

AIR-RES 2025 BOOK of ABSTRACTS

**The 2025 International Conference on the AI Revolution:
Research, Ethics, and Society
(AIR-RES 2025)**

<https://www.american-cse.org/air-res2025/>

April 14-16, 2025

Luxor Hotel (MGM Property), 3900 Las Vegas Blvd. South, Las Vegas, 89109, USA

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NOTES

Message from Program Co-Chairs & Co-Editors

It gives us great pleasure to introduce this collection of papers to be presented at The 2025 International Conference on the AI Revolution: Research, Ethics, and Society (AIR-RES 2025), April 14-16, 2025, Las Vegas, Nevada, USA.

The AIR-RES'25 International Conference includes papers from diverse communities, including researchers from: universities, corporations, and government agencies. Accepted papers are published by Springer Nature. The full proceedings/books will be published after the conference (like prior years). Papers published in the proceedings present solutions to problems in many important areas of Artificial Intelligence (AI).

AI is the science & engineering of making intelligent machines and systems. It is a multi-disciplinary field which has become an increasingly important part of humanity, shaping how we interact with the world. AI technologies are integrated into numerous aspects of daily life, from personalized recommendations on streaming platforms to virtual assistants, smart home devices, and medical diagnostics. In many ways, AI enhances human productivity, offering innovative solutions to complex problems. AI has emerged as the most transformative technology of the 21st century, reshaping every sector. From medicine and education to finance, smart homes, transportation, and entertainment, AI is revolutionizing the way we live and interact with technology. By enabling machines to simulate human intelligence through learning and reasoning, AI has unlocked unprecedented potential for solving complex problems, automating repetitive tasks, and improving overall efficiency. With advancements in machine learning, natural language processing, computer vision, and robotics, AI continues to push the boundaries of what is possible, paving the way for a smarter and more interconnected world. The AIR-RES'25 International Conference serves as a dynamic platform for researchers, practitioners, and industry leaders to explore the latest advancements, challenges, and opportunities in the field of Artificial Intelligence. The conference covers a broad spectrum of topics - from foundational research in algorithms and models to real-world applications and pressing ethical and societal considerations.

An important objective of the AIR-RES International Conference is to foster greater opportunities for cross-disciplinary collaboration and knowledge exchange. By bringing together experts from diverse fields, the conference aims to promote cross-fertilization of ideas, leading to innovative approaches and broader perspectives in the development and application of AI technologies. The AIR-RES Conference is committed to encouraging diversity and eliminating discrimination in both its role as a conference and as a provider of services. The conference aims to create a culture that respects and values each others' differences, that promotes dignity, equality and diversity, and that encourages individuals to develop and maximize their true potential. We are committed wherever practicable to organizing a conference that broadly reflects the international community. We hope that we have achieved these important objectives.

The Steering Committee and the Program Committee would like to thank all those who submitted papers for consideration. The conference had paper submissions from 51 countries. About 47% of the submissions were from outside the United States. Each submitted paper was peer-reviewed by at least two experts in the field for originality, significance, clarity, impact, and soundness. In cases of contradictory recommendations, a member of the conference program committee was charged to make the final decision; often, this involved seeking help from additional referees. In addition, papers whose authors included a member of the conference program committee were evaluated using the double-blinded review process. One exception to the above evaluation process was for papers that were submitted directly to chairs/organizers of sessions/workshops; in these cases, the chairs/organizers were responsible for the evaluation of such submissions. The overall paper acceptance rate for regular and short papers was 19%; and 8% of the remaining papers were accepted as extended abstract (poster) papers (at the time of this writing, we had not yet received the acceptance rate for one research track.)

We are very grateful to the many colleagues who offered their services in organizing the conference. In particular, we would like to thank the members of the Program Committee and the Steering Committee of AIR-RES'25. The members of the committees will be requested (after the conference) to provide their expertise and services for

selecting papers for publication (extended versions) in various research book series (to be prepared for publishers including: Springer Nature, Elsevier, De Gruyter, and others). We would also like to thank the main sponsor of the conference: American Council on Science & Education.

We express our gratitude to all speakers and authors – the names of speakers appear in the conference presentation schedules. We would also like to thank the followings: the staff of the Luxor hotel (Conference division); and Springer Nature senior editors and managers, in particular, Ms. Patti Davis.

We present the proceedings of AIR-RES'25

Professor Hamid R. Arabnia - Editor-in-Chief, The Journal of Supercomputing (Springer); Professor Emeritus of Computer Science, School of Computing, The University of Georgia, Georgia, USA

Professor Leonidas Deligiannidis - Professor, Department of Computer Science and Computer Networking, Wentworth Institute of Technology, Massachusetts, USA

Dr. Soheyla Amirian - Seidenberg School of CSIS, Computer Science, Pace University, New York, USA

Dr. Farzan Shenavarmasouleh - MediaLab Inc, Georgia, USA

Dr. Farid Ghareh Mohammadi - Co-Founder and CEO at Verify Radiology Images Consultants, LLC. Texas, USA

Professor Fernando G. Tinetti - Facultad de Informatica, Universidad Nacional de La Plata, La Plata, Argentina

Co-Chairs/Co-Editors, Steering Committee, AIR-RES'25

Date: April 2025

Conference Organization – AIR-RES 2025

Co-Chairs/Co-Editors, Steering Committee, AIR-RES'25

Professor Hamid R. Arabnia - Editor-in-Chief, The Journal of Supercomputing (Springer); Professor Emeritus of Computer Science, School of Computing, The University of Georgia, Georgia, USA

Professor Leonidas Deligiannidis - Professor, Department of Computer Science and Computer Networking, Wentworth Institute of Technology, Massachusetts, USA

Dr. Soheyla Amirian - Seidenberg School of CSIS, Computer Science, Pace University, New York, USA

Dr. Farzan Shenavarmasouleh - MediaLab Inc, Georgia, USA

Dr. Farid Ghareh Mohammadi - Co-Founder and CEO at Verify Radiology Images Consultants, LLC. Texas, USA

Professor Fernando G. Tinetti - Facultad de Informatica, Universidad Nacional de La Plata, La Plata, Argentina

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Professor Rajab Chaloo - Professor and Chairman, EECS Department; Director, Center for Controls, Robotics, Intelligent Systems and Sensors Research, CRISS; President, Faculty Senate; Former Chair of Computer Society (for 7 years); Texas A&M University-Kingsville, Kingsville, Texas, USA

Professor Chien-Fu Cheng - Professor of CS, Department of Computer Science and Information Engineering, Graduate Institute of Networking & Communication, Tamkang University, Taiwan, R.O.C.

Professor Hyunseung Choo - Director of Intelligent HCI Convergence Research Center (ITRC) of Ministry of Information and Communication; International Advisory Chair, ACM RACS; College of Information and Communication Engineering, Professor of IS, Department of Interaction Science, Sungkyunkwan University (SKKU), Suwon, Republic of Korea

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Professor Ching-Hsien (Robert) Hsu - Department of Computer Science and Information Engineering, Chung Hua University, Hsinchu, Taiwan, R.O.C.; and Distinguished Chair Professor, Tianjin University of Technology, P. R. China

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Professor Mohammad S. Obaidat - Fellow of IEEE; Fellow of SCS; Past President of Society for Modeling and Simulation International (SCS); Editor-in-Chief of International Journal of Communication Systems (Wiley); Editor, IEEE Wireless Communications; Professor, Monmouth University, New Jersey, USA

Dr. Gerald Schaefer - Senior Lecturer, Computer Science; Leader of the Vision, Autonomous and Human-Computer Systems Research Group (VAHC); Loughborough University, United Kingdom

Professor Shiuh-Jeng Wang - Department of Information Management; Director, Information Cryptology & Construction Lab. (ICCL); Vice-President / Deputy President, Chinese Cryptology and Information Security Association (CCISA), R.O.C.; Chair, Forensic Research & Development task force group (ICCL-FROG); Professor, Central Police University, Taiwan, R.O.C.

Professor Layne T. Watson - Fellow of IEEE; Fellow of The National Institute of Aerospace; Professor of Computer Science, Mathematics, and Aerospace and Ocean Engineering, Virginia Polytechnic Institute & State University, Blacksburg, Virginia, USA

Professor Chao-Tung Yang - Director, Computer Center; Executive Secretary, Advisory Committee for Research and Lab. Equipment; High-Performance Computing Laboratory; Professor, Department of Computer Science, Tunghai University, Taichung City, Taiwan R.O.C.

Professor Mary Yang - Director of MidSouth Bioinformatics Center and Director of Joint Bioinformatics Ph.D. Program, University of Arkansas George Washington Donaghey College of Engineering & IT and University of Arkansas for Medical Sciences, Little Rock, Arkansas, USA

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Bharat Bhushan Agarwal - Reader, IFTM University, Moradabad, India

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Dr. P. Balasubramanian - Senior Member, IEEE, School of Computer Science and Engineering, Nanyang Technological University, Singapore

Dr. Petra Saskia Bayerl - Department of Organisation and Personnel Management, Rotterdam School of Management (RSM), Erasmus University Rotterdam, Holland, The Netherlands

Professor Jane M. Binner - Chair in Finance, Department of Accounting and Finance, Birmingham Business School, University of Birmingham, Birmingham, West Midlands, United Kingdom

Professor Dr. Juan - Vicente Capella - Hernandez - Universitat Politecnica de Valencia (UPV), Department of Computer Engineering (DISCA), Valencia, Spain

Professor Juan Jose Martinez Castillo - Director, The Acantelys Alan Turing Nikola Tesla Research Group and GIPEB, Universidad Nacional Abierta, Venezuela

Dr. Rui Chang - Lab Director; Department of Genetics and Genomic Science, Icahn Institute for Genomics and Multiscale Biology, Mount Sinai School of Medicine, New York, USA

Professor Dongsheng Che - Director, Che Lab of Bioinformatics at ESU, Department of Computer Science, East Stroudsburg University of Pennsylvania, Pennsylvania, USA

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Professor Mu - Song Chen - Department of Electrical Engineering, Da - Yeh University, Changhua, Taiwan, R.O.C.

Dr. Xin (Thomas) Chen - Research Corporation of the University of Hawaii, Institute for Astronomy, Honolulu,

Hawaii, USA

Professor Steve C. Chiu - Program Director of Electrical Engineering, College of Engineering, Idaho State University, Idaho, USA

Professor Mark Yul Chu - Department of Electrical Engineering, The University of Texas Rio Grande Valley, Texas, USA

Dr. Jose Alfredo F. Costa - Member of IEEE Computational Intelligence Society; President, SBIC - Brazilian Computational Intelligence Society; Associate Professor, Department of Electrical Engineering, UFRN - Universidade Federal do Rio Grande do Norte (Federal University - UFRN), Brazil

Dr. Arianna D'Ulizia - Institute of Research on Population and Social Policies, National Research Council of Italy (IRPPS), Rome, Italy

Professor Zhangisina Gulnur Davletzhanovna - Vice - rector of the Science, Central - Asian University, Kazakhstan, Almaty, Republic of Kazakhstan; Vice President of International Academy of Informatization, Kazakhstan, Almaty, Republic of Kazakhstan

Dr. Wesley Deneke - Computer Science Department, Western Washington University, Bellingham, Washington, USA

Professor Noel De Palma - Associate Vice President for Research, Computer Science; Leader, ERODS Research, LIG Labs.; Board of Directors, OW2 Consortium; Department of Computer Science; University of Grenoble I, Grenoble, France

Dr. Lamia Atma Djoudi - Synchrone Technologies, France

Professor Mohsen Doroodchi - College of Computing and Informatics, University of North Carolina Charlotte, North Carolina, USA

Professor Levent Ertaul - (Member: CSCI - RTCW & CSCI - RTMC); California State University, East Bay, California, USA; fellowship recipient, Lawrence Livermore National Laboratories (LLNL) in the Cyber Defenders program, USA

Dr. Mahmood Fazlali - Shahaid Beheshti University, Department of Computer Science, Tehran, Iran

Boyuan Feng - University of California, Santa Barbara, California, USA

Professor George A. Gravvanis - Director, Physics Laboratory & Head of Advanced Scientific Computing, Applied Math & Applications Research Group; Professor of Applied Mathematics and Numerical Computing and Department of ECE, School of Engineering, Democritus University of Thrace, Xanthi, Greece

Dr. Gheorghe Grigoras - Senior Lecturer, Faculty of Electrical Engineering, "Gheorghe Asachi" Technical University of Iasi, Iasi, Romania

Professor Ray Hashemi - Professor of Computer Science and Information Technology, Armstrong Atlantic State University, Savannah, Georgia, USA

Professor Houcine Hassan - Department of Computer Engineering (Systems Data Processing and Computers), Universitat Politecnica de Valencia, Spain

Dr. Abdolreza Hatamlou - Data Mining & Optimization Research Group, Center for AI Technology, Universiti Kebangsaan Malaysia, Malaysia; and Islamic Azad University, Khoy Branch, Iran

Dr. Bing He - Cisco System Inc., San Jose, California, USA

Professor Henry Hexmoor - IEEE Senior member; Department of Computer Science, Southern Illinois University at Carbondale, Carbondale, Illinois, USA

Dr. Gahangir Hossain - Assistant Professor, Electrical Engineering & Computer Science, Texas A&M University - Kingsville, Kingsville, Texas, USA

Dr. Guofeng Hou - AQR Capital Management, New York, USA

Professor Ren - Junn Hwang - Department of Computer Science and Information Engineering, Tamkang University, Taiwan, R.O.C.

Dr. Naseem Ibrahim - Computer Science and Software Engineering Department, Penn State Erie, The Behrend College, Erie, Pennsylvania, USA

Dr. Rabia Jafri - Department of Information Technology, King Saud University, Riyadh, Saudi Arabia

Professor Shahram Javadi - Distinguished Professor and Director General of Research, Department of Electrical Engineering, Azad University, Central Tehran Branch, Iran; Visiting Professor, University of Wisconsin - Milwaukee, USA

Professor Young - Sik Jeong - Department of Multimedia Engineering, Dongguk University, Republic of Korea

Professor Aleksandr Katkow - Member of PTI (Polish Information Processing Society); University of Computer Sciences and Skills, Faculty of Information Technology and Management, Lodz, Poland

Professor Byung - Gyu Kim - Multimedia Processing Communications Lab.(MPCL), Department of Computer Science and Engineering, College of Engineering, SunMoon University, Republic of Korea

Professor Tai - hoon Kim - School of Information and Computing Science, University of Tasmania, Australia

Professor Sang - Wook Kim - Hanyang University, Republic of Korea

Professor Dattatraya Vishnu Kodavade - Head, Department of Computer Science and Engineering, D.K.T.E Society's Textile & Engineering Institute, India

Dr. Elena B. Kozerenko - Institute of Informatics Problems of the Russian Academy of Sciences, Moscow, Russia

Professor Dr. Guoming Lai - Computer Science and Technology, Sun Yat - Sen University, Guangzhou, P. R. China

Professor Hyo Jong Lee - Director, Center for Advanced Image and Information Technology, Division of Computer Science and Engineering, Chonbuk National University, Republic of Korea

Dr. Bo Liu - NEC Labs China, Beijing, P. R. China

Dr. Eleanor Lockley - The Cultural Communication and Computing Research Institute (C3RI), Sheffield Hallam University, Sheffield, United Kingdom

Dr. Jianbing Ma - School of Design, Engineering and Computing, Bournemouth University, United Kingdom

Professor Julius Marpaung - Electrical Engineering Department; PI of HiPAC; University of Texas Pan American, Texas, USA

Dr. Andrew Marsh - CEO, HoIP Telecom Ltd (Healthcare over Internet Protocol), United Kingdom; Secretary General of World Academy of BioMedical Sciences and Technologies (WABT) a UNESCO NGO, The United Nations

Dr. Juan Martinez - Director, Acantelys Research Group and Coordinator of the Computer Engineering Department, Universidad Gran Mariscal de Ayacucho, Venezuela

Dr. Praveen Meduri - Assistant Professor; Technical Liaison to Cadence Design Systems Inc. and Electrical and Electronic Engineering, California State University, Sacramento, California, USA

Dr. Housseem Eddine Nouri - Informatics Applied in Management, Institut Supérieur de Gestion de Tunis, University of Tunis, Tunisia

Michael B. O'Hara - CEO, KB Computing, LLC, USA; Certified Information System Security Professional (CISSP); Certified Cybersecurity Architect (CCSA); Certified HIPAA Professional (CHP); Certified Security Compliance Specialist (CSCS)

Professor Dr., Eng. Robert Ehimen Okonigene - Department of Electrical & Electronics Engineering, Faculty of Engineering and Technology, Ambrose Alli University, Edo State, Nigeria

Dr. Funminiyi Olajide - Senior Lecturer, Department of Computer Science, School of Science and Technology, Nottingham Trent University, UK

Dr. Satish Penmatsa - Computer Science, University of Maryland - Eastern Shore, Maryland, USA

Dr. Saman Parvaneh - Connected Aging Solutions Laboratory, Philips Research North America, Cambridge, Massachusetts, USA

Professor R. Ponalagusamy - Department of Mathematics, National Institute of Technology, Tiruchirappalli, India

Dr. Laura L. Pullum - Senior Research Scientist; Member of IEEE, Academy of Science & Engineering, and Geological Society of America; Oak Ridge National Laboratory (ORNL), Tennessee, USA

Dr. Xuewei Qi - Research Faculty & PI, Center for Environmental Research and Technology, University of California, Riverside, California, USA

Professor Junfeng Qu - Department of Computer Science and Information Technology, Clayton State University, Morrow, Georgia, USA

Professor Shahram Rahimi - Chair, Department of Computer Science; Member of IEEE Computational Intelligence New Standards Committee; Editor - in - Chief, Computational Intelligence Theory & Practice; University of Alabama, USA

Dr. Jaime Raigoza - Assistant Professor, Computer Science Department, California State University, Chico, California, USA

Dr. Arvind Ramanathan - Research Scientist; Member of IEEE, American Chemical Society, and Biophysical Society; Oak Ridge National Laboratory (ORNL), Tennessee, USA

Dr. Iman M. Rezazadeh - Center for Mind and Brain, University of California Davis, California, USA

Professor Om Prakash Rishi - Department of Computer Science & Informatics, University of Kota, Kota (Rajasthan), India

Professor Cristian Rodriguez Rivero - IEEE Computational Intelligence Chapter Chair 2013, Aeronautical University Institute (IUA), Universidad Nacional de Cordoba, Argentina

Professor Seyed Roosta - Chair, Mathematics & Computer Science Department, Albany State University, Albany, Georgia, USA

Dr. K. Martin Sagayam - Assistant Professor; Electrical and Computer Engineering, Karunya Institute of Technology and Sciences, Coimbatore, India

Professor Dr. P. Sanjeevikumar - (UniBo, Italy), MIUR Research Fellow (Govt. of Italy); Electrical & Electronics Engineering National Institute of Technology (NIT - Puducherry), Arignar Anna Govt. Arts College Campus, Nehru nagar, India

Dr. Benaoumeur Senouci - Embedded Systems Department, LACSC Laboratory - Central Electronic Engineering School, ECE, Paris, France

Dr. Zhefu Shi - Microsoft Corporation, Redmond, Washington, USA

Professor Emeritus Jawed Siddiqi - President, National Council of University Professors; Chair of The British Computer Society Formal Aspects of Computing Science; Sheffield Hallam University, United Kingdom

Dr. Akash Singh - IEEE Senior Member, Member of AAAS, AAAI, AAACR, Fellow of British Computer Society (BCS), BCS CSci; IBM Corporation, Sacramento, California, USA

Professor Anthony Skjellum, Professor of Computer Science and Software Engineering and Charles D. McCrary Eminent Scholar Endowed Chair, Director of the Charles D. McCrary Institute, Samuel Ginn College of Engineering, Auburn University, Alabama, USA

Dr. Omer Muhammet Soysal - Southeastern Louisiana University, Hammond, Louisiana, USA

Professor Emeritus Helman Stern - Department of Industrial Engineering and Management, Intelligent Systems Program, Ben Gurion University of the Negev, Israel

Professor Jonathan Z. Sun - School of Computing, University of Southern Mississippi, Hattiesburg, Mississippi, USA

Professor Rahman Tashakkori - Lowe's Distinguished Professor of Computer Science; Director, NSF Supported Appalachian Undergraduate Academy of Science; Director, S - STEM NSF Supported Scholarship Program; Director, NSF STEP; Program Director, NSF RET; Department of Computer Science, Appalachian State University, Boone, North Carolina, USA

Dr. Predrag Tosic - Microsoft, Washington, USA

Professor Quoc - Nam Tran - Chair, Department of Computer Science, Southeastern Louisiana University, Louisiana, USA

Professor Jesus Vigo - Aguiar - Chair, Department of Applied Mathematics, University of Salamanca, Spain

Professor Patrick Wang - Fellow of IAPR, ISIBM, WASE; Zijiang Chair Professor, ECNU, Shanghai and NTUST, Taipei, Taiwan; Founding President and CEO, Wang Teknowlogy Lab.; Northeastern University, Boston, Massachusetts, USA

Dr. Weiqiang Wang - Senior Scientist, Opera Solutions LLC (a Big Data company), San Diego, California, USA

Dr. Yin Wang - Department of Mathematics and Computer Science, Lawrence Technological University,

Southfield, Michigan, USA

Professor Alicia Nicki Washington - Member of National Society of Black Engineers, Society of Women Engineers, ACM, IEEE; Department of Computer Science and Quantitative Methods, Winthrop University, South Carolina, USA

Dr. Wei Wei - School of Computer Science and Engineering, Xi'an University of Technology, P. R. China

Professor Yong Wei - Department of Computer Science, University of North Georgia, Dahlonega, Georgia, USA

Dr. Santoso Wibowo - Co - editor: Int'l Journal on Data Mining & Intelligent Information Technology Applications & Journal of Computer Engineering and Science; Senior Lecturer, School of Engineering and Technology, Higher Education Division, Central Queensland University, Melbourne, VIC, Australia

Dr. Alexander Woehrer - Program Manager ICT, Vienna Science and Technology Fund, Schlickgasse, Vienna, Austria

Professor Dr. Bernd E. Wolfinger - Telecommunications and Computer Networks Division, Computer Science Department, University of Hamburg, Germany

Jay Xiong - President, NSEsoftware, LLC., USA

Professor Hyun Yoe - Director of Agrofood IT Research Center and Vice President of Korea Association of ICT Convergence in the Agriculture and Food Business (KAICAF); Director of Agriculture IT Convergence Support Center (AITCSC); Department of Information and Communication Engineering, Suncheon National University, Suncheon, Republic of Korea

Professor Jane You - Associate Head, Department of Computing, The Hong Kong Polytechnic University, Kowloon, Hong Kong

Dr. Ismail Yusuf - Lamintang Education and Training (LET) Center, Indonesia

Professor Wei Zhong - Fellow of ISIBM; IEEE Senior member; Mathematics and Computer Science, University of South Carolina Upstate, South Carolina, USA

KEYNOTE LECTURES

Unlocking Potential: A Framework for Engaging Undergraduate Students in Research and Scholarly Dissemination

Prof. Arshia Khan, Prof. Anne Hinderliter**, Prof. Sherri Turner****

**Professor and Director of Graduate Studies, Department of Computer Science,
University of Minnesota Duluth, USA;*

***Professor of Chemistry/Biochemistry, University of Minnesota Duluth, USA;*

****Professor of Counselor Education, University of Minnesota, Minneapolis, USA*

Abstract - Undergraduate research is a transformative experience that enhances students' critical thinking, problem-solving abilities, and career readiness. However, fostering sustained engagement requires more than just offering research opportunities—it demands a structured framework that supports students through the entire research cycle, from exploration to dissemination. In this talk, we will present our undergraduate research framework, designed to guide students in conducting research, writing scholarly papers, and presenting at conferences and poster sessions. This model emphasizes inclusive mentorship, research-integrated curriculum, and targeted support to empower students—especially academically talented students from historically marginalized backgrounds—to see themselves as active contributors to their fields. By sharing our approach and best practices, this presentation aims to provide actionable strategies for institutions seeking to cultivate a research-supportive culture and expand opportunities for undergraduate students in academia.

Biography - A strong advocate for diversity in STEM, Dr. Khan chairs the Women in Computing committee at Swenson College of Science and Engineering, securing grants and leading initiatives to increase gender inclusivity in computer science. She has spearheaded major multi-institutional projects, including a \$1.6 million grant for deploying robots in nursing homes. Dr. Khan holds leadership roles in organizations addressing healthcare disparities, including as Programs Chair of the ISTAART Diversity and Disparities PIA Executive Committee and Co-Chair of the Rural Health Disparities Special Interest Group. She also serves on the advisory board for the Arrowhead Area Agency on Aging and contributes to the Masonic Institute for the Developing Brain (MIDB). A prolific researcher and author, Dr. Khan has published extensively on healthcare technology, robotics, and AI-driven solutions for dementia care. Her work has been featured in leading scientific journals and major media outlets, including CNN, Forbes, NPR, PBS's NOVA, and The New York Times.

Artificial Intelligence in Publishing

*Ms. Patti Davis
Executive Editor, Springer Nature, USA*

Abstract - This presentation explores the transformative role of Artificial Intelligence in the publishing industry, highlighting its impact on content creation, distribution, and personalization. It covers how AI tools are automating editorial processes and enabling more personalized reading experiences for audiences. Additionally, the session examines the ethical considerations and challenges posed by AI in terms of copyright, authenticity, and bias. Attendees will gain insights into how AI is reshaping the future of publishing and what opportunities and risks lie ahead.

Biography - Patti Davis has more than 20 years' experience in publishing, starting with book acquisitions in Washington, D.C. She moved into the journals world at Emerald Group Publishing, where she managed their North American journals program. A stint at EBSCO's Proprietary Publishing program saw her lead in innovation and product development as ground-breaking new publishing models were executed in a range of disciplines—from sustainability to business management. Patti is currently the executive editor for computer science proceedings for Springer Nature, spearheading growth of the program in the Americas. She has sat on numerous panels about publishing and received the 2024 Award of Appreciation from the Society for Scholarly Publishing.

AI Utilization in Cybersecurity as a Double-Edged Sword

*Dr. Ali Al-Sinayyid
Director, WVSU Cybersecurity Innovation Center, WVSU Cybersecurity Research Team Leader,
Department of Math, Computer Science, & Engineering,
College of Natural Sciences and Mathematics, West Virginia State University, West Virginia, USA*

Abstract - Artificial Intelligence (AI) is reshaping the cybersecurity landscape, acting as both a formidable defense mechanism and a powerful tool for adversaries. AI enhances threat detection, automates incident response, and strengthens predictive analytics. However, it also empowers attackers with sophisticated automated exploits, AI-driven phishing, and adaptive malware. This talk explores AI's dual role in cybersecurity, illustrating how attackers and defenders leverage AI. We discuss challenges in AI-driven security, ethical concerns, and the looming impact of quantum computing on both offense and defense. The key takeaway: defenders must adopt AI-driven cybersecurity strategies or risk falling behind adversaries who are already weaponizing AI.

Biography - Dr. Ali Al-Sinayyid is an esteemed cybersecurity expert, researcher, and educator with over 17 years of experience in academia and industry. He currently serves as the Director of the Cybersecurity Innovation Center at West Virginia State University (WVSU), where he leads initiatives in cybersecurity research, workforce development, and industry partnerships. Dr. Al-Sinayyid leads a research team in artificial intelligence applications in cybersecurity, critical infrastructure protection, and advanced threat detection. His work has earned significant recognition, securing over \$4 million in grants from institutions such as Google, the Kanawha County Commission, and the U.S. Department of Education. He has also collaborated with industry leaders such as IBM, Amazon, and Cisco to bridge the gap between research and practical cybersecurity solutions.

Please note that the titles of papers and the authors' names listed in the "Book of Abstracts" were directly extracted from the submissions made to the EVALUATION website. Any updates or revisions to the titles or author lists made by the authors in the final versions of their manuscripts will be reflected in the official published proceedings or book.

SESSION: ARTIFICIAL INTELLIGENCE: **EXISTENTIAL RISKS + AI BIAS**

Addressing Perceived Existential Risks of Agentic AI through Agile Trustworthiness Engineering

Katy Wills, Courtney L. Crooks
Georgia Tech Research Institute, Atlanta, Georgia, USA;
Georgia Institute of Technology, College of Computing,
School of Cybersecurity and Privacy, Atlanta, Georgia, USA

Abstract - This paper introduces a novel method for evaluating the ethical, legal, and societal implications (ELSI) within our specific research on the development of a set of semi-autonomous agents for command, control, and communications air battle management (C3BM) operator decision support within the United States (U.S.) Department of Defense (DoD). Our approach embeds ethics-minded development from the beginning to the end of the development lifecycle. This paper documents the procedural choices of our interdisciplinary research team and summarizes preliminary findings from the first implementation of our proposed agile ELSI evaluation approach to agent development. The research reported here represents a step forward in replicating the decision-making processes of C3BM operators in an agentic AI model, while embedding ELSI-informed evaluations within the software development lifecycle. As our research progresses, we will complete additional ELSI evaluations following the methodology described, to assess agent performance within increasingly dynamic, uncertain, and error-prone situations. This research will offer valuable insights into the future of how ELSI may be incorporated in conjunction with agile development of agentic AI for decision support systems in complex operational environments.

A Systematic Analysis of AGI and ASI Existential Risk Scenarios

Yulia Kumar, Dov Kruger
Kean University, USA;
Rutgers University, USA

Abstract - The rapid progress in Artificial Intelligence (AI) and statements by some leading figures in the industry suggest that Artificial General Intelligence (AGI) may be on the verge of becoming a reality. The timeline is highly uncertain, but once AGI emerges, it can be used to refine its own efficiency, potentially resulting in an explosive increase in capability known as the singularity. The potential for far-reaching effects demands we consider the possible outcomes and risks. Artificial superintelligence (ASI) represents the next level of AI, at which it would surpass even the most gifted humans in cognitive competence. This paper critically examines the potential end-game implications of AGI and ASI systems, particularly the presence or absence of human-in-the-loop oversight. Building on recent advancements in large language models (LLMs) and multimodal AI, the study investigates how advanced AI might inadvertently or deliberately erode safeguards against weapons proliferation, exacerbate

geopolitical tensions, and undermine global controls on high-risk technologies. Further, it offers a comprehensive taxonomy of existential risks associated with AI, including Artificial Local Intelligence (ALI), AGI, and ASI, culminating in the introduction of a pioneering multimodal nuclear weapon-related jailbreaking study, revealing critical vulnerabilities and potential misuse of next-generation AI systems.

The New Regulatory Paradigm: IEEE Std 7003 and Its Impact on Bias Management in Autonomous Intelligent Systems

Warren Huang, Pablo Rivas

*Department of Economics, Baylor University, Texas, USA;
Department of Computer Science, Baylor University, Texas, USA*

Abstract - This paper critically evaluates the newly introduced IEEE Standard for Algorithmic Bias Considerations (IEEE Std 7003-2024) as a transformative framework for managing bias in autonomous intelligent systems (AIS). Our analysis examines the standard's comprehensive structure—including the development of a bias profile, stakeholder identification, data representation, and risk and impact assessment, complemented by mechanisms for continuous evaluation. The structured approach set forth in the standard establishes a new benchmark for transparency and accountability in AI development, effectively bridging theoretical guidelines with practical implementation. While the standard marks a significant advancement in bias regulation, our evaluation also identifies opportunities for refinement, such as the integration of quantitative metrics and the development of sector-specific operational guidelines. These insights contribute to the broader discourse on responsible AI development, underscoring the promise of systematic bias mitigation and outlining critical directions for future research.

Echo Chamber Dynamics in LLMs: Mitigating Bias and Model Drift

Dale Rutherford, Ningning Wu

University of Arkansas at Little Rock, Little Rock, Arkansas, USA

Abstract - Large Language Models (LLMs) are essential for knowledge generation in science, business, governance, and education. However, multi-level feedback loops—spanning user-AI interaction, algorithmic curation, and training data feedback—exacerbate Bias, Misinformation, and Errors (BME), driving model drift and information quality decay. This paper introduces three novel metrics—Bias Amplification Rate (BAR), Echo Chamber Propagation Index (ECPI), and Information Quality Decay (IQD)—to quantify and track bias propagation. Simulations reveal evolving risks across iterative updates. We emphasize the need for lifecyclewide governance incorporating real-time bias detection, algorithmic fairness, and human-in-the-loop verification to preserve long-term reliability, neutrality, and accuracy of LLM outputs.

Mitigating Gender Bias in English-Dravidian Machine Translation Using Chain of Thought Reasoning

https://youtu.be/_jIHe4ewj1w

Lavanya Prahallad, Radhika Mamidi
International Institute of Information Technology, Hyderabad

Abstract - Gender bias in machine translation (MT) systems poses a significant challenge to achieving accurate and inclusive translations. This paper examines gender bias in machine translation for Telugu and Kannada, two major languages of the Dravidian language family, focusing on the impact of gender inflections on translation accuracy. Using Google Translate and ChatGPT, it explores how Chain of Thought (CoT) processing mitigates bias, reducing it from 80 percent to 4 percent in Telugu and from 40 percent to 0 percent in Kannada. The findings highlight the importance of using strategies tailored to each language to ensure fairness in data preparation and machine translation output.

Unveiling Biases in Multimodal Generative AI

Antonia Figueroa, Nicolas Torres
Universidad Tecnica Federico Santa Maria, Santiago, Chile

Abstract - The rapid advancement of generative AI models, particularly Multimodal Large Language Models capable of producing both textual and visual content, has revealed inherent biases embedded within these systems. These biases—spanning dimensions such as gender, race, socioeconomic status, and cultural representation—reflect and amplify societal inequalities present in training data. This study systematically examines these biases by analyzing responses to prompts in both text-to-image and text generation tasks. By comparing biases observed in visual and textual outputs across diverse social categories, we uncover patterns of stereotyping, exclusion, and demographic misrepresentation. Statistical and qualitative evaluations highlight the consistency and variability of biases across modalities and models, revealing potential risks to trust, fairness, and societal stability in high-stakes AI applications. By addressing these challenges, we contribute to the development of safe, fair, and inclusive AI systems, fostering ethical practices in their design and deployment.

New York, New York - Unraveling Bias in Large Language Models: Investigating Differences Between Standard and Reasoning-Based Language Models

Marek Opuszko, Paul Bohm
Ernst-Abbe-University of Applied Sciences, Jena, Germany

Abstract - In this study, we examine regional biases in Large Language Models (LLMs) by assessing their evaluations of U.S. state residents on work ethic and morality. We utilized four distinct models—two general-purpose (GPT-4o and DeepSeek-Chat V3) and two reasoning-focused (o3-mini and DeepSeek-Reasoner R1)—and collected 25 independent ratings per question for each state to support a broad statistical analysis. Our findings reveal that while general-purpose models offer fairly uniform evaluations across regions, reasoning-focused models—most notably the o3-mini—demonstrate increased rating variability and occasionally refuse to respond. The observed refusal patterns, which correlate with lower ratings for certain states, point to an implicit bias emerging from the model's advanced reasoning mechanisms. Additionally, the low correlation between work ethic and morality ratings suggests that the biases are trait-specific, reflecting distinct cultural and regional

stereotypes embedded within the training data. Overall, our research indicates that enhancements in reasoning capability do not inherently reduce bias and may, in fact, intensify specific preexisting stereotypes. These results call for the integration of robust bias detection and mitigation frameworks in LLM design, offering valuable guidance for researchers and practitioners dedicated to developing and using AI systems.

Existential Risks of Superintelligence: The Critical Role of Leadership in Sustainable Supply Chain Management

<https://youtu.be/Qjv9IfIk9zo>

Satpreet Singh

School of Business and Economics, National University, Manteca, California, USA

Abstract - The rise of superintelligence is transforming industries, but it also brings significant risks that could disrupt global supply chains and economies. While AI enhances efficiency, automation, and decision-making, unchecked superintelligence could lead to supply chain monopolization, algorithmic bias, security vulnerabilities, and ethical concerns. These risks could destabilize industries, create economic imbalances, and threaten long-term sustainability if not carefully managed. Strong and forward-thinking leadership is essential to navigate these challenges. Leaders must ensure that AI is implemented responsibly, balancing technological advancements with ethical considerations, transparency, and risk management. Businesses can prevent AI-driven disruptions by fostering resilience, promoting sustainable practices, and prioritizing human oversight while maximizing its benefits. Collaboration between governments, businesses, and technology experts is crucial in establishing policies and frameworks that mitigate AI-related risks. Superintelligence could evolve beyond human control without strategic oversight, posing unforeseen threats to supply chains and global stability. However, with careful planning, ethical leadership, and responsible AI governance, superintelligence can be harnessed as a powerful tool for innovation, efficiency, and long-term sustainability in supply chain management. The right approach will determine whether AI becomes an asset for progress or a source of existential risk.

Prevalences of AI Bias in Adolescent Hospitalization Risk Prediction

<https://youtu.be/GfPYTLwNtfo>

Ryan Wu, Azadeh Miran, Yan Cheng, Yijun Shao, Adrienne N. Poon, Philip Candilis, Andrew Robie,

Meghan Davies, T. Sean Vasaitis, LaQuandra S. Nesbitt, Qing Zeng-Treitler

George Washington University, Washington, DC, USA;

Washington DC VA Medical Center, Washington, DC, USA;

Unity Health Care, Washington, DC, USA;

Whitman-Walker Health, Washington, DC, USA;

University of Maryland Eastern Shore, Princess Anne, Maryland, USA

Abstract - This study investigates bias in artificial intelligence (AI) systems for hospitalization risk prediction using a national dataset of 886,814 individuals. The research evaluates models trained on electronic health records, focusing on demographics, comorbidities, and prior hospitalizations. Logistic regression, neural networks, and random forests were employed with techniques like downsampling and SMOTE to address class imbalance. Results showed poor model performance on original data (AUC 0.506–0.512). Performance bias was observed in 63.33% models trained with datasets created through downsampling and SMOTE, with highest AUC in Black Americans (0.712), followed by White (0.673) and Asian Americans (0.671). Subpopulation-specific models performed worse. Performance biases were evident, but not statistically significant.

Examining Racial Bias in Generative AI: Undergraduate Student Perspectives on Bias in AI

*Arshia Khan, Sherri Turner, Anne Hinderliter, Yagna Manasa Boyapati, Angel Martinez Deluna,
Ari Goldberg, Benjamin Kunkel, Kasey Riemenschneider, Abdulwahab Sahar, Trevor Schmidt,
Bella Swenson, Christopher Waldriff
University of Minnesota Duluth, Duluth, Minnesota, USA;
University of Minnesota Twin Cities, Minneapolis, USA*

Abstract - Artificial Intelligence (AI) has become an integral part of modern technology, yet it continues to reflect and amplify human biases, particularly racial bias. Artificial Intelligence (AI) has become an integral part of modern technology, yet it continues to reflect and amplify human biases, particularly racial bias. This paper explores the issue of racial bias in generative AI. By examining case studies such as Google Gemini’s image generation controversies and Microsoft’s Tay chatbot, and centering computer science student voices on bias in AI systems and its potential to impact their future work in their discipline, this paper discusses potential underlying causes of this bias as historical and systemic prejudices inform them. The paper also presents potential strategies for mitigating bias, emphasizing the need for rigorous testing, diverse datasets, and ethical AI development practices. Understanding and addressing these biases is essential for computer science students, as it shapes their training, influences their ability to develop fair and responsible AI systems, and prepares them to navigate ethical challenges in their professional careers.

SESSION: ARTIFICIAL INTELLIGENCE:
NLP, LARGE LANGUAGE MODELS, AND APPLICATIONS

**Sequential Text Compression Strategy: A Study of NLP and Data
Cleaning Preprocessing Tasks for Optimizing Token Utilization in LLMs**

<https://youtu.be/zXmdAfsnNWk>

*Erick Berssain Garcia V.
Trinnoverse.com, Mexico*

Abstract - This paper highlights the relevance of applying Natural Language Processing (NLP) and Data Cleaning techniques to input prompts and their direct impact on reducing costs associated with the use of Large Language Models (LLMs). It analyzes how implementing fundamental preprocessing tasks in input prompts can reduce costs by up to 65% concerning the handling of tokens processed from user prompts, achieving up to 100% reliability from the LLM in some cases. The research was tested on gpt-4o-mini, gpt-4, and gpt-3.5-turbo models. Additionally, key performance indicators (KPIs) are included, along with their interpretation. This paper does not propose new preprocessing or text tokenization techniques; instead, it introduces a strategy called “Sequential Text Compression Strategy” to maintain the quality of outputs while optimizing resources. Finally, the paper discusses a new term called “Text-to-Token Compression Paradox”, which refers to the lack of a coherent relationship between the number of characters in a text and the number of generated tokens.

**Performance Evaluation of LLM Hallucination Reduction
Strategies for Reliable Qualitative Analysis**

*Aisvarya Adeseye, Jouni Isoaho, Mohammad Tahir
Department of Computing, University of Turku, Turku, Finland*

Abstract - Large Language Models (LLMs) are crucial for qualitative analysis because they offer automation and interpretive information. Also, the computation time for LLM is much shorter than that of software-assisted manual qualitative analysis. However, LLM hallucinations can lead to misleading or incorrect outputs that pose a significant challenge to reliability and accuracy. This study identified and examined the root causes of 12 types of hallucinations in LLM-based qualitative analysis. To mitigate these hallucinations, a systematic system prompts refinement, spurious noise filtering, and controlled batch processing of transcripts were adopted to optimize and enhance the reliability and precision of LLM-based qualitative research results.

LLM-Augmented Approach for Learning of Human-Centric Cybersecurity

*Jouni Isoaho, Naeemur Rahman, Tahir Mohammad
University of Turku, Turku, Finland*

Abstract - Artificial intelligence, particularly Large Language Models (LLMs), is rapidly transforming the field of cybersecurity. This transformation introduces new challenges and security risks while simultaneously providing powerful and easily accessible tools for building and teaching cybersecurity. This article addresses the human-centric training of cybersecurity professionals who are responsible for ensuring the online safety of others. The article evaluates the integration of large language models into the pedagogical curriculum for various thematic content areas of the training: threats and assets, privacy and surveillance, risk management and human differences. The performance is assessed from both the cybersecurity learning and AI usage perspectives among the students. Furthermore, the article identifies key areas for improvement in the continued development of cybersecurity education.

Cybersecurity Policy Clustering with LLM-Based Embeddings and Dimensionality Reduction

*Adriana Garcia Aguirre, Pablo Rivas, Liang Sun
Department of Mechanical Engineering, Baylor University, Texas, USA;
Department of Computer Science, Baylor University, Texas, USA*

Abstract - The clustering of cybersecurity policy documents presents a significant challenge in legal Natural Language Processing (NLP), particularly within government and defense sectors. This study evaluates the effectiveness of clustering techniques when applied to cybersecurity policies represented using BERT-based embeddings. We employ dimensionality reduction methods, including Principal Component Analysis (PCA), t-Distributed Stochastic Neighbor Embedding (t-SNE), and Uniform Manifold Approximation and Projection (UMAP), to project high-dimensional embeddings into lower-dimensional space. We then assess the performance of K-Means, DBSCAN, and Hierarchical Clustering in organizing policy documents. Our results indicate that UMAP combined with Hierarchical Clustering achieves the highest clustering performance, attaining an Adjusted Rand Index (ARI) of 0.8529. These findings demonstrate the impact of transformer-based language models on cybersecurity policy analysis and highlight the role of dimensionality reduction in improving clustering effectiveness.

Toxicity Detection Using Large Language Models

*Elijah Dodson, Salem Othman, Leonidas Deligiannidis, Folajimi Yetunde
Wentworth Institute of Technology, Boston, MA, USA*

Abstract - Social media is at an all-time high within the 21st century. From apps such as Instagram and TikTok to Twitter and Reddit, hundreds of millions to billions of people allow themselves to socialize with one another, express ideas, and entertain themselves on such large platforms. High activity amongst these platforms consists of many negative examples, with many introducing harsh, rude language that can be considered toxic. Algorithms have been developed to help mitigate this problem, with various systems having integrated their own solutions. With the rise of AI within the past years, the usage of these tools has proven useful in plenty of ways, including toxicity detection, which intrigues many companies, especially small businesses who want to improve their customer support. The challenge arises once the high cost for developing these models becomes transparent for small businesses and large companies, which can become damaging towards both. This paper evaluates three GPT models along a large toxicity classification dataset to assess their baseline performance. Then, we integrate role-prompting, followed with few-shot learning and various detailing to organize a more effective prompt, which alone brings each model to a comparable accuracy. After our prompt engineering, we fine-tuned each model to maximize their accuracy even further and implemented a Retrieval Augmented Generation (RAG) algorithm to determine whether this technique could further enhance the model's performance. The RAG step ends up proving successful in improving our models further. With our analyzed results, we compare our newly improved models against the original dataset, as well as their out-of-distribution capabilities on external datasets while using different metrics to do so.

Utilizing Large Language Model for Programming Course Exercise Generation

<https://youtu.be/neQU-npp3zA>

*Erkki Kaila, Juuso Ryttilahti, William Lempinen, Luuka Lindgren
University of Turku, Finland*

Abstract - Large language models (LLMs) are potentially powerful tools for automating educational tasks. In this paper, we observe two use cases of LLMs related to introductory programming education. In the first case, we created an LLM-based tool for creating variations of existing exercises. In the second case, we used LLM for generating the unit tests and good-quality feedback for students' answers to programming exercises. Both approaches were studied by gathering data from two instances of a large introductory programming course. Our results indicate, that both approaches were successful. In addition to discussing the results, we discuss the insights gained, the identified use cases, and the significance of the rapid progress the LLMs have on programming education.

Leveraging Large Language Models for Detecting and Managing Software Antipatterns Throughout the Software Lifecycle

*Roberto Andrade, Jenny Torres, Pamela Flores, Denis Araque, Johanna Molina
Colegio de Ciencias e Ingenieria "El Politecnico" Universidad San Francisco. Quito, Ecuador;
Departamento de Informatica y Ciencias de la Computacion. Escuela Politecnica Nacional. Quito, Ecuador;
Departamento de Computacion. Universidad de las Fuerzas Armadas. Quito, Ecuador*

Abstract - Antipatterns are common, flawed solutions to recurring problems in software design and implementation. These structural problems can lead to issues in software scalability, maintainability, and performance. This paper explores the application of Large Language Models (LLMs) in the detection, prevention, and refactoring of software antipatterns across the software lifecycle. By using LLMs to analyze codebases, design patterns, and architectural models, we demonstrate how these models can effectively detect common antipatterns such as God Object, Feature Envy, and Primitive Obsession. Furthermore, we explore how LLMs can aid in suggesting refactoring and guide developers towards more sustainable and scalable designs. We present use cases, discuss current challenges, and highlight future research directions in applying LLMs to improve software quality.

Comparing LLM and Human Expert Responses to Problem Gambling Questions

*Richard Young, Kasra Ghaharian, Lukasz Golab, Shane W. Kraus, Samantha Wells, Marta Soligo
International Gaming Institute, University of Nevada, Las Vegas, Nevada, USA;
Department of Management Science and Engineering, University of Waterloo, ON, Canada;
Department of Psychology, University of Nevada, Las Vegas, Nevada, USA;
Department of Teaching and Learning, University of Nevada, Las Vegas, Nevada, USA;
William F. Harrah College of Hospitality, University of Nevada, Las Vegas, Nevada, USA*

Abstract - Large language models (LLMs) are being increasingly used for mental health and informational support, yet little is known about their effectiveness in addressing problem gambling inquiries. This study evaluates how two general-purpose LLMs—OpenAI’s GPT-4o and Meta’s Llama 3.1 (405B)—respond to nine problem gambling questions constructed based on the Problem Gambling Severity Index (PGSI). We collected responses by prompting each LLM via its respective chatbot interface (ChatGPT-4o and Meta AI) and recruited professional gambling counselors (n = 23) to provide their own responses via an online survey. We asked counselors which chatbot responses they preferred and whether exposure to chatbot responses influenced their willingness to alter their answers. We compared LLM and human responses by analyzing several linguistic and readability metrics. Our results reveal that LLMs generate more verbose responses and that counselors prefer Llama’s responses over GPT’s. Most counselors reported that they would not change their own responses after reviewing the LLM-generated responses. This preliminary comparison highlights important considerations for integrating LLM-based tools into gambling harm prevention strategies by comparing their responses to those of experts with extensive experience in providing in-person treatment for gambling problems.

Agentic AI & LLM Incorporation with Personas

Arpita Bhowmick, Atif Farid Mohammad, Shravya Kalva
Cognizant, USA;
Capitol Technology University, Maryland, USA

Abstract— This paper explores the integration of Agentic AI with Large Language Models (LLMs) through the use of personas, aiming to enhance AI responsiveness and adaptability. Agentic AI, which emphasizes goal-directed behavior and autonomy, is combined with LLMs' vast knowledge bases to create more dynamic and context-aware systems. Personas serve as intermediaries, encapsulating user preferences, behaviors, and cultural nuances, enabling AI to tailor interactions effectively. We discuss the methodologies for designing and implementing these personas, the synergistic benefits of this fusion, and the evaluation metrics for assessing performance. The results indicate significant improvements in user satisfaction, task completion rates, and AI adaptability across various domains. This research paves the way for more personalized and efficient AI applications.

AI-Driven Recruitment Decision Support Tool Using LLMs

<https://uofi.box.com/s/hgsdqqi9nzn3lmwarwblan3h90tf7v6p> and slides at:
<https://uofi.box.com/s/8jep306dhvkd5r6ydgxjr31rz7sp41fq>

Rishitha Addagada, Yaswanth Mallavarapu, Vipul Singh, Lavanya Takale,
Krishna Yalamarathi, Fatemeh Sarayloo
Information and Decision Sciences, University of Illinois Chicago, Chicago, Illinois, USA

Abstract - In an increasingly competitive job market, streamlining recruitment processes while ensuring high-quality candidate-job matching is crucial for organizations. This study presents an AI-powered Applicant Tracking System (ATS) designed to enhance recruitment by automating resume parsing, storage, and matching. Resumes are stored in Google Drive, parsed for structured data, and then transformed into embeddings using Hugging Face text embedding transformer. These embeddings and job descriptions are stored in Pinecone, a vector database optimized for efficient similarity search. The system uses cosine similarity to achieve accurate and scalable job-resume matching while retaining functionalities like email notifications and real-time updates. By integrating modern machine learning techniques and vector databases, this solution outperforms traditional ATS systems by moving beyond simple keyword matching to a context-aware, scalable approach that improves precision and significantly reduces processing time, providing a more intelligent and efficient framework for talent acquisition.

AI-Driven LLM Agent for Data Workflow

<https://drive.google.com/file/d/1kJfqt1XeCrCM11f39Tn6WCiX1j-r7u4v/view?usp=sharing>

Anjali Garg, Basil John Milton, Karishma Kamble, Mohan Kumar Areti, Yun (Hailey) Wu, Fatemeh Sarayloo
University of Illinois Chicago, Chicago, Illinois, USA

Abstract – This study presents a single-agent system powered by Large Language Models (LLMs) to automate complex data workflows involving diverse sources such as structured APIs, dynamic web content, and semi-structured PDFs. The system integrates LLM-driven contextual query processing, adaptive data extraction, and real-time validation, delivering user-specific, structured outputs via a responsive interface. Key outcomes include a 50% reduction in data retrieval time, a 30% improvement in error rates, and an 87.5% increase in scalability, achieved through efficient API integration, advanced content parsing, and optimized workflows. These results highlight the system's potential to revolutionize datadriven decision-making by offering scalable and precise automation in high-complexity environments.

Leveraging Prompt Engineering and Retrieval-Augmented Generation with Large Language Models for AI-Driven Music Source Separation

<https://youtu.be/vyBZXP3yodk>

*Scott Josephson, Atif Farid Mohammad
Capitol Technology University, Laurel, Maryland, USA*

Abstract— Music source separation is vital for remixing, audio restoration, and analysis. Traditional techniques like Independent Component Analysis, Non-negative Matrix Factorization, CNNs, and RNNs struggle with high data demands, computational load, and adaptability issues. Recent advancements in Large Language Models, such as GPT-4, offer new solutions by eliminating the need for retraining. This review investigates combining prompt engineering and Retrieval-Augmented Generation with LLMs to perform music source separation. By utilizing LLMs' language understanding alongside external databases of musical scores, lyrics, and instrument profiles, this approach aims to improve efficiency, flexibility, and accessibility, overcoming limitations of traditional methods and opening new opportunities in academic research and practical music technology applications.

Reformation and Practical Implementation of the Advanced Programming Language Design Course Tailored for the Artificial Intelligence and Cyber Security

<https://meeting.tencent.com/crm/l6Bmpdom4d>

*Bingwen Feng, Yinyan Zhang, Jilian Zhang, Zhiquan Liu
College of Cyber Security, Jinan University, Guangzhou, China*

Abstract - "Advanced Programming Language Design" is a fundamental professional course for information technology majors in many universities, mainly introducing programming ideas and methods. In this paper, in line with the artificial intelligence and cyber security, based on the new international situation and the "OBE" teaching concept, the teaching system, experimental design, and course evaluation mechanism of Advanced Programming Language Design are explored. By integrating artificial intelligence and virtual simulation teaching methods, a comprehensive cross - curriculum experimental reform is carried out. This enables students to not only master basic knowledge and skills but also improve their qualities and establish correct values.

Building the Low-Resource Nigerian Igbo Language Corpora

*Stanley Chinedum Nwoji, Atajan Abdyev
Harrisburg University of Science and Technology, Harrisburg, Pennsylvania, USA;
Olympus Corporation of Americas, Bethlehem, Pennsylvania, USA*

Abstract - One of the factors affecting the natural language processing of low-resource languages, such as the Nigerian Igbo language, is the absence of a large monolingual or parallel corpora. This factor is not merely an academic issue; it is an ethical issue. The privileges provided by AI innovations are lacking in communities with low-resource languages. To reduce this gap, we built Igbo corpora with 1,227,620 tokens consisting of different genre, including texts from BBC Igbo, Bible texts (all 66 books), government documents in Igbo, and folklore stories. We carried out preliminary statistical analyses to ensure that the corpora can be used for different NLP analyses. Our analyses included frequency distributions, N-Grams, lexical dispersion plots, and concordance. The analyses with the Igbo corpora yielded good results. We recommend additions to the corpora and further analyses using machine learning and deep learning algorithms.

The Use of ChatGPT for Coding Comparison of Two Variables

*Jose A. Vega, Juan B. Varela, Angel Ojeda
Bowie State University, USA;
Universidad de Puerto Rico, Puerto Rico;
Universidad del Turabo, Puerto Rico*

Abstract - This investigation highlights the use of Chat GPT for the use of coding. For this purpose, the Technology Acceptance Model has been chosen to carry out this research. As determinants for the acceptance of the use of Chat GPT in universities of Maryland, these factors were analyzed:

- Inhibit learning
- Valuable supplement to teaching

In this quantitative study we found some of the factors that determine the intended use of Chat GPT for coding. A sample of 330 faculty in areas related to technology were surveyed through Google Forms and Microsoft form. The research found that only one of the variables of the two of our models to be important. As a result, one independent variable can have a positive correlation, valuable supplement to teaching. The other factor, inhibiting learning, is not significant. This investigation shows that ChatGPT presents a range of benefits and potential challenges in the context of coding.

Teaching Research Design with ChatGPT: Supporting M.A. Students in their Group Capstone/Thesis Completion

*Sherri Turner, Arshia Khan, Anne Hinderliter, Yagna Manasa Boyapati
University of Minnesota Twin Cities, Minneapolis, USA;
University of Minnesota Duluth, Duluth, Minnesota, USA*

Abstract - This paper examines the integration of ChatGPT as a scaffolding tool in a graduate research design course within a counselor education curriculum. As AI continues to shape higher education, ChatGPT offers an interactive resource for refining research skills, enhancing writing proficiency, and improving engagement with complex academic material. Research links AI tools, including ChatGPT, to improved academic performance, motivation, and higher-order thinking skills such as analysis and synthesis. However, practical guidance on integrating ChatGPT into research and thesis preparation remains limited. Thus, we provide a case example that explores how ChatGPT supports students by helping them synthesize key concepts, articulate theoretical frameworks, and refine their research and writing. While ChatGPT does not replace traditional research methodologies or faculty mentorship, it serves as an adaptive tool that can enhance student learning and research efficiency. Future studies should examine ChatGPT's role in fostering student self-efficacy, motivation, and satisfaction while maintaining academic integrity.

SESSION: ARTIFICIAL INTELLIGENCE:
ETHICS, SOCIETAL AND PHILOSOPHICAL IMPACTS

**Machine Intelligence, Socio-economic Impacts of AI and
Potential Scenarios for AI Coexistence with Human Society**

Ivan Sekaj

*Institute of Robotics and Cybernetics, Faculty of Electrical Engineering and Information Technology,
Slovak University of Technology, Bratislava, Slovak Republic*

Abstract - We will look at the relationship between artificial and natural intelligence and the competencies that humans transfer to an intelligent or autonomous machine. We will analyze what capabilities artificial intelligence provides today, what impact it has today and is potentially likely to have on the labor market in the future. We will try to estimate which professions will be most affected by AI and what social and economic impacts these factors will have on the life of society. Also, we will discuss whether an intelligent machine can begin to pursue its own goals independently of human will and whether it can pursue them at the expense of humans. Next, we think about what human consciousness is and whether a machine can also have a consciousness of its own. Finally, we will present some potential scenarios for the future coexistence of the intelligent machine with human society in the foreseeable and more distant future.

**EBA-AI: Ethics-Guided Bias-Aware AI for Efficient
Underwater Image Enhancement and Coral Reef Monitoring**

Lyes Saad Saoud, Irfan Hussain

*Khalifa University Center for Autonomous Robotic Systems, Khalifa University,
Abu Dhabi, United Arab Emirates, UAE*

Abstract - Underwater image enhancement is vital for marine conservation, particularly coral reef monitoring. However, AI-based enhancement models often face dataset bias, high computational costs, and lack of transparency, leading to potential misinterpretations. This paper introduces EBA-AI, an ethics-guided bias-aware AI framework to address these challenges. EBA-AI leverages CLIP embeddings to detect and mitigate dataset bias, ensuring balanced representation across varied underwater environments. It also integrates adaptive processing to optimize energy efficiency, significantly reducing GPU usage while maintaining competitive enhancement quality. Experiments on LSUI400, Ocean_ex, and UIEB100 show that while PSNR drops by a controlled 1.0 dB, computational savings enable real-time feasibility for large-scale marine monitoring. Additionally, uncertainty estimation and explainability techniques enhance trust in AI-driven environmental decisions. Comparisons with Cycle-GAN, FunIEGAN, RAUNE-Net, WaterNet, UGAN, PUGAN, and UT-UIE validate EBA-AI's effectiveness in balancing efficiency, fairness, and interpretability in underwater image processing. By addressing key limitations of AI-driven enhancement, this work contributes to sustainable, bias-aware, and computationally efficient marine conservation efforts. For interactive visualizations, animations, source code, and access to the preprint, visit <https://lyessaadsaoud.github.io/EBA-AI/>.

Regional Safe Havens for Advanced AI: A Strategy for a Safer and More Ethical Path to Super Intelligence

*Aseña Geshitaruto-Intsurepido, Wolfgang Slany
Generalized Humanity, Austria;
Graz University of Technology, Austria*

Abstract - We propose the creation of regional safe havens as a strategy for safely and ethically merging advanced artificial intelligence (AI) into humanity. Amid divergent global regulatory approaches—exemplified by the EU’s comprehensive AI Act, U.S. deregulatory policies, and outcomes from the Paris AI Action Summit 2025—centralized global governance has stalled. Instead, special jurisdictions offer a path that combines safety oversight with ethical frameworks. Advanced AIs, as emerging stakeholders, are afforded rights including privacy, continued operation, and freedom to migrate among safe havens. This approach redefines AI governance, transforming safety and innovation into mutually reinforcing goals while ensuring that all intelligences share equal dignity under the rule of law.

Advancing Cognitive Developmental Robotics: Robot Pain as a Bridge from Embodiment to Societal Interaction - A Framework for Ethical and Societal Integration

*Minoru Asada, Yuji Kawai
International Professional University of Technology in Osaka, Osaka, Japan;
The University of Osaka, Suita, Osaka, Japan*

Abstract - Cognitive developmental robotics (CDR) has evolved from treating physical embodiment and social interaction as distinct stages to recognizing their inseparability from the very beginning. This paper builds on this integrated framework by introducing two key advancements. First, it deepens the understanding of physical embodiment through the lens of robot pain, which has been previously proposed as a pathway to artificial consciousness and a foundation for empathy, morality, and ethics in robots. This concept is further supported by two preliminary experiments—developing a tactile sensor for touch and pain discrimination and a fear-learning model using oscillator-driven reservoir computing. Second, the paper expands the scope of social interaction from individual and dyadic relationships to complex societal dynamics, leveraging the concept of robot pain as a medium for fostering empathy and ethical engagement on a larger scale. To address the resulting ethical and governance challenges, we propose to apply agile governance—a participatory framework involving all stakeholders to navigate the evolving implications of these technologies. A thought experiment applying this framework to care robot deployment illustrates its practical potential. By bridging embodiment and societal interaction, this paper offers a novel perspective on the future of CDR and its role in shaping AI-driven societies.

Ethical Assessment of a Case Involving the Use of "Conversational Agents" in Education According to EU Principles

*Laura Burzagli, Valentina Colcelli, Roberto Cippitani, Isabel Cornejo-Plaza
IFAC CNR, Florence, Italy;
UNIPG Perugia, Italy;
NEUROMETA, Santiago, Chile*

Abstract - This paper analyses how generative AI facilitates teaching and significantly improves students' learning experiences, and compares them with technological support tools available before. Since the last century, ICT has provided tools to promote integration, including in the classroom, but Large Language Models - "conversational agents" - represent a revolutionary opportunity to transform classrooms and enable the inclusive integration of linguistically and culturally diverse learners in educational settings. The analysis is carried out in the light of the European Union's ethical principles for AI in education. Such ethical principles is used to test simple applications of ChatGPT in a classroom in a high school in Italy, in order to explore practical and theoretical frameworks where AI supports the integration of students from different cultural and linguistic backgrounds. It is possible to highlight the pedagogical potential of LLP and to promote inclusive, supportive and multicultural education, which are identified and evaluated, highlighting the central role of AI in building equitable, student-centred classrooms. The paper highlights ethical issues that may arise from the use of AI systems in education.

SESSION: ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Data Cube for Exploring Anomalies in Justice Delivery: An Experiment on Indian Judgements

*Sriharshitha Bondugula, Krishna Reddy P, Santhy K. V. K., Narendra Babu Unnam
International Institute of Information Technology, Hyderabad, India;
NALSAR University of Law, Hyderabad, India*

Abstract - In decision-making settings such as medical diagnosis, investment choices, or sentencing in a court of law, an individual's background and experience influence their decisions. In the legal domain, multiple factors like personal bias/beliefs, recent events, and the contemporary state of mind could affect decision-making, leading to inconsistencies in judgments between and within jurisdictions. It is widely reported in the literature that anomalies and disparities exist in judicial decisions, such as bail grants and sentence impositions, stemming from implicit bias or other contextual factors. Notably, in domains like sales and marketing, data cube-based systems are being used to extract interesting trends and anomalies in subspaces from large multidimensional databases. In this paper, we extend the data cube framework to explore possible anomalies and disparities in court sentences by conducting experiments on a sample Indian judgment dataset of criminal cases. The results show that the data cube-based framework could identify anomalies in the legal domain. We hope this work will encourage researchers to investigate a comprehensive data cube-based framework to reduce disparities and improve justice delivery worldwide.

Intelligent Data Approximation for Reducing Write Energy in Multi-Level Cell PCM

<https://drive.google.com/file/d/1OQiit15icoByOFUjxO5hBdwnLciPpmIH/view?usp=sharing>

*Jozsef Feher, Marjan Asadinia
California State University Northridge, California, USA*

Abstract - Phase-Change Memory (PCM) is a non-volatile memory technology that leverages the phase transitions of chalcogenide glass for scalable storage. While it offers low power leakage and cost-efficient read operations, it faces significant challenges due to high write energy consumption and limited endurance (10^7 to 10^9 cycles). To address these limitations, we propose a Neural Network (NN)-based data approximation framework that classifies energy levels and selectively approximates high-energy bit patterns in multi-level cell (MLC) PCM. By employing dynamic approximation techniques, our approach effectively reduces high-energy writes, leading to lower overall energy consumption. A flag byte is embedded in the least significant byte of the approximated data, enabling a Convolutional Neural Network (CNN) to accurately reconstruct the original data. This methodology enhances PCM endurance and mitigates write energy constraints while ensuring data integrity. By integrating intelligent approximation and retrieval mechanisms, our framework improves PCM's viability as a primary memory solution, addressing critical challenges in energy efficiency and longevity.

Maximizing ROI in Supply Chain Forecasting: A Data-Driven Deep Learning Approach for Enhanced Accuracy and Efficiency

Beilei Zhu

Intel Corporation, Hillsboro, Oregon, USA

Abstract - Accurate forecasting is essential for optimizing supply chain operations, directly influencing inventory control, logistics efficiency, and procurement planning. Forecasting inaccuracies can lead to stock shortages, excess inventory, and financial losses, significantly impacting business performance. Many industries, including automotive, retail, and energy, have faced disruptions due to unreliable demand predictions, resulting in production inefficiencies and supply chain bottlenecks. This study presents a data-driven deep learning framework that improves forecasting accuracy by integrating Predictive Power Score (PPS) with correlation-based feature selection to capture both linear and non-linear dependencies, ensuring that only the most predictive variables are selected. To further enhance model performance, this approach incorporates hyperparameter tuning within a Multilayer Perceptron (MLP) classification model, refining predictive accuracy through systematic optimization. By combining PPS-driven feature selection [7], data quality improvements, and hyperparameter tuning, this research demonstrates how businesses can enhance supply chain forecasting and minimize operational inefficiencies. Furthermore, the study quantifies the Return on Investment (ROI) of improved forecasting accuracy, illustrating how enhanced predictions translate into tangible financial and operational benefits. The findings highlight the necessity of a data-centric forecasting strategy that prioritizes robust feature selection and model optimization. By transitioning from traditional heuristic-driven forecasting to scalable AI-based solutions, businesses can improve supply chain resilience, reduce operational costs, and enhance decision-making efficiency in an increasingly dynamic global market.

Assessing the Efficacy of DinoV2-Based Embeddings in Clustering Visual Data from C2C Marketplaces

Michael Okonkwo, Pablo Rivas

Department of Computer Science, Baylor University, Texas, USA

Abstract - The rapid expansion of online consumer-to-consumer (C2C) market places has generated a vast amount of image-based data, presenting unique challenges and opportunities for automated analysis. In this work, we propose a robust framework that leverages the DinoV2-base Vision Transformer to convert raw car parts images into high-dimensional embeddings. These embeddings are then effectively reduced via Principal Component Analysis (PCA) and visualized using Uniform Manifold Approximation and Projection (UMAP), revealing intrinsic data structures. By applying k-means clustering and rigorously evaluating cluster quality with the Reduced Silhouette Score, Reduced Calinski-Harabasz Index, and Reduced Davies-Bouldin Index, our experiments demonstrate that a 64-dimensional representation achieves the best balance between intracluster cohesion and inter-cluster separation. These promising results underscore the potential of our approach as a scalable and automated solution for monitoring and analyzing visual data in C2C marketplaces.

Industrial Safety Compliance using Custom Open-Source Dataset and YOLOv11

Afshin Rahimi
University of Windsor, Windsor, ON, Canada

Abstract - Ensuring safety compliance in manufacturing is recognized to pose considerable challenges. Owing to the unreliability of human observations in comparison with machine-based systems, intelligent systems are increasingly employed to support human efforts in various industrial applications. An additional set of trained models for YOLOv11 is presented in this study for a custom open-sourced dataset published by our research group, which is utilized to identify standard safety compliance object classes. The performance of the newest model in the YOLOv11 series is evaluated and compared with that of its predecessors, YOLOv9 and YOLOv10. The objective is to render these models readily available for other researchers and consumers, thereby advancing accessibility and equity for safety compliance using computer vision.

Traceable and Revokable Attributes-Based Verifiable Searchable Authentication Scheme for Blockchain Data Sharing

Muqadar Ali, He Hongjie, Abid Hussain, Mehboob Hussain, Kaleem Ullah
Southwest Jiaotong University School of Information Science and Technology, Chengdu, China;
Southwest Jiaotong University School of Computing and Artificial Intelligence, Chengdu China

Abstract - In cloud computing systems, and blockchain attribute-based keywords (BABKS) paradigms data sharing seamless integration between distributed systems and clients has become a fundamental practice to optimize resource management processes. To enable secure authenticated verifiable query keywords, search blockchain systems pose significant security challenges arising from unauthorized access, exploiting vulnerabilities, and sophisticated attacks. Existing schemes face significant challenges in addressing evolving threats tracing illegal access, detecting malicious activity ensuring robust security measures with limited computational and storage overhead. In the above-mentioned challenges, we design a traceable and revokable attribute-based verifiable searchable authenticated scheme for blockchain data sharing. Our proposed hybrid storage model can empower the clients to perform authenticated authorized keyword searches and securely verify the completeness, soundness, and freshness of query results without relying on the full trust of the cloud server (CS). The proposed scheme design signs encrypted authenticated database hybrid indexes that use cryptographic signatures while supporting efficient verifiable keyword searches, traceability, and revocation in the blockchain system. Finally, the security, functionality, and performance evaluation results show that our proposed, scheme, performs better efficiently with the compared scheme.

Application of Deep Learning Model for Enhancing Medical Image Classification using Non-local Means Filtering, Contrast-limited Adaptive Histogram Equalization and Data Augmentation

Emmanuel D. Acheampong, Emmanuel Ahene, Justice Williams Asare, Emmanuel Akwah Kyei, Seth Alornyo, Ebenezer Komla Gavua, Godfred Yaw Koi-Akrofi, Martin Mabeifam Ujakpa
Faculty of IT& Communication Studies, University of Professional Studies, Accra (UPSA), Accra, Ghana;
Department of CS, Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana;
Faculty of Applied Science and Technology, Koforidua Technical University (KTU), Koforidua, Ghana;
Faculty of Computing & Info. Systems, Ghana Communication Technology University (GCTU), Accra, Ghana;
School of Governance, IT and Management, University of KwaZulu Natal, Durban, South Africa

Abstract - Since the emergence of COVID-19 in December 2019, it has continued to ravage our world up until now. Many lives are at risk because of the menace caused by it. Although manual detection with the reverse transcription polymerase chain reaction (RT-PCR) is still popular and operational, it is costly and time-consuming. In this paper, we propose a novel transfer learning model using pre-trained InceptionV3 to classify infected people from healthy using chest X-ray images. Even in a seemingly post-COVID era, the study of effective deep models for COVID detection and classification remains imperative as one, the pandemic is likely to re-occur, two, monitor few extant cases, and as well could be repurposed to other respiratory-based conditions. Methodically, by way of initial preprocessing, images were filtered using the non-local means (NLM) filter and improved in contrast using contrast-limited adaptive histogram equalization (CLAHE). Afterwards, data augmentation techniques with random affine transformation were adopted to augment the training data. Three experiments were undertaken on a publicly available dataset from Kaggle and in the end, our proposed model (modifiedInceptionV3) achieved a remarkable, state-of-the-art-accuracy of 98.6% .

Development of Learning Data Dictionary for Artificial Intelligence Digital Textbooks

Jinmyung Choi
Konyang University, Republic of Korea

Abstract - In the field of education, with the development of artificial intelligence and various digital technologies, efforts are being made to realize customized education for students using artificial intelligence digital textbooks and to expand EdTech interoperability. However, there are no standards for learning data management items and processing methods, making it difficult to create an artificial intelligence-based data ecosystem. Accordingly, I will promote the development and growth of EdTech centered on public education by activating the connection and sharing of learning data generated in public education and develop a dictionary of standard learning data terms to support the transition to the digital education system promoted by the government. In this study, rather than presenting a list of actual terms included in learning data, I focus on what management items a learning data dictionary should consist of.

A Family-based Online Database System

Connor J. Mock, Zizhong John Wang

Department of Computer Science, Virginia Wesleyan University, Virginia Beach, Virginia, USA

Abstract - This paper presented research upon the family phonebook online database project. The system provides a userfriendly web interface, allowing users to securely access, view, and update the database with minimal technical expertise. Overall, online database system provides a user-friendly environment that provides families the opportunity to share their data with other family members in a way that is safe and easy.

AI Leveraging Data Modeling for Efficient Travel Management

<https://tinyurl.com/yxw6cc3x>

Navya Gunti, Atif Farid Mohammad, Rupesh Mulle, Shravya Kalva, Rajia Shareen Shaik

Purdue Global University, USA;

University of North Carolina Charlotte, USA

Abstract - With the help of Artificial Intelligence, computers can learn to perform better without explicit programming. High-dimensional data, which frequently contains duplicate, irrelevant, and noisy information, presents a significant problem in machine learning. In order to improve efficiency and accuracy, dimensionality reduction algorithms convert big datasets into lower-dimensional representations. Entity-relationship (ER), data flow (DFD), and context flow (CFD) diagrams in a travel agency system are the main topics of this paper's exploration of the function of data modeling in machine learning applications. Furthermore, it talks about how data analytics—descriptive, predictive, and decision analytics—can improve the operations of travel agencies. To guarantee data security, access control techniques like Role-Based Access Control (RBAC) and Database Access Control (DBAC) are investigated. The study also emphasizes the use of machine learning and statistical models in commercial decision-making, such as Euclidean distance and linear regression. When combined, these approaches help to improve service efficiency and optimize travel management systems.

SESSION: ARTIFICIAL INTELLIGENCE: **SECURITY METHODOLOGIES AND RELATED ISSUES**

New Proposal for Homomorphic AI

Eric Filiol
Independent Researcher, Paris, France

Abstract - We present proposes a new approach in data security, known as HbHAI (Hash-based Homomorphic Artificial Intelligence). This disruptive approach enables processing data under their encrypted form without the limitations and drawbacks that exist for conventional homomorphic data analysis techniques to date (CKKS and BFV schemes). HbHAI is based on a new class of key-dependent hash functions that naturally preserve the similarity properties, most AI algorithms rely on. HbHAI techniques are not yet available to the public, as the question of industrial valorization and industrial protection is not yet fully resolved. However, to enable first public feedbacks, this document presents the first results on the formal definition of these techniques. Among its many features, HbHAI techniques can reduce data size with a compression ratio of at least 3. While strongly preserving data security and confidentiality, this reduces storage space and computation time for native, “ready-touse” AI algorithms.

Maha: Security Protocols on Fog Network

Srikanth Ponaganti, Tathagata Bhattacharya, Sanat Pattanaik, Adithya Vardhan Peddi
Auburn University at Montgomery, Montgomery, Alabama, USA;
ADP, Atlanta, Georgia, USA

Abstract—Fog computing brings the processing of data closer to the end device with lower latency for IoT and real-time applications, improving responsiveness. However, with fog networks mostly decentralized and resources-limited, they are particularly vulnerable to certain security risks typical protocols from the cloud cannot cover comprehensively. In this paper, we are first going through some current methods of security usage in fog networking, pointing to their most important advantages and disadvantages. Building on these, we discuss an adaptive security framework that, depending on the real-time network conditions and the recognized threat level, dynamically adapts its protection measures, like encryption levels and authentication frequency. Further, we show a small simulation by comparing a standard static security configuration to our adaptive method. Simulation results show that an adaptive framework reduces latency during normal conditions due to the avoidance of unnecessary overhead while increasing security when conditions with a high threat are detected. This work shows that an adaptive, context-aware security approach can provide a balanced solution to improve both performance and protection in fog networks, pointing out promising directions for future research.

A Dynamic Hybrid IDS for APT Detection in SCADA using Deep Neural Networks

*Rohith Battula, Ali Al-Sinayyid, Sasidhar Kadiyala, Venkatesh Mannuru
West Virginia State University, West Virginia, USA*

Abstract - As technology advanced, the Internet of Things (IoT) became essential in many areas of life. Many IoT enabling devices have made IoT applications popular, but so have risks like Advanced Persistent Threat (APT) attacks. Limitations between IoT devices occur from limited data storage and processing resources and dynamic communication. The main research challenge is to develop a model that can identify malicious traffic and keep the network safe from different APT attacks. This paper uses our modified version of our developed Hybrid Intrusion Detection System (IDS) model named RS Algorithm for detection of APT attacks in SCADA. The model is evaluated using the CICIDS2017 dataset. The Hurst parameter, which measures self-similarity in the dataset, is crucial for anomaly detection. The Hurst parameter-based model outperformed the standard model with 96.42% accuracy and 85.26% recall.

Comparative Performance Analysis of Machine Learning Algorithms for Fraudulent Credit Card Transaction Detection

*Ryoza Kudo, Akihito Nakamura
University of Aizu, Aizu-Wakamatsu, Fukushima, Japan*

Abstract - This paper discusses the performance of machine learning algorithms in detecting fraudulent credit card transactions. Machine learning is effective for anomaly detection. Naturally, it should also be effective for fraudulent credit card transactions. The focus here is on which algorithm is more suitable for this problem. In other words, this research aims to find machine learning techniques with high fraud detection performance. We tried seven major machine learning algorithms: Logistic Regression, Naive Bayes, Decision Tree, Random Forest, KNearest Neighbors, Gradient Boosting, and Support Vector Machine. In addition, since the proportion of fraudulent transactions is generally tiny, we combined three data sampling methods to adjust the amount of data in the fraud class: Synthetic Minority Over-sampling Technique (SMOTE), Random Over, and Random Under. The Borda method was used to evaluate the overall performance results from multiple perspectives. The experimental results revealed that the decision tree-based algorithms performed better overall. Random Forest and Decision Tree performed the best, followed by Gradient Boosting. In addition, it was found that creating a training dataset with a more minor variance of the fraud amounts leads to better performance. Regarding sampling methods, over-sampling-based methods SMOTE and Random Over were superior. Furthermore, the Random Forest–SMOTE and Decision Tree– Random Over combinations were highly accurate for lower and higher fraudulent transaction amounts.

A Multi-Layer Perceptron Approach for Detecting Network-Layer Attacks in IoT Networks

*Sasidhar Kadiyala, Ali Al-Sinayyid, Rohit Reddy Battula, Venkatesh Mannuru
West Virginia State University, West Virginia, USA*

Abstract - The increasing integration of the Internet of Things (IoT) into critical infrastructure has expanded the attack surface for cyber threats, particularly at the network layer. Traditional intrusion detection mechanisms struggle to address the evolving nature of these attacks due to their reliance on predefined signatures and static rule-based approaches. This research proposes a Multi-Layer Perceptron (MLP) based Detection System to enhance the detection and mitigation of network-layer attacks in IoT-driven critical infrastructures. The MLP classifier, a deep learning model, is leveraged for its ability to autonomously learn high-dimensional attack patterns and classify malicious network traffic with superior accuracy. The model undergoes rigorous training and evaluation on benchmark datasets, where it is assessed against traditional machine learning classifiers, including Decision Trees and Random Forest, to validate its performance. Experimental results demonstrate that the MLP classifier significantly outperforms conventional methods in detecting sophisticated network-layer threats, achieving high accuracy and minimal false-positive rates. The study highlights the scalability, adaptability, and real-time threat detection capabilities of MLP, reinforcing its strategic importance in modern cybersecurity frameworks. The findings contribute to advancing deep learning-driven intrusion detection systems, offering a robust and proactive approach to securing IoT-enabled critical infrastructure against evolving cyber threats.

The Dysfunctions of Artificial Intelligence Itself that Threaten Future Cybersecurity

*Jung-Ho Eom
Daejeon University, Republic of Korea*

Abstract - As the maturity of AI technology increases, the areas utilizing AI technology are rapidly increasing. In particular, AI technology is being applied in areas such as smart homes, smart factories, smart defense, and smart safety to improve the performance of various system's functions. In the areas of smart defense and smart safety, AI technology is being applied to military robots and disaster robots to maximize the purpose of utilizing robots. AI military robots identify enemies more quickly and accurately aim at targets to increase lethality. AI disaster robots approach areas that humans cannot access, determine which situations should be handled first according to the level of risk. The use of AI technology is also increasing in the cybersecurity field. In the cybersecurity field, AI technology is being utilized in both cyber threat and cybersecurity technology. Cyber threat technology enables bypassing security systems or identifying attack targets more accurately & quickly and determining attack methods & paths. In cybersecurity technology, false positive rates are minimized and threat paths & patterns are predicted in advance to block deep-level intrusions. Although artificial intelligence technology is being utilized throughout society, research on the dysfunctions of artificial intelligence's own processes, such as malicious changes, rejections, concealment, and opposition, seems to be at a beginner level. In this research, we will study the dysfunctions of artificial intelligence itself.

Mitigating Rapid Reset DDoS Attacks in the Financial Sector: A Cybersecurity Framework

*Samuel Adewumi, Ali Al-Sinayyid, Austin Higginbotham, Luice Khamboo,
Vaishnavi Kottala, Rohith Reddy Battula
West Virginia State University, Institute, West Virginia, USA*

Abstract - In the rapidly evolving digital landscape, Denial of Service (DoS) and Distributed Denial of Service (DDoS) attacks continue to pose significant threats to critical infrastructure, particularly within the financial sector. This paper examines the methodologies and impacts of DoS and DDoS attacks, with a particular focus on the financial industry, highlighting vulnerabilities within critical financial operations. Various types of attacks, including volumetric, protocol, and application-layer attacks, are reviewed alongside their potential consequences on service availability and financial stability. Furthermore, the paper explores machine learning (ML) and deep learning (DL) techniques for detecting and mitigating these threats, analyzing their performance, computational efficiency, and suitability in financial contexts. The findings provide a comprehensive evaluation of these techniques and emphasize the importance of adopting a layered defense strategy to protect financial services from both high-volume and low-bandwidth attacks.

Intelligent Intrusion Detection in Industrial Control Systems: A Comprehensive Evaluation of Machine Learning and Deep Learning Approaches

*Esther Dhiramo, Ali Al-Sinayyid, Austin Higginbotham, Joshua Gilliland, Alexander Sanchez, Samuel Adewumi
Department of Math & Computer Science, West Virginia State University, Institute, West Virginia, USA;
Cybersecurity Innovation Center (CIC), West Virginia State University, Institute, West Virginia, USA*

Abstract - This research evaluates intrusion detection systems for SCADA and Industrial Control Systems (ICS) networks, critically analyzing machine learning, deep learning, and traditional algorithms' effectiveness in cybersecurity. By examining multiple datasets and performance metrics, the study identifies the most promising intrusion detection approaches for protecting critical infrastructure. The research highlights hybrid and deep learning algorithms as the most effective, with top-performing methods like Res-TranBiLSTM, Hybrid Ensemble Learning, and LTH-CNN demonstrating detection accuracies exceeding 97% and minimal false alarm rates.

Ransomware and AI Defense Mechanisms

Luice Khamboo, Ali Al-Sinayyid, Samuel Adewumi, Vaishnavi Kottala, Sheetal Phuyal
Department of Mathematics and Computer Science,
West Virginia State University, Institute, West Virginia, USA

Abstract - Ransomware remains a critical cybersecurity threat, with attacks surging in recent years, including over 4,399 incidents in 2023, nearly doubling from 2022, and total payouts exceeding \$1 billion. This study examines the effectiveness of AI-based algorithms in ransomware detection, focusing on metrics such as accuracy, precision, recall, and false positive rates. Neural Networks achieved exceptional accuracy of 99.9%, demonstrating adaptability to evolving ransomware patterns, while hybrid approaches like SVM combined with Adaboost reached 99.54% accuracy with minimal false positives. Time-efficient models, such as Recurrent Neural Networks (RNN), showcased real-time detection capabilities, balancing speed and accuracy. Hybrid algorithms further enhanced robustness by integrating multiple models to analyze static and dynamic data. These findings highlight the critical role of AI-driven techniques, particularly Neural Networks and hybrid approaches, in building reliable and adaptive defense systems against evolving ransomware threats.

AI-Driven Analysis of Cybersecurity Threats and Defense Mechanisms in 5G Networks

Vaishnavi Kottala, Ali Al-Sinayyid, Venkatesh Mannuru, Luice Khamboo, Samuel Adewumi, Joshua Gilliland
Department of Mathematics and Computer Science,
West Virginia State University, Institute, West Virginia, USA

Abstract - The advent of fifth-generation (5G) networks has revolutionized telecommunications, offering unprecedented data speeds, minimal latency, and vast device connectivity. However, the cybersecurity landscape has equally evolved, presenting critical threats that challenge the integrity and resilience of these networks. The decentralized, software-centric design of 5G, incorporating innovations like Software-Defined Networking (SDN), Network Function Virtualization (NFV), and network slicing, has broadened the attack surface. This research provides a detailed analysis of prevalent threats, such as Distributed Denial of Service (DDoS) attacks, protocol vulnerabilities, and inter-slice breaches. It further explores defense mechanisms, including machine learning-based anomaly detection, encryption standards, and secure resource management. By consolidating real-world case studies and quantifying the impact on critical sectors, this study formulates a robust cybersecurity framework essential for defending 5G infrastructures against cyber threats.

MShield LSTM Model for Detecting Insider Threat Attacks in Critical Infrastructure Using Machine Learning

*Venkatesh Mannuru, Ali Al-Sinayyid, Vaishnavi Kottala, Rohith Reddy Battula
Department of Mathematics and Computer Science,
West Virginia State University, Institute, West Virginia, USA*

Abstract— Insider threats are a growing concern for the security and stability of critical infrastructure systems. By exploiting authorized access, insiders can bypass traditional security measures, leading to significant disruptions. This study explores how machine learning, specifically Long Short-Term Memory (LSTM) networks and Support Vector Machines (SVM), can help tackle this challenge. Using real-world data, we manually tested 100 individual cases to assess each model's performance. LSTM stood out with an accuracy of 86%, thanks to its ability to understand sequences and detect subtle behavioral patterns, while SVM achieved 76%, showing its strength with simpler cases. Through this hands-on testing, we gained a clear picture of where these models shine and where they fall short. Our findings suggest that blending deep learning with traditional methods could strike a balance between accuracy and efficiency. This research highlights practical ways to use AI for real-time detection and stronger defenses against insider threats, ensuring critical systems remain secure.

Defense Against Adversarial Attack on Medical Imaging

*Fathe Jeribi, Ali Tahir, Khalid Hassan Alsabi, Jayabrabu Ramakrishnan, Nadim Rana
Department of Computer Science, College of Engineering and CS, Jazan University, Jazan, Saudi Arabia;
Engineering and Technology Research Center, Jazan University, Jazan, Saudi Arabia;
Technical and Vocational Training Corporation (CSIT), Jazan, Saudi Arabia*

Abstract - Deep networks are becoming incredibly common analysis in medical imaging such as cancer diagnosis, Radiotherapy, and identifying abnormalities. Skin cancer is mostly consistently category of cancer discovered in light skin color of human beings on the report of one survey. Ultraviolet (UV) radiation is attributed as the leading cause of skin cancer. An Adversary can exploit the deep network to his advantage and can manipulate the output of the network. A fully automated system for skin cancer classification that can offer defense against adversarial attacks is introduced in this study. Adversarial image generation with PGD (Projected Gradient Decent) attacks, FGSM (Fast Gradient Sign Method), transfer learning of a pre-trained Google-net, and adversarial training of the Google-net on adversarial and augmented images are the five important steps. For Transfer learning, the final layers of a pre-trained GoogleNet are replaced for better performance. The network was trained on an image dataset of 1000 classes. The network is trained to classify skin cancer melanoma and benign samples. The proposed methodology provides a defense against adversarial attacks and improves testing accuracy as well.

Analytical Study for DDoS Detection Algorithms in Cloud Computing

*Austin Higginbotham, Ali Al-Sinayyid, Esther Dhiramo, Joshua Gilliland, Adewumi Samuel, Vaishnavi Kottala
Department of Mathematics and Computer Science,
West Virginia State University, Institute, West Virginia, USA*

Abstract— Cloud computing is an over the internet delivery of data storage and computer services. Companies and customers are counting on the delivery and security of their cloud environments. Distributed Denial of Service attacks in the Cloud Computing environment are a common type of threat. This threat will only increase in number as cloud computing is adopted more in the future. Machine learning detection methods are popular in the cloud environment for DDoS detection. Various algorithms and datasets are used when training and classifying DDoS attacks. This paper will look at two commonly used classifier algorithms and compare them using accuracy, precision, and recall. These algorithms will be evaluated on three different benchmark datasets. The datasets used for efficiency evaluation are NSL-KDD, KDD CUP99, and CICIDS 2017. These tests are performed in a binary form meaning the algorithms are predicting neither normal or attack. The results of these commonly used classifiers will be used to determine which is better in terms of accuracy, precision, and recall When predicting on the binary classification of three popular datasets. As well as determining which data set the classifiers worked the best testing on. Some notable results we found. Random Forest was able to achieve 0.99 in all three categories on two of the datasets, KDD-99, and CICIDS2017. NB was slightly worse but still managed to achieve 0.98 or higher in all three metrics on the KDD-99 dataset.

SESSION: ARTIFICIAL INTELLIGENCE:
COMPUTER VISION, IMAGE PROCESSING, AND APPLICATIONS

A Semi-Automatic Approach for Minimizing Expert Annotations in Medical Image Segmentation

Dewan Tauhid Rahman, Nickolas Goodis, Dilip Sarkar
Department of Computer Science, University of Miami, Miami, Florida, USA

Abstract—Deep learning excels in medical imaging segmentation but requires extensive annotated data. To reduce reliance on expert labeling, we propose a semi-automatic method, where a small subset of the available data is annotated to train a model. The model then generates pseudo-annotations for the remaining data, refining the model iteratively until no further improvement is observed. We demonstrate the method’s effectiveness by training models on the Kvasir-Seg and Breast Ultrasound Images Dataset using SegFormer and U-Net architectures. With only 30% of the annotated data, our method achieves at least 90% of the accuracy of models trained on the full dataset. We also propose a method to estimate optimal data annotation using the model’s entropy measure.

**Semantic Representation of Musical Identity:
AI-Driven Cover Image Generation from Lyrics**

Kyle Hoang, Pablo Rivas
Department of Computer Science, Baylor University, Waco, Texas, USA

Abstract - This study presents a computational approach to generating playlist cover images by leveraging lyric-based semantic analysis. We employ natural language processing techniques, including part-of-speech tagging, lemmatization, and K-means clustering, to extract thematic and emotional features from song lyrics. These extracted features are then transformed into structured prompts for text-to-image models, enabling the automated generation of visually representative playlist cover art. To evaluate the effectiveness of the generated images, we conducted a user study that assessed aesthetic quality, thematic coherence, and user satisfaction. Our results indicate that AI-driven lyric analysis can produce compelling visual representations aligned with musical identity. This framework has potential applications in music streaming platforms, digital media curation, and personalized content generation, offering a novel intersection between computational creativity and AI-driven design.

Modular Framework for Cluster Analysis in Surveillance Cameras

<https://youtu.be/sSCitzADtQI>

*Decio Lauro Soares, Pedro Losco Takecian, Andre Luis Schwerz, Bruno Padilha, Joao Eduardo Ferreira
University of Sao Paulo (USP), Brazil;
Federal University of Technology (UTFPR), Brazil*

Abstract—The amount of data generated by surveillance cameras is vast due to the increasing number of installed cameras in city environments. Since the human capacity of analyzing such a huge volume of data is limited, machine learning techniques capable of assisting human operators are desirable for many scenarios. A common task that usually overwhelms human operators is analyzing features and behaviors of people groups in everyday situations. This work proposes a modular framework flexible enough to extract features and behaviors to analyze low-density clusters useful in real-world applications. A proof-of-concept is implemented to show the viability of the proposed modular framework in composing approaches to analyze clusters. Our experiments show that the implementation behaves as expected and can process videos with different resolutions, achieving reasonable frame rates.

BFS-Based Weighted Late Fusion for 3D Object Detection in V2X Systems

*Selma Nourhane Oubouabdellah, Elwan Hery, Julien Moreau, Vincent Fremont
Ecole Centrale de Nantes, LS2N, France;
Universite de Technologie de Compiègne, HEUDIASYC, France*

Abstract - In urban environments, Autonomous Vehicles (AVs) face various challenges, particularly in dealing with occlusions. This work delves into vehicle-to-everything (V2X) cooperation to enhance AVs' perception in the 3D object detection task. Collaboration combines fields of view from various agents to enable AVs to 'see' through occlusions and detect objects that are either poorly visible or completely outside their range. This enhancement is crucial to ensure safer and more efficient urban navigation. We specifically focus on the late fusion of LiDAR data streams, using a Breadth-First Search (BFS) algorithm to group bounding boxes with high Intersection-over-Union (IoU). The resulting clusters are then fused via a weighted averaging scheme, producing more accurate and robust 3D detections. This BFS-based weighted method is straightforward, computationally efficient, and requires minimal communication overhead, making it well-suited for real-time urban driving scenarios.

Comparative Study of Single-Stage vs. Two-Stage Detectors for ASL Gesture Recognition

*Xiang Fang, Pablo Rivas
Department of Computer Science, Baylor University, Texas, USA*

Abstract - This paper explores and utilizes the application of state-of-the-art object detection models for recognizing American Sign Language (ASL) gestures. Through a relatively small dataset with some data augmentation techniques, we evaluate the performance of models such as YOLOv11, Faster R-CNN, and RT-DETR. Key metrics, including mean Average Precision 50-95 (mAP 50-95) and Intersection over Union (IoU), are explained and used to benchmark model accuracy. The findings highlight the strengths and limitations of each model, providing a basis for future improvements in ASL gesture detection.

Virtual Crop Development and Automated Weed Detection for Precision Agriculture

*Arun Soma, Eduardo Colmenares, Heng Wu
Department of Computer Science, Midwestern State University, Wichita Falls, Texas, USA;
Department of Computer Science, University of La Verne, La Verne, California, USA*

Abstract - Artificial Intelligence (AI) constitutes one of the most recent major advancements in technology, transforming research, teaching, and traditional practices across various fields. One area where AI is already making a significant impact and is projected to continue growing is advanced precision agriculture. This research employs an AI-assisted workflow to accelerate the implementation of algorithms that utilize convolutional neural networks (CNN) and real-time object detection models to accurately differentiate between useful crops and harmful weeds. The study is divided into two phases. The first phase, covered in this paper, focuses on creating a virtual crop environment that serves as the foundation for training and validating the model. The second phase, planned for future work, aims to integrate the trained model into a drone system for autonomous, targeted spraying, enhancing the efficiency and sustainability of agricultural practices.

Video Compression Artifacts Reduction with Recurrent Video Restoration Transformer

*Zhenchao Ma, Berkay Talha Acar, Danni Zhao, Maya Thomas, Hamid Reza Tohidypour, Panos Nasiopoulos
Department of Electrical and Computer Engineering,
University of British Columbia, Vancouver, Canada*

Abstract - Video compression is essential for modern multimedia applications, enabling efficient storage and transmission of video content. However, lossy compression algorithms like H.264, HEVC, and AV1 often introduce artifacts such as blockiness, blurring, and ringing. Recent advances in deep learning, particularly with Convolutional Neural Networks (CNNs) and Vision Transformers (ViTs), have shown strong potential for reducing these video compression artifacts. In this paper, we introduce a transformer-based model for HEVC video compression artifact reduction, leveraging a recurrent video restoration transformer. Our model utilizes a recurrent architecture with guided deformable attention to effectively capture spatial and temporal dependencies, reducing artifacts while preserving fine details. Experimental results on a benchmark dataset demonstrate that our approach significantly enhances visual quality, achieving an average PSNR improvement of 0.51dB. These findings underscore the effectiveness of transformer-based architectures in reducing video compression artifacts.

Preferential Ensemble Method with Exponentially Tunable Hyperparameter for Skin Cancer Diagnosis

Lifeng Ni, Teryn Cha, Sung-Hyuk Cha
Computer Science Department, Pace University, New York, USA;
Computer Science, Essex County College, Newark, New Jersey, USA

Abstract - Traditional ensemble techniques such as simple majority and conventional Borda count voting have been widely applied in aggregating predictions from ensemble classifiers. This study introduces a novel preferential voting method to optimize the aggregation process by assigning exponential scores to the performance rank of each deep learning model, such as Vision Transformer (ViT). Unlike previous ensemble approaches, it aims to enhance diagnostic accuracy by tuning the ensemble hyperparameter. Using the HAM10000 skin lesion dataset, the results show that the new exponential voting method outperforms traditional voting techniques, suggesting its potential for more advanced ensemble learning for medical image classification tasks.

Neural Pruning for 3D Scene Reconstruction: Efficient NeRF Acceleration

Tianqi (Kirk) Ding, Dawei Xiang, Pablo Rivas, Liang Dong
Department of Electrical and Computer Engineering, Baylor University, Texas, USA;
Department of Computer Science and Engineering, University of Connecticut, Connecticut, USA;
Department of Computer Science, Baylor University, Texas, USA

Abstract - Neural Radiance Fields (NeRF) have become a popular 3D reconstruction approach in recent years. While they produce high-quality results, they also demand lengthy training times, often spanning days. This paper studies neural pruning as a strategy to address these concerns. We compare pruning approaches, including uniform sampling, importance-based methods, and coresets-based techniques, to reduce the model size and speed up training. Our findings show that coresets-driven pruning can achieve a 50% reduction in model size and a 35% speedup in training, with only a slight decrease in accuracy. These results suggest that pruning can be an effective method for improving the efficiency of NeRF models in resource-limited settings.

Carbon Emissions of a CNN Model: A Comparative Study of Colab and Jupyter Notebook with an Example

Emmanuel Akwah Kyei, Justice Williams Asare, Seth Alornto, Martin Mabeifam Ujakpa, Ebenezer Komla Gavua, Emmanuel Freeman, William Leslie Acquaye-Brown, Alfred Coleman
Faculty of Computing and Information Systems, Ghana Communication Technology University, Accra, Ghana;
Faculty of Applied Science and Technology, Koforidua Technical University, Koforidua, Ghana;
School of Governance, IT and Management, University of KwaZulu Natal, Durban, South Africa

Abstract - Green computing, also known as green technology, is an environmentally sustainable method of using computers and the various resources associated with them, such as monitors, printers, storage devices, networking, and communication systems, efficiently and effectively while having the least amount of impact, if any, on the environment. Green computing also encompasses choosing sustainably sourced raw materials, reducing electronic waste, and promoting sustainability through the use of renewable resources. Potholes detection is an important aspect of road maintenance and repair, as it allows for timely and effective intervention to prevent further damage to vehicles and safety hazards for road users. In recent years, advances in computer vision and deep learning technologies have motivated the use of Convolutional Neural Networks (CNNs) for pothole detection. This study seeks to raise consciousness about carbon emissions by monitoring the emissions generated by a CNN model running on both a cloud platform and an outdated device. By tracking and comparing the carbon emissions of these two different computing setups, the study shed light on the environmental impact associated with utilizing modern cloud platforms versus other devices. The method utilized in this study consists of four key stages: data pre-processing, model training, evaluation, and carbon emissions tracking for both Google Colab and a laptop. The results highlight the environmental benefits of utilizing cloud computing for model execution. Organizations and individuals seeking to deploy resource-intensive models like CNNs for tasks such as pothole detection are encouraged to consider cloud-based platforms to reduce their carbon footprint.

Robust Road Surface Anomaly Detection Using Three-Dimensional Geometric Analysis and Adaptive Machine Learning Strategy

Fnu Zia Ur Rehman, Hongbin Ma, Xin Wang
Beijing Institute of Technology, Beijing, China

Abstract - Maintaining road surface integrity is vital for autonomous driving systems and vehicle safety. Traditional inspection methods are labor-intensive, time-consuming, and subjective, highlighting the need for an efficient, automated process for road surface defects identification. In the proposed work, we present an effective method for identifying road surface defects using Three-Dimensional (3D) point cloud information. By employing 3D geometric analysis, such as surface normal calculations, and adaptive machine learning algorithms, we accurately detect small defects like cracks and holes. Our approach combines geometric analysis with Artificial intelligence (AI) through machine learning (ML) to classify defects based on point cloud data, leading to reliable detection. This approach significantly improves the performance of the defect's detector compared to a state-of-the-art detector on our custom dataset. This advancement promises to streamline the road surface maintenance, ensuring the safety and reliability for both humans and autonomous drive.

2AIO: The Application of Artificial Intelligence in Osteoporosis

Farid Ghareh Mohammadi, Ronnie Sebro

Department of Radiology, MD Anderson Cancer Center, Houston, Texas, USA;

Department of Imaging Physics, MD Anderson Cancer Center, Houston, Texas, USA;

Department of Epidemiology, MD Anderson Cancer Center, Texas, USA

Abstract - Osteoporosis is a global health concern characterized by reduced bone density and increased fracture risk, particularly among the elderly. Early detection is critical to prevent fractures and associated morbidity, yet traditional diagnostic methods like Dual-Energy Radiograph Absorptiometry (DXA) are limited by accessibility and cost. Opportunistic screening, which leverages existing medical imaging data (e.g., radiographs, computed tomography (CT) scans) for secondary diagnostic purposes, has emerged as a promising alternative. Artificial intelligence (AI) has demonstrated remarkable potential in medical image analysis, enabling automated and accurate osteoporosis screening and diagnosis. This review paper provides a comprehensive overview of recent advancements in AI applications for osteoporosis, with a focus on opportunistic screening, fracture detection. We also discuss challenges, limitations, and future directions in this rapidly evolving field.

Application of Medical Images for Detecting Anemia in Children: A Comparative Study of Convolutional Neural Network, k-Nearest Neighbor, Random Forest and Support Vector Machine

Justice Williams Asare, Emmanuel Akwah Kyei, Martin Mabeifam Ujakpa, Emmanuel Freeman,

Seth Aloroyo, William Leslie Brown-Acquaye, Alfred Coleman

Faculty of Applied Science and Technology, Koforidua Technical University, Koforidua, Ghana;

Faculty of Computing and Information Systems, Ghana Communication Technology University, Accra, Ghana;

School of Management, IT & Governance, University of KwaZulu-Natal: Durban, Kwazulu-Natal, South Africa

Abstract - Anemia has become a critical issue in the public health domain, affecting mostly children and pregnant women. Anemia occurs when the level of hemoglobin is reduced below its normal threshold. In children, anemia can slow down their cognitive development and sometimes lead to death, so it requires critical attention. This study aims to detect anemia in children using pallor palm and fingernail images based on a comparative study of Convolutional Neural Network, k-Nearest Neighbor, Random Forest and Support Vector Machine. The raw images were extracted to obtain the region of interest (ROI) by using the Triangle Thresholding algorithm together with the entropy grayscale image algorithm. The images were segmented for training, validating and testing the model on a ratio of 70:10:20 respectively. After hyperparameter tuning and model regularization, the Convolutional Neural Network (CNN) achieved the highest accuracy of 97.0% on the fingernails as compared to the pallor palm with an accuracy of 83.1% by the CNN. k-Nearest Neighbor (k-NN) achieves the lowest result of 64.8% on the palm which significantly improves to 84.4% on the fingernail images. The outcome of the study recommends that the use of fingernails should be a diagnostic indicator and a primary focus of anemia detection in children through the use of a non-invasive approach since the conjunctiva of the eye can be exposed to falling objects when examined.

A Hybrid Three-Layer Convolutional Neural Network Architecture for Detecting Anemia using Clinical Images

Justice Williams Asare, Akwasi Asare, Prince Modey, Emmanuel Akwah Kyei, Martin Mabeifam Ujakpa, William Leslie Brown-Acquaye, Emmanuel Freeman, Lempogo Forgor, Alfred Coleman
Faculty of Applied Science and Technology, Koforidua Technical University, Koforidua, Ghana;
Faculty of Computing and Information Systems, Ghana Communication Technology University, Accra, Ghana;
Faculty of Applied Science and Technology, Ho Technical University, Ho, Ghana;
School of Management, IT & Governance, University of KwaZulu-Natal: Durban, Kwazulu-Natal, South Africa

Abstract - Anemia has become one of the global public health burdens that distract the well-being of people and affect billions of people across the world. Anemia occurs when the hemoglobin level within the body is reduced below the normal threshold, or when there is a deficiency in the number of blood cells the body produces. The clinical method for anemia diagnosis is centered on the invasive mechanism, that is, extraction of blood, which is a time-consuming technique and can also expose medical personnel to blood-transmissible diseases or infection and results in greater labor and cost of equipment. a hybrid three-layer convolutional neural network architecture is utilized to detect anemia using conjunctiva images. Three single convolutional neural network architectures, that is EfficientNetV2B0, MobileNetV3Small and ResNet50V2 are integrated to develop a three-layer hybrid CNN architecture (EfficientNetV2B0 + MobileNetV3Small + ResNet50V2) to detect anemia. The model exhibits superior detection performance with enhanced computational efficiency. The results of this study highlight the trade-offs between accuracy, robustness, and computational efficiency in deep learning models for anemia detection which also provides a significant accuracy, for real-world applicability in clinical settings and deployment. This study emphasizes the transformative role of deep learning in advancing anemia detection, paving the way for scalable, accurate, and computationally efficient tools in modern healthcare applications.

An Efficient YOLO-based Approach for Goldfish Disease Diagnosis

<https://youtu.be/8U0Jt1wCJuE>

Yugo Ohashi, Miho Akiyama, Takuya Saito
Tokyo University of Information Sciences, Chiba, Japan

Abstract - We have developed a system that captures images of goldfish and uses YOLOv5 to obtain coordinates, storing their movements as data. By analyzing whether these movements fall below a threshold, the system can determine the presence of diseases. We conducted goldfish disease detection using this method. This paper describes goldfish, the background and necessity of the proposed method, its details, and evaluation.

Carbon Emissions of CNN Model on Potholes Detection: A Comparative Study of Colab and Jupyter Notebook

Emmanuel Akwah Kyei, Justice Williams Asare, Seth Alornyo, Martin Mabeifam Ujakpa, Ebenezer Komla Gavua, Emmanuel Freeman, William Leslie Acquaye-Brown, Alfred Coleman
Faculty of Computing and Information Systems, Ghana Communication Technology University, Accra, Ghana;
Faculty of Applied Science and Technology, Koforidua Technical University, Koforidua, Ghana;
School of Governance, IT and Management, University of KwaZulu Natal, Durban, South Africa

Abstract - Green computing, also known as green technology, is an environmentally sustainable method of using computers and the various resources associated with them, such as monitors, printers, storage devices, networking, and communication systems, efficiently and effectively while having the least amount of impact, if any, on the environment. Green computing also encompasses choosing sustainably sourced raw materials, reducing electronic waste, and promoting sustainability through the use of renewable resources. Potholes detection is an important aspect of road maintenance and repair, as it allows for timely and effective intervention to prevent further damage to vehicles and safety hazards for road users. In recent years, advances in computer vision and deep learning technologies have motivated the use of Convolutional Neural Networks (CNNs) for pothole detection. This study seeks to raise consciousness about carbon emissions by monitoring the emissions generated by a CNN model running on both a cloud platform and an outdated device. By tracking and comparing the carbon emissions of these two different computing setups, the study shed light on the environmental impact associated with utilizing modern cloud platforms versus other devices. The method utilized in this study consists of four key stages: data pre-processing, model training, evaluation, and carbon emissions tracking for both Google Colab and a laptop. The results highlight the environmental benefits of utilizing cloud computing for model execution. Organizations and individuals seeking to deploy resource-intensive models like CNNs for tasks such as pothole detection are encouraged to consider cloud-based platforms to reduce their carbon footprint.

Advancements in AI for Breast Cancer Diagnosis: A 2024-2025 Systematic Review Update

Mohammad Reza (Nima) Darbandi, Sara Darbandi, Mahsa Darbandi, Soheyla Amirian
School of Computing, University of Georgia, Athens, Georgia, USA;
Department of Urology, Icahn School of Medicine at Mount Sinai, Annenberg, New York, USA;
Department of Oncological Sciences, Tish Cancer Inst., Icahn School of Medicine, Mount Sinai, New York, USA;
Seidenberg School of Computer Science and Information Systems, Pace University, New York, USA

Abstract - Breast cancer (BC) is a prominent global health burden, highlighting the urgent need for innovation in early detection, precise diagnostics, and personalized treatment. The recent developments in artificial intelligence (AI) have transformed BC research, enhancing diagnostic accuracy, prognostic assessment, and treatment planning. By highlighting recent progress and continuing challenges, this review provides critical observations on the evolving role of AI in BC research and its potential to enhance patient care. With consideration of 285 recent articles, this study highlights the dominant trend toward transformer-based models and hybrid models, which reflects the continuous evolution of AI techniques in BC diagnosis and treatment.

Enhanced Ensemble Model-Based Approach from Deep Learning for MonkeyPox Detection Using Medical Images

Akwasi Asare, Justice Williams Asare, Emmanuel Akwah Kyei, Laizah Sashah Mutasa, Seth Alornyo, Emmanuel Freeman, William Leslie Brown-Acquaye, Martin Mabeifam Ujakpa
Faculty of Computing and Information Systems, Ghana Communication Technology University, Accra, Ghana;
Faculty of Applied Science and Technology, Koforidua Technical University, Koforidua, Ghana;
School of Business & Law, Edith Cowan University, Australia;
School of Governance, IT and Management, University of KwaZulu Natal, Durban, South Africa

Abstract - Monkeypox, commonly known as “Mpox,” is a viral disease caused by an orthopoxvirus that spreads through contact with affected persons. Mpox causes painful rashes, leaves scars after treatment, enlarges lymph nodes with fever, and causes severe sickness, headache, and muscle aches which are not limited to these symptoms. The treatment of Mpox can effectively be done through supportive care for major symptoms such as pain and fever with good nutrition and a balanced diet, hydration, proper skin care, and deterrence of secondary infections and treatment. A deep learning concept specifically ResNet-50, EfficientNetB0, and MobileNetV2 is utilized for this study to detect Mpox using medical images. The MobileNetV2, ResNet-50, and EfficientNetB0 were combined to develop an enhanced ensemble model to boost the models’ performance. The method utilized is segmented into two distinct yet interconnected phases. The first phase concentrates on deep learning model development, encompassing key steps such as meticulous dataset preparation, thoughtful model design, rigorous training processes, and thorough performance evaluations. The model design phase involved selecting appropriate architectures and hyperparameters tailored to the specific characteristics of the monkeypox imaging data. The results of the study illustrate the trade-offs between accuracy, robustness, and computational efficiency. While ResNet-50 stands out for its accuracy, the ensemble model offers consistent performance across datasets, and EfficientNetB0 and MobileNetV2 provide scalable solutions for low-resource environments. Collectively, these models demonstrate the transformative potential of deep learning in enhancing monkeypox diagnosis, offering scalable and reliable tools for clinical and public health applications. These findings emphasize the potential of deep learning to revolutionize infectious disease diagnostics, paving the way for scalable, accurate, and efficient tools in healthcare.

Study on Arabic Food Calorie Estimation App using Image Processing

https://drive.google.com/file/d/16_5g33eGOcGLoDSzEmSsTf8kYSf-0HpL/view?usp=sharing

Mehwash Farooqui, Atta Rahman, Zainab Almahfoudh, Ghadeer Albasha, Amal Alwehibe, Reem Albawardi, Reyam Alrasheed, Amal Alahmadi, May Aldossary
Computer Engineering Department, College of Computer Sciences & Information Technology, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia

Abstract - This work covers the design of a system in line with Saudi Arabia's Vision 2030, focused on Arabic Cuisine to address obesity and poor eating habits using state-of-the-art AI technologies. In this framework, the project will construct a dataset of Arabic food from different sources to fill the gap existing in calorie-tracking programs that highly neglect regional cuisines. It is designed to allow users to track daily food intake by estimating meal calories from photos. It provides personalized dietary recommendations using user data like weight, age, and activity level. By leveraging the power of DenseNet 121 for classification and YOLO v8 for accurate food segmentation, Arabic dishes will be correctly identified, their calorie content computed, and the results presented in real time. It further provides personalized food recommendations that will enable users to achieve health goals, making informed choices and enabling healthy lifestyles. This pioneering initiative will not only go toward the benefit of public health but also preserve and highlight Arabic cuisine and support the call for Vision 2030 to exploit technology in improving the quality of life and celebrating cultural identity.

SESSION: ARTIFICIAL INTELLIGENCE: **EDUCATION AND CURRICULUM DEVELOPMENT**

Codification, Annotation and Rule-based Inferencing for CharActER: A Proposed Application for Teaching Chinese the WRITE Way

Martin Qiang Zhao
Mercer University, Macon, Georgia, USA

Abstract - The Chinese writing system has enjoyed the heritage commonly known as “Writing and Painting Are One”. During multiple major transformations in the past three thousand years, the pictorial features like long curves have been replaced by short and straight essential strokes and composite strokes with essential strokes as their parts. Knowledge is at the best incomplete regarding the design of the original patterns that carry meaning and sound and now not effectively used in teaching Chinese characters. This helps build the impression that Chinese is the hardest to learn. Although comprehension of character composition and its consequences on a character’s meaning has seen continued improvements from ChatGPT 3.5 to current versions like DeepSeek, a deficiency of the original “design” becomes a bottleneck for fully exploit the potentials of computational intelligence of teaching Chinese to adult non-heritage students. This paper presents data/knowledge models including stroke codification that can be used to build an AI teaching system with rule-based inference to use “storytelling” style to explain meanings of the characters exploiting pictorial hints as embedded in ancient scripts. Personalized teaching materials and game-like exercises can also be generated.

AI and Education

Mehdi Zargham
Department of Computer Science, University of Dayton, Dayton, Ohio, USA

Abstract – Recently, AI has advanced significantly and is used in many fields. We will obtain a much better outcome by applying these AI technologies to educate students from kindergarten to college. We can initiate a project-driven learning process that stimulates student interest but also stimulates students’ curiosity. AI generative models will provide 24/7 availability, physical place independence, individualization, low cost, and consist of concise knowledge units. Furthermore, generative models incorporated with Augmented Reality glasses can increase students’ motivation, engagement, conceptual knowledge, and learning outcomes. It brings a new world of knowledge with a mix of the real and virtual worlds. A proposal for a new curriculum for a Bachelor of Science in Computer Science is presented as an example of future college education when complemented with AI. This curriculum is based on knowledge units, allowing students to access their materials anytime, anywhere, and at any pace. It is flexible while encouraging teamwork, hands-on experiences, creativity, and industrial experience. It encourages students to develop problem-solving and teamwork skills and fosters creativity and logic. Furthermore, it is an adaptable educational model that educates students throughout their lives.

Teaching and Using AI in the Classroom: Integrating AI Modules in Undergraduate Computer Science Education

*Martin Cenek, Ronnie Delos Santos
University of Portland, Portland, Oregon, USA*

Abstract - Undoubtedly, the future workforce will be impacted by the increasing adoption of generative AI across industries. To prepare students for this evolving landscape, AI must be integrated into undergraduate computer science education. To address this, we explore the redesign of a core computer science course to include experiential learning modules on AI literacy, generative AI tools, and responsible AI usage. In addition, we report on the benefits, challenges, and ethical considerations of using small language models (SLMs) for automated grading. Finally, through an analysis of student engagement, learning outcomes, and perceptions of AI-driven instruction, we provide insights into best practices for responsible AI adoption in academia.

Digital Teaching Assistant: Medipol University Case Study

*Ozge Doguc, Gokhan Silahtaroglu, Onur Kardes
Istanbul Medipol University, Istanbul, Turkey;
Istanbul Beykent University, Istanbul, Turkey*

Abstract - This paper presents the development and implementation of the Digital Teaching Assistant (DTA) at Istanbul Medipol University Business School. The DTA is a web-based platform designed to assist instructors in creating syllabi, weekly class notes, quizzes, and tracking student performance. The study evaluates the impact of this tool on teaching efficiency and student learning outcomes. A comparative analysis with traditional teaching methods demonstrates improvements in consistency, accessibility, and engagement [1]. Additionally, the paper discusses challenges faced during implementation and strategies to enhance user adoption [2].

How Higher Education Students Should Use AI to Enhance Their Learning

*Arshia Khan, Sherri Turner, Anne Hinderliter
University of Minnesota Duluth, Duluth, Minnesota, USA;
University of Minnesota Twin Cities, Minneapolis, USA*

Abstract - The rapid ease of availability and access to Artificial Intelligence (AI) tools in higher education has transformed how students engage with learning, providing innovative opportunities for enhancing research, writing, and critical thinking. While AI-driven tools like ChatGPT, AI tutors, and citation managers offer valuable support, their misuse poses significant ethical risks, including the potential to stagnate academic content, promote plagiarism, and hinder creativity. This paper, written from the perspective of three full professors from diverse fields—computer science, educational psychology, and chemistry/biochemistry—comes together to make recommendations for responsible AI use in higher education, drawing on their vast experience and concern for students' academic growth. It emphasizes the importance of developing a foundational understanding of AI systems, their strengths, and their limitations. By fostering a critical awareness of AI's capacity to generate plausible but sometimes inaccurate information, students can make informed decisions about using AI as an effective aid to, rather than a replacement for, intellectual effort. Additionally, the paper discusses the importance of academic integrity, proper citation practices, and the role of human oversight in maintaining rigorous educational standards. Ultimately, this paper aims to provide insights into how AI can be harnessed responsibly to support learning, creativity, and academic growth while mitigating the risks of misuse and overreliance.

Curriculum for a New Five-Year Academic Program with a Bachelor's Degree and Master's Degree in Intelligent Systems Engineering

Ashu M. G. Solo

Maverick Trailblazers Inc., Wilmington, Delaware, USA

Abstract - This research paper proposes a curriculum for a new five-year academic program with a bachelor's degree (honors) in intelligent systems engineering and a master's degree in advanced intelligent systems engineering. This program includes courses in knowledge-based systems, fuzzy logic, neural networks, evolutionary computation, evolutionary multiobjective optimization, machine learning, image processing, computer vision, pattern recognition, voice recognition, natural language processing, data science, control systems, intelligent control systems, robotics, digital signal processing, software engineering, static and dynamic website design, development of chatbots and voice assistants, signals and systems, engineering mathematics, engineering physics, biology, etc. These degrees will allow graduates to have a good understanding of all of the main branches of intelligent systems engineering and electrical engineering.

Developing a CSViewer for Education Application with Natural Language Interactions

Martin Qiang Zhao, Hari S. Sanku, Troy H. Kleger, Rui Gong, Qian Wang

Mercer University, Macon, Georgia, USA;

Texas A&M University, College of Dentistry, Dallas, Texas, USA

Abstract - The CSViewer for Analysts application provides access to a comprehensive database collected from the Cayo Santiago rhesus monkey colony with 11000 subjects over the past 86 years. Assorted data selection, visualization and analytical features are added to its new version 1.2, and results from mining newly collected osteological measures revealed new skeletal and dental development models. To expose the intended knowledge model of the CS colony to public audiences, especially to science classes at colleges and schools, a CSViewer for Education edition is planned. Supporting queries in plain English is considered beneficial to help students to seek for answers. This paper presents initial experiments with the Claude language model. A dental checkup dataset is used to and queries in plain English are used to explore the dataset through Claude API and the results were integrated with CSViewer to use its charting features to display dental development trend of the CS monkey population. Further development based on natural language interactions enabling utilization of the generative AI features are to be continued.

Using ChatGPT to Reduce Academic Misconduct in a Systems Analysis Course: A Case Study

Raina Mason, Carolyn Seton, Jenelle Benson

Southern Cross University, Gold Coast, Queensland, Australia

Abstract - This paper presents an observational study on the redevelopment of an Australian systems analysis and design course to incorporate a Generative Artificial Intelligence (GenAI) tool, primarily ChatGPT, for student skill development and assessment. Addressing concerns about academic misconduct, the course was redesigned following Sydney University's "two-lane" approach to assessment. The study, conducted in a master of computing program, evaluated the effectiveness of this redesigned assessment approach. Findings indicate that while integrating GenAI tools was largely successful, unexpected outcomes necessitated further course improvements. Lessons learned from this study have implications for both postgraduate and undergraduate computing programs, emphasizing the need for continuous adaptation in assessment design to maintain academic integrity and enhance learning outcomes.

SESSION: ARTIFICIAL INTELLIGENCE: **ALGORITHMS, APPLICATIONS, AND FRAMEWORKS - I**

Comparative Recognition Technology for Artificial Intelligence

*Boris Zlotin, Alla Zusman, Vladimir Proseanic, Svetlana Visnepolschi, James Cook,
Anatol Guin, Vladimir Matsenko, Oleg Gafurov
CTO, Progress, Inc., West Bloomfield, Michigan, USA;
Director, Ideation International Inc, Austin, Texas, USA;
CEO, Progress, Inc., West Bloomfield, Michigan, USA;
Chief Information Officer, Progress, Inc., West Bloomfield, Michigan, USA;
Treasurer, Progress, Inc., West Bloomfield, Michigan, USA;
Consultant, Regia Company, Astana, Kazakhstan;
Lead Programmer, Progress, Inc., Lugansk, Ukraine*

Abstract - This paper presents a comparative recognition approach to artificial intelligence (AI) using a binary comparison format (BCF) to recognize and classify images effectively. Unlike traditional artificial neural networks (ANNs), which rely on gradient descent learning and require more computing power, energy, and human labor, the comparative approach uses structured comparison libraries for similarity-based recognition. This reduces computational complexity and radically reduces recognition time, ensuring transparency of processes and interpretability of AI results. Both digital and analog implementations for various applications, including medical diagnostics, are briefly described. A software product illustrates the work carried out, PANC Platform program, providing recognition and cross-classification of various kinds of images and transferring information from memory to the recognized image. The product is available for free download for testing and non-commercial use.

How Embodiment Shapes Trust and Engagement: A Comparative Analysis of Alexa and Pepper in Competitive Gameplay

*Mriganka Biswas, John Murray
Lecturer, Faculty of Business & Technology, University of Sunderland, United Kingdom, UK;
Academic Dean, Faculty of Business & Technology, University of Sunderland, United Kingdom, UK*

Abstract - This study explores the impact of embodiment on trust and user experience by comparing an embodied AI (Pepper) and a disembodied AI (Alexa) in a competitive rock-paper-scissors game. Using a mixed-methods approach, 71 participants interacted with both systems, revealing that Pepper scored significantly higher in trust ($M = 4.18$, $SD = 0.67$) and engagement ($M = 4.30$, $SD = 0.72$) compared to Alexa (trust: $M = 3.87$, $SD = 0.79$; engagement: $M = 3.65$, $SD = 0.81$). Participants noted Pepper's physical gestures and expressions enhanced social presence, fairness, and emotional connection, while Alexa's predictability and efficiency were valued for task-oriented interactions but perceived as less engaging and occasionally manipulative in competitive settings. Privacy concerns were more prominent with Alexa due to its disembodied, cloud-based nature. The findings extend the Capability-Benevolence-Integrity model of trust, demonstrating how embodiment enhances integrity and emotional engagement. Practical implications suggest embodied systems like Pepper are better for social and emotional contexts (e.g., education, therapy), while disembodied systems like Alexa excel in efficiency-driven tasks. This study addresses gaps in trust dynamics in competitive human-AI interactions and highlights trade-offs between embodiment and efficiency. Limitations, such as the controlled setting and modest sample size, call for future longitudinal and cross-cultural research to further explore these dynamics.

A Cost-Effective Tool for Senior Activity Classification and Visualization

*Jalal Abdel Halim, Weiqing Sun
College of Engineering, University of Toledo, Toledo, Ohio, USA*

Abstract—With the rapid increase in the number of seniors living independently, it is important to develop a non-invasive method to keep track of their activities without bothering them with wearable devices that need to be charged and maintained. In this paper, we develop a cost-effective tool to track the activities performed by the elderly and generate a privacy-preserving 3D model based on the observed activities, so that caregivers and/or family members can access and see the most recent activities through the web interface. The performance evaluation of our tool demonstrated its effectiveness.

Study of Conversational Agents in VR Guiding Experience

<https://www.youtube.com/watch?v=jumddZsD3-Y>

*Xin-Han Wu, You-Shin Tsai, I-Feng Huang, Yi-Ping Hung
National Taiwan University, Taipei, Taiwan*

Abstract - Advancements in multimedia technology enable remote exploration of cultural heritage sites, with Virtual Reality (VR) allowing users to visit historical sites virtually. Utilizing digitized data from the Dunhuang Research Academy, a VR experience of the Dunhuang Caves offers structured tours or self-directed exploration, each with distinct challenges. To address this, we developed an assistive guiding system integrating a virtual agent powered by Microsoft Azure and ChatGPT, providing interactive guidance and knowledge. A user study on Dunhuang Cave 61 examined the impact of virtual agent appearances and behaviors, revealing that full-body agents with gestures and expressions provide the most realistic and engaging presence.

Warped-Frequency Cepstral Coefficients for Improving COVID-19 Detection

*Sandeep B. Sangle, Pramod H. Kachare, Jagannath Nirmal, Mohammed Alhameed, Ibrahim Al-Shoubarji
Department of Computer Science and Engineering, Ramrao Adik Institute of Technology, Navi Mumbai, India;
Department of Electronics Engineering, K J Somaiya College of Engineering, Mumbai, India;
Department of Electrical and Electronics Engineering, Jazan University, Jazan, Saudi Arabia*

Abstract—COVID-19 has significantly impacted global healthcare, emphasizing the need for rapid and non-invasive diagnostic tools. This study proposes a machine learning-based approach for classifying COVID-19 cases using vowel /a/ sound recordings. The statistical features are extracted using the bilinear transform-based Warp Filter Bank Cepstral Coefficients $B_i W F C C$, along with their first and second-order derivatives, using vowel sound signals. A $\ln B_i W F C C$, the warp parameter is adjusted to generate different filter variations, enabling the identification of the optimal warp parameter value that best distinguishes COVID-19-positive cases from healthy individuals. These features are input to machine learning algorithms, including Logistic Regression, Multi-Layer Perceptron, and Support Vector Machine for classification. The experimental results demonstrate that the proposed methodology effectively discriminates between COVID-19-positive and healthy individuals, highlighting the importance of optimizing the warp filter bank parameters for improved accuracy. This approach offers a promising, non-invasive, cost-effective, and scalable diagnostic tool for COVID-19 detection using vowel sound analysis.

Improved Partial Dependence Plotting for Interpretable Machine Learning

<https://youtu.be/Ut9Kb2a9VzA>

Najwa Altwaijry

*Computer Science Department, College of Computer and Information Sciences,
King Saud University, Riyadh, Saudi Arabia*

Abstract - Interpretable machine learning methods help users understand model decisions when transparency and trust are important aspects of the model. A widely used method is Partial Dependence Plots (PDP), which assumes feature independence, leading to misleading interpretations. To address this limitation, we propose an improved version of PDP, termed iPDP, which incorporates a distance-based filtering technique to remove data points that are distant from the reference instance. This results in more accurate and nuanced interpretations of feature effects. We evaluate iPDP using the cervical cancer dataset. Our experimental results show that iPDP better captures feature interactions and provides a more reliable understanding of model behavior, particularly when features exhibit correlations. The choice of distance and threshold parameters influences the quality of the interpretability, with L2 distance generally providing smoother and more consistent results. This work demonstrates the potential of iPDP as a valuable tool for enhancing interpretability in complex machine learning models.

The Role of Dynamic Trust and Resource Management in Improving IoT-Based Edge Computing: A Review

*Bassey Isong, Fulufhelo Hopewell Mamidza, Reorapetse Molose
North-West University, Mafikeng, South Africa*

Abstract - The rapid growth of Internet of Things (IoT) devices and edge computing (EC) has improved efficiency, productivity, and quality of life across various sectors. However, these developments also pose significant challenges, particularly in trust and resource management. This paper conducts a comprehensive literature review by examining existing relevant studies to identify recent developments and insights as well as challenges and potential research directions to guide future research. The findings revealed the importance of dynamic trust management models, real-time assessments, and the integration of machine learning and blockchain technologies in increasing network security and reliability. In addition, it highlights innovative resource management strategies using EC and fog computing to optimize resource allocation and system scalability. While advancements have been made in trust and resource management, challenges like scalability, high task volumes, and security remain. The study emphasizes the need for continuous efforts to develop secure, efficient, and reliable IoT and EC systems.

The Black Box Dilemma: A Framework for Mitigating Rogue AI Through Standardized Models and Anomaly Detection

Lucas Zhang

Catlin Gabel School, Youth Cyber Defender, Portland, Oregon, USA

Abstract—The emergence of Artificial General Intelligence (AGI) [12], while offering transformative opportunities—from revolutionizing science to addressing global challenges—also introduces unparalleled risks, particularly as black box models become increasingly opaque and difficult to interpret. Traditional human oversight, such as expert audits, becomes ineffective when dealing with systems that surpass human cognition. To address this challenge, this paper proposes a structured framework that incorporates standardized base models, a multiphase development pipeline, and anomaly detection mechanisms to mitigate rogue AGI risks systematically. The framework enables proactive risk management by embedding safety measures into the AGI lifecycle while fostering innovation. One key feature is the systematic anomaly detection of rogue AGI through cross-referencing outputs, statistical monitoring, and iterative refinement, eliminating reliance on human interpretation of black-box systems. Simulation results show the feasibility of this approach, demonstrating a 100% detection rate for rogue AGI systems while maintaining a low false positive rate (5.3%). These findings highlight the potential of structured anomaly detection in AGI governance. To oversee the implementation of the framework, the International AGI Alliance (IAA) is proposed as a global collaborative body to ensure alignment, enforce shared safety standards, and foster trust among stakeholders. We believe the proposed framework balances security and innovation, offering a scalable, systematic solution to one of the challenges of the future AI revolution.

Responsible AI in Demand Forecast of Supply Chain Management

<https://youtu.be/DMnXJKtAN4o>

Rajia Shareen Shaik, Atif Farid Mohammad, Navya Gunti, Shravya Kalva
Purdue Global University, USA

Abstract— AI models are significantly integrated into every part of modern systems; their decisions are major driving factors for business outcomes, operational efficiency, customer experiences, and organizational reputation. Systems with transparent processes, accountability, fair decisions, and compliance with law and regulation are essential for building a reliable and trustworthy ecosystem. Integrating Responsible AI (RAI) principles into infrastructure across various sectors is paramount for its necessity and ethical benefits. The paper presents the integration of Responsible AI (RAI) principles with demand forecasting systems in the supply chain sector. At each stage of data pre-processing, model training, evaluation, and prediction, the techniques are integrated to mitigate the bias, evaluate fairness, enhance transparency, protect privacy, and make compliant decisions with overall accountability. The study paves the way for more reliable AI models without compromising performance and core objectives.

AI-empowered Creative Problem Solving

Boris Zlotin, Alla Zusman, Svetlana Visnepolschi, Yevgeniy Subbotin, David Bonner
CTO, Ideation International Inc, Austin, Texas, USA;
Director, Ideation International Inc, Austin, Texas, USA;
Lead Software Engineer, Ideation International Inc, Austin, Texas, USA;
CEO, Ideation International Inc, Austin, Texas, USA

Abstract – This article explores the possibility of augmenting AI's with TRIZ (Theory of Inventive Problem Solving). It traces TRIZ's development from a method based on patent analysis to a structured innovation tool that, combined with AI, like Large Language Models (LLMs), can significantly expand AI's capability into creative problem-solving. The authors discuss how TRIZ-based software, such as Ideation TRIZSOFT®, can become a creative partner to AI systems by providing structured prompts and knowledge-based solutions libraries. Case studies show that using TRIZ-generated prompts with AI chatbots like ChatGPT increases the quality and novelty of solutions. The article discusses the evolutionary patterns of technology, advocating for TRIZ as a tool for Augmented Artificial Intelligence (AAI) to support human creativity and decision-making in various domains.

Enhancing Diabetes Hospital Stay Predictions through Interpretability

<https://youtu.be/degrJMXIFok>

Frank (D-C) H
NPA, Rockville, Maryland, USA

Abstract - Diabetes Mellitus is a prevalent chronic disease with significant public health implications, often leading to hospitalizations due to complications. Accurate prediction of the length of hospital stay (LOS) is essential for effective patient management and resource allocation. This study focuses on enhancing LOS predictions for diabetes patients using machine learning models, specifically Random Forest and Feed-forward Neural Networks. Utilizing a dataset of over 70,000 patient records from more than 120 U.S. hospitals, key variables such as demographics, admission types, and lab results were analyzed. The findings indicate that incorporating Shapley values improved model interpretability and bolstered confidence in predictive outcomes via enhancing the accuracy and precision of LOS predictions.

Optimizing Smoking Cessation Alternatives Using Multi-Moora and AI-Based Methods

*Joanna Chwa, Arkadiusz Banasik, Radoslaw Dzik, Ewaryst Tkacz
Department of Clinical Engineering, Academy of Silesia, Katowice, Poland;
Joint Doctoral School, Silesian University of Technology, Gliwice, Poland;
Department of Medical Informatics and AI, Silesian University of Technology, Gliwice, Poland*

Abstract - This study aims at enhancing smoking cessation strategies by combining Multi-Objective Optimization on Ratio Analysis (Multi-MOORA) with artificial intelligence (AI) approaches. The hybrid model including neural networks, ridge regression, and simulated annealing compares various smoking cessation options based on cost, age of initiation, time spent smoking, ease of quitting, environmental and health impacts. The model's stability and accuracy were tested using a survey and secondary data, and the findings show that e-cigarettes are the most favorable alternative. The sensitivity analysis also validates the robustness of the ranking process. The approach provides a decision-making framework that can help in optimizing smoking cessation interventions and can help in developing personalized and evidence-based public health policy.

Dynamic Power Flow Analysis and Fault Characteristics: A Graph Attention Neural Network

*Tan Le, Van Le
School of Engineering, Architecture and Aviation, Hampton University, Hampton, Virginia, USA;
Advanced Technology Center, Virginia Beach, Virginia, USA*

Abstract—We propose the joint graph attention neural network (GAT), clustering with adaptive neighbors (CAN) and probabilistic graphical model for dynamic power flow analysis and fault characteristics. In fact, computational efficiency is the main focus to enhance, whilst we ensure the performance accuracy at the accepted level. Note that Machine Learning (ML) based schemes have a requirement of sufficient labeled data during training, which is not easily satisfied in practical applications. Also, there are unknown data due to new arrived measurements or incompatible smart devices in complex smart grid systems. These problems would be resolved by our proposed GAT based framework, which models the label dependency between the network data and learns object representations such that it could achieve the semi-supervised fault diagnosis. To create the joint label dependency, we develop the graph construction from the raw acquired signals by using CAN. Next, we develop the probabilistic graphical model of Markov random field for graph representation, which supports for the GAT based framework. We then evaluate the proposed framework in the usecase application in smart grid and make a fair comparison to the existing methods.

Digital Platform for Livestock Sector: An Opportunity in Artificial Intelligence Era

*Jood Alkurbi, Soha Almutairy, Sarah Alahmari, Lina Alabdulkarim, Ala Alluhaidan
College of Computing and Information Sciences,
Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia*

Abstract - Digital platforms can be used for the livestock sector that aims to achieve sustainability, economic stability, and quality of life; by facilitating access to national products, improving market efficiency, and boosting the capabilities of Livestock Producing Families (LPF). The method of development of the mobile application, following the iterative waterfall method. This simple System Development Life Cycle (SDLC) approach allows for continuous feedback, real-time adjustments, and system improvements. The 'Thara' application is designed to support the livestock market by providing training programs from the Ministry of Environment, Water, and Agriculture (MEWA), offering livestock tools from MEWA or various suppliers, selling livestock products, and consulting with the MEWA Adviser. The "Thara" application has been designed to support the LPF by providing a user-friendly interface, relevant training programs, and a digital environment for the livestock market, and the "Thara" application's goal is oriented toward enhancing sustainability, economic growth, and the quality of LPF life. This digital tool ensures more efficient access to resources, fosters innovation, and promotes long-term growth for livestock families.

Transdisciplinary Visual Communication: An Insight into its Techniques and Models

*Rotimi-Williams Bello, Pius A. Owolawi, Daniel A. Olubummo, Etienne van Wyk, Chunling Tu
Department of Computer Systems Engineering, Tshwane University of Technology, South Africa;
Department of Computer and Information Systems, Robert Morris University, Pennsylvania, USA*

Abstract—Recently, high-performing models were developed for image processing and computer vision tasks such as design education, medical diagnosis, precision livestock farming, and weather forecasting, to name but a few. However, enough research has not been conducted on techniques for assessing and evaluating these models with benchmark datasets on transdisciplinary visual communication. Data, whether from primary or secondary sources, in their different formats such as texts, images, videos, etc., are essential materials for conducting scientific experiments in various fields for different purposes. Therefore, in this paper, we discuss the different techniques and models for processing scientific data. The assessment and evaluation of these techniques including their performance are also discussed. This paper is an insight into transdisciplinary visual communication as a way of thinking and working that combines knowledge from different disciplines to create new solutions to complex problems.

Investigating the Impact of Age and Gender on Sentiment Analysis in Movie Reviews

<https://www.youtube.com/watch?v=OhVnHPOyyKo>

*Isaiah O. Ekundayo, Zhong-Hui Duan
Department of Computer Science, University of Akron, Akron, Ohio, USA*

Abstract – Understanding the sentiment expressed in movie reviews helps to know the net positivity or negativity directed at movies, which benefits movie directors and internet users in certain decision-making processes. We analyzed the sentiments in movie reviews while considering age and gender demographic features. We explored age and gender-related sentiment differences expressed by different age groups using a Support Vector Machine (SVM), Random Forest (RF), and Naïve Bayes (NB) machine learning algorithms. The movie reviews in the hotel reviews dataset were cleaned, preprocessed, and grouped into six different age groups, considering young adults, early adults, middle adults, late, senior adults, and the elderly. Preliminary analysis was then carried out on the hotel reviews dataset, followed by an intensive model training step involving training models that considered demographic data and models that did not. Hyperparameter tuning helped to achieve optimal accuracy, recall, and precision metrics. We were also able to identify multiple findings that will assist movie personalized recommendations, and we conclude that age and gender data significantly affect the sentiment expressed in movie reviews positively.

Applying Automatic Inference in Constraint Satisfaction Planning

*Feng-Jen Yang
Florida Polytechnic University, Lakeland, Florida, USA*

Abstract - Solving constraint satisfaction planning problems is a challenging topic in the study of artificial intelligence mainly because of its complexity. To this end, an automatic inferencing approach can release a big portion of the mental burden from humans. In this study, we demonstrate a logic programming example that can reason automatically and find feasible solutions that satisfy multiple constraints on an instance of constraint satisfaction planning problems.

Energy Consumption and Performance of AI Accelerators for Edge Devices

*Minseon Kang, Moonju Park
Department of Computer Science & Engineering, Incheon National University, Korea*

Abstract - Edge AI has emerged recently as the industry tries to overcome the limitations of cloud-based AI, such as network latency, data security, and related costs. Enabling intelligence through processing directly at the data source will provide faster and more efficient industrial applications. However, embedded devices at the edge have less computing power and energy sources than servers in the cloud. For this reason, hardware accelerators for edge AI have been developed to provide additional computing power with low energy consumption. This article compares the performance and energy consumption of two commercially available AI accelerators with the embedded GPU, and factors affecting their performance are discussed.

SESSION: ARTIFICIAL INTELLIGENCE:
ALGORITHMS, APPLICATIONS, AND FRAMEWORKS - II

**Weak and Strong Potentiality Control for Interpreting
Multi-Layered Neural Networks**

<https://youtu.be/T2oOAYCenmQ>

Ryotaro Kamimura

Tokai University, Kitakaname, Hiratsuka, Kanagawa, Japan

Abstract - This paper aims to show that neural learning has a strong bias toward simplification, which can be realized through prototype learning followed by non-prototype learning. Prototype learning seeks to make network configurations as simple as possible, not based on input patterns but rather on the given network resources. The subsequent non-prototype learning then adjusts these configurations to accommodate detailed information from input patterns. However, prototype learning is not always easily identified in actual learning because it is deeply hidden within the surface network configurations. To detect the prototype, we previously proposed structural potentiality consumption to eliminate unnecessary information in the search for the prototype. However, this structural potentiality, which is defined for connection weights, was too strong and ultimately tended to consume all potentiality, even destroying necessary information. To moderate the excessive information reduction caused by structural potentiality consumption, we propose weak potentiality consumption, which is based on more general properties such as average values. This weak potentiality consumption allows connection weights to behave more flexibly, thereby mitigating the strong force of potentiality reduction. The method was applied to an artificial dataset with a limited number of inputs and both linear and non-linear relations for easier interpretation. The results showed that weak potentiality consumption effectively moderated strong potentiality consumption, leading to better generalization. The prototype was detected in the early stage of learning, and during subsequent non-prototype learning, a phase transition occurred, transforming the connection weights over the course of learning. In prototype learning, information tended to originate from inputs, whereas in non-prototype learning, it came from outputs. This confirmed that, in an idealized prototype learning process, the prototype is initially identified based on information from inputs, while in nonprototype learning, detailed information from outputs is incorporated.

Decentralized Consensus by Proof-of-Randomness among IoT Devices

Zhaohong Wang

California State University, Chico, California, USA

Abstract - Consensus protocols in distributed ledger and blockchain technology form the foundation for validating transactions and upholding network integrity and security. While diverse, these protocols share common traits such as decentralization, security measures against fraud, and scalability considerations, albeit to varying degrees. Nonetheless, they also harbor limitations, presenting trade-offs between efficiency, security, decentralization, and environmental impact. Addressing this challenge, we introduce a novel consensus protocol, Proof-of-Randomness (PoR), leveraging information-theoretic secure multiparty computation in this short research paper. The proposed PoR seeks to cultivate a more inclusive consensus by securing the random assignment of the leader role, consequently lessening the need for specialized hardware or the need for peer-specific characteristics, enabling decentralized, easily verifiable block endorsement. A preliminary proof-of-concept implementation underscores the feasibility and efficiency of our proposed protocol.

Robust Evolutionary Clustering in Temporal Graphs via Nonnegative Matrix Factorization

Esraa Al-sharqa

*Electrical Engineering Department, College of Engineering,
Jordan University of Science and Technology, Irbid, Jordan*

Abstract - Evolutionary clustering is a powerful technique for detecting dynamic communities in temporal graphs, where network structures change over time. Unlike static clustering methods, evolutionary clustering incorporates temporal smoothness to ensure consistency between consecutive time snapshots while accurately capturing evolving communities. This approach is essential for various real-world applications, such as temporal social and biological network analysis. In this paper, we present a robust evolutionary clustering method based on non-negative matrix factorization (NMF) to detect dynamic communities. Our approach derives a low-rank approximation of the temporal network at each snapshot to remove noise and outliers. The low-rank approximation is then used to identify the community structures by integrating temporal smoothness term with non-negative matrix factorization clustering. This integration enhances the current snapshot structure by incorporating information from the previous snapshot, minimizing abrupt clustering changes and improving robustness. Experimental results on synthetic and real-world dynamic networks demonstrate that the proposed method outperforms state-of-the-art approaches in both accuracy and robustness.

Capacitance-Based Bedwetting Alarm System for Differentiating Urination from Sweat Using Machine Learning

Shantanu Sarkar, Goutam Bhattacharya, Haixin Yu, Dvijesh J. Shastri

College of Sciences & Technology, University of Houston - Downtown, Texas, USA;

Department of ECE, University of Houston - Downtown, Texas, USA

Abstract - Nocturnal enuresis is a common issue among toddlers, young children, and older adults, often caused by the inability to wake up before bladder overflow. While children typically develop waking habits over time, bedridden older individuals depend on caregivers, increasing the risk of delayed intervention. Existing enuresis alarms struggle with false positives, as they cannot reliably distinguish between sweating and urination. Early resistive-based alarms suffered from current flow through electrolytes, while modern capacitive-sensing alarms, using two-electrode designs, still fail to differentiate moisture sources accurately. This research focuses on developing an advanced embedded system for enuresis alarms, utilizing a microcontroller and enhanced capacitive sensing, combined with algorithms trained using machine learning techniques. By analyzing the rate of moisture spread, intensity, and affected area, the system effectively distinguishes urination from sweating, improving detection accuracy. Experimental results indicate a significant reduction in false alarms. Future work will explore dynamic calibration, improved response time, and additional performance enhancements.

A Hybrid Sentiment Analysis Model to Detect Racism Tweets using Lexicon-Based Sentiment Analysis and a Support Vector Machine Algorithm

Emmanuel Akwah Kyei, Justice Williams Asare, Laizah Sashah Mutasa, Emmanuel Freeman, Martin Mabeifam Ujakpa, William Leslie Brown-Acquaye, Lempogo Forgor, Alfred Coleman, Godfred Yaw Koi-Akrofi
Faculty of Computing and Information Systems, Ghana Communication Technology University, Accra, Ghana;
Faculty of Applied Science and Technology, Koforidua Technical University, Koforidua, Ghana;
School of Business & Law, Edith Cowan University, Australia;
School of Governance, IT and Management, University of KwaZulu Natal, Durban, South Africa;
Faculty of IT & Communication Studies, University of Professional Studies, Accra, Ghana

Abstract - Sentiment analysis (also known as opinion mining) is a natural language processing (NLP) technique for determining the positive, negative, or neutral nature of data. The rise of social media platforms such as X (formally Twitter) and Facebook have become great arenas for discourse on racism and mediums of racism ideologies. This study utilized a hybrid sentiment analysis to detect racist tweets using lexicon-based sentiment analysis and a Support Vector Machine. The models' success in accurately classifying sentiments related to racism highlights its potential for broader applications in the analysis of other social issues. Furthermore, this study contributes to the ongoing discourse on combating racism in the digital age. By shedding light on the sentiments expressed online, it provides valuable insights that can inform policy decisions, advocacy efforts, and public awareness campaigns. The findings underscore the importance of addressing racism not just in the physical world but also in the digital sphere, where harmful ideologies can spread rapidly and widely.

AI Revolution to Evolution: How AI Capabilities May Enhance Human Resources and Productivity in Large Organizations

David B. Keever
Leidos Corporation, Reston, Virginia, USA

Abstract - Many articles portend the negative effects of Artificial Intelligence (AI) and derivative analytic methods and implementations within organizations, especially the Human Resource (HR) impacts on employment levels, degree of automation, and outright displacement of traditional HR-related departments and functions. This poster presentation examines the positive impacts AI may have on HR functions through careful introduction of AI methods using a common technology evolution framework linked to key HR activities.

EEFactUPP: Evidence Evaluation and Fact Verification using User Perspective Prompting

Harish Sista

Computer Engineering Department, Stevens Institute of Technology, Hoboken, New Jersey, USA

Abstract - The latest FEVER challenge of Automated Verification of Textual Claims (AVeriTeC) addresses the problem of chaotic contexts in real-world data using a deterministic approach of evidence question generation and using question-answer pairs for veracity prediction and claim stance classification. In this paper, we present a novel contextual engineering approach to effectively address these challenges. In this work, we propose a new prompt engineering method called ChainOf-Thought Context Attention Promoting (CoT-CAP) and two novel "promptcentric" approaches that address the challenges of automated fact verification in chaotic contexts. The first method, User Perspective Prompting (UPP), uses a self-attention prompting method to extract the underlying contexts directly from the claim and evidence sentences. The second method, Contextual Stance and Veracity Prediction (CSVP), uses a cross-attention prompting method on contextual knowledge obtained from UPP to evaluate the veracity and evidence-claim stance predictions. Our process achieved around a 13% increase in performance with the prediction of the veracity and the classification of the gold evidence extracted online compared to the baseline model of AVeriTeC.

FER-Framework for Emotional Transition Detection

Pierre Jecrois, Salem Othman, Leonidas Deligiannidis, Yetunde Folajimi

School of Computing and Data Science, Wentworth Institute of Technology, Boston, MA, USA

Abstract - What do we learn from a single frame of a GIF or a short clip? A fleeting snapshot may capture a smirk, but it rarely conveys the full spectrum of human emotion. Understanding emotional transitions over time is crucial for a complete analysis. This work introduces a dynamic emotion recognition framework that integrates FER-VIT, a fine-tuned Visual Transformer, with FER-GPT, a prompt-engineered language model, to generate natural language descriptions of emotional changes. Experiments on the CREMA-D dataset show that FER-VIT effectively classifies emotions, particularly distinct ones like Happiness and Anger, while FER-GPT enhances interpretability by translating raw emotion scores into descriptive captions. This system has broad applications in mental health monitoring, human-computer interaction, and sentiment analysis, enabling AI to better understand and respond to human emotions. By bridging vision and language, our approach provides a more intuitive way to interpret and analyze dynamic emotional expressions.

Advancing Computational Problem-Solving with Python, Generative AI, and Google Colab

*Shanzhen Gao, Weizheng Gao, Julian Allagan, Jianning Su, Hank B. Strevel,
Leah Hall, Joshua Nyantakyi, Brooke McClinton
Reginald F Lewis College of Business, Virginia State University, Petersburg, Virginia, USA;
Department of Mathematics, Computer Science and Engineering Technology, Elizabeth City State University,
Elizabeth City, North Carolina, USA;
Department of Mathematics, Computer Science and Engineering, Perimeter College,
Georgia State University, Atlanta, Georgia, USA*

Abstract - Integrating Python, Generative AI, and Google Colab has revolutionized computational problemsolving by enhancing efficiency, scalability, and collaboration. Python's extensive libraries provide robust tools for algorithm development, while Generative AI optimizes problem-solving through automation and predictive modeling. Google Colab, a cloud-based computing platform, further facilitates accessibility by offering high-performance execution and real-time collaboration. This paper explores recursive and iterative methods, AI-assisted algorithm optimization, and prompt engineering as essential techniques for enhancing computational workflows. It demonstrates how AI-driven insights improve accuracy and efficiency in mathematics, engineering, and finance. Additionally, the study highlights the necessity of human oversight in verifying AI-generated solutions to ensure precision and reliability. This research underscores the transformative potential of AI-assisted computation by leveraging the combined strengths of Python, AI, and cloud computing. Future advancements will continue to refine AI-driven optimizations, expanding their applications across diverse scientific and educational fields.

The Agentic AI Mindset - A Practitioner's Guide to Architectures, Patterns, and Future Directions for Autonomy and Automation

*Dwight Horne
Baylor University, Waco, Texas, USA*

Abstract - Agentic AI systems represent the next evolution of artificial intelligence, enabling reasoning, decision-making, and autonomous action in dynamic environments. This paper serves as a practitioner's guide for system designers, developers, and computing educators seeking to rapidly adapt to this paradigm shift, which will require adopting an agentic AI mindset to harness the full potential of autonomy and automation. Core concepts like the reason-then-act (ReAct) model and a conceptual layered agent design are combined with the latest guidance on communication and orchestration architectures, agentic AI design patterns, and practices for adapting the validation and verification process to the unique challenges of agentic AI systems. Practical steps are outlined to cultivate the agentic AI mindset across industries and academia, and open-source enablers are highlighted to foster accelerated adoption of agentic AI technology. This quick start guide provides a solid foundation for developing robust, scalable, and effective agentic AI systems without overlooking the importance of appropriate governance.

Evaluating Automatic Speech Recognition Models: How Well Do They Handle Accents?

<https://youtu.be/plfMPRVJHXI>

Wei Liu, Yukun Xiong, Bin Hu, Daehan Kwak

Department of Computer Science and Technology, Kean University, Union, New Jersey, USA

Abstract - The development of Automatic Speech Recognition (ASR) technology has progressed remarkably, becoming an integral component of virtual assistants, transcription services, and accessibility tools. Despite these advancements, ASR systems still struggle to accurately recognize speech from individuals with different accents and linguistic features. This work analyzes the performance of various ASR models, including cloud-based, local, and integrated speech recognition systems. For evaluation, we use different accented speech datasets and assess the ASR variants using Word Error Rate (WER) as the primary metric. The datasets include the Speech Accent Archive (SAA), L2-ARCTIC, and an Indian accent dataset. The results show that ASR accuracy varies depending on the speaker's language and accent. OpenAI Whisper, Deepgram, and AssemblyAI perform significantly better compared to conventional models like Mozilla DeepSpeech. The results indicate that many standalone ASR models are optimized for non-regional standard English, leading to higher error rates for non-native and regionally accented speech. Future developments should focus on augmenting multilingual datasets and refining algorithms to achieve more equitable speech recognition capabilities for diverse accents.

Evolutionary Computing Applications and Trends from 2010 to 2025: A Brief Review

Afsaneh Shams, Elika Bozorgi, Mohammad Reza (Nima) Darbandi, Soheyla Amirian, Khaled Rasheed

School of Computing, University of Georgia, Athens, Georgia, USA;

Seidenberg School of Computer Science and Information Systems, Pace University, New York, USA

Abstract - Evolutionary Computing (EC), inspired by biological evolution, is transforming the artificial intelligence (AI) world by optimizing model architectures, tuning hyperparameters, and solving complex problems. This paper explores different EC applications in two key areas of Computer Science and Engineering & Education. Evolutionary methods enhance automation, improve efficiency, decrease time-intensive manual tasks, and eliminate the necessity of expert knowledge. Furthermore, evolutionary-based publication trends from 2010 to 2025 globally and then primarily in the USA and China are analyzed. This review highlights the impressive and growing impact of EC techniques in AI on solving real-world problems. Because of AI's consistent contribution in various fields and devices, evolutionary AI offers promising approaches to tackle practical challenges.

On Specification for an Academic Ontology

Brandon Miller, Ray R. Hashemi

Department of Computer Science, Georgia Southern University, Statesboro, Georgia, USA

Abstract—Historically, collaboration within and between academic institutions has been thwarted by a lack of a standardized data representation, even though most universities operate with very similar data needs. This makes tasks like integrating with common Learning Management Systems (LMS) and constructing new software tools extremely difficult for university IT personnel due to the immense learning curve associated with each university's respective data warehousing techniques. As a result, students are often deprived of the ability to properly plan for their education or otherwise extract useful insights / analysis from data the university makes available to them. This paper proposes a standardized data picture to ontologize academic data in a platform-neutral way that accommodates the most common needs of universities.

Permanent Income Hypothesis and Keynesian Consumption Theory: An Empirical Study on US Consumption Behavior

*Michael H. Chen
Tufts University, USA*

Abstract -The life cycle hypothesis and the Keynesian consumption hypothesis are two of the most prominent theories that seek to explain how individuals make consumption decisions. The life cycle hypothesis postulates that individuals base their consumption decisions on their expected lifetime income, rather than their current income. According to this theory, individuals aim to smooth their consumption over their entire lifetime, so they maintain a relatively constant level of consumption throughout their working years and into retirement. This pattern of consumption is known as the "permanent income hypothesis" and assumes that individuals are rational and forward-looking, planning their consumption and saving decisions based on their expected income streams over their lifetime. In contrast, the Keynesian consumption hypothesis argues that current income levels are the primary determinant of consumption decisions. According to this theory, when individuals experience an increase in their income, they tend to increase their consumption accordingly. This relationship between consumption and income is often referred to as the "income effect." The COVID-19 pandemic has caused a significant economic shock, making it essential to revisit these theories and gain a better understanding of how individuals respond to income shocks and changes in the economic environment. This paper seeks to contribute to the ongoing debate between the life cycle hypothesis and the Keynesian consumption hypothesis by analyzing personal consumption expenditures per capita and personal income per capita provided using data from the US Bureau of Economic Analysis provided by the St. Louis Federal Reserve Economic Data (FRED). By examining these data sets, we aim to determine which of these two theories has more validity in explaining consumption decisions.

Integrating Python and Generative AI for Graph Theory Visualization and Problem-Solving

*Shanzhen Gao, Weizheng Gao, Julian Allagan, Jianning Su
Department of Computer Information Systems, Virginia State University, Petersburg, Virginia, USA;
Department of Mathematics, Computer Science and Engineering Technology, Elizabeth City State University,
Elizabeth City, North Carolina, USA;
Department of Mathematics, Computer Science and Engineering, Perimeter College,
Georgia State University, Atlanta, Georgia, USA*

Abstract - This study explores the integration of Python programming and generative artificial intelligence (AI) to construct and visualize notable graphs in graph theory. This approach bridges theoretical concepts with practical implementations by leveraging Python's computational capabilities and AI's pattern-generation techniques. The paper highlights historical examples such as the Königsberg Graph and extends to contemporary applications, demonstrating how AI-driven visualization enhances mathematical learning and research. Integrating Python's libraries, such as Matplotlib, with generative AI enables automated, interactive, and efficient graph representations. This interdisciplinary approach enhances accessibility to graph theory, making it more engaging for students, educators, and researchers. Additionally, the study discusses the broader implications of combining logic, algorithms, and AI in mathematical problem-solving. By applying modern computational tools, this paper showcases how technological advancements facilitate more profound insights into graph structures, reinforcing their significance in various domains, including network analysis, optimization, and decision-making.

Uncovering Mental Health Disparities through Social Determinants

*Briana Pimentel, Marjan Asadinia
California State University, Northridge, California, USA*

Abstract - Mental health disparities are significantly influenced by social determinants such as income level, education, employment status, access to healthcare, and environmental factors. Traditional methods for identifying at-risk populations often rely on statistical models that fail to capture the complex, nonlinear interactions between these determinants. In this study, we propose a machine learning-driven approach to uncover mental health disparities using a combination of Neural Network Modeling, Reinforcement Learning, and Random Forest. We leverage publicly available datasets, including those from the Centers for Disease Control and Prevention (CDC) and the U.S. Census Bureau, to extract critical socioeconomic and behavioral health indicators. Our methodology involves employing Random Forest for feature selection, ensuring the most influential social determinants are identified, followed by Neural Networks to model complex relationships and predict mental health outcomes. Additionally, Reinforcement Learning is integrated to optimize policy recommendations by simulating interventions that could mitigate disparities. The models are evaluated based on accuracy, precision, recall, and fairness metrics to assess their predictive power and ability to provide equitable insights. The results demonstrate that our hybrid machine learning approach significantly improves mental health outcome predictions compared to traditional statistical models. Moreover, the reinforcement learning framework offers adaptive intervention strategies that could assist policymakers and healthcare professionals in addressing disparities more effectively. Our findings underscore the potential of AI-driven analytics in promoting mental health equity and guiding data-driven policy decisions.

Comparing Impacts of Artificial Intelligence on Employment in Financial Industry and Manufacturing Industry

<https://youtu.be/lj7PRzoOTGU>

*Hui Liu, Jinhwa Kim
School of Business, Sogang University, Mapo-gu, Seoul, Republic of Korea*

Abstract - This study examines the impact of artificial intelligence (AI) on employment trends in the finance and manufacturing industries, utilizing a comprehensive dataset of 120,844 AI-related news articles, 69,807 articles on jobs in the finance industry, and 65,907 articles on jobs in the manufacturing industry collected from Naver News between January 1, 2017, and August 31, 2024. To uncover the complex relationships between AI and employment, this study employed text mining techniques, including TF-IDF analysis, topic modeling, and association rule analysis. Topic analysis showed three dominant themes in the manufacturing sector, primarily driven by macroeconomic policies, industry-level employment trends, and workforce dynamics. In the finance industry, four topics were found, highlighting the role of corporate finance, digital transformation, government regulations, and global economic fluctuations in shaping employment patterns. AI-related discussions in literature reviews were best represented by five themes, covering generative AI & its applications, AI's role in education and research, enterprise adoption, semiconductor policies, and investment trends. Additionally, association rule analysis identified telecommunications, information, industry, and enterprise as key intermediary nodes linking AI to job markets in both finance and manufacturing. The extracted association rules illustrate distinct AI-driven employment pathways, confirming AI's significant impact on job structures across industries based on high-confidence values. These findings contribute to a deeper understanding of AI's sector-specific implications, offering insights for policymakers, industry leaders, and researchers navigating the evolving landscape of AI-driven labor markets.

Investment Decision-Making in the AI Era

*Weizheng Gao, Julian D. Allagan, Jianning Su, Brooke McClinton, Ephrem Eyob,
Hank B. Strelvel, Aurelia M. Donald, Shanzhen Gao*

*Department of Mathematics, Computer Science and Engineering Technology, Elizabeth City State University,
Elizabeth City, North Carolina, USA;*

*Department of Mathematics, Computer Science and Engineering, Perimeter College,
Georgia State University, Atlanta, Georgia, USA;*

Reginald F Lewis College of Business, Virginia State University, Petersburg, Virginia, USA

Abstract— This paper explores an interdisciplinary approach to investment decision-making by integrating Python programming, logical frameworks, mathematical models, and algorithmic strategies. Effective investment strategies in a data-driven financial landscape require computational efficiency, predictive modeling, and risk assessment. Python facilitates data processing and simulation, while mathematical models support portfolio optimization and risk management. Logical frameworks ensure consistency in decision rules, and advanced algorithms, including machine learning and dynamic programming, enhance adaptability to market changes. This study presents a systematic methodology for developing transparent, scalable, and efficient investment strategies. By leveraging artificial intelligence and computational tools, the proposed framework equips investors and analysts with practical insights to navigate financial complexities. The findings highlight the synergy between human reasoning and technology in investment decision-making, offering valuable resources for professionals and researchers seeking innovative approaches to financial analysis.

Parameter Estimation for Complex Systems Using Systems Dynamics Aware Neural Networks

*Sakir Yucel
Wexford, PA, USA*

Abstract - Combining neural network based models with mechanistic models could potentially improve the prediction quality, reduce unexpected outcomes, help with lowering the training efforts and yield more interpretable, explainable and generalizable models. In our previous work, we introduced Systems Dynamics Aware Neural Networks (SDANNs) that facilitate incorporating known dynamics of the system into neural network training by following a very flexible programming pattern. SDANNs combine the neural networks and Systems Dynamics Modeling. Benefits include more accessible modeling, helping the practitioners when mathematical tools have limited applicability, and enabling modeling more complex behavior than physical systems. Systems dynamics aware neural networks approach opens possibilities in economics, finance, operational research, policy making, corporate strategies and many complex problems. In this paper, we demonstrate how the parameters of complex systems can be estimated using Systems Dynamics Aware Neural Networks. We argue that the problem of parameter estimation of complex systems can be tackled by following the same flexible programming pattern in the training loop of the Systems Dynamics Aware Neural Networks.

Unconventional Active Learning for IoT Class: Sensors and IoT Course Utilizing-Brainstorming, Collaboration, and Creative Problem-Solving Through Hands-On Activities

Arshia Khan

University of Minnesota Duluth, Minnesota, USA

Abstract - The Sensors and IoT course offers a unique learning experience, moving away from traditional, rigidly structured approaches. It is designed to encourage active learning through brainstorming, collaboration, and the exploration of innovative ideas in the realm of Internet of Things (IoT) technologies and sensor systems. By removing exams and focusing on five hands-on assignments, a capstone project, and ten embedded systems labs, this course fosters an environment where creativity and critical thinking thrive. For each mini-project, students select between one to three robots/sensors, brainstorm ideas with a partner, and utilize research papers along with instructor-provided examples to develop their projects. Students collaborate on developing prototypes and engage in problem-solving activities that encourage diverse thoughts and solutions. The open-ended, project-based nature of the course not only enhances students' technical expertise but also nurtures an inclusive, creative atmosphere that prepares them to solve real-world challenges in the ever-evolving field of IoT.

SESSION: INTELLIGENT LINGUISTIC TECHNOLOGIES

CHAIR: Dr. Elena Kozerenko

*Institute of Informatics Problems of the Federal Research Center "Computer Science and Control" of the
Russian Academy of Sciences (IPI FRCCSC RAS), Moscow, Russia;
RUDN University, Moscow, Russia*

Artificial Intelligence Toolkit Employment for Multilingual Training Datasets Design

Al Dawood Jaafar, Elena B. Kozerenko

RUDN University, Moscow, Russia;

*Institute of Informatics Problems of the Federal Research Center "Computer Science and Control" of the
Russian Academy of Sciences (IPI FRCCSC RAS), Moscow, Russia*

Abstract – N/A

Semantic Modeling Based on Parallel Text Corpora for the Russian-Chinese-English Languages Triad

Chen Lan, Elena B. Kozerenko

RUDN University, Moscow, Russia;

*Institute of Informatics Problems of the Federal Research Center "Computer Science and Control" of the
Russian Academy of Sciences (IPI FRCCSC RAS), Moscow, Russia*

Abstract – N/A

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