Research in Artificial Intelligence

RAITE

Testing and Evaluation

PROGRAM &

SYMPOSIUM PROCEEDINGS

September 22, 2025

UNG | UNIVERSITY of NORTH GEORGIA

THE MILITARY COLLEGE OF GEORGIA

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Program of the
2025
Research in Artificial Intelligence Testing & Evaluation Symposium

Symposium Co-Chairs

Dr. Tamirat Abegaz and Dr. Denise McWilliams

University of North Georgia

Dahlonega, Georgia

Sponsoring Institutions

University of North Georgia

Institute for Cyber Operations

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RAITE Symposium Welcome

Welcome to the 2025 Research in Artificial Intelligence Testing & Evaluation (RAITE) Symposium. We are excited to have you join a day of personal enrichment and research discussions. This symposium would not be possible without a generous grant from the University of North Georgia's Institute for Cyber Operations and additional support from the Mike Cottrell College of Business and the College of Science and Mathematics, including the departments of Computer Science & Cybersecurity and Management & Information Systems.

Gathered today are participants from five of the senior military colleges: Norwich University, The Citadel, University of North Georgia, Virginia Institute of Technology, and Virginia Military Institute. Participants come from a variety of disciplines, including computer science, cybersecurity, information systems, health informatics, and management.

The agenda features a diverse group of faculty, industry guest speakers, student researchers, and interested guests, all aimed at sharing insights and advancing the exploration of artificial intelligence. We hope you enjoy your experience at the 2025 RAITE Symposium!

Sincerely,

Dr. Tamirat Abegaz
Professor

Dr. Denise McWilliams
Assistant Professor

Acknowledgements

The 2025 RAITE Symposium co-chairs would like to thank all those people who were involved in making the symposium possible. A significant amount of planning and organizing is required to hold a successful symposium, so we are grateful to those who volunteered their time and energy.

UNG Institute for Cyber Operations

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Kelli N. Sutton-Bosley, *Assistant Director, Cyber Institutes*
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The Citadel

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About RAITE

The Research in Artificial Intelligence Testing and Evaluation (RAITE) program addresses a critical need in the rapidly evolving fields of cybersecurity, computer science, and information systems by engaging undergraduates in research focused on artificial intelligence (AI) testing and evaluation. This initiative aims to inspire students to pursue advanced education and cultivate the next generation of researchers who will lead in both academic and governmental research domains. While all undergraduates are encouraged to participate, there is a particular emphasis on recruiting women and underrepresented minority participants.

The RAITE program directly addresses the gap in these fields by providing undergraduate students with research opportunities that build technical expertise, critical thinking, and practical problem-solving skills. The program aligns student learning with national priorities by focusing on AI testing and evaluation, ensuring participants are well-prepared for impactful careers in government research labs and graduate programs.

The RAITE program originated from the 2024 Graduate Research in AI Testing and Evaluation for Women (GRAITE Women) initiative, which was sponsored by Virginia Tech. Virginia Tech received a generous donation from Google to support its efforts to engage historically marginalized groups in computing. This funding enabled Virginia Tech to host a GRAITE Women Workshop and facilitate a semester-long research project with participants from senior military colleges.

RAITE Symposium Agenda

Monday, September 22, 2025

University of North Georgia - Cottrell Center Ballroom (CC 172)

Time	Topic	Presenter
9:00 AM – 9:15 AM	Welcome Remarks	
9:15 AM - 10:15 AM	**KEYNOTE ADDRESS** How AI is Transforming Neuroscience	**Dr. Helene Sisti**, Associate Professor, Norwich University
10:15 AM- 10:35 AM	From Algorithms to Qubits: How Quantum Will Transform AI	**Dr. Murthy Rallapalli**, Professor of Practice, Cybersecurity, University of North Georgia
10:35 AM - 11:00 AM	Harnessing AI for Scientific Advancement	**Dr. Yong Wei**, Professor, Computer Science & Cybersecurity, University of North Georgia
11:00 AM - 12:00 PM	**INDUSTRY SPEAKER** The Future of AI - The Road Towards Autonomy	**Dr. Flavio Villanustre**, SVP of Technology and Chief Information Security Officer, Lexis Nexis Risk Solutions
12:00 PM - 12:10 PM	Morning Closing Remarks	
12:10 PM - 1:20 PM	LUNCH BREAK	
1:20 PM – 1:30 PM	Afternoon Opening Remarks	
1:30 PM – 1:50 PM	AI-Driven Extraction and Standardization of Medical Entities from Hospital Discharge Summaries	**Dr. Hyungbae Park**, UNG Associate Professor, Computer Science & Cybersecurity
1:50 PM – 3:45 PM	Student Presentations & Posters	Student paper and poster presentations
3:45 PM – 4:00 PM	AFTERNOON BREAK	
4:00 PM – 4:20 PM	Social Good Metrics: Using Artificial Intelligence to Define Organizational Status	**Dr. Renee Pratt**, Assistant Professor, Information Systems, University of North Georgia
4:20 PM – 4:50 PM	AI and Robotics	**Dr. Tamirat Abegaz**, Associate Professor, Cybersecurity
4:50 PM – 5:00 PM	Closing Remarks	
5:15 PM – 6:00 PM	Reception with Students and Faculty	Cottrell Ballroom, room 172 and 1st Floor Atrium

Keynote Address
How AI is Transforming Neuroscience

Helene M. Sisti, Ph.D.
Associate Professor of Psychology
Executive Editor, *Guest*, Journal of Motor Behavior
Norwich University

Dr. Helene Sisti is a contributing author to Human Brain Mapping, the Encyclopedia of Behavioral Neuroscience, and Learning & Memory, among others. Her area of expertise is learning and neuroplasticity — a topic she has investigated using both cellular models and human brain imaging. She has served as a reviewer for several scholarly journals, including the Journal of NeuroEngineering and Rehabilitation, Attention, Perception & Psychophysics, and Neurorehabilitation and Repair. She has also served as a grant reviewer for NIH Sensory-Motor Neuroscience Study Section. Her neuroscience training started as an undergraduate at Dartmouth College and culminated in a Post Doctoral Fellowship at the Research Center for Motor Control and Neuroplasticity at KU Leuven, Belgium. She launched an undergraduate research program at Norwich University in 2020. She mentors students across disciplines in neuroscience techniques with the goal of understanding the neural dynamics that drive optimal human performance.

Industry Speaker
The Future of AI - The Road Towards Autonomy

Flavio Villanustre, Ph.D.
SVP, Technology and Chief Information Security Officer, LexisNexis Risk Solutions

Dr. Flavio Villanustre is the Senior Vice President of Technology and Chief Information Security Officer at LexisNexis Risk Solutions. With over three decades of experience spanning systems architecture, cybersecurity, and applied artificial intelligence, Flavio is a recognized thought leader in the convergence of enterprise technology and AI innovation.

His recent research focuses on the architecture and implications of large language models (LLMs), including the role of attention mechanisms in transformer-based systems and the transition from discriminative to generative models. He has authored internal presentations and contributed to enterprise-wide initiatives on causal AI, explainability, and post-quantum cryptography. Flavio's work also explores the operational risks of generative AI, including its use in social engineering, malware generation, and automated cyberattacks.

He has presented the ethical and compliance challenges of AI deployment in regulated environments, emphasizing the importance of trustworthy, fair, and accountable frameworks. His insights have been featured in industry publications such as InformationWeek and Forbes, and he regularly engages with academic institutions and public sector forums to discuss the future of AI.

Flavio holds the CISSP certification and serves as a RELX Distinguished Technologist. He is committed to responsible innovation and continues to advocate for multidisciplinary approaches to AI governance and policy.

Presentation Summary:

Deep learning has revolutionized AI, with generative models like GPT and diffusion models leading the charge. But what lies beyond? This presentation explores the next frontier: post-transformer architecture, theories of consciousness, and the diverse paths toward Artificial General Intelligence (AGI).

Proceedings of the 2025 Research in Artificial Intelligence Testing & Evaluation Symposium

Symposium Co-Chairs
Dr. Tamirat Abegaz and Dr. Denise McWilliams
University of North Georgia

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Contents

RAITE Symposium Abstracts

Adversarial Evasion Attacks Efficiency Against EEG-BCIs

Alison Gallegos and Noah Haynes
The Citadel
Faculty Advisor: Dr. Farhath Zareen

Brain–Computer Interface (BCI) systems translate electroencephalography (EEG) signals into control commands using machine learning classifiers. While these pipelines enable real-time interaction, they are increasingly exposed to adversarial attacks such as evasion attacks. One such recent technique is adversarial filtering evasion attack that manipulates the signal-processing stage to induce misclassification without visibly degrading signal quality. This preprocessing-level attack technique is especially concerning due to the ubiquitousness of filtering techniques in EEG processing for BCIs.

In this work, we present a defense technique based on model compression, which reduces a model's effective capacity through structured weight pruning and quantization-aware training (QAT) to (i) regularize the decision boundary, (ii) suppress dependency on narrowband artifacts to overall increase resilience to preprocessing perturbations. In this study, we use the ERN dataset from the 2015 IEEE Neural Engineering Challenge (16 subjects), to train and test subject-specific EEGNet classifiers. Model compression was applied with the Intel Neural Compressor, where convolutional and classification layers were gradually pruned to ~30% sparsity and then fine-tuned for 50 epochs; QAT simulated 8-bit weights and activations with an additional 50-epoch fine-tune. We evaluated the robustness of our technique under clean data and adversarial filtered trials. Performance is reported using Balanced Classification Accuracy (BCA) to account for class imbalance.

The baseline EEGNet model achieved an average clean BCA of 73.98 ± 11.77% across 8 subjects. Under adversarial filtering, performance drops to 50.07 ± 11.06%, confirming adversarial filtering attack consequences. We compare this with the compressed models which combined pruning and QAT to yield BCA of 72.97 ± 9.83% (8 subjects), effectively demonstrating near baseline performance and maintaining accuracy on unperturbed data. Also, beyond accuracy, model compression reduced memory footprint and inference cost, facilitating on-device deployment for resource constrained BCIs.

These results show that model compression techniques can effectively defend against adversarial filtering by smoothing decision boundaries, making the model less sensitive to small, targeted frequency-domain shifts produced in the preprocessing stage. In the future, we will focus on complete per-subject evaluation, compare against alternative defenses (e.g., adversarial training and randomized or learned filters) and study cross-subject and cross-dataset generalization.

AI Agents For Computer Navigation: Instruction-Based Computer

Aliou Aboubakar
University of North Georgia
Faculty Advisors: Dr. Tamirat Abegaz and Dr. Denise McWilliams

AI is increasingly becoming integrated into our daily technologies. From our smartphones to intelligent robots serving us in restaurants, AI is taking on a significant role in our society. OpenAI's ChatGPT product has driven a boom in the AI market in early 2020. Since then, it has evolved significantly, with multiple industries adopting it to stay current with technological trends and avoid falling behind. However, one obvious application has yet to be implemented: an AI computer assistant that utilizes natural

language processing (NLP). The purpose of this project is to create a "Siri"-like version specifically for computers. This AI capability would allow users to manipulate their computers simply through voice commands or typing. Imagine being able to search for a file you cannot find, browse a computer without touching the keyboard, modify the calendar, and access many other functions with not just a robotic assistant, but an AI companion that helps you every step of the way.

AI Music Visualizer: Audio-Inspired Image Generation Using Machine Learning

Alondra Hart
University of North Georgia
Faculty Advisor: Dr. Tamirat Abegaz

This project revolves around developing and constructing an AI music visualizer. This paper explores the design and implementation of a system that converts short audio samples into custom-generated images using machine learning. Users record audio within the mobile application, which is then processed through a backend that identifies song metadata using ACRCloud [2] and applies contextual analysis to generate personalized artwork. This app combines frontend development with React Native and backend APIs to create an engaging multimedia experience. This project reflects how AI can link music and visual art through interactive design.

AI-Driven Extraction and Standardization of Medical Entities from Hospital Discharge Summaries

Daniel Collis, Dr. Hyungbae Park, and Dr. Phillip Williams
University of North Georgia

This project focuses on developing and constructing an AI-driven program that extracts structured clinical data from free-text hospital discharge summaries. The system identifies significant medical entities (diagnoses, medications, procedures, etc.) and maps them to standardized UMLS (Unified Medical Language System) codes. This approach enhances data interchangeability and interoperability among healthcare providers and allows consistent reporting across Electronic Health Record (EHR) systems. The parser system leverages natural language processing (NLP) techniques using the spaCy and sciSpaCy libraries, implemented via a FastAPI backend and a React-based frontend. The system's output can be validated for accuracy and potential utility in real-world clinical workflows. Index Terms—natural language processing (NLP), hospital discharge summaries, clinical named entity recognition (NER), UMLS mapping, medical concept normalization, SciSpaCy, spaCy, electronic health records (EHR), AI in healthcare.

Click, Ask, Fix: Your AI-Powered IT Assistant

Jose Reyes-Molina
University of North Georgia
Faculty Advisor: Dr. Tamirat Abegaz

Everyday computer problems like printer errors, devices not connected via Bluetooth, or computers failing to start can be frustrating for users who may not have technical knowledge on these subjects. These issues are usually simple to fix but often require help from IT support, which can take time and resources from both parties. This project aims to develop an AI-powered assistant that can help users solve these common IT issues. The project uses Artificial Intelligence to understand user's questions and provide step-by-step solutions based on a collection of known technical issues and fixes. The system is designed to be easy to use by allowing people to get help quickly without needing to contact IT professionals. This research will test how effective the AI assistant is at diagnosing problems and giving correct solutions. It will also explore how helpful users find the tool and whether it can reduce the need for human interaction. The goal is to make technical support faster, easier, and more accessible every day through AI.

Decentralized AI Systems: The Efficiency of Stigmergy-Based Collaborative Transport

Rodney Santana and Anthony Orza
University of North Georgia
Faculty Advisors: Dr. Tamirat Abegaz and Dr. Denise McWilliams

Cooperative transport by decentralized agents was studied using stigmergy only, without inter-agent messages. In a grid world with obstacles, agents left and followed a pheromone field; heavy objects required k carriers to move. Two local mechanisms were used: a one-step shortest path move for objects and pheromone scrubbing around an object once quorum formed. Parameter sweeps (agents 20–120, obstacles 0–45, k in {2,3,4}; 300 steps, 30 trials per setting) showed success rates of 80–91% across conditions. For k=2, 80% success was achieved with about 20 agents and a near-peak "knee" around 30; for k=3–4 at moderate obstacles, 80% was reached at about 40 agents with a knee near 60. Normalizing by agent pressure A/(k×objects) collapsed curves, with 80% success at roughly 0.7 agents per required slot and near-peak performance around 1.0–1.3. Discovery-to-delivery time decreased with agent count, while redundancy increased, indicating a trade-off. These results show that stigmergy with local environmental cues is sufficient for cooperative transport in clutter and provide a simple rule for sizing swarms.

Defense Against Data Poisoning Attacks in EEG-BCIs

Luke Pennisi and Zion Lindsey
The Citadel
Faculty Advisor: Dr. Farhath Zareen

Electroencephalography (EEG)–based brain–computer interfaces (BCIs) increasingly rely on machine-learning classifiers to translate neural activity into control commands in real time. As these systems are being incorporated in everyday and clinical use, they are becoming attractive targets for adversaries. Backdoor attacks such as data poisoning attacks inject a small set of maliciously crafted samples into the training data which can be triggered by an attacker to cause misclassifications in future inputs. This can result in adverse effects such as device failure or patient death in worst case. Recent work has shown that backdoor keys can be implemented as filter-based spatial/spectral perturbations embedded in the signal-processing stage, making such attacks very hard to detect.

This initial study explores model compression techniques, specifically quantization-aware training (QAT) to reduce numerical precision during training and inference to mitigate high-precision trigger functions that backdoor attacks exploit. We evaluate our technique on the ERN dataset from the 2015 IEEE Neural Engineering Challenge consisting of 16 subjects. Initially, the EEG trials are downsampled to 128 Hz, band-pass filtered [1, 40 Hz], and normalized. Subject-specific EEGNet classifiers are trained with an 80/20 split of trials. To realize the threat model, we perform training-time poisoning by adding a spatial

backdoor key to a small subset of training samples and assigning them to a chosen target class. At test time, clean trials and key-triggered trials are both evaluated. Compression is implemented with the Intel Neural Compressor, applying QAT and fine-tuning for 50 epochs. Performance is measured using Balanced Classification Accuracy (BCA) to account for class imbalance common in EEG tasks.

Preliminary results indicate that QAT can effectively mitigate the impact of filter-based backdoors while preserving nominal performance. Across subjects, the compressed EEGNet achieves an average BCA of 73% on backdoor-triggered trials, recovering performance close to clean baseline (73.98%) and showing minimal loss on clean data. Moreover, model compression reduces the model inference cost, which is advantageous for on-device, resource-constrained BCIs. This preliminary study outlines limitations where we have only evaluated one dataset and one family of filter-based backdoors. In the future, we plan to expand our evaluation to cross-subject/cross-dataset settings, compare against adversarial training and randomized/learned filtering defenses and analyze memory trade-offs on embedded hardware. Overall, these initial results suggest that QAT-based compression can defend against data-poisoning backdoors in EEG-BCIs with deeper study needed within the broader AI testing and evaluation.

Does Reliance on AI Tools (e.g., ChatGPT, automation) Improve Decision-Making or Erode Critical Thinking in Employees?

Camryn Wright, Alex Moelter, and Parker Roush
University of North Georgia
Faculty Advisor: Dr. Inchul Cho

Artificial intelligence (AI) is becoming a normal part of work, especially in areas like hiring, management, and everyday decision-making. This raises an important question: does relying on AI actually help employees make better decisions, or does it slowly take away their ability to think critically? The purpose of this research is to review and summarize the current literature on effects of AI on employee decision-making. After reviewing twelve relevant articles that were published from 2019 to 2025, the evidence points to a clear trend—while AI can sometimes make work easier or more efficient, in most cases people end up leaning on it too much. Instead of using AI as a tool to think with, employees often use it as a shortcut to avoid thinking, which over time weakens problem-solving and critical thinking skills.

When AI advice is correct, people usually perform a little better on tasks because they have extra guidance. But the problem is that when AI gives bad advice, people usually follow it anyway. This is called automation bias, and it shows how easy it is to over-trust technology. Even when workers recognize that AI output might not be totally accurate or fair, they still tend to rely on them. This blind trust means that employees don't always question what they are being told, which hurts their ability to think through problems on their own. This shows that while AI might boost performance in the moment, it also creates a habit of dependence that weakens employees' ability to challenge or double-check information on their own.

Some researchers have tried to fix this problem by making AI "explainable," like adding charts or heatmaps that show how the system came to its answer. The idea is that if people understand the process, they are better at spotting mistakes. But across studies, these explanations don't really help much. People still follow incorrect AI advice even when they have extra information. This suggests that the issue isn't just about technology—it's about human behavior. Most of us want things done faster and easier, so we let AI "do the thinking" instead of engaging with the problem ourselves.

There's also a social side to this. Many employees say that AI decision-making feels less fair, less humane, or less trustworthy compared to human managers. Still, they often end up deferring to AI anyway. This combination—distrusting the process but still relying on it—shows how much convenience drives behavior at work. Even though AI could be used to spark new ideas or push people to analyze more deeply, the reality is that nine times out of ten people use it as a way to get the answer quickly without doing the work.

Overall, research suggests that AI does more to erode critical thinking than to improve it. While it can support decision-making in very specific situations, the dominant effect is that people stop practicing independent judgment. This is a real concern for organizations, because employees who rely too heavily on AI may lose the problem-solving skills that businesses actually need. The challenge moving forward is figuring out how to use AI without letting it replace human thought.

From Algorithms to Qubits: How Quantum Will Transform AI

Dr. Murthy Rallapalli
University of North Georgia

Quantum computing promises to redefine the boundaries of artificial intelligence by leveraging principles of superposition, entanglement, and quantum parallelism. This presentation explores how quantum speedup fundamentally alters the computational landscape, offering capabilities far beyond classical methods. Key algorithms such as Shor's factorization algorithm highlight both the opportunities and threats quantum computing poses to AI security, while Grover's search algorithm demonstrates its potential to accelerate optimization challenges central to AI. The talk also examines emerging approaches in quantum machine learning, where hybrid quantum-classical models are being developed to tackle problems previously considered intractable. Finally, the discussion addresses the current limitations and challenges—ranging from error correction to hardware scalability—that must be overcome before quantum-enhanced AI becomes mainstream. Together, these insights illuminate a transformative path where quantum technologies augment and expand the future of artificial intelligence.

Harnessing AI for Scientific Advancement

Dr. Yong Wei
University of North Georgia

Artificial intelligence (AI) is revolutionizing scientific discovery by enabling faster, more accurate analysis of complex data and accelerating materials innovation. This presentation highlights recent advances in machine learning—including graph neural networks, self-supervised learning, and foundation models—for predicting materials properties, guiding experimental design, and discovering rare-earth-lean magnetic materials and high-entropy perovskite oxides. Case studies illustrate the impact of AI-powered approaches on protein adsorption, electrocatalyst design, and anomaly detection. Finally, we discuss UNG's unique role as a Senior Military College in advancing dual-use AI research and building mission-ready AI talent in alignment with America's AI Action Plan.

Hearing the Message: Using Graph Signal Processing to Help Improve Model Accuracy for Malware Prediction

John McCausland
University of North Georgia
Faculty Advisors: Dr. Tamirat Abegaz and Dr. Denise McWilliams

In an exponentially evolving, technological world, malware attacks have increased dramatically and become more advanced in their tactics. Graph Neural Networks (GNNs) have rapidly emerged as a powerful tool for analyzing graph-structured data. Moreover, Graph Signal Processing (GSP) shows promise in its ability to assess graph-structured data, including social networks and molecular graphs. GNNs are widely utilized as a powerful tool for malware detection due to their ability to leverage the inherent graph structure of malware to capture both local and global patterns. However, studies investigating the use of GSP on malware and benign graph data to filter out noise and enhance model

accuracy are few. Due to the lack of GSP in cybersecurity settings, this study examines the use of Graph Fourier Transforms and Filters to clean up malware and benign graph data to enhance model accuracy and better predict the file type.

How should a GEOINT AI tool be tested and evaluated?

Victoria Jarvis, Aaron Neidermeyer, and Justin Agri
Norwich University
Faculty Advisor: Dr. Kelli N. Sutton-Bosley

AI tools have found their way into defense and intelligence through Seerist and AskSage. AI has also proved its value in image processing through advancements in medical imaging. If these concepts were combined, it would create a new type of AI that could comprehend images and reason to form an argument based upon them, which could revolutionize geospatial intelligence. A tool such as this would not fit within the confines of existing T&E protocols. This project attacks these problems and describes the testing criteria and other challenges facing a potential model such as this.

Improving Military Medical Decision-Making Through AI Enhanced UAV Visualization Interfaces

Ada Arcinas and Wesley Stoudenmier
University of North Georgia
Faculty Advisors: Dr. Tamirat Abegaz and Dr. Denise McWilliams

Current military medical personnel face challenges conducting rapid and accurate casualty assessments in hostile environments. Traditional UAV systems lack intelligent interfaces that could enhance human decision-making under time pressure. The use of drones for triage in mass-casualty incidents recently emerged. Current challenges include inaccurate assessments of heart rate, breathing, and bleeding severity. With the need for "situational triage" in large scale combat operations, civilian triage protocols are rendered inadequate for the complexity and resource constraints placed by modern battlefield environments. The ARTS algorithm assesses casualties from major bleeding, walking ability, alertness, and signs of life, which is specifically adapted for drone-based visual assessment and relies on remote observations. The possibility of a system enhanced with AI-enhanced visualization interfaces that incorporates both the ARTS system and the military's own can support the development of next-generation casualty management tools, improving battlefield medical outcomes through enhanced situational awareness and streamlined evacuation decision-making.

Is AI Accurate and Consistent Across Different Patient Populations?

Dr. Rima A. Gibbings and Ciin T. Cing
University of North Georgia

As artificial intelligence (AI) becomes increasingly embedded within healthcare systems, ensuring its reliability, standardization, and adaptability across diverse patient populations has emerged as a central concern for both clinicians and researchers. In high-stakes domains such as interventional cardiology—where procedural precision, reproducibility, and safety are paramount—AI’s successful deployment depends not only on its technical performance, but also on its alignment with varied clinical settings, the trust of healthcare professionals, and the confidence of patients. This study seeks to examine whether

current AI systems used in interventional cardiology can consistently deliver safe and effective outcomes across different hospitals, geographic regions, and demographic groups.

A review of the current literature reveals persistent challenges that hinder universal trust in AI systems. These include variability in procedural techniques among clinicians, limited access to long-term outcome data, and the inconsistent integration of AI into real-world workflows (Chirag Bavishi et al., 2023; Cheng et al., 2025). These inconsistencies not only complicate clinical application but also raise concerns about the transparency and trustworthiness of AI-driven decisions—factors that directly influence patient perceptions, engagement, and informed consent in care involving emerging technologies.
To explore these critical concerns, we are currently in the process of conducting structured interviews with interventional cardiologists, clinical practitioners, and AI system developers. The objective is to understand how AI tools are being deployed, how effectively they align with diverse institutional practices, and how they are perceived by clinical teams. A key component of this investigation includes examining patient engagement—specifically, the extent to which patients are informed about AI involvement, their level of trust, and how they participate in decisions influenced by AI technologies.

Data collected through these interviews will be analyzed to identify key themes and areas for improvement. From these insights, we aim to develop a framework for evaluating procedural standardization and AI integration across varying environments. Additionally, we seek to identify potential input variables and metrics that can be used to improve AI design and implementation, particularly in ways that support patient-centered engagement and shared decision-making.

While results are forthcoming, this ongoing work aspires to generate practical, evidence-based recommendations for the safe, effective, and equitable integration of AI into interventional cardiology. These recommendations will include strategies to enhance clinician training, foster interdisciplinary collaboration, and promote transparency and trust among patients. Ultimately, this research aims to bridge the gap between technological advancement and human-centered healthcare, supporting the development of AI systems that are not only accurate and efficient but also ethically aligned and widely accepted by both care providers and the communities they serve.

Personalized Music Recommendation Through Emotion Recognition: Auralyn

Audree Moua
University of North Georgia
Faculty Advisor: Dr. Tamirat Abegaz

As artificial intelligence continues to evolve, it's becoming one of the most important technological advancements of our time. Its integration into our everyday experiences are not only changing how we interact with the world, but also how we care for ourselves emotionally. Music, a universally understood and emotionally driven art form, has always played a special role in our lives. From iconic festivals like Woodstock to the playlists we rely on daily, music connects people across cultures and generations. It's more than just sound—music is a language of emotion. It has long served as a coping mechanism for stress, anxiety, sadness, happiness, and more. For many, music is like a best friend—something that's always there to help express, reflect, or shift how we feel.

This research paper focuses on the creation and development of Auralyn, an AI-powered system designed to detect users' emotions and recommend music based on how they feel. Whether the goal is to match their current mood or help uplift a negative state, Auralyn aims to be a comforting and emotionally intelligent support tool. By combining AI with music, Auralyn encourages emotional healing, mood improvement, and long-term mental wellness.

Throughout this study, we'll evaluate how effective emotion-based music recommendations can be in improving a person's mood and helping maintain emotional stability over time. This project is about more

than just technology—it's about building something that supports real people with real emotions, using one of the most powerful tools we all share: music.

Should Organizations Ban or Encourage Generative AI Use in Performance Evaluations, Hiring, or Employee Development?

Caroline Branch, Chanley Box, Edwin Bowman, and Rylie Moody
University of North Georgia
Faculty Advisor: Dr. Inchul Cho

Should businesses prohibit or promote the use of AI inside the business world? This question unfolds because of the rapid growth in AI in the workplace, and whether the use of AI in that workspace is more beneficial than hazards it may bring vice versa.

The purpose of this research is to review and summarize the current literature on effects of AI use in the human resource functions. After reviewing sixteen relevant articles that were published in the last five years, we notice several patterns. First, AI has the potential to improve human resource (HR) operations being objective and efficient. AI can speed up the hiring process, eliminate discrimination, and personalize employee development by improving efficiency, supplying accessible learning resources, and helping data-driven choice-making. Secondly, there are risks and morals choices associated with it. Some research addresses the concerns of AI such as "hallucinations", unfairness, and the lack of accountability, the lack of transparency that AI puts out, misunderstandings, and job loss concerns. One article specifically highlights AI copies assumptions from its initial hardware leading to producing unethical outputs. The final common theme is the demand for moral control and leadership. All of the studies argue that organizations need to establish strong ethical norms in order to control hazards.

Thus, the literature reveals a clear divide between the potential benefits and the significant risks associated with AI implementation in HR. On one hand, AI is praised for enhancing efficiency, reducing human bias, and offering personalized development opportunities. On the other hand, issues such as ethical concerns, lack of transparency, algorithmic bias, and potential job displacement raise important questions about accountability and fairness. While the technological promise of generative AI in HR is compelling, the consensus across the literature is that its success depends on the presence of strong ethical guidelines, human oversight, and strategic leadership. In sum, generative AI should not be unconditionally banned or promoted but instead approached with caution, clear ethical frameworks, and robust governance to ensure it serves the best interest of both organizations and employees.

Despite the growing body of research on AI in HR, several gaps remain. First, there is a lack of empirical, long-term studies evaluating the real-world impact of generative AI on workforce outcomes such as diversity, retention, and employee satisfaction. Much of the existing literature is theoretical or speculative, lacking concrete evidence on how AI affects HR functions over time. Second, while many studies raise concerns about bias and ethical risks, few provide actionable solutions or frameworks for ethical AI integration. There is also limited research on how AI is perceived by employees across different industries, cultural backgrounds, or job levels - factors that could significantly affect AI's effectiveness and acceptance. Lastly, little attention has been given to the role of training HR professionals to understand and work alongside AI tools, which is essential for implementation success. Future research should aim to address these gaps with interdisciplinary studies, involving both technical and human-centered approaches.

Social Good Metrics: Using Artificial Intelligence to Define Organizational Status

Dr. Renee Pratt, University of North Georgia

Dr. Jack Crumbly, Tuskegee University

More than ever artificial intelligence is a pervasive and impactful technology for businesses and organizations. The opportunities to elevate, expand, and transform organizations are unimaginative. As AI has the opportunity to change the impact of many organizations, several startups and traditional businesses are exploring the concept of using artificial intelligence to achieve sustainable development goals (Leal Filho et al 2022; Nahar 2024). The year 2025 marks a decade of global progress towards the 2030 deadline set to shift the world into a sustainable and resilient path. This specifically seeks to build on the Millennium Development Goals (eight goals to reduce extreme poverty in 2015), realize human rights of all (including gender equality and empowerment of all women and girls), and integrate and balance the sustainable dimensions (economic, social, and environmental). AI is a tool that could significantly diminish the time and efforts required to meet this timeline.

We are aware that this short timeline is not feasible, however, nations across the world continue to take action to implement this plan and believe in the long-term benefits of the plan. In that effort, businesses/organizations push forward with a desire to meet a new set of standards - sustainable development goals (SDGs) - to demonstrate their footprint to contribute to "peace and prosperity for people and the planet, now and into the future" (https://sdgs.un.org/goals). AI has the potential to change the landscape of society. This draws the questions - how much and in what ways? Therefore, the inclusion of artificial intelligence to influence societal impact requires methods to measure and identify the impact where organizations are able to eradicate hunger and poverty, strengthen and improve health and education, reduce inequality, and spur economic growth through the use of AI. Businesses will not only fight general fears of AI with employees and staff, but also clients and customers. We must determine the best method to verify and assess the benefits or consequences of using AI in the fight to achieve peace and prosperity.

The goal of this research is to determine areas in which organizations may measure their use of AI towards the impact of sustainable development goals. In order to achieve this goal, we initially begin with a literature review. The literature review will explore the three main categories of interest - AI, social good, and SDG - across the information systems and supply chain field. We will conduct a systematic review to determine what has been discovered about the intersection of these three areas and highlight the gaps and potential concerns of AI on sustainable development goals. Once this is determined, we will explore the websites and documentation of other secondary data to see what organizations are promoting and identifying as contributions to peace and prosperity for people and the planet. Based on these initial findings, we will discuss the expectations and requirements for organizations to meet sustainable development goals to define testing and evaluation. We also believe we will find points that not only contribute to the well-being of the world, but also cause damage and harm, for example negative impact of the power distributed by AI systems.

Teaching AI in Virtual Reality: Reward Verification and Demonstration-Based Training with Unity ML-Agents

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Faculty Advisors: Dr. Tamirat Abegaz and Dr. Denise McWilliams

Artificial intelligence (AI) agents trained in simulation often exploit proxy rewards in ways that diverge from intended goals, a phenomenon known as reward hacking. This project explores reward verification in reinforcement learning through a novel virtual reality (VR) environment built in Unity with ML-Agents. In this environment, a player demonstrates tasks, such as picking up and placing an object, while an AI “hand” agent learns from these demonstrations via behavioral cloning and reinforcement learning.

Our research focuses on bridging the gap between proxy rewards (simple metrics like object placement) and verifiable rewards (evidence-based signals that ensure the agent actually learned the correct task). To achieve this, we integrated Bayesian verification to cross-check agent actions with contextual signals

(e.g., stability, holding state, and placement conditions). The VR setup allows for richer, gesture-based human input, enabling more intuitive training compared to traditional 2D environments.

Preliminary results show that the agent can interact autonomously with the environment, though challenges remain in stabilizing its movements and preventing unintended behaviors such as drifting outside the play area. This work highlights the potential of VR-based reinforcement learning as both a teaching tool and a platform for studying reward alignment in AI.

Testing & Evaluation of Cyber Reinforcement Learning Agents and Network Configuration Generation Tool

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As machine learning and artificial intelligence become more embedded in mission-critical systems, robust testing and evaluation (T&E) is crucial. Deep reinforcement learning (RL) can be utilized in cybersecurity tasks including penetration testing in simulated environments to learn exploitation strategies without access to ground truth network structure or vulnerabilities. This work executes a set of developmental tests on an RL-enabled tool as part of a larger T&E planning exercise. The repository contained different implementations of automated network penetration agents built on the Network Attack Simulator (NASim). Q-learning, Deep Q-Learning, and Upper Confidence Bound agents showed strong performance when hyperparameters were tuned—outperforming NASim's benchmark agents in complex environments while using fewer resources. A coordinating network scenario generation tool used natural language prompts to create NASim topologies. Preliminary research suggests that testing possible modifications such as Double DQN, gradient clipping, soft target updates, and learning rate annealing may improve convergence stability and reduced policy variance. Future testing will focus on error coverage and address training instabilities discovered in the developmental testing and evaluation stage. This work demonstrates both the potential and current challenges of using RL for automated cybersecurity testing.

The "Real" Adversary: The Impact of Artificial Intelligence on the Availability of Cyber Attacks

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Artificial Intelligence (AI) has been around for more than a decade and has captured the attention of people worldwide due to its revolutionary ability to mimic human learning. The development of Artificial Intelligence began seven decades ago during the 1950s when researchers became curious about neural networks. Over recent years, AI has become more accessible, with platforms such as ChatGPT, Claude, Grok AI, and Gemini being available to the public. This accessibility has made AI a practical tool in different scenarios, allowing anyone to use advanced technologies. However, the wide availability of AI raises ethical concerns, as individuals with little to no expertise can misuse AI for malicious purposes, including phishing, the practice of sending fraudulent emails or messages from an authoritative position to reveal personal information or credentials, leading to system infiltration [6]. AI-driven tools streamline the programming process, allowing developers to generate and test code more efficiently. In cybersecurity, AI can automate vulnerability scanning and even simulate attacks, which helps in designing stronger systems. AI's cybersecurity capabilities are extensive, with both defensive and offensive applications. As AI becomes more powerful over time, learning from its prompts, understanding its role on both sides of security and vulnerability becomes incredibly important to understand. The availability of AI has increased, which allows inexperienced users to potentially access skills that raise cybersecurity risks. This makes AI a potential weapon for malicious use, even in the hands of inexperienced individuals. Along

with this, we are inching closer to a theoretical AI called AGI that can execute an intellectual task that humans are able to perform. This is a correlational and comparative study using a qualitative approach. The data collection begins with the participation of students in a first-year high school cybersecurity program who participate in a competition developed by Carnegie Mellon University, the leading cybersecurity school in the nation, called PicoCTF. Before the study begins, I acknowledge that as a student who leverages AI in my brainstorming of approaches to different offensive-based challenges, I am prone to bias in stating that AI is capable of great advancement in this occupation. During the study, the focus will be on how much of a difference there is between the first-year students and the third-year students in a three-year pathway. The difference in performance, including the number of challenges solved and in what time frame, is taken into consideration to analyze the amount of help that AI can provide in offensive-based challenges in comparison to web browsers. With the understanding that first-year students feel that AI is less effective than web browsers, and with more knowledge in the topics, AI becomes more effective according to the third-year students. Due to these findings, it is possible that since we used the first-year students to mimic the inexperienced adversaries who could be attempting to perform infrastructure infestations, these inexperienced adversaries will not be able to utilize AI to the same extent as more experienced adversaries.

Tone over Talent: Exploring Linguistic Bias in Automated Hiring

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As the demand for artificial intelligence (AI) being incorporated into business functions grows higher, it is important to consider the high potential of algorithmic bias being present within these AI programs. Using AI recruitment systems has become increasingly standardized due to the convenience and proposed “objectivity” that is suggested when relying on an AI model’s decision-making. There is a significant amount of research available that illustrates how algorithmic recruiting systems can have a negatively amplified effect on a large language model’s existing bias, which can lead to the questioning of the ethics and legality involved in the hiring scene. This research also exposes the extent to which AI’s bias covers by analyzing the various ways in which wording patterns or certain phrasing can influence an LLM’s predictions. For this research, both machine learning algorithms and a fine-tuned LLM will be used for testing.

Using Machine Learning to Predict the Severity of General Aviation Accidents

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The scheduled air carriers have a fatal accident rate of 0.006 per 100,000 flight hours, in comparison to the general aviation (GA) rate of 1 per 100,000. More than 90% of registered aircraft in the United States are operated as general aviation aircraft, and they are flown by over 80% of US certified pilots. Despite ongoing efforts to reduce GA fatalities since 1998, recent data shows a static rate of fatal accidents, despite a decline in flight hours from 2000 to 2020. In this study, we aim to enhance our understanding of accident severity prediction in GA. Leveraging data from the National Transportation Safety Board (NTSB) Aviation Accident Database (Avall), we investigate key variables influencing accident outcomes.

Vysoul: An AI-Driven Mood-to-Art Interface for Accurate Emotion Detection and Expression

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The ideology of this project is to explore the convergence of artificial intelligence while considering emotional understanding and interpretation of what expressive and personalized artwork implies. If utilizing all the tools provided, this can develop a system that will interpret an individual's emotional state based on user input that will then generate artificial intelligence art. Utilizing natural language processing performances will enhance the learning system by classifying emotions from user input.

Once the emotion is detected, the output is conditioned to generate an AI artwork that aligns with the user's emotional state. The overall aim of this project is to evaluate how accurate artificial intelligence can understand a human's emotional state through user input and be able to generate artwork that best correlates to the attached emotion. The system consists of using a mobile friendly user interface, AI generated artwork, emotional detection, and feedback towards users. This will be performed through the metrics of emotional accuracy of the AI generated artwork. The project is aimed not to just identify a human's emotional state, but to hopefully be able to communicate through expressive and personalized visual art.

Wildlife Poaching Detection Systems Using AI, Satellite Imagery, and Sound Data

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Wildlife poaching remains a serious issue in many protected areas, especially in remote areas. In remote areas, there aren't enough rangers to monitor everything at once. Some tools like satellite imagery and motion sensors are used today. Although, most systems still require a lot of manual work and aren't fast enough to stop poachers on time. As a result, poaching often goes undetected until it is too late. The goal of this project is to build a simple app that can automatically spot unusual activity, such as abnormal animal movement patterns or suspicious environmental sounds. This is done by analyzing images and sound data. An OpenAI model will be trained to analyze these signs and send alerts so that rangers can react more quickly. This research will look at how well AI can understand patterns in images and audio data and how accurate it can be at spotting real threats. The goal is to build a tool that helps give rangers smarter, faster insights and protects endangered wildlife more effectively.

Index of Authors and Faculty Advisors

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