelligence in Action* Seminar Series

Wednesday, Aug. 21

Presenter:
Michael Pencina, PhD
Duke University
School of Medicine

Title: "Evaluation and Governance of Health AI Technologies"

Summary: In this early stage of health AI technologies, Dr. Pencina explained, it's crucial for health systems to establish robust AI governance and prioritize ethics and patient benefit. He encouraged the application of strict evaluation standards to ensure only high-quality, valuable AI technologies are adopted.

Friday, September 6

Presenter:
Yu Huang, PhD
University of Florida

Title: "Health Digital Twin: AI and Machine Learning Meet Real-World Data"

Summary: Dr, Huang's talk covered health digital twins (HDTs), virtual patient replicas created from multimodal data for personalized, predictive healthcare. He also reviewed the techniques necessary for constructing an HDT, highlighting the role of AI and and real-world data in enhancing the efficacy of patient care tools.

Friday, September 20

Presenter:
Emma Pierson, PhD
Cornell University

Title: "Using Machine Learning to Increase Equity in Healthcare and Public Health"

Summary: Presenting vignettes form several domains, Dr. Pierson discussed how data science and machine learning can be used to combat inequality in healthcare and public health.

Monday, Sept. 23

Presenter:
Chen Hu, PhD
Johns Hopkins
School of Medicine

Title: "Statistical Considerations of Biomarker-Driven Oncology Clinical Trials: Fundamentals, Controversies, and Lessons Learned"

Summary: In this talk, Dr. Hu outlined key considerations in designing biomarker-driven oncology trials, focusing on adaptive designs to enhance flexibility and efficiency. He shared best practices and lessons from real trials to improve personalized patient care.

Monday, October 21

Presenters:
Joseph Rigdon, PhD &
Sarah Lotspeich, PhD
Wake Forest University
School of Medicine

Title: "Overcoming Data Challenges to Estimate Whole Person Health"

Summary: Dr. Rigdon and Dr. Lotspeich explained how a targeted audit design can improve the accuracy of allostatic load index estimates from EHR, enabling better identification of at-risk patients by selectively validating the most informative data in logistic regression analysis.

Friday, November 1

Presenter:
Yong Fan, PhD
University of
Pennsylvania School
of Medicine

Title: "Machine Learning for Medical Imaging Data Analytics"

Summary: Dr. Fan highlighted advancements in self-supervised deep learning models for medical imaging, emphasizing personalized networks, segmentation, and interpretable predictive modeling. Discussed applications included Alzheimer's prediction, brain development analysis, and lung cancer outcome forecasting.

Upcoming Events

Wednesday, November 20
3:00 p.m. – 4:00 p.m. ET

WHAT: [CTSI Joint NC Biostatistics, Epidemiology, and Research Design (BERD) November Seminar](#)

WHO: Huiman Barnhart, PhD; Duke University School of Medicine

WHERE: [Zoom](#)

Thursday, December 5
4:00 p.m. – 6:00 p.m. ET

WHAT: CAIR Anniversary Celebration

WHERE: Wake Forest Biotech Place, Atrium
(575 N. Patterson Ave., Winston-Salem)

[REGISTER HERE](#)

Monday, January 13
12:00 p.m. – 1:00 p.m. ET

WHAT: Artificial Intelligence in Action Seminar

WHO: Jaime Lynn Speiser, PhD; Wake Forest University School of Medicine

WHERE: WebEx & Bailey Power Plant, 4th Floor (486 N. Patterson Ave., Winston-Salem)

Wednesday, January 15
12:00 p.m. – 1:00 p.m. ET

WHAT: Artificial Intelligence in Action Seminar

WHO: Christie Coughlin, JD; Wake Forest University School of Law

WHERE: WebEx & Bailey Power Plant, 4th Floor (486 N. Patterson Ave., Winston-Salem)

Wednesday, February 13
12:00 p.m. – 1:00 p.m. ET

WHAT: Artificial Intelligence in Action Seminar

WHO: Rachel Levy, PhD; North Carolina State University

WHERE: WebEx & Bailey Power Plant, 4th Floor (486 N. Patterson Ave., Winston-Salem)

Wednesday, March 19
12:00 p.m. – 1:00 p.m. ET

WHAT: Artificial Intelligence in Action Seminar

WHO: Yash Singh, PhD; Mayo Clinic

WHERE: WebEx & Bailey Power Plant, 4th Floor (486 N. Patterson Ave., Winston-Salem)

WE ARE

HIRING

POSTDOCTORAL RESEARCHERS

The Clinical Image Analysis Lab (CIALAB) at the Wake Forest Center for Artificial Intelligence Research (CAIR) is seeking postdoctoral researchers to help pioneer the future of AI-driven healthcare solutions.

Key Responsibilities:

- Develop and implement advanced AI algorithms for medical image analysis
- Collaborate with interdisciplinary teams to execute research projects
- Publish research findings in high-impact journals and present at conferences
- Mentor and guide junior researchers and students

Required Qualifications:

- PhD in Computer Science, Electronics, Biomedical Engineering or related field
- Experience in AI/ML algorithms and medical imaging
- Strong programming skills and experience with deep learning frameworks
- Excellent communication and teamwork skills

HOW TO APPLY

Email Dr. Metin Gurcan (mgurcan at wakehealth.edu) with the subject line "Post-Doc Application" and include a cover letter, CV, and references.

Metin Gurcan, PhD

Director, Center for Artificial Intelligence Research
Senior Associate Dean, Artificial Intelligence
Professor, General Internal Medicine
Professor, Wake Forest Institute for Regenerative Medicine

Publications

Rezapour M, Wesolowski R, Gurcan MN, "Identifying Key Genes Involved in Axillary Lymph Node Metastasis in Breast Cancer Using Advanced RNA-Seq Analysis: A Methodological Approach with GLMQL and MAS," International Journal of Molecular Sciences. 2024; 25(13):7306. **https://doi.org/10.3390/ijms25137306**, 2024.

Lu H, Rezapour M, Baha H, Niazi MK, Narayanan A, Gurcan MN, "Gene pointNet for tumor classification," Neural Computing and Applications, Aug 22:1-5, 2024.

Su Z, Rezapour M, Sajjad U, Niu S, Gurcan MN, Niazi MK, "Cross-attention-based saliency inference for predicting cancer metastasis on whole slide images, IEEE Journal of Biomedical and Health Informatics, 2024.

Rezapour M, Niazi MKK, Lu H, Narayanan A, Gurcan MN, "Machine Learning-Based Analysis of Ebola Virus' Impact on Gene Expression in Nonhuman Primates," Frontiers in Artificial Intelligence, 7:1405332, 2024.

Su Z, Afzaal U, Niu S, de Toro MM, Xing F, Ruiz J, Gurcan MN, Li W, Niazi MKK, "Deep Learning Model for Predicting Lung Adenocarcinoma Recurrence from Whole Slide Images," Cancers, 16(17):3097. **https://doi.org/10.3390/cancers16173097**, 2024.

Camalan S, Langefeld CD, Zinnia A, McKee B, Carlson ML, Deep NL, Harris MS, Jan TA, Kaul VF, Lindquist NR, Mattingly JK, Shah J, Zhan KY, Gurcan MN, Moberly AC, "Digital Otoscopy With Computer-Aided Composite Image Generation: Impact on the Correct Diagnosis, Confidence, and Time," Otolaryngol Head Neck Surg., Sep 2. doi: 10.1002/ohn.965. Epub ahead of print. PMID: 39221462., 2024

Achievements

Elected a Fellow of the American College of Medical Informatics (ACMI)

Meredith Adams, MD, MS, FASA, FAMIA

Associate Professor, Anesthesiology
Associate Professor, Public Health Sciences

Accomplishments

New Award

- Title: Developing a Diverse Workforce: Advancing Data Science for Addiction Research and Professional Training (ADAPT)
- Role: PI; Dates: 09/01/2024-08/31/2027; $405,980

In the Spotlight

Dr. Adams was selected by the Association of American Medical Colleges (AAMC) for the MidCareer Women's Leadership Seminar, a prestigious women's leadership program (they pick 100 people across all of medicine per year)

Stephen M. Downs, MD, MS

Professor, Pediatrics – General

Publications

South AM, et al. The Study of the Epidemiology of Pediatric Hypertension Registry (SUPERHERO): Rationale and Methods. Am J Epidemiol. 2024 Jun 17;. doi: 10.1093/aje/kwae116. [Epub ahead of print] PubMed PMID: 38881045.

Lehmann CU, Adams WG, Chaparro JD, Fiks AG, Grout RW, Leu MG, Mendonca EA, Michel JJ, Okechukwu K, Salmon J, Sharifi M, Downs SM. Better Guidelines and Policies: AAP's Partnership for Policy Implementation. Pediatrics. 2024 Jun 12:e2023061360. doi: 10.1542/peds.2023-061360. Epub ahead of print. PMID: 38864111.

Submitted CHICA-CN to the 2024 AMIA/HL7 FHIR App Competition

Achievements

Serving on FAIR AI project and Emerging Tech Ethics Committees with Atrium.

Presented CAIR overview at Atrium Wake Forest 2024 Fall Research Symposium

Ajay Dharod, MD, FACP

Associate Professor, General Internal Medicine
Associate Professor, Implementation Science

Publications

Manuscripts Under Review or In Preparation

Bundy R, Moses AW, Stambaugh E, Stewart WP, Witek L, Carlasare L, Rosenthal G, Sinsky C, Dharod A. "Exploring physician time in the EHR Inbasket and tools aimed at optimizing Inbasket efficiency." *Journal of General Internal Medicine (JGIM)*. Accepted with revisions.

Xiao T, Witek L, Bundy RA, Moses AW, Obermiller C, Dharod A, Russo M, Rudnick S. "Identifying patients at risk for metabolic dysfunction-associated steatotic liver disease (MASLD) with advanced fibrosis and the linkage to care". *American Journal of Gastroenterology*. Under Review.

Jacqueline G. You, MD[1,2], Lipika Samal, MD, MPH[2], Tiffany I. Leung, MD, MPH[3,4], Ajay Dharod, MD[5,6], Haipeng Mark Zhang, DO, MMSc[7], David C. Kaelber, MD, PhD, MPH[8], Rebecca G. Mishuris MD, MS, MPH[2,9]. "A Call to Support Informatics Curricula in US-Based Residency Education" Published to *Applied Clinical Informatics*. Accepted for publication. October 2023

Peer-Reviewed Publications

Birken SA, Matulewicz R, Pathak R, Wagi CR, Peluso AG, Bundy R, Witek L, Krol B, Parchman ML, Nielsen M, Dharod A. "Toward the Deimplementation of Computed Tomography Urogram for Patients With Low-to Intermediate-risk Microscopic Hematuria: A Mixed-method Study of Factors Influencing Continued Use". *Urology Practice*. 2023 Sep;10(5):511-9.

Ajay Dharod- Manuscript published to JGIM. Bundy H, Gerhart J, Baek S, Connor CD, Isreal M, Dharod A, Stephens C, Liu TL, Hetherington T, Cleveland JA. "Can the Administrative Loads of Physicians be Alleviated by AI-Facilitated Clinical Documentation?" *Journal of General Internal Medicine*. 2024 Jun 27. doi: 10.1007/s11606-024-08870-z. Online ahead of print. PubMed PMID: 38937369

Ajay Dharod- Manuscript published to JAMA Network Open. Liu TL, Hetherington TC, Stephens C, McWilliams A, Dharod A, Carroll T, Cleveland JA. "AI-powered Clinical Documentation and Clinicians' Electronic Health Records Experience: A Nonrandomized Controlled Trial. Published to *JAMA Network Open* . 2024; 7(9):e2432460. doi: 10.1001/jamanetworkopen.2024.32460. PubMed PMID: 39240568

Ajay Dharod- Manuscript accepted. Liu TL‡, Hetherington TC‡, Dharod A, Carroll T, Bundy R, Nguyen H, Isreal M, McWilliams A*, Cleveland JA*. "Does AI-powered Clinical Documentation Enhance Clinician Efficiency? A Longitudinal Study". *NEJM AI*. 2024. Accepted on September 4th, 2024.

Accomplishments

Invited Extramural Presentations and Seminars

- Presentation: Obermiller C, Bundy R, Witek L, Moses A, Dharod A. "Exploring EHR use during physician time off (PTO)", Oral Presentation: AMA EHR Use Research Virtual Summit, December 8th, 2023.

- Oral Presentation: Chris T. Kelly, MD, Hal Atkinson, MD, Donna Williams, MD, Ajay Dharod, MD, Lauren Witek, M Stat, Casey Glass, MD. "POCUS Champion Pathway: Innovative Training Structure Supporting the Ultrasound Curriculum of a large Internal Medicine Residency Program" Presented at the 2024 Health Professions Education Institute (HPEI) conference on May 14, 2024.

Ajay Dharod, MD, FACP (cont.)

Associate Professor, General Internal Medicine
Associate Professor, Implementation Science

Accomplishments

Presentations at Professional Meetings

- Oral Presentation: Chris Kelly, Donna Williams, and Ajay Dharod- Kelly CT, Atkinson H, Williams D, Dharod A, Witek L, Glass C. "POCUS Champion Pathway: Innovative Training Structure Supporting the Ultrasound Curriculum of a large Internal Medicine Residency Program." Presented at the 2023 World Congress on Ultrasound in Medical Education international conference. September 7-10, 2023. Detroit, MI.
- Poster: Jones B, Quinn M, Garcia JM, Refugio Aviles L, Russell L, Isom S, Sucaldito AD, Alonzo J, Mann-Jackson L, Wright E, Dharod A, Palakshappa D, Tanner A, Rhodes SD, Morse CG. "Food insecurity, pre-diabetes, and diabetes in a cohort of adults with HIV residing in central and western North Carolina". Wake Forest School of Medicine Student Research Day, Winston-Salem, NC, 11 October 2023, poster #2.
- Poster: Quinn M, Jones B, Garcia JM, Refugio Aviles L, Russell L, Isom S, Sucaldito AD, Alonzo J, Mann-Jackson L, Wright E, Dharod A, Palakshappa D, Tanner A, Rhodes SD, Morse CG. "Prevalence and Distribution of Food Insecurity in Persons with HIV Followed in the Atrium Health Wake Forest Baptist Infectious Disease Specialty Clinic". Wake Forest School of Medicine Student Research Day, Winston-Salem, NC, 11 October 2023, poster #6.
- Stern S, Obermiller C, Witek L, Rigdon J, Moses A, Chebrolou S, Anderson M, Xiao T, Richardson K, Cristiano J, Dharod A, Lippert W. "Updating Residency Note Templates to Reduce Documentation Burden". Ignite Style Talk at: American Medical Informatics Association (AMIA) Clinical Informatics Conference (CIC), May 2024. Minneapolis, MN.
- Poster: David Miller, Ajay Dharod, Anna Snavely, Mark Dignan, Elena Wright, Aliza Randazzo, and Kristie Foley- Title: "High touch vs low touch strategy for implementing a colorectal cancer screening digital health intervention in primary care practices: a hybrid randomized implementation trial". Presented at the SGIM Conference May 15-18, 2024, in Boston, MA.
- Poster: Corey Obermiller, Richa Bundy, Lauren Witek, Adam Moses, Christine Sinsky, Gary Rosenthal, Lindsey E. Carlasare, and Ajay Dharod- "Unplugged or Plugged In? Physician time in the Electronic Health Record (EHR) During Paid Time Off (PTO)". Presented at the SGIM Conference May 15-18, 2024, in Boston, MA
- Poster: Matthew Ellis, Lauren Witek, Corey Obermiller, Richa Bundy, Adam Moses, Ajay Dharod, Nyree Thorne, Sean Hernandez, and Nancy Denizard-Thompson- Title: "Implementing High-Value Care with Ambulatory Costs Transparency (ACT): Improving Provider Awareness of Orders Expenses". Presented at the SGIM Conference May 15-18, 2024, in Boston, MA
- Ajay Dharod- Abstract accepted. Obermiller C, Bundy R, Witek L, Moses A, Carlasare L, Rosenthal G, Sinsky C, Dharod A. "Physician Electronic Health Record Use Surrounding Paid Time Off". Will be presented at the American Medical Informatics Association (AMIA) Annual Conference, San Francisco, CA. Nov 2024
- Ajay Dharod- Abstract accepted. Anderson V, Witek L, Bundy R, George T, Obermiller C, Moses A, Rowland B, Dharod A, Palakshappa J. "Intensive Care Unit (ICU) Readmission or Mortality Risk Model Performance". Will be presented at the American Medical Informatics Association (AMIA) Annual Conference. San Francisco, CA. November 2024
- Ajay Dharod- Abstract accepted. Dharod A, Moses A, Corn P, Durham J, Rossman W, Kirkendall E. "Data Access Work Group (DAWG) Conception and Implementation" Will be presented at the American Medical Informatics Association (AMIA) Annual Conference. San Francisco, CA. November 2024
- Ajay Dharod- Abstract accepted. Witek L, Bundy R, Obermiller C, Moses A, Rowland B, Pajewski N, Dharod A. "Enhancing Health System Implementation: A Contextual Approach Through Utilization Dashboards". American Medical Informatics Association (AMIA) Annual Conference, San Francisco, CA. Nov 2024
- Ajay Dharod- Abstract for poster presentation accepted to the 17th Annual Conference on the Science of Dissemination and Implementation, December 8-11, 2024, in Arlington, VA. "Evaluating the reach of a digital outreach strategy for lung cancer screening". Poster will be presented at the Crystal Gateway Marriott.

Da Ma, PhD

Assistant Professor, Gerontology and Geriatric Medicine

Publications

Journal Publications

Ma D, Zhang H, Wang L. Editorial: Deep Learning Methods and Applications in Brain Imaging for the Diagnosis of Neurological and Psychiatric Disorders. Frontiers in Neuroscience. 2021.09.

Sudarshan Krishnamurthy, Lingyi Lu, Christian J. Johnson, Laura D. Baker, Xiaoyan Leng, Sarah A. Gaussoin, Timothy M. Hughes, Da Ma, Allison Caban-Holt, Goldie S Byrd, Suzanne Craft, Samuel N. Lockhart, James R. Bateman. Impact of Neighborhood Disadvantage on Cardiometabolic Health and Cognition in a Community-Dwelling Cohort. Alzheimer's & Dementia: Diagnosis, Assessment & Disease Monitoring (Accepted)

Olesya Mironchuk, Andrew Chang, Kaitlyn Portell, Elena Nunez, Zack Nigogosyan, Da Ma, Karteek Popuri, Vincent Tze Yang Chow, Mirza Faisal Beg, Jingqin Luo, and Joseph E. Ippolito. Volumetric Body Composition Analysis of The Cancer Genome Atlas Reveals Novel Body Composition Traits and Molecular Markers Associated with Renal Carcinoma Outcomes Scientific Reports (Accepted)

Tiffany Tse, Yudan Chen, Mahsa Siadati, Yusi Miao, Jun Song, Da Ma, Zaid Mammo, and Myeong Jin Ju. Generalized 3D registration algorithm for enhancing retinal optical coherence tomography images. Journal of Biomedical Optics 2024.08

Dietz MV, Popuri K, Janssen L, Salehin M, Ma D, Chow VT, Lee H, Verhoef C, Madsen EV, Beg MF, van Vugt JL. Evaluation of a fully-automated computed tomography image segmentation method for fast and accurate body composition measurements. Nutrition. 2024 Oct 5.

Conference

Dip SA, Ma D, Zhang L. DeepAge: Harnessing Deep Neural Network for Epigenetic Age Estimation From DNA Methylation Data of human blood samples. Machine Intelligence for Equitable Global Health 2024.08.

Accomplishments

Editorial

Frontiers in Neuroscience Section in Brain Imaging Methods, Section Topic Editor, Research Topic: Deep Learning Methods and Applications in Brain Imaging for the Diagnosis of Neurological and Psychiatric Disorders (09/2023 - 09/2024)

Arezoo Movaghar, PhD

Assistant Professor, Pediatrics

Accomplishments

Grants and Proposals

Studies on Developmental Circuit Reorganization and Medication Development for ASD, Simons Foundation, Role: MPI, $2.9M, 3 years, Under Review.

Presentations/Invited Talks

Artificial Intelligence for Discovery in Fragile X Associated Disorders, Department of Translational Neuroscience Seminar Series, September 11, 2024

Application of Artificial Intelligence in Improving Patients' Health Outcomes, Department of Pediatrics, September 25, 2024

Mohammad J. Moghimi, PhD

Assistant Professor, Biomedical Engineering

Publications

R. Kumaresan, E. Lim, M. J. Moghimi, "Effect of Flexible Substrate Young's Modulus on Vibration Transmission of Micro-Epidermal Actuators" Accepted for Oral Presentation in Microfluidics, BioMEMS and Medical Microsystems XXIII, SPIE Photonics West, San Fransisco CA.

R. Kumaresan, E. Lim, M. J. Moghimi, "PDMS Compositions for Pediatric Conductive Hearing Aids," Accepted in Biomaterials Session, BMES, Baltimore, MD.

Eric S. Kirkendall, MD, MBI

Co-Director, Center for Healthcare Innovation
Professor, Pediatrics – Hospitalists
Professor, Implementation Science

Accomplishments

Ongoing participation in Advocate AI Governance group (with Brian Wells)

In Center for Healthcare Innovation project, we've built an electronic Cognitive Health Index to help find adults with mild cognitive impairment. Continuing to scale the tools and clinical care pathway.

Partnering with Stanford Center for Digital Health to administer AI survey to clinicians, to gauge their usage, perception, and predictions on AI tools

Ibrahim Karabayir, PhD

Assistant Professor, Internal Medicine, Cardiovascular Medicine

Publications

Evaluation of Long-term Cardiovascular Risks in ENDS Users with ECG-AI Models to Predict Heart Failure and Fatal Coronary Heart Disease, Heart Rhythm, Volume 21, Issue 9, S784

An ECG-based Heart Failure Screening Tool for People with Sickle Cell Disease, Accepted for the AHA 2024, Moderated Digital Poster Session

ECG-AI to Assist with the Classification of Low Ejection Fraction and Heart Failure with Preserved Ejection Fraction, Accepted for the AHA 2024

Towards Remote Monitoring of Sickle Cell Disease for Heart Failure: A Single Lead ECG-AI Model, Accepted for the 66th ASH Annual Meeting and Exposition.

Accomplishments

Grants

A Mobile App for Noninvasive BNP Estimation, NIH STTR Submission, Academic PI, August 2024.

Talks

MCW DSI Seminar Series: "Electrocardiographic Artificial Intelligence (ECG-AI) Driven Insights: Predicting Cardiovascular Outcomes and Expanding Remote Monitoring", September 23rd, 2024, Medical College of Wisconsin, Milwaukee, WI, In person

Duke Informatics Research Seminar Series: "Leveraging ECG for Generalizable Deep Learning Models for Heart Failure and Its Subtypes with Implications for Wearable ECG Deployment", October 2nd, 2024, Duke University, Online

The Wake Forest CAIR and CIIRRC Joint Pilot Collaboration, a short talk on ECG-AI and their deployment for remote monitoring, August 29, 2024.