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ABSTRACT BOOK

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San Francisco Airport,
835 Airport Blvd, Burlingame,
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Keynote Presentations

Artificial Intelligence and Deep Learning in the Study of Fine Art Paintings and Drawings

David G. Stork*

Stanford University, Stanford, CA

Abstract:

Not Available

Biomimetic Human Simulation with Neuro-musculoskeletal and Neuro-visuomotor Control

Demetri Terzopoulos*

University of California, Los Angeles, CA

Abstract: Not Available

Foundational Methods for Foundational Models for Scientific Machine Learning

Michael Mahoney*

ICSI, LBNL, and Department of Statistics, UC Berkeley

Abstract:

The remarkable successes of ChatGPT in natural language processing (NLP) and related developments in computer vision (CV) motivate the question of what foundation models would look like and what new advances they would enable, when built on the rich, diverse, multimodal data that are available from large-scale experimental and simulational data in scientific computing (SC), broadly defined. Such models could provide a robust and principled foundation for scientific machine learning (SciML), going well beyond simply using ML tools developed for internet and social media applications to help solve future scientific and engineering problems. I will describe recent work demonstrating the potential of the "pre-train and fine-tune" paradigm, widely-used in CV and NLP, for SciML problems, demonstrating a clear path towards building SciML foundation models; as well as recent work highlighting multiple "failure modes" that arise when trying to interface data-driven ML methodologies with domain-driven SC methodologies, demonstrating clear obstacles to traversing that path successfully. I will also describe initial work on developing novel methods to address several of these challenges, as well as their implementations at scale, a general solution to which will be needed to build robust and reliable SciML models consisting of millions or billions or trillions of parameters.

Biography:

Michael W. Mahoney is at the University of California at Berkeley in the Department of Statistics and at the International Computer Science Institute (ICSI). He is also an Amazon Scholar as well as head of the Machine Learning and Analytics Group at the Lawrence Berkeley National Laboratory. He works on algorithmic and statistical aspects of modern large-scale data analysis. Much of his recent research has focused on

large-scale machine learning, including randomized matrix algorithms and randomized numerical linear algebra, scalable stochastic optimization, geometric network analysis tools for structure extraction in large informatics graphs, scalable implicit regularization methods, computational methods for neural network analysis, physics informed machine learning, and applications in genetics, astronomy, medical imaging, social network analysis, and internet data analysis. He received his PhD from Yale University with a dissertation in computational statistical mechanics, and he has worked and taught at Yale University in the mathematics department, at Yahoo Research, and at Stanford University in the mathematics department. Among other things, he was on the national advisory committee of the Statistical and Applied Mathematical Sciences Institute (SAMSI), he was on the National Research Council's Committee on the Analysis of Massive Data, he co-organized the Simons Institute's fall 2013 and 2018 programs on the foundations of data science, he ran the Park City Mathematics Institute's 2016 PCMI Summer Session on The Mathematics of Data, he ran the biennial MMDS Workshops on Algorithms for Modern Massive Data Sets, and he was the Director of the NSF/TRIPODS-funded FODA (Foundations of Data Analysis) Institute at UC Berkeley. More information is available at https://www.stat.berkeley.edu/~mmahoney/.

Autonomous Learning Agents: A Theoretical Framework

Bing Liu*

University of Illinois Chicago, USA

Abstract:

As more and more AI agents are used in practice, it is time to think about how to make these agents fully autonomous so that they can (1) learn by themselves continually in a self-motivated and self-initiated manner rather than being retrained offline periodically on the initiation of human engineers and (2) accommodate or adapt to unexpected or novel circumstances. As the real-world is an open environment that is full of unknowns or novelties, the ability to detect novelties (out-of-distribution cases), characterize them, accommodate/adapt to them, and gather ground-truth training data and continually or incrementally learn the unknowns/novelties is becoming critical in making the AI agent more and more knowledgeable, powerful, and self-sustainable over time. The key challenge is how to automate the process so that it is carried out continually on the agent's own initiative and through its own interactions with humans, other agents, and the environment just like human on-the-job learning. In this talk, I will present a theoretical framework called SOLA (Self-initiated Open-world continual Learning and Adaptation), which theoretically unifies the key tasks of out-of-distribution (or novelty) detection, continual learning, open-world learning, and human-AI interactions. To show feasibility, an implemented such agent is also described.

Biography:

Bing Liu is a distinguished professor at the University of Illinois Chicago. He received his Ph.D. in Artificial Intelligence (AI) from the University of Edinburgh. His current research interests include continual learning, lifelong learning dialogue systems, out-of-distribution detection, machine learning and natural language processing. He has published extensively in prestigious conferences and journals and authored four books. Three of his papers have received the Test-of-Time awards, and another one received Test-of-Time honorable mention. He is the winner of 2018 ACM SIGKDD Innovation Award, and is a Fellow of AAAI, ACM, and IEEE

How AI is Creating a Feeling Economy

Roland T. Rust*
Ming-Hui Huang*

University of Maryland, College Park, MD
National Taiwan University, Taiwan

Abstract: Not Available

Contrastive Learning Models for Sentence Representations

Haoran Xie*

Lingnan University, Hong Kong

Abstract:

Sentence representation learning is a crucial task in natural language processing, as the quality of learned representations directly influences downstream tasks, such as sentence classification and sentiment analysis. Transformer-based pretrained language models such as bidirectional encoder representations from transformers (BERT) have been extensively applied to various natural language processing tasks, and have exhibited moderately good performance. However, the anisotropy of the learned embedding space prevents BERT sentence embeddings from achieving good results in the semantic textual similarity tasks. It has been shown that contrastive learning can alleviate the anisotropy problem and significantly improve sentence representation performance. Therefore, there has been a surge in the development of models that utilize contrastive learning to fine-tune BERT-like pretrained language models to learn sentence representations. But no systematic review of contrastive learning models for sentence representations has been conducted. To fill this gap, this talk summarizes and categorizes the contrastive learning-based sentence representation models, common evaluation tasks for assessing the quality of learned representations, and future research directions. Furthermore, we select several representative models for exhaustive experiments to illustrate the quantitative improvement of various strategies on sentence representations.

Open Cyberinfrastructure for an Open Society

Frank K. Wuerthwein*

University of California, San Deigo, CA

Abstarct:

We describe a vision of cyberinfrastructure that is both horizontally and vertically open.

Horizontally open in the sense that institutions pursuing open science on open data using open source software can federate their compute, storage, CDN, devices etc. with each other, and horizontally such that services can be built on it at different layers.

We describe the extend to which we have created such an infrastructure across more than 150 institutions worldwide, and discuss

how this democratizes access to AI infrastructure in ways that is crucial to make AI education more accessible.

Topological methods for artificial intelligence

Gunnar Carlsson*

BluelightAI Inc, Stanford, CA

Abstract:

This talk will present topological methods (called topological data analysis) for modeling data and producing, analyzing, and modifying various different types of machine learning models. In this case topological methods include both the construction of graph theoretic models approximating the data as well as methods of "measuring" the associated shapes. These methods have demonstrated their utility in a number of directions, both in the understanding of data as well as the analysis of model behavior for complex modeling mechanisms. We will demonstrate with examples in various domains.

Biography:

Assistant, associate, full Professor of Mathematics, and Professor Emeritus at University of Chicago (1976-78), University of California at San Diego (1978-86), Princeton University (1986-1991), and Stanford University (1991). PI of DARPA multi university DARPA initiative on topological data analysis, Co-founder of Ayasdi Inc. and BlueLightAI Inc.

Oral Presentations

Empowering Energy Storage: AI Fusion of Vision and Language for Advanced Battery Analysis

Daniela Ushizima[1,2,3,*]
Zineb Sordo[1]
Eric Chagnon[1]
Iryna Zenyuk[1,4]

[1]*Lawrence Berkeley National Laboratory, Berkeley, CA*
[2]*University of California, Berkeley, CA*
[3]*University of California, San Francisco, CA*
[4]*University of California, Irvine, CA*

Abstract:

We present an AI framework that combines Iterative Residual U-Net's deep learning capabilities with SciBERT transformers' advanced linguistic analysis. This integrated framework is engineered to decode the complexities of lithium-metal batteries, leveraging operando XCT imaging acquired at the U.S. Department of Energy (DOE) facilities to provide insight into lithium (Li) behavior. By transcending traditional hurdles like low X-ray attenuation of Li and voluminous datasets, this approach enhances gradient flow and allows detailed 3D visualizations of Li structures, from morphological changes of the electrodes and electrolyte to dynamics.

The strategic incorporation of SciBERT into this framework, trained on scientific literature, enriches semantic segmentation with a deep understanding of textual data from the DOE's lithium battery projects. This dual analysis illuminates the intricacies of "dead" Li, electrode compositions, and the re/deposition processes, propelling battery design and diagnostic strategies forward.

This approach seamlessly integrates Computer Vision with Natural Language Processing, which is a step forward in gathering multimodal data representations and holds considerable promise for applications beyond battery research. The framework is easily transferrable to other fields and scientific enquiries, so we will also illustrate how this framework has been applied to biofuel research.

Biography:

Daniela Ushizima, Ph.D., is a Senior Scientist at Lawrence Berkeley National Laboratory's Applied Math and Computational Research Division, where she leads the CAMERA ML Team. An expert in Computer Vision and NLP, she serves as Affiliated Faculty at the Bakar Institute, UCSF, and the Berkeley Institute for Data Science, UC Berkeley. Her research spans scientific data analysis from advanced imaging techniques, covering materials like batteries, biofuel and carbon fibers. Ushizima's work in Alzheimer's disease research, specifically on radioactive labels with Dr. Grinberg, earned her the Pioneer Award at the Precision Medicine World Conference in 2023. More: http://bit.ly/idealdatascience

Diffusion Equation based Subspace Extraction of Image Data for Fast K-means

Bingcheng Li[*]

Lockheed Martin, Owego, NY

Abstract:

In this paper, a diffusion equation evolution approach is proposed to extract subspaces from high dimensional image sensor data and the subspace extraction approach is applied to fast K-Means implementation and demonstrates high performance.

First, a subspace model in image spaces is introduced and the solutions and issues of traditional subspace clustering methods are discussed. Then, the motivation of using the diffusion equation evolution to solve the problems of traditional approaches is described.

Second, a diffusion equation evolution of image data is introduced and an evolution behavior for the subspaces of image data is described. It is shown that the local structures of subspaces can be derived from this evolution behavior. Thus, the optimization to extract local structures required by traditional methods is eliminated for the proposed method. This significantly reduces the computational cost.

Third, multiple one dimensional iterative exponential filtering is proposed to implement the diffusion equation that allows us to implement the diffusion equation with a constant computational cost for any large evolution steps. This significantly reduces the implementation cost of the diffusion equation evolution.

Fourth, the proposed subspace extraction approach is applied to K-Means implementation. It is shown in theory that the proposed method has much lower computational cost and higher performance than directly using the original data.

Fifth, the proposed method for the K-Means implementation is tested with MNIST digit image data. Test results show that the proposed method is not only 20% better in performance, but also over 20 times faster than the traditional implementation.

Biography:

Bing C. Li received his BS, MS and PhD in EE, and MS in CS. He led team, developed, and implemented multiple technologies and products that solved many practical problems. These technologies and products were deployed to real fields. He also published over 90 trademark, trade secrets, patents, and technical papers in the fields of radio frequency signal processing, image processing, machine learning, computer vision, pattern recognition, radar waveform design, fractal, and chaos system. Currently he works in Lockheed Martin as a Lockheed Martin Fellow and chief technologist for AI/ML sensor data analytics.

ℓ1,2 Norm and CUR Matrix Decomposition based Sparse Online Active Learning for Data Streams

Zhong Chen*

Southern Illinois University, Carbondale, IL

Abstract:

Aiming at learning from a sequence of data instances over time, online learning has attracted increasing attention in the big data era. As an important variant, sparse online learning has been extensively explored by facilitating sparse constraints for online models such as truncated gradient, ℓ1-norm, ℓ1-ball projection, and regularized dual averaging. However, most existing studies consider sparse online learning with fixed feature spaces, whereby in real practice the features may be dynamically evolved over time. To the end, we propose a novel ℓ1,2 norm based sparse online learning algorithm (ℓ1,2-SOAL) tailored for data streams described by open feature spaces, where new features can emerge constantly, and old features may be vanished over various time spans. Furthermore, we develop an effective online CUR matrix decomposition method based on the ℓ1,2 mixed norm constraint to actively select important up-to-date samples in a sliding window and facilitate stable performance over time.

If the loss function is simultaneously Lipschitz and convex, a sub-linear regret bound of our proposed algorithm is guaranteed with a solid theoretical analysis. Empirical results benchmarked on ten widely used datasets substantiate the superiority of ℓ1,2 -SOAL over existing state-of-the-art competitors in terms of classification accuracy and model sparsity. Keywords: Sparse Online Learning, Mixed-norm Constraints, Active Learning, Data Streams.

Biography:

Zhong Chen is currently an assistant professor at the School of Computing, Southern Illinois University. His main research interests include deep learning, machine learning, data mining, online learning, bioinformatics, and medical physics. He has published 32 peer-reviewed articles in scientific journals and conferences such as PRL, IVC, JMLC, TCBB, MLJ, Bioinformatics, SDM, IEEE BigData, ICDM, CIKM, DSAA, ECML-PKDD, and AAAI. He has been invited to serve as the ad hoc reviewer of TCRT, INS, TMI, TFS, TKDD, TGCN, IoT, TCSS, TNNLS, TV, JMLC, ICDM, SDM, AIKE, ICAIS, AAAI, CIKM, IJCAI, BIBM, PAKDD, KDD, FAccT, SMC, and ECML-PKDD. His homepage: https://www2.cs.siu.edu/~zchen/

Groundwater Level Prediction with Machine Learning

Xiao Chang*
Alexander Traylor

Tuskegee University, USA

Abstract:

Groundwater level (GWL) prediction is critical in managing groundwater resources for various purposes, including drinking water supply, agriculture, industry, and environmental conservation. GWL prediction could help with optimizing the use of groundwater resources by enabling water managers to anticipate changes in groundwater levels, and plan water usage accordingly. This study aims to investigate GWL prediction with machine learning and show a comparison of the effectiveness of machine learning methods on GWL prediction. The seven machine learning methods were investigated for learning GWL prediction models, including the classical machine learning (ML) models and deep sequence models. The daily GWL data collected in the observation well located in Transylvania County in North Carolina in the years from 2000 to 2019 were used in the experiment. The four classical machine learning methods, linear regression, RF, XGBoost, and SVM, achieved 20.9%, 19.7%, 20.5% and 22.2% mean absolute percentage error (MAPE) on the test data, respectively. The three deep sequence methods, Bi-LSTM, LSTM and 1-D CNN, achieved 1.50%, 1.48% and 4.24% MAPE on the test data, respectively, which outperformed all the classical machine learning methods tested in this study. LSTM achieved best performance in this study. The experimental results demonstrated the effectiveness of the machine learning methods on GWL prediction. The GWL forecasting with machine learning would be useful for monitoring groundwater conditions and water supply planning.

Biography:

Xiao Chang is an assistant professor of computer science at Tuskegee University. His research areas include machine learning (ML), deep learning (DL), image analysis, and data analytics. His research has been published in the prestigious journals, including NeuroImage, Journal of Digital Imaging, and International Journal of Radiation Oncology-Biology-Physics. His research on ML/DL is supported by NSF, NIH, Intel and IBM.

Quantum Computing: Exploring its Business Implications and Industry Applications

Arit Kumar Bishwas*

PricewaterhouseCoopers, USA

Abstract:

Quantum computing, a groundbreaking technology that leverages the principles of quantum mechanics, has the potential to revolutionize various industries and transform traditional business practices. The investigation examines the current state of quantum computing, highlighting its unique capabilities such as exponential processing power, improved data security, enhanced optimization algorithms, and application in artificial intelligence. It delves into the potential applications of quantum computing across various industries. The topic also discusses the challenges and limitations of quantum computing, such as its current technological constraints and the need for specialized skills and infrastructure. Finally, we discuss the future prospects and potential impact of quantum computing on businesses, emphasizing the need for organizations to stay informed and adapt to this emerging technology to gain a competitive advantage and be quantum ready.

Biography:

Dr Arit Kumar Bishwas holds advanced degrees in computer science, including two master's degrees and a Ph.D. specializing in artificial intelligence and quantum computing. Currently, he is serving as the Director at PWC USA Innovation Hub, where he leads research and development initiatives in quantum computing for the United States, along with a strong focus on business-oriented AI/Generative AI R&D. With over 17 years of experience, his career has been marked by leadership in industrial, application-driven research and development, distinguished by a unique and rare combination of expertise in Quantum Computing and Artificial Intelligence. Additionally, he is also engaged with Coventry University, UK as a "Visiting Research Fellow". His profile includes multiple patents filed on quantum computing and artificial intelligence along with several scientific publications.

Approximating Memorization using Loss Surface Geometry for Dataset Pruning and Summarization

Rajiv Khanna*

Abstract: Not Available

Efficient and Scalable Fine-tune of Language Models for Genome Understanding

Huixin Zhan[1]*
Ying Nian Wu[2]
Zijun Zhang[1,3]

[1]Division of Artificial Intelligence in Medicine
Cedars-Sinai Medical Center, USA
[2]UCLA, USA
[3]Department of Computational Biomedicine,
Cedars-Sinai Medical Center, USA

Abstract:

Although DNA foundation models have advanced the understanding of genomes, they still face significant challenges in the limited scale and diversity of genomic data. This limitation starkly contrasts with the success of natural language foundation models, which thrive on substantially larger scales. Furthermore, genome understanding involves numerous downstream genome annotation tasks with inherent data heterogeneity, thereby necessitating more efficient and robust fine-tuning methods tailored for genomics. Here, we present Lingo: Language prefix fINe-tuning for GenOmes. Unlike DNA foundation models, Lingo strategically leverages natural language foundation models' contextual cues, recalibrating their linguistic knowledge to genomic sequences. Lingo further accommodates numerous, heterogeneous downstream fine-tune tasks by an adaptive rank sampling method that prunes and stochastically reintroduces pruned singular vectors within small computational budgets. Adaptive rank

sampling outperformed existing fine-tuning methods on all benchmarked 14 genome understanding tasks, while requiring fewer than 2% of trainable parameters as genomic-specific adapters. Impressively, applying these adapters on natural language foundation models matched or even exceeded the performance of DNA foundation models. Lingo presents a new paradigm of efficient and scalable genome understanding via genomic-specific adapters on language models.

Biography:

I am currently a Postdoctoral Scientist in the Division of Artificial Intelligence in Medicine at Cedars-Sinai Medical Center. Previously, I obtained my Ph.D. in Computer Science from the Department of Computer Science at Texas Tech University, where I am fortunately advised by Prof. Victor Sheng. I obtained my MS degree from the University of Texas at San Antonio. I have a strong interest in and actively contribute to various research areas. These include end-to-end learning of complex modular information processing assemblies, meta-learning (or learning to learn), attention mechanisms, deep generative models, convolutional architectures, natural language processing (with a particular focus on word embeddings, summarization, and language models), graph neural networks, security & privacy, as well as their diverse applications in fields such as text mining, biomedicine, healthcare systems, and gene prediction.

An AI and Machine Learning Collaborative at Southeast Florida Coastal Environmental Data and Modeling Center

Jason Liu*
Todd Crow[l]
Dongsheng Luo
Jayantha Obeysekera

Leonardo Bobadilla Florida International University
Miami, Florida, USA

Abstract:

The United States has experienced significant population growth in coastal counties during recent decades. Southeast Florida is the domain of this study area, which includes ecologically sensitive and economically important Biscayne Bay, urbanized corridor and tributary watersheds bordering the Bay, and the surface and groundwater systems in regional watersheds. This region, with a major metropolitan area of Miami Dade county is highly susceptible to significant flood damages from sea level rise, high tides, storm surge, hurricanes/tropical storms, and extreme rainfall due to dense populations, high property values, and disproportionately vulnerable populations in low-lying areas. Largely due to the influx of urban pollution, the Bay is already experiencing routine episodes of fish kills due to rapidly changing its water quality during warmer days and inland rainfall events. The understanding and prediction of the consequences of both stresses and shocks in this coupled land-ocean system is important for the future viability and sustainability of Southeast Florida.

Florida International University (FIU) is collaborating with the NSF AI Institute for Research on Trustworthy AI in Weather, Climate, and Coastal Oceanography (AI2ES) to build the ExpandAI South Florida Coastal Environmental Data and Modeling Center at FIU for integrated research and education efforts to develop AI/ML techniques for understanding and predicting the key processes affecting ocean, urban, agricultural, and natural systems, and studying coastal environmental issues important to South Florida, such as sea-level rise, urban flooding, water quality monitoring, and harmful algae bloom detection. The research thrusts of the Center include foundational research in trustworthy AI with the goal of improving model performance, accuracy, and reliability, and applied research to study coastal environmental problems. This talk will provide an overview of the project and discuss some of the initial research developments since its inception.

Biography:

Jason Liu is an Endowed Computer Science Professor and the Director of the Knight Foundation School of Computing and Information Sciences, Florida International University (FIU) in Miami, Florida, USA. He received his Ph.D. from Dartmouth College in 2003. His research focuses on modeling and simulation, parallel discrete-event simulation, performance modeling and simulation of computer systems and computer networks. He currently serves on the Editorial Board of ACM Transactions on Modeling and Computer Simulation (TOMACS), SIMULATION,

Transactions of the Society for Modeling and Simulation International, and IEEE Networking Letters. Jason Liu is an NSF CAREER awardee in 2006 and an ACM Distinguished Scientist in 2014. His research has been supported by various funding agencies in U.S., including NSF, DOE, DOD, NSA, and DHS.

How to Create AGI and Not Die

Craig A. Kaplan, PhD*

iQ Company, USA

Abstract:

The safest path to Artificial General Intelligence (AGI) is to create a community of human and AI agents. Keeping humans in the loop for as long as possible maximizes the opportunity for humans to align the values of AI before it achieves SuperIntelligence. Enabling millions of humans to teach AI agents their values, ensures that the values of AGI reflect a statistically representative and valid sample of human values. This approach is in stark contrast to the idea of allowing AI to teach itself values by following a "constitution" created by an elite few.

Biography:

Craig A. Kaplan, PhD is the CEO and founder of iQ Company, a consulting company focused on AGI. He was also the founder and CEO of PredictWallStreet, a data gathering firm whose clients included NASDAQ, TDAmeritrade, Schwab, and other well-known financial institutions. Kaplan has over three decades of expertise in designing and implementing intelligent systems. His current consulting focus is the development of AGI systems, including the topics of AI safety and ethics. He is working to apply AI and collective intelligence to solve challenging problems that affect the planet globally, including the development of super-intelligent systems.

Design of Warning Messages against Phishing Attacks: A Case for Personalized AI enabled Warning Designs

Joseph Aneke1*
chutima boothum-denecke[1], Jean Muhammad[1]

Hampton University, Hampton, Viginia, 23668, USA.

Abstract:

Phishing a major type of cyber-attack involving identity theft has been on the increase. Safeguarding users against this fraudulent act on the cyberspace, has remained a doubting task for cybersecurity experts. Advancements in form of automated detection are increasingly been defiled largely due to user negligence, ignorance, and sometimes active collaborations with attackers.

Evidently, consideration of human factors becomes imperative and should be an important part of any security system design. This idea revolves around the fact that a system can have users of different backgrounds, technical prowess, and thus the `usability' of the system is a high priority requirement today. We argue that Understanding user's behavior and their interactions with artificial-intelligent-based systems is a key component.

In this paper, we present an AI enabled polymorphic personalized warning messages. Its architectural framework comprises of a multi-dual-stage process. First, it is the adoption of behavioral traits peculiar to users in the design of the warning message. Next, we adapted Cialdini's persuasion principles to add the needed coloration to help reinforce the acceptance of the warning text advice. Thus, a warning message customized to a user's personality trait preference and coloration of Cialdini's persuasive principle is presented.

The preliminary evaluation results of the polymorphic interface are still being analyzed; we can anticipate that they look promising since explanations provided by the polymorphic behavior resulted in more readable, understandable, and effective for lowering the effectiveness of phishing attacks than baselines like Chrome, Firefox, and Edge.

Keywords: Artificial intelligence, phishing, warning messages, human factors

Biography:

Dr. Joseph Aneke is an Assistant Professor of Computer Science at Hampton University Virginia. He earned his PhD in Computer Science from University of Bari, Italy. His research is focused on securing the cyber space using AI tools, Human Computer Interaction and Machine learning. He is particularly interested in understanding and unveiling Artificial Intelligence classification algorithms that result in predictions made by AI models (e.g., neural networks), which are difficult or even impossible to explain usually referred to as - black-boxes. His research findings would find useful applications in domains where AI models are used e.g. Cybersecurity, Health care, Biogenetics, Aerospace etc

Harnessing Generative AI in Supply Chains: An Application on Inventory Classification

Carlos D. Paternina-Arboleda[1*]
Harrison Halperin[1]

[1]*Dpt. of Management Information Systems, San Diego State University, San Diego, CA, 92182*

Abstract:

The integration of generative artificial intelligence (AI) into supply chain management represents a significant paradigm shift, particularly in the domain of inventory control. This research explores the application of generative AI in inventory management, with a focus on a novel case study from the electrical supply industry, presenting a comprehensive use case to demonstrate its effectiveness. In an industry traditionally reliant on manual processes, this study demonstrates how generative AI can radically streamline operations, even in contexts where detailed industry knowledge is lacking. Generative AI offers a promising alternative by leveraging machine learning algorithms to automatically generate classification models based on the inherent patterns within the data. The primary objective was to implement Generative AI-driven inventory classification in a real-world scenario, addressing the challenges of managing a large inventory system in a brick-and-mortar electrical supply business. Leveraging SQL for data extraction, Python for data analysis, and the GPT-4 API for AI-driven categorization, the study developed a comprehensive plan using generative AI to automate the categorization and description enrichment of over 3,000 SKUs. The outcome outlined the new location for each inventory item, a task that would have been labor-intensive without AI assistance. This case study underscores the efficiency gains and time savings achieved through generative AI, highlighting its potential application in managing larger and more complex inventory systems.

Biography:

Carlos D. Paternina-Arboleda, Assistant Professor at San Diego State University, works in Supply Chain AI-driven optimization and analytics. Holding a Ph.D. in Industrial Engineering, he previously served as a Full Professor at Universidad del Norte in Colombia. Actively involved in editorial boards and advisory roles, his work focuses on embedding intelligent cooperative agent structures, such as reinforcement learning algorithms, evolutionary algorithms, and Generative AI into decision support systems for supply chain analytics and optimization. Paternina-Arboleda has chaired notable conferences and continues to contribute significantly to the field.

Innovations in the immersive space: Case studies from Education and Navigation Research with Eye-tracking analytics in Virtual Reality

Dr. Bobby Nisha*

Department of Urban Studies and Planning, The University of Sheffield, U.K

Abstract:

Immersive Virtual Reality has enabled us to simulate space in a way that it can be felt in our senses, it enables us to not merely look at space but inhabit it. This has allowed us to study the intricacies of the relationship between mind and space in new ways like never before. The talk presents two case studies to showcase innovative use of virtual reality (VR) in Education and spatial navigation research with eye-tracking analytics in VR in an immersive way-finding game. The pedagogical value of learning with VR will be outlined from understandings informed by action-research project that used VR with learners and underpinning interdisciplinary research on cognition, perception of space, and learning pedagogies.

Case study two presents the innovative use of VR where an immersive play experience was set up as a way-finding treasure hunt game, where participants were tasked with finding three hidden objects in the market square. An interactable immersive play environment of a market square in U.K. was created for experience in VR. The immersive play generated bodily interaction with objects and eye-tracking data was plotted against this spatial memory and navigation oriented behavioural task. The experiment investigated how locations from the virtual space encoded in memory would be recalled when participants were asked to produce mental spatial representations of the market square. The case studies show the potential of VR as a tool in education, research, and public engagement and more such innovative approaches are needed to push boundaries and shape futuristic thinking.

Biography:

Bobby Nisha is Senior Lecturer (Teaching) and the Director of Postgraduate programmes at the Department of Urban Studies and Planning in The University of Sheffield. With a background in Architecture, her research focuses on psychological aspects of urban design, and uses immersive virtual reality to understand how people experience and navigate through spaces. She also studies the pedagogic impact of learning with immersive realities such as virtual and augmented realities in maker-space settings.

From Concept to Reality: Addressing Challenges and Constructing a Blueprint for Effective Generative AI Integration in Business Operations

Giulio Marchena Sekli[1,2*]
Ivan De La Vega[1,2]

[1]*CENTRUM Católica Graduate Business School, Lima, Perú;* [2] *Pontificia Universidad Católica del Perú, Lima, Perú*

Abstract: Not Available

Towards High-Fidelity Text-to-3D Generation

Yingcong Chen*

Hong Kong University of Science and Technology (Guangzhou)

Abstract:

Recent advancements in text-to-3D generation have unlocked new avenues for creating imaginative 3D assets, yet the quest for high-quality, detailed models remains a significant challenge. A key limitation

lies in the prevalent use of Score Distillation Sampling (SDS), which leads to inconsistent and low-quality updates, causing an over-smoothing effect. In this talk, I will share insights from our recent work, LucidDreamer. Particularly, I will delve into the Interval Score Matching (ISM) approach, a promising alternative of SDS that leverages deterministic diffusing trajectories and interval-based score matching to significantly enhance the quality of 3D model generation. I will explore the technical nuances of ISM, highlighting how it diverges from and improves upon existing methodologies. The presentation will also showcase our experimental findings, demonstrating ISM's capability in producing more realistic 3D models with reduced training costs and a more streamlined training pipeline.

Biography:

Ying-Cong Chen is an Assistant Professor at AI Thrust of Hong Kong University of Science and Technology (Guangzhou), and also jointly appointed by the department of Computer Science & Engineering. Prior to that, he was a Postdoctoral Associate at Computer Science & Artificial Intelligence Lab of Massachusetts Institute of Technology. he has been dedicated to research in computer vision, particularly in deep generative models. He has published more than thirty papers on top conferences and journals like TPAMI, CVPR, ICCV, ECCV, and his has been invited to give oral presentations at these conferences. His research achievements include being selected for ESI Highly Cited Papers, ICCV Best Paper Nomination, and winning the first prize in the Natural Science Award of the China Society for Image and Graphics. He serves as a program committee member or reviewer for top academic conferences and journals like TPAMI, IJCV, CVPR, ICCV, ECCV, NeurIPS, AAAI, and is a senior program committee member at IJCAI and AAAI□

A Tale of (at Least) Two Titles

David Israel*

SRI, Artificial Intelligence Center (Emeritus)

Abstract:

In 2017 a small army (really, a squad) of researchers from Google Brain and Google Mind published "Attention Is All You Need", a paper that could have been titled: "Attention Is Enough". In 2021, four researchers from (Google) Deep Mind published "Reward Is Enough" , a paper that could have been titled" "Reward Is All You Need". Despite the fact that both of these papers could have been titled, e.g., "X Is All You Need", the substituends for 'X' are different, and hence these two need not be in conflict. First, and most obviously, their titles could have been completed by quite different continuations of the frame "All you need for ….", or "All you need to do …". Second, the claims of the two papers should be read (are most plausible interpreted) as claims of sufficiency, not necessity. And of course there are lots of cases where there can be multiple sufficient conditions for X or for doing Y. Still: it would be nice to understand the relations between these claims and, more importantly, between the deeply impressive substantive work behind them. This talk will present some things to think about in reaching such an understanding.

SMARTER Robots Engaged in Robotic Interventions for Students with Learning Disabilities

Anshu Arora*[1]
Amit Arora[1]
Mohamad Sepehri
John R. McIntyre[2]

[1]University of the District of Columbia
Washington DC, USA
[2]Georgia Institute of Technology, Atlanta, USA

Abstract:

Social Motivation Approach for Rehabilitation Through Educational Robotics (SMARTER) research project focuses on creating interdisciplinary knowledge through social-educational robotics, and targets cognitive rehabilitation in students diagnosed with learning/cognitive disabilities (e.g., Autism Spectrum Disorder or ASD) in the District of Columbia Public Schools in Washington, DC. The research objectives of SMARTER research are to: (1) examine social-behavioral relationships and human personality traits in ASD students using social motivation theory of autism; (2) investigate robotic anthropomorphism and robotic intentionality exhibited during human-robot interaction (HRI) with ASD students; (3) develop curriculumrelated interactive scenarios designed for improving cognitive rehabilitation through robotic interventions targeting ASD students. The central research hypothesis of this SMARTER research is that educationalsocial robots may help to overcome sensory and motivational barriers encountered by the ASD individuals when they interact with humans by utilizing social motivation theory and approach in social-behavioral human-robot interaction; and educational robotics will enhance learning for K-12 students in Washington DC. The research utilizes a mix of qualitative and quantitative robotic interventions, and social-behavioral sciences methods, such as responses to surveys / questionnaires, structured content analysis, and multigroup analysis using structural equation modeling. The intellectual innovation of SMARTER project includes the creation of interactive curriculum-based scenarios based on school and university curricula utilizing ethical robotic interventions for students with learning disorders (e.g., ASD). The most significant impact of the SMARTER research is strengthening the research capacity in the interdisciplinary education, consumer behavior and robotics fields, and providing research training and opportunities for university students through educational robotics.

Biography:

Anshu Saxena Arora, Ph.D, PMP is the Tenured Associate Professor of Marketing at the School of Business and Public Administration in the University of the District of Columbia (UDC), Washington, DC. She is the Director of the AI, Social Robotics, and Behavioral Research Lab @ UDC, funded by the National Science Foundation. Dr. Arora is the Senior Editor for Marketing Area for the International Journal of Emerging Markets (IJoEM) published by Emerald Publications, United Kingdom. She is the Series Editor for International Marketing and Management Research published by Palgrave Macmillan - Springer Nature, UK. She has published more than 55 research papers in national and international journals of repute, and has presented more than 70 papers in esteemed national and international conferences.

Scaling Bitcoin: Addressing Payment Channel Network Challenges

Hsiang-Jen Hong*

Western Washington University, USA

Abstract:

Bitcoin and its underlying blockchain technology have garnered significant attention in both industry and academic communities. However, real-world experience with the Bitcoin network reveals numerous challenges that need to be addressed. This talk will explore the challenges in Payment Channel Networks, one of the scalable solutions for Bitcoin networks. Key issues include the poor success rate of current routing solutions, which is due to limited information and a naive trial-and-error approach. Additionally, the potential problem of channel rebalancing when a channel is depleted will be discussed. Building on these current issues, the talk will extend the vision to address these challenges and present the potential of incorporating innovative cryptographic technologies to enhance the overall efficiency and effectiveness of Payment Channel Networks.

Biography:

Hsiang-Jen Hong is an Assistant Professor in the Computer Science Department at Western Washington University. His research interests center around cybersecurity, blockchain technology, and computer networks, with a particular emphasis on algorithmic techniques. Recently, he has been delving deep

into Multi-Party Computation (MPC) and Zero-Knowledge Proofs (ZKPs), two critical pillars of the evolving Web3 landscape.

Predicting user Engagement Toward Movie Trailers using Applications of AI Tools

Nadia Maarfavia[1]
Marcos R. Machado[2]
Salma Karray[1*]

[1]*Ontario Tech University, Canada*
[2]*Twente University, The Netherlands*

Abstract:

This paper investigates for the first time the value of extracting information about actors appearing in movie trailers in predicting user engagement toward the video. We build a unique dataset of trailers containing movie and trailer information extracted using different AI tools (e.g., DeepFace) and apply different machine-learning models for predicting engagement. We find that the Kernel Ridge model performs best (R2 = 54%), and adding facial attributes to movie and trailer information improves the predictive accuracy of most models by 5 to 7%. Further, Shapley values and feature importance scores indicate that the number, gender, and average age of faces in the trailer are among the top ten most important features in our predictive frameworks; in contrast, race, size, and emotion of faces were less important. We also show that using classification algorithms improves predictive performance (Accuracy = 77%). Our findings indicate that advertisers and movie managers can use trailer content features to improve their predictions of user engagement.

Biography:

Dr. Salma Karray is the Research Excellence Chair in Marketing Analytics and Decision Models and Professor at the Faculty of Business and Information Technology. She uses optimization, data analytics and AI techniques to help businesses improve their performance and strive in a competitive environment. Applications of her work include digital advertising, pricing, retailing, loyalty program management, CRM, and e-commerce

Artificial Intelligence in Search and Rescue

Franz J. Kurfess[1*]
Chris Young[2]
Gary Bloom[3,4]

[1]*California Polytechnic State University,San Luis Obispo, CA, USA*
[2]*Bay Area Search and Rescue Council, CA, USA*
[3]*Contra Costa County Sheriff Search and Rescue, CA, USA*
[4]*San Mateo County Sheriff Search and Rescue, CA, USA)*

Abstract:

During a search and rescue mission for a missing person, searchers currently use paper-based forms to collect information about the missing person. After converting a set of relevant forms to digital versions, our team is using a variety of AI methods and tools to support the search team. Starting with a repository of information collected through the current search mission, we use semantic search in combination with a domain ontology, SAROnt, to retrieve relevant information. Probabilistic Reasoning, Machine Learning, Deep Learning, and Generative AI use information from historic missions in combination with external services (maps, weather, public transit, and others) to provide the search team with suggestions about the likelihood of finding the missing person in a certain location or area, visualized through a heat map.

This information is displayed in a dashboard with multiple panes: Basic information about the missing person, a list or graph of clues, a map with multiple overlays (clue locations; topographical information; roads and trails; "likelihood" heat map), available resources, a timeline with important events (last seen reported missing, search begins), and weather information. Others are in development and will be added as available.

As we continue our project with the exploration and integration of AI methods and tools, we are also reaching out to partners better equipped to deploy such a system for use by search and rescue organizations, primarily those based on volunteers.

Biography:

Franz J. Kurfess is a professor in the Computer Science and Software Engineering Department at Cal Poly, San Luis Obispo. He teaches courses in Artificial Intelligence and Human-Computer Interaction. In addition to careers in the construction and tech industry, respectively, Chris Young and Gary Bloom have a long history of working with Search and Rescue organizations in the Bay Area. Chris obtained his doctorate in Search Intelligence from the University of Portsmouth, UK and Gary was the CEO of several software companies in Silicon Valley.

Advancing Access Control: Exploring AI and ML Techniques for Enhanced Security

Thang Bui*

California State University, Monterey Bay

Abstract:

Access control researchers are exploring the diverse capabilities of AI and ML techniques, with the primary objective of enhancing authentication, authorization, and overall security posture. This presentation explores various AI/ML approaches to tackle diverse access control problems, including policy mining, policy management, and policy enforcement. Specifically, we will explore how AI/ML can be utilized to tackle the task of mining Attribute-Based and Relationship-Based Access Control policies, as well as navigating the landscape of various MLbased access control frameworks. Our focus will be on the complexities inherent in adopting black-box ML models for enforcing access control policies. Additionally, we will discuss the issue of inadequate real-world datasets in the access control research field and its impact on the selection of suitable AI/ML models.

Biography:

Dr. Thang Bui is an Assistant Professor in Computer Science at California State University, Monterey Bay. He received his Ph.D. in Computer Science from Stony Brook University in 2021. He also earned his Bachelor's degree and Master's degree in Computer Science from the same institution in 2016 and 2019. His research focuses on the management and enforcement of access control policies to protect computing resources/data/information.

Rapid and Scalable Classification of Viral Genomes

Jonathan Stubblefield[1*]
Sudip Panday[2]
David Ussery[2]

[1]*Arkansas State University, USA*
[2]*University of Arkansas for Medical Sciences, USA*

Abstract:

Viruses are small, obligate intracellular parasites with compact and highly variable genomes. With this inherent variability, efficiently classifying viral genomic sequences in the wild requires robust and scalable methods. Here we present a method for the classification of viral genomes that is fast and

scales well. To achieve this, we used hierarchical clustering to construct a dendrogram encompassing all of the 14,392 viral genomes present in RefSeq (in November 2023), with each species of virus being represented by its reference sequence. To accomplish this in a computationally efficient manner, we made use of the MinHash algorithm for comparing DNA sequences and divided the clustering problem by the labeled viral class. The International Committee on the Taxonomy of Viruses (ICTV) has recently proposed an extensive nomenclature for viruses; there are currently 40 different 'Classes' of viruses. The RefSeq genomes for each class of virus was clustered. Then, the centermost genomes of each cluster (medoids) were determined. With the class dendrogram complete, we classified a set of unknown genomes in two steps, first determining the genome's class by finding the minimum distance to a centermost class genome, then determining the species by finding the minimum distance to a reference genome in that class. Our new phylogenetic tree has been made available in scalable vector graphic form. We expect classifying viral genomes using this method to be accurate, fast, and computationally efficient.

Biography:

Dr. Jonathan Stubblefield is an early-career tenure-track faculty at Arkansas State University. After earning his MD and PhD, Dr. Stubblefield began conducting research on the applications of artificial intelligence and machine learning to medicine and other biological problems at Arkansas State University in association with the Arkansas Biosciences Institute.

Advancing AI/ML in the Water Sector; A Review of Potential Uses to Leverage Existing Data

Chris Gerrits[1]*

Crozier Consulting Engineers, Canada

Abstract:

The water sector is teeming with and abundance of historic data whether it be water level data from groundwater monitoring networks, operation data from water or wastewater systems, or water quality data from groundwater and surface water sources. Many water system operators and regulatory agencies have been collecting robust data for many decades. We will show through case studies and examples the potential to utilize the data sets to better predict future trends and to assist operators in decision making. Some of the examples will include;

- Utilizing long term water level data to predict future well rehabilitation
- We have developed a model for a municipal well that has accurately predicted when the well needs to be rehabilitated based on water level and pumping rate data.
- Predicting surface water quality trends
- Our model has been used to determine relationships between different water quality parameters in a creek in order to predict future water quality trends.
- Leveraging operational data to schedule maintenance
- Operational pump data can be used to predict when equipment will fail so that maintenance can be schedule in order to reduce operation downtime and unscheduled breakdowns.
- The potential for Object Detection to identify potential water quality threats
- Models can be trained to detect features from satellite imagery. Our model was trained to detect above ground manure storage tanks from Google Earth.

Biography:

Chris Gerrits, M.Sc., P.Eng. is the Manager - Hydrogeology at Crozier Consulting Engineers, a medium sized engineering firm with five locations in Ontario, Canada. Chris completed his B.Sc. and M.Sc. in Water Resources Engineering at the University of Guelph and has over twenty years of experience as a licensed Professional Engineer in Ontario. Chris is a former long time

Director of the Ontario Ground Water Association and a Founding Director of the Canadian Ground Water Association. Chris has presented on Artificial Intelligence and Machine Learning topics at the National Ground Water Association Groundwater Week in 2022 and 2023 as well as at the Canadian Water and Wastewater Conference in 2023.

AI Validation and Assurance and Accountability - Current Legislation, Policies and Industry Practices for Scaling AI Adoption While Managing Risk

J.P. Auffret, Ph.D.*

George Mason University, Fairfax, Virginia U.S.A

Abstract:

With the increasing adoption and interest in AI and consideration of associated risk, there is increasing legislation and policy requiring AI assurance and validation. New laws and policies include broad policy frameworks such as the recently passed European Union AI Act and the U.S. White House "White House Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence" to more tailored legislation such as New York Local Law 144 that mandates requirements for employers utilizing AI for the recruiting and hiring of employees.

These laws and policies mandate requirements on both developers and users on risk, assurance, validation, transparency and accountability. Not only are the mandates applicable to the initial on boarding of a system, they are also relevant throughout the AI system lifecycle s given the dynamic nature of AI systems.

The talk will open with consideration of the October 30th, 2023 "White House Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence", the E.U. AI Act and other legislation and policies and then will the focus on the challenges and approaches to AI assurance and validation and considerations for AI system audits. The discussion will include overview of current research and technology development for the application of automated tools The discussion will conclude with how organizations are addressing the assurance and validation requirements within the overall context of AI governance and building organizational capability for AI.

Biography:

J.P. Auffret is director, Center for Assurance Research and Engineering in the College of Engineering and Computing, and director, Research Partnerships in the School of Business at George Mason University, USA. Auffret is also co-founder and current president of the International Academy of CIO (IAC), an NGO headquartered in Tokyo. Auffret's work and research span a range of applied technology fields including innovation and application of emerging technologies; associated regulation and policy; ICT governance; and cybersecurity.

Auffret earned a B.S. from Duke University where he was an A.B. Duke Scholar, M.B.A. from the University of Virginia and Ph.D. in Physics from American University.

AI-powered Marketing: Real-world Insights and Strategic Frameworks

Dr. Sajjan Kanukolanu*

Position2, Santa Clara, CA, USA

Abstract:

HBR's March 2023 article highlighted a matrix of Risk and Demand evaluation in selecting a GenAI project. Marketing stood at the top due to the high demand and low risk. Rightfully, soon after OpenAI changed the consumer AI landscape, many companies launched AI platforms. Marketers readily adopted these.

With my experience in marketing and advertising over the last 20+ years and as a leader spearheading organizational-wide AI initiatives at my firm, I will share frameworks, infrastructure, successes, and areas of caution. My presentation will discuss the alignment of AI with marketing, demonstrating why this integration enhances targeted outreach and optimizes marketing.

I will outline a strategic model for swift AI adoption, focusing on the required structural and strategic adjustments within firms. This includes a detailed analysis of the necessary staff competencies, leadership roles, and the cultivation of an AI-ready culture.

I will share practical methodologies for implementing AI tools to refine marketing strategies and customer interactions. These technical approaches will be contextualized with real-world applications and case studies that underscore AI's operational benefits and scalability in marketing.

My narrative is supported by insights from reputable sources such as McKinsey & Company and Harvard Business Review, as well as industry research. By the conclusion of this presentation, attendees will gain a comprehensive understanding of the dynamics of AI in marketing, and the foundational infrastructure, applications, and platforms needed to make Marketing more effective than ever.

Biography:

Dr. Sajjan Kanukolanu is a marketer with a background in business and technology. For the past 24 years, Sajjan has helped design cutting-edge technologies and driven digital and marketing strategies for Fortune 500 firms. He has held senior strategic and account roles at global firms such as Ogilvy, Razorfish, and Wunderman in the US and Asia. As VP of Global Operations and Strategy at Position2, a Silicon Valley-based Growth Marketing company, Sajjan leads a 150-member team and spearheads the company's AI vision and strategy.

AI expert system using Bayesian data fusion for optimal concrete structure evaluation

Mehdi Sbartaï[1]*
Sylvain Dufau[1]
Cédric Baudrit[1]
Géraldine Villain[2]
Sidi Mohammed Elachachi[1]
Vincent Garnier[3]

[1]*Université de Bordeaux, UMR 5295, Institut de Mécanique et d'Ingénierie, France*
[2]*Univ Gustave Eiffel, MAST-LAMES, Campus de Nantes, Allée des Ponts et Chaussées, CS5004, F44344 Bouguenais, France*
[3]*Aix Marseille University, LMA, CNRS UPR 7051, IUT, Bd Gaston Berger, 13625 Aix en Pce*

Abstract:

The maintenance of civil engineering infrastructure is an international priority. Technological advances and data digitalization now allow us to acquire a large quantity of substantial data from sensors integrated into road infrastructure (bridges, viaducts, tunnels, etc.) or energy production (wind turbines, nuclear power plants, etc.). In a context of digital transition, the "intelligent" exploitation of data to optimize and/or guide maintenance actions has become essential. Addressing the complexity of civil engineering infrastructure through interdisciplinary fields (artificial intelligence, civil engineering, forensic engineering) could improve our understanding of systems holistically, and provide more robust and efficient decision-making alternatives in infrastructure maintenance management. For this context and the context of the national Frensh project ANR SCANING on concrete properties prediction using embedded sensor and Artificial Intelligence, the goal of this research work is to implement a new expert system based on the fusion of data from several sensors for predicting concrete properties. The predicted properties are compressive strength, porosity, moisture content, modulus of elasticity, etc. First, a database was created from experimental program. The measurements were from sensors embedded in concrete at different depth (as ultrasonic sensor, electrical and capacitance sensors).

Secondly, a probabilistic Bayesian AI expert system was developed for predicting concrete properties from sensors data. The Expert system was first trained and after validated on data not used for training procedure. The results show high prediction capacity of the developed tool which is useful and untestable to end-users for the evaluation of concrete structures.

Biography:

Mehdi Sbartaï is full professor at the University of Bordeaux. He is the responsible of the research axis NDT and decision of the department of civil engineering. His works deals with nondestructive evaluation of structures using combining NDT methods and sensors with the use of optimization tools and AI. He received his Ph.D in 2005 from Sherbrooke University and Toulouse University (France). He publishes more than 200 papers in journals, conferences and books chapters. He participates in several French and European projects. He was involved in the RILEM committee 249-ISC on NDT for concrete evaluation with the publication of new RILEM recommendations in 2019.

Developing Conversational AI Agents to Enhance Academic Learning

Sanghamitra Deb*

Chegg Inc.,

Abstract:

In the past year Generative AI and Large Language Models(LLMs) have disrupted the Machine Learning Landscape. Using prompts you can build a prototype ML solution in just a few days. The real question is are these prototypes ready for production? In an ever changing world of models powering third party API's , dealing with the unchartered zone of evaluations, is it even prudent to expose customers to the LLM powered applications?

Clearly the popularity of ChatGPT shows us that people are relying on LLMs for not just for information but also for composing content such as emails or slides, generating code, reading papers to mention a few. People have even started looking towards AI for companionship.

This is the Age of Generative AI, innovation is moving faster than development speed. There are no rules, yet we have to build an application, that is high quality, robust to changes and provides the best possible customer experience.

In this presentation I will talk about building ML applications with Generative AI. In order to build ML applications there are a few approaches: use external APIs, fine-tune your own model using domain specific data and doing Retrieval Augmented Generation to provide context to the LLMs. In most applications some or all of these methods are combined. Having a framework for evaluations both human and automated helps with optimizing high quality results with performance and cost. Building scalable applications with streaming functionality has its own challenges.

Fast iterations are extremely important to keep up with the pace of innovation, at the same time creating best practices to ensure accountability and reproducibility is important for experimentation and to create an optimal customer experience. Some of these include prompt versioning, model versioning and monitoring models as they go into production.

Another important factor to consider while building an LLM or Generative AI assisted application, does it make sense to build smaller ML models that do classifications, summarizations, NER to reduce the ask from Generative models such that it can scale to larger traffic at lower latency and cost. Is the tradeoff higher development cycles or is it possible to build these models faster using LLM assisted training data? I will address how to answer these questions that come up in the lifecycle of a Generative AI driven application.

Biography:

Sanghamitra Deb is Engineering manager: Generative AI and ML at Chegg INC. She works on improving student learning with LLMs. Prior to being a manager she was a Lead Staff Data Scientist for several years. Her work involves building conversational interfaces using LLMs, recommendation systems, computer vision, graph modeling, NLP , architectural decision-making, data pipelines and machine learning. Previously, Sanghamitra was a data scientist at a Accenture where she worked on a wide variety of problems related data modeling, architecture and visual story telling. She is an avid fan of python and has been programming for more than a decade.

Trained as an astrophysicist (she holds a PhD in physics) she uses her analytical mind to not only work in a range of domains such as: education, healthcare and recruitment but also in her leadership style. She mentors junior data scientists at her current organization and coaches students from various field to transition into Data Science. Sanghamitra enjoys addressing technical and non-technical audiences at conferences and encourages women into joining tech careers. She is passionate about diversity and has organized Women In Data Science meetups.

Deep Learning in Robustness

Wei Dai, PhD*

Purdue University Northwest, Indiana, USA

Abstract:

Deep learning (DL) classifiers are often unstable in that they may change significantly when retested on perturbed images or low quality images. This research adds to the fundamental body of work on the robustness of DL classifiers. We introduce a new two-dimensional benchmarking matrix to evaluate robustness of DL classifiers, and we also innovate a four-quadrant statistical visualization tool, including minimum accuracy, maximum accuracy, mean accuracy, and coefficient of variation, for benchmarking robustness of DL classifiers.
In the context of deep learning research, where model introductions continually occur, the need for effective and efficient evaluation remains paramount. Existing methods often emphasize accuracy metrics, overlooking stability. To address this, the research introduces the Accuracy-Stability Index (ASI), a quantitative measure incorporating both accuracy and stability for assessing deep learning models.

Biography:

Dr. Wei Dai is an engineer and scientist specializing in computer science and data science. As a faculty member of Purdue University system, he focuses on teaching, research, and service in computer science and artificial intelligence. He is the director of Advanced Intelligence Software Lab. Dr. Dai has industry experience in IBM company as a senior engineer and Arkansas state government as a data scientist, respectively.

David earned the Ph.D. degree in Computer and Information Sciences in August 2020 from the University of Arkansas at Little Rock, USA. Now he is an IEEE Senior member and an NSF reviewer.

A Novel Machine Learning Method for Gene Network Profiling and Weak Signal Detection in Prediction of Ovarian Cancer Occurrence, Survival, and Severity

Yanming Li*
Mihaela Sardiu
Devin C. Koestler
Fengwei Yang
Md Tamzid Islam
Stephan Komladzei
Murshalina Akhter

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University of Kansas Medical Center. Kansas City, KS 66160. USA

Abstract:

Ovarian cancer (OC) is a gynecological malignancy characterized by its high mortality rate, poor long-term survival rate, and late-stage diagnosis. OC is the leading cause of cancer death among woman. Its 5-year survival rate is less than 50%. Only ~17% OC patients are diagnosed within early stage. Currently, the identified OC predictive genes are very sparse, resulting in pool prognostic performance. Unmet needs exist to identify novel prognostic genes for OC occurrence, survival, and clinical stages to promote the likelihood of survival and to perform optimal treatments at the earliest stage possible. Previous RNAseq analysis on OC focused on detecting differentially expressed (DE) genes only. Many genes, although having weak marginal differential effects, may still exude strong predictive effects on disease outcomes though regulating other DE genes. In this work, we employed a new machine learning method, netLDA, to detect such predictive coregulating genes with weak marginal DE effects for predicting OC occurrence, 5-year survival, and clinical stage. The netLDA detects predictive gene networks (PGN) containing strong DE genes as hub genes and detects coregulating weak genes within the PGNs. We identified predictive signature genes for OC occurrence, survival, and clinical stage. Many of the detected predictive gene networks and coregulating weak genes therein overlapped with OC-related biological pathways such as KEGG tight junction and cell cycle pathways. Cellular mapping of selected feature genes using single-cell RNAseq data further revealed the heterogeneous expression of the signature genes on different cell types.

Biography:

Dr. Yanming Li is an Assistant Professor in the Department of Biostatistics and Data Science, University of Kansas Medical Center (KUMC). He is an associated member of University of Kansas Cancer Center (KUCC) and University of Kansas Alzheimer's Disease Research Center (KUADRC). He received his Ph.D. in Biostatistics from University of Michigan. His research has been focused on developing statistical methods and computational algorithms and building predictive models for analyzing big and complex-structured data, with applications to cancer-genomic, neuroimaging-genomics studies and electronic health record data analysis.

Detecting Transition States of Dual Mode Scramjet Data Utilizing Deep Learning Techniques

Janett Walters-Williams*
Qiang Le
Anthony Powell
Liya Taylor
Tommaso Ciaglia

Hampton University, USA

Abstract:

There are presently research looking at ways to predict and control the behavior of Dual Mode Scramjets (DMSJ), which are engines that can be operated in both subsonic and supersonic combustion mode. This current research examines the use of Optical Emission Spectroscopy (OES) sensors to determine the shock location and the health of the combustion environment. This requires the analysis of the transition from one steady state to another in the spectral emissions data with the aim or reducing or avoiding unstart. This portion of the research aims to detect the transition states using long-short term memory (LSTM) and support vector machine (SVM) deep learning techniques. In doing this the research seeks to improve the predictability of these techniques when identifying the transition states from given denoised data of DMSJ. Both the qualitative and quantitative assessments of the study produce desired results, with LSTM and SVM yielding a model accuracy of over 90 percent.

Biography:

Janett Walters-Williams is an Associate Professor in the Department of Computer Science at Hampton University. She received her Ph.D. emphasis in ML applications from the University of Southern Queensland, Australia. Currently, much her work in Machine Learning surrounds the development of algorithms for prediction, analogy detection and classification to fits problems and needs in different disciplines such Aerospace and Atmospheric Science. Dr. Walters-Williams is the author of one book and many papers on Signal Processing, and Machine Learning. She has given tutorials, and invited talks including DeLoitte's Leading Conversations in AI and Women in AI.

Transforming Precision Manufacturing: Unleashing AI's Potential

Tanmay Aggarwal*

Lambda Function, USA

Abstract:

In the ever-evolving landscape of manufacturing, a revolutionary stride is emerging: the fusion of Artificial Intelligence with Precision Manufacturing, heralding a new era of production excellence. This session at AIM 2024 will delve into this not-so-distant transformative future and its impact potential on N.A. manufacturing, offering an inspiring roadmap to tackle pressing manufacturing challenges while unlocking unprecedented opportunities. Harnessing the synergy of AI within the context of precision manufacturing, our discussion will center on tangible applications of AI from CAD-to-Part, reviewing examples of emerging innovations from academia to startups to industry. We will discuss pragmatic approaches that early adopters/innovators are adopting to seamlessly intertwine AI-driven insights within their CAD-to-Part processes, igniting a surge in productivity and capital efficiency. We will navigate the complexities of AI implementation, guiding the audience to pinpoint where AI integration amplifies efficiency without sacrificing workforce competency. By demystifying this symbiotic relationship, we will highlight the way to attract, retain & develop a skilled workforce, an indispensable asset in re-establishing global dominance of N.A. manufacturing. This session is a beacon for reshaping the manufacturing landscape in N.A. We will unravel the threads of innovation, weaving a tapestry of heightened productivity, elevated part quality, strategic automation, and a robust workforce. As costs diminish and demand surges, this paradigm shift will drive the resurgence of American manufacturing prowess, poised to redefine global market dynamics. Join us as we unravel the extraordinary potential of AI within precision manufacturing, reshaping the manufacturing paradigm and catalyzing a transformative wave across industries.

Biography:

Mr. Aggarwal is the Founder & CEO of Lambda Function, an SF-based startup focused on using AI/ML to enable autonomous precision manufacturing. He has over 12 years of experience in technology, including enterprise software, infrastructure hardware, and industrial technologies. Before Lambda Function, he was a Senior Engagement Manager at L.E.K. Consulting, a global strategy consulting firm, leading projects on go-to-market and growth strategy. He has experience in corporate strategy working with precision manufacturers across Aerospace, Semiconductor, Automotive, and Medical Device sectors. He holds a B.Sc. and M.Eng. degree from the University of Michigan and an MBA from the University of Chicago Booth School of Business.

Poster & Drinks:

Rewiring Progress: How to Unleash the Full Power of AI

Kim Carson*

Parallax Futures, Berkeley, CA

Abstract:

In the rapidly evolving landscape of technological innovation, a critical issue persists—homogeneity in the creation process. Despite the transformative potential of emergent technologies like artificial intelligence, quantum computing, and biotechnology, the current paradigm is dominated by a lack of diverse perspectives, resulting in missed opportunities for groundbreaking advancements. This pivotal moment demands immediate action to overcome three primary obstacles hindering our path to a more positive and abundant future: Absence of a Systematic Innovation Framework: The absence of a structured approach for harnessing advancements in technology to create new entities such as companies, products, jobs, and policies impedes progress. Diversity Deficit in Promising Fields: Despite evidence demonstrating that diverse companies yield a greater proportion of revenue from innovation, the fields with the most promise remain largely homogeneous. Negativity Bias in Tech Discourse: Many emerging organizations focus on contemporary issues with a negative and scarcity-oriented mindset, limiting exploration of the vast possibilities offered by technical solutions. We need to tackle these obstacles by ensuring diverse perspectives are present in technology creation, and guiding individuals from various backgrounds, cultures, disciplines and perspectives through a new approach to technology innovation. This will be the new design thinking - designed with an emphasis on exploration and creativity. A new way to build technology that focuses on making us better humans. We can build the workforce of the future by creating a community of practitioners whose focus is to explore the limits of AI and inspire a better future for us all

Biography:

Kim Newman, CEO & Founder of Parallax Futures, leads a nonprofit fellowship program championed by Reid Hoffman, fostering Conceptual Technologists to inspire positive futures. As a Black woman in America, I faced discouragement from pursuing computer engineering. Despite my tech passion, I lacked a supportive community. It was only upon entering tech that I found like-minded individuals unenthused by the industry's direction. Now, within this hidden community, we share a vision of using technology to genuinely better the world. I advocate for multi-dimensional diversity in technology and strive to reshape AI leadership, leveraging emergent technology to enhance humanity's future.

Deep-Learning for Traffic Accident Anticipation

Jeha Ryu*

Gwangju Institute of Science and Technology, Korea (Republic of)

Abstract:

Safety in driving is the top priority for manual, semi-autonomous, and fully autonomous vehicles. For advanced driver assistance system (ADAS), therefore, an object that may cause an accident in the future should be anticipated as early and accurately as possible. First, we present a summary of the state-of-the-art deep-learning-based methodology in this research area. Then we propose a novel physically explainable, deep-learning model to anticipate accident-involved objects. The proposed model predicts the accident probability by using geometrical and physical motion features such as object poses (location, orientation, size) from the detected bounding boxes and their velocities that can be obtained by differential operators. Then, spatio-temporal relationships between objects are captured by an attention mechanism both on the pose and velocity in the past and predicted future features. The proposed model can thus reduce effects of visual biases in datasets, and thereby generalize well to

unseen data. Effectiveness of the proposed model has been comprehensively validated for a variety of publically available real traffic accident datasets that were collected all over the world.

Biography:

2021 – Present: Director of Institute of Integrated Technology, Gwangju Institute of Science and Technology (GIST), Gwangju, South Korea.

2021 – Present: Head of School of Integrated Technology, Gwangju Institute of Science and Technology (GIST), Gwangju, South Korea.

2015 - 2020: Review Board Member of NRF (National Resech Foundation)

2015 – 2021: Technical Editor for IEEE/ASME Transactions on Mechatronics

2013 – 2015: President of Korean Society of Haptics

2010 – Present: Director of Korean Human-Computer Interaction Society

2007.1 – 2010.12 --- Director for Korea Auto-Vehicle Association

Transfer Learning on Physics-Informed Neural Networks for Tracking the Hemodynamics in the Evolving False Lumen of Dissected Aorta

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Abstract:

Aortic dissection is a life-threatening event responsible for significant morbidity and mortality in individuals ranging in age from children to older adults. A better understanding of the complex hemodynamic environment inside the aorta enables clinicians to assess patient-specific risk of complications and administer timely interventions. In this study, we propose to develop and validate a new computational framework, warm-start physics-informed neural networks (WS-PINNs), to address the limitations of the current approaches in analyzing the hemodynamics inside the false lumen (FL) of TBAD vessels reconstructed from apolipoprotein null mice infused with AngII, thereby significantly reducing the amount of required measurement data and eliminating the dependency of predictions on the accuracy and availability of the flow boundary conditions. Specifically, we demonstrate that the WS-PINN model allows us to focus on assessing the 3D flow field inside FL without modeling the

true lumen and various branched vessels. Furthermore, we investigate the impact of the spatial and temporal resolutions of MRI data on the prediction accuracy of the PINN model, which can guide the data acquisition to reduce time and financial costs. Finally, we consider the use of transfer learning to provide faster results when looking at similar but new geometries. Our results indicate that the proposed framework can enhance the capacity of hemodynamic analysis in vessels with aortic dissections, with the promise of eventually leading to an improved prognostic ability and understanding of the development of aneurysms.

Biography:

Dr. He Li is currently an assistant professor at School of Chemical, Materials and Biomedical Engineering at University of George. He developed multiscale computational models based on physics laws using various numerical methods, such as molecular dynamics, dissipative particle dynamics and spectral element method, to simulate biological systems that span multiple spatial scales, including molecular level, protein level, cellular level, multi-cell systems, vasculature and organ systems. Dr. He Li' current research interest is to employ AI techniques to develop advanced multiscale models and build predictive AI models that can assimilate data from different sources to improve digital health technologies.

Supervised Machine Learning for Civil Engineering Infrastructure Maintenance

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Sylvain Dufau[1]

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Abstract:

In the context of sustainable development and the depletion of natural resources, the maintenance of civil engineering infrastructure is a national priority. Technological advances and data digitalization now allow us to acquire a large quantity of substantial data from sensors integrated into road infrastructure (bridges, viaducts, tunnels, etc.) or energy production (wind turbines, nuclear power plants, etc.).In a context of digital transition, the "intelligent" exploitation of data to optimize and/or guide maintenance actions has become essential. Addressing the complexity of civil engineering infrastructure through interdisciplinary fields (artificial intelligence, civil engineering, forensic engineering) could improve our understanding of systems holistically, and provide more robust and efficient decision-making alternatives in infrastructure maintenance management. Current research on representing complex systems relies on the development of networks in which nodes represent functional elements and links represent their interactions. In this sense, the formalism of probabilistic graphical models (MGPs) allows us to represent and describe complex evolving systems tainted with uncertainty. It is based on graph theory and probability theory and allows users to carry out different modes of reasoning, whether abductive, inductive or deductive. Based on MGPs, a new tool for monitoring structures has been developed trained and updated from data transmitted by sensors embedded in the infrastructure. The model is scalable over time and is capable of evaluating and predicting the state of an infrastructure with regard to physical measurements from sensors.

Biography:

Mehdi Sbartaï is full professor at the University of Bordeaux. He is researcher in the institute of mechanics and engineering (I2M) of Bordeaux University. He is the responsible of the research axis NDT and decision of the department of civil engineering. His works deals with nondestructive evaluation of structures using combining methods with the use of optimization tools and AI. He received his Ph.D in 2005 from Sherbrooke University (Qc, Ca), and Toulouse University (France). He publishes more than 200 papers in journals, conferences and books chapters. He participates in several French and European projects as DuratiNET, NaurSea, ENDE, Scaning...etc. He was involved in the RILEM committee 249-ISC on NDT for concrete evaluation with the publication of new RILEM recommendations in 2019.

Application of artificial intelligence for predicting the risk of postnatal growth failure at 7 days after birth among very low birth weight infants

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So Jin Yoon
Joohee Lim
Teahyen Cha
Jung Ho Han
Jeong Eun Shin
Ho Seon Eun
Min Soo Park

Department of Pediatrics, Yonsei University College of Medicine, Seoul, Korea;

Abstract:

We developed 'BT-580 AI,' a machine learning model to predict postnatal growth failure (PGF) at discharge among very low birth weight (VLBW) infants, which include a total 13 clinical indicators. Our goal is to validate the performance of the 'BT 580 AI', which predicts the risk of PGF at 7 days after birth among VLBW infants. For a clinical trial of the medical device 'BT-580 AI', A dataset comprising a total of 548 VLBW infants born between 2018 and 2020 in four hospitals was retrospectively used for external validation. PGF was defined as a z-score decrease exceeding 1.28 from birth to discharge. We compared the PGF results predicted by experienced neonatology specialists (control group) with those predicted by BT-580 AI. The sensitivity and specificity, accuracy, positive predictive value, negative predictive value, and the area under the receiver operating characteristic (AUROC) curve were analyzed. Among 548 VLBW infants (28.7 weeks of gestation, 1116.8g of birth weight), 66 infants (12%) showed PGF. BT-580 AI showed higher sensitivity (84.9%) and specificity (93.2%) than those of control group (53.0% and 79.3%). BT-580 AI showed accuracy (92.2%) surpassed the control group (76.1%), along with higher positive predictive value (62.9% vs. 25.9%) and negative predictive value (97.8% vs. 92.5%). The AUROC of BT-580 AI was 0.96. This clinical validation demonstrated that the sensitivity and specificity of BT-580 AI were superior to those of the neonatal specialist's interpretation, suggesting it could help prevent PGF at the time of discharge for VLBW infants.

Biography:

Prof. Dr. Soon Min Lee is an associate professor at the department of Pediatrics of Yonsei University College of Medicine, Seoul, Korea. She also has worked at neonatal intensive care unit in Gangnam severance hospital, Seoul, Korea, as a division chief of neonatology. She has an interest about clinical application of artificial intelligence, biosensor, and epidemiologic studies.

She conducted several research projects such as development of a multifunctional smart incubator, development of Artificial Intelligence-Based Screening of autism spectrum disorder, development of a smart wearable biosensor platform, health promotion program for very preterm infant after discharge:

A Data-Driven AI Approach for Seasonal-to-Annual Forecasts

Pratik Shukla[1]*
Milton Halem[1]

[1]*University of Maryland Baltimore County, USA*

Abstract:

Capitalizing on the recent availability of extensive long-term climate data from reanalysis, remote sensing, and model intercomparisons, machine learning offers a promising alternative to traditional numerical weather prediction. We introduce DUNE (Deep UNet++-based Ensemble), a new deep-

learning architecture for seasonal and annual predictions of 2m temperature and 10m winds. DUNE's error statistics match or surpass conventional models for monthly to seasonal forecasts, producing an annual series of monthly means from each successive forecast. This approach leverages AI to infer patterns from long-term records of monthly, seasonal, and annual datasets. Using ERA5 monthly mean data for 2m temperatures over land and sea surface temperatures over oceans, initial results show DUNE outperforming persistence and climatology forecasts for monthly to seasonal predictions. The accuracy of these forecasts is demonstrated using RMSE and ACC error estimates and observed difference maps. Integrating deep learning with comprehensive reanalysis data offers a powerful tool for precise, extended-range predictions with significant implications for immediate weather forecasts and broader climate insights. Furthermore, we propose extending this AI architecture to forecast seasonal-to-annual CO2 emissions from Boreal Forest wildfires, offering critical insights into climate feedback mechanisms. The increasing frequency of moisture-related droughts and extreme temperatures at high latitudes heightens the risk of wildfires. Given the vast expanse of Boreal forests in North America and Eurasia, our model's applicability to subseasonal-to-seasonal-annual (S2SA) predictions is particularly relevant for forecasting summer droughts and mitigating extreme wildfire CO2 emissions.

Biography:

Pratik Shukla is a graduate student working with Dr. Milton Halem. His research focuses on developing AI-based models for long-term weather forecasts. Currently, he is studying the predictability of CO2 emissions in the Boreal region across North America and Eurasia. By leveraging advanced machine learning techniques, Pratik aims to improve our understanding of how climate change and extreme weather events affect CO2 emissions in these critical forests, contributing to better forecasting and mitigation strategies.

Multi-Musical Instrument Recognition Neural Network

Bardia Timouri*
Ravdeep Aulakh
Gatherean Dela Cruz

British Columbia Institute of Technology, Canada

Abstract:

Artificial intelligence continues to evolve, particularly in the realms of natural language processing (LLMs), image generation, and task automation. Despite these advancements, multi-musical instrument recognition remains a challenging area with limited effective solutions. Addressing this, our research introduces an innovative methodology using a convolutional neural network (CNN) embedded within an artificial neural network framework. This method utilizes the OpenMIC-2018 dataset, meticulously refined for our purposes. We process entire songs by converting them into mel-spectrograms, which are instrumental in distinguishing subtle variations in pitch, dynamics, and timbre. Our approach sets a new benchmark in the field, adeptly identifying and categorizing up to 10 distinct musical instruments within complex audio recordings. It boasts an impressive F1 score of 56%. This significant achievement not only advances audio signal processing but also highlights the versatility and effectiveness of CNNs in handling sophisticated tasks like multi-instrument recognition. Our work serves as a steppingstone for future explorations in audio recognition, potentially paving the way for more nuanced and accurate audio analysis in various applications, from music production to sound engineering.

Biography:

As a second-year Computer Systems Technology student at the British Columbia Institute of Technology, I am deeply committed to advancing in the field of full-stack development. My academic endeavors are focused on harnessing the transformative potential of technology. Professionally, I have developed expertise in IT, Azure, and network systems by working at the University Canada West. With proficiency in multiple programming languages including Java, C++, Python, and more, I excel in complex technical environments. My approach combines rigorous academic training with practical experience, preparing me to contribute significantly to the field of technology.

Qubit Stabilisation via learning capable materials

Dr. Andrei T. Patrascu*

Abstract:

I describe the engineered decoherence of a qubit state by means of an environment formed out of a neurally architected material. Such a material is a material that can adjust its inner properties in the same way a neural network is adjusting its weights, subject to a built-in cost function. Such a material is naturally found in biological structures (like a brain) but can in principle be engineered at a microscopic level. If such a material is used as an environment for a Nakajima-Zwanzig equation describing the controlled decoherence of a quantum state, we obtain a modified decoherence that allows for correlated states to exist longer or even to become robust. Such a neural material can also be architected to implement certain quantum gate operations on the encapsulated qubit.

Biography:

My first goal is to open a start-up focused on quantum information theory and its applications both to designing new materials and for understanding fundamental aspects of quantum gravity. My second goal is to start my own foundation focused on the acceleration of scientific improvement and transformation of society with an aim at analysing the social implications of quantum technologies. I obtained my PhD from University College London in 2016 on a thesis of my own creation, resulting in the publication of a Springer Theses book https://link.springer.com/book/10.1007/978-3-319-46143-4 I did research in quantum chemistry, high energy physics, quantum gravity and quantum computing and I published in 2023 a total of seven articles, another five under review or in an advanced stage of publication. My interests now are in the connection between quantum computing and learning capable materials, and how such materials could in principle improve our aim at producing viable, robust, reliable quantum computing devices. The article I wish to present here can also be found at https://www.researchgate.net/publication/369151400_Qubit_stabilisation_via_learning_capable_materials.

A Photo-realistic Virtual Platform for Versatile Robots

Jian Zhang[1]*
Yongshuai Wu[1]

[1]*Kennesaw State University, USA*

Abstract:

For learning-based robotic methods, it's a great challenge to collect sufficient training samples due to the dependency on the specific hardware platform and potential damage to the environment caused by an imperfect task policy. To mitigate this challenge, it is a common and pivotal practice in the robotics community to utilize simulated environments to develop effective policies.

In this work, we proposed a photo-realistic virtual platform for the training and evaluation of versatile robots based on Unity3D and ROS. The platform is designed to deliver accurate sensory observations for the policies and to enable seamless conversion between real-robot and virtual environments. This platform is capable of offering photo-realistic objects and precise physical features (gravities, appearance, and more) to provide close to real environments. Virtual robots, digital twins of real robots, can be created by intuitive description files that provide the characteristics of their mobility and sensing capabilities, etc. These virtual robots work as agents to train and assess algorithms for various tasks

through a freely interacting space and an easy-to-access method for data collection, which overcomes the costly and dangerous process of training physical robots in a real environment. By utilizing the photo-realistic virtual environments and digital replicas of robotic platforms to train the policy, the "reality gap" is effectively bridged, enabling the robot to perform tasks seamlessly in both virtual and real-world settings, thereby increasing zero-shot generalization capabilities.

Biography:

Jian Zhang is an assistant professor at the Department of Information Technology at Kennesaw State University (KSU). He received his Ph.D. in Electrical Engineering from Auburn University in 2016. His primary research interests are automated and intelligent robotic systems, especially those that utilize learning-based methods for versatile tasks in open environments. Additionally, he is interested in ubiquitous sensing, especially in investigating radio-frequency identification (RFID) technology to improve our daily lives and industries.

Enhancing Privacy in Internet of Vehicles Through Hardware-Accelerated Authentication Scheme Using Physical Unclonable Function (PUF)

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Kayla White[1]
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Abstract:

The evolution of smart cities, driven by technological advancements, has led to the integration of sophisticated urban management systems. This integration is facilitated by the Internet of Vehicles (IoV), serving as a foundational technology. By connecting vehicles with smart cities, IoV improves transportation safety and efficiency. However, this connectivity raises concerns about individual privacy. This paper proposes an innovative scheme focused on preserving privacy in IoV. It employs the k-Nearest Neighbors (KNN) encryption technique, known for its multi-searching property, to authenticate Autonomous Vehicles (AVs) within the IoV framework. To bolster security, a Physical Unclonable Function (PUF) is utilized to generate random keys.

This two-layer security approach aims to thwart various cyber-attacks, including fraudulent identities, man-in-the-middle attacks, and unauthorized access to user information. Due to the substantial processing requirements for authentication, the scheme is implemented using hardware acceleration on an FPGA board. Privacy and security analyses demonstrate the achievement of design goals, while performance evaluation indicates reduced computational burden and resource utilization compared to existing schemes.

Keywords: Physical Unclonable Function, Internet of Vehicles (IoV), Authentication, Autonomous Vehicles (AVs), Hardware Acceleration

Biography:

Ujunwa Florence Madububambachu is an instructor at the University of Southern Mississippi, specializing in programming languages and pursuing a Ph.D. in computer science. Her research focuses on privacy-preserving techniques in traffic management, cloud computing security, and mental health prediction using machine learning. Ujunwa is President of the CyberWatch Foundation, advocating for diversity in Mississippi's tech sector. She leads the "1000 Tech-Savvy 2030" initiative, mentoring students. Active in professional groups like Women in Cybersecurity and Women in IEEE, Ujunwa is dedicated to advancing education and inclusion. Additionally, she's a member of the Project Management Institute and Forbes BLK.

Artificial Intelligence: The path forward

Henry Hexmoor*

Southern Illinois University, Carbondale, IL 62901

Abstract:

I outline the AI discipline from the early days through the recent massive-scale machine learning applications. I will touch on the underpinning of generative AI. There is a growing need for evolving change in the roles of mixed teams of humans, and machines. Mixed initiation is a prominent focus as well as the responsibility and accountability of initiators and participants. I review the current commonplace applications of AI in practice followed by the public and private rights, the need for stringent policies and best practices. I wrap up with the emergence of synthetic consciousness, projections, and implications for future developments, as well as collective clarion calls for action.

Biography:

Henry Hexmoor received the M.S. degree from Georgia Tech, Atlanta, and the Ph.D. degree in computer science from the State University of New York, Buffalo, in 1996. He taught at the University of North Dakota before a stint at the University of Arkansas. Currently, he is an Associate Professor with the School of Computing, Southern Illinois University, Carbondale, IL. He has published widely in artificial intelligence and multiagent systems. His long term and sponsored research include federal and state agencies and prime contractors. He is an IEEE senior member. His current Interests include Cyber-physical systems, Wireless networks, Complex Networks, Multiagent Systems, cognitive science, Robotics, and Digital forensics, and Blockchain.

Remote Detection of Chemical Warfare Simulants using a Miniature Potentiostat

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Jesy Alka Motchaalangaram[2]
Wujian Miao[2]
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[2]Department of Chemistry and Biochemistry, School of Mathematics and Natural Sciences, The University of Southern Mississippi, United States
[3]Department of Chemistry and Biochemistry, Stephen F Austin State University, Nacogdoches, TX, United States

Abstract:

A miniaturized electrochemical sensor has been developed for remote detection of Chemical warfare agent (CWA) simulants. To facilitate drone-based remote sensing, this present study focuses on advancing the miniaturized, and compact electrochemical sensor for monitoring two CWA simulants DFP and O, S-DEMPT. The differential pulse voltammetry (DPV) signal is processed, and the DPV signature features are extracted based on the reduction oxidation properties associated with the absence and the presence of the simulants. The results were validated using a portable Palmsens Emstat HR potentiostat, which corroborates the results obtained using a lab benchtop potentiostat. Additionally, Boolean logic ("AND" operation) was implemented for future drone technology deployment. This advancement enables the fabrication of a networked device capable of autonomously executing tasks without constant oversight.

Biography:

Amer Dawoud is an associate professor at the School of Computing Sciences and Computer Engineering, The University of Southern Mississippi. His research focuses on computer engineering hardware acceleration and applications related to cyber security and chemistry.

Voice Cloning and Text-to-Speech for Dialogue in Video Games

Dale Musser, Ph.D.*

Adroit Studios, University of Missouri

Abstract:

This session presents the use of cloned voices, text-to-speech (TTS) technologies, and generative AI cloud services for character dialogue within "Mission HydroSci (MHS)," an educational video game being developed by Adroit Studios at the University of Missouri. A system of software and services generates audio files from the lines of text in a dialogue database for the game, that is being developed using Unity to create a WebGL application to run on Chromebooks in schools. Voice actors provide short samples across a range of emotions that are used to generate voice clones. The use of software and cloned voices to create the dialogue audio files through TTS increases consistency, improves the speed of development, and provides a new level of creative control in video game development. MHS is being developed with a grant from the U.S. Department of Education in Adroit Studios within the College of Education's School of Information Science & Learning Technologies. The development of the game and supporting systems is a collaboration between the Colleges of Education and Engineering (specifically Information Technology and Computer Science programs). This game is being designed for a study to evaluate the effectiveness of delivering instruction through a video game compared to traditional classroom instruction. All software and materials produced for "Mission HydroSci" are being released under an open-source license, promoting broader accessibility and innovation in educational technology.

Biography:

Dale Musser, Ph.D. is a faculty member in the IT and CS programs in the University of Missouri College of Engineering. He serves as Technical Director for the Mission HydroSci game development project in Adroit Studios. He is also CEO of Intelligence Builders in San Francisco, a company focused on edutainment products and services. Dale Musser has experience managing technological innovation, designing and developing products and services, and teaching designers, software engineers, and computer scientists.

The 'good, bad and ugly' of algorithmic management and the missing microfoundation of micro foundation movement

Shahriar Sajib[1*]
Samsad Ul Islam[2]
Zian Shah Kabir [3]

[1]*University of Technology Sydney, Australia*[1]
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[3]*University of Technology Sydney, Australia*[3]

Abstract:

The rapid adoption of AI has resulted in increasing concern about the 'dark side' of AI among scholars and practitioners to articulate the potential risks, threats or challenges of AI adoption. In a parallel narrative, the discussion and debate about the harmful or adversarial consequences of algorithmic bias has also gained attention. In this presentation, we will showcase the good side, bad side and ugly side of AI and articulate the microfoundation of the dark side of AI. We need to continue experimenting, experiencing, and enhancing the good sides, learn how to overcome the bad sides and untangle the ugly sides. To explicate and explain the underlying phenomenon leading to extreme circumstances concerning any new technology, we need to appraise the agency, efficacy and aspiration of the actors, the integrity and intent of the actions of the actors and finally, accept the potential of the wicked antagonists, possessing unpredictable adversarial purposes. These actors may augment their visibility

by exploiting the ambiguity and complexity of 'ugliness' within the context. Thus, we separate the 'dark side' and 'ugly side' to prevent labeling the malicious use of AI as the embedded dark side of this technology.

Biography:

Shahriar Sajib is a researcher, academic and tech-entrepreneur based in Sydney. He is currently associated with the University of Technology Sydney and Lincoln Institute of Higher Education. Shahriar has published in top tier journals and his research expertise spans a wide range of areas including AI, digital platform, data driven innovation, cyber security, dynamic capabilities etc. He provides leadership in developing innovative applications targeting different sectors such as healthcare and education adopting emerging technologies.

AI Evolution - Acceleration Intelligence

James Michael Awrach[1*]

[1]*SeaFire Micros, Inc., USA*

Abstract:

An artificial intelligence (AI) network accelerator and its applications are presented. The accelerator optimizes data transfer within high performance computing environments, offloading the host from network protocol processing. This acceleration engine variant is used for AI platform solutions. It is consistent with modern devices in that it operates at high speed yet maintains power efficiency. It differs from other platforms in that it is a new type of offload engine technology coupled with artificial intelligence, enhancing AI such that the rate of both learning and inference are also accelerated.

The intelligent acceleration technology uses a learning model that is more conducive to a network environment, and performs AI operations at line rate from multiples of 10Gbps through 100 Gbps. Work is planned for 400 Gbps tests towards accelerating artificial general intelligence.

SeaFire Acceleration Intelligence is usable as-is or expandable by systems developers for other AI functions and algorithms. Portability across several platforms avoids obsolescence and the cyclical availability of electronics components.

Biography:

Mr. Awrach is Systems Architect at SeaFire. In 2001, he presented AI network interface designs to the government. He holds a BSEE from University of Massachusetts - Lowell and MSEE from Texas Tech. He has 33 years of industy and research experience in software and hardware. His automation processed tens of millions of integrated circuits. His embedded computers and SOC have been produced in hundreds of thousands. Mr. Awrach's funded work has received industry recognition, with end products used by the government and Fortune 500 firms. His publications cover electronics, AI, networking, and he holds one patent in network acceleration.

Learned Features from Convolutional Neural Networks for Improved Glioma Grade Prediction

Sreedevi Gutta[1*]
Shyam Sundhar Yathirajam[1]

[1]*California State University San Marcos, Computer Science and Information Systems, USA*

Abstract:

Accurate prediction of glioma grade is significant for treatment planning. The standard way to determine the grade is through biopsy, which is an invasive and expensive process. Recently, radiomic features have been explored, but these features do not contain the information required for accurate

grade prediction. The goal was to explore the potential of learned features extracted from various convolutional neural networks (CNN) for grade prediction. We used the brain tumor segmentation BraTS dataset, that consisted of T1, T1 contrast enhanced (T1CE), T2, and fluid attenuated inversion recovery (FLAIR) sequences. We proposed a CNN architecture that was trained to learn the features and then these features were given as inputs to machine learning (ML) models, support vector machine (SVM), decision tree, random forest, and Xtreme grading boosting (XGBoost), for prediction of glioma grade. The proposed architecture was compared with other popular deep learning architectures, such as autoencoder and U-net. The proposed method achieved an F1-score of 98%, which is at least 6% higher compared to the state-of-the-art deep learning models. In addition, the proposed model has 14 times less trainable parameters and 6 times faster in extracting learned features. These results indicate the potential of CNN models to learn features that were valuable for accurate determination of glioma grade. Through these findings, we aim to provide a non-invasive, accurate, and efficient approach for glioma grade prediction.

Biography:

Sreedevi Gutta is an assistant professor at the California State University San Marcos. She received her bachelor's in technology degree in Electronics and Communication Engineering from the Jawaharlal Technological University Kakinada, and MSc and PhD degrees in Computational and Data Sciences from the Indian Institute of Science in 2014 and 2018, respectively. Her current research interests include medical imaging, machine learning, and deep learning.

Contemporary Art Authentication with Large-Scale Classification

Todd Dobbs[1*]
Abdullah-Al-Raihan Nayeem[1]
Isaac Cho[2]
Zbigniew Ras[1,3]

[1]*University of North Carolina at Charlotte, USA*
[2]*Utah State University, USA*
[3]*Polish-Japanese Academy of Information Technology, Poland*

Abstract:

Art authentication is the process of identifying the artist who created a piece of artwork and is manifested through events of provenance, such as art gallery exhibitions and financial transactions. Art authentication has visual influence via the uniqueness of the artist's style in contrast to the style of another artist. The significance of this contrast is proportional to the number of artists involved and the degree of uniqueness of an artist's collection. This visual uniqueness of style can be captured in a mathematical model produced by a machine learning (ML) algorithm on painting images. Art authentication is not always possible as provenance can be obscured or lost through anonymity, forgery, gifting, or theft of artwork. This paper presents an image-only art authentication attribute marker of contemporary art paintings for a very large number of artists. The experiments in this paper demonstrate that it is possible to use ML-generated models to authenticate contemporary art from 2,368 to 100 artists with an accuracy of 48.97% to 91.23%, respectively. This is the largest effort for image-only art authentication to date, with respect to the number of artists involved and the accuracy of authentication.

Biography:

Todd Dobbs is a visiting assistant professor of Computer Science at University of North Carolina at Charlotte. His work focuses on the intersection of Art and Computer Science and his dissertation work explored the use of machine learning models as a digital marker for art authentication. He has spent five years in academia as a professor and researcher. Beforehand, he worked for 25 years in the financial industry as a software engineer and technology leader. In his free time, he enjoys retreats at Insight Meditation Society and playing World of Warcraft.

Use of AI for Scoring in Educational Assessments

Mo Zhang[1*]
Matthew Johnson[2]
Chunyi Ruan[3]

[1]*Educational Testing Service, USA*
[2]*Educational Testing Service, USA*
[3]*Educational Testing Service, USA*

Abstract:

Modern AI capabilities can greatly improve the efficiency of scoring educational tests, and in some cases improve on the accuracy of human ratings of constructed-response items. Our research focuses on improving the fairness, transparency, and trustworthiness of AI for the purpose of scoring in educational testing. The primary focus is on the development and evaluation of methodologies that can detect and mitigate bias and unfairness in AI-scored assessments. Our aim is to contribute to a better understanding of the fairness of AI-generated scores and to enhance the transparency and trustworthiness of these scores. The methodologies developed are expected to have wide-ranging implications and applications, potentially leading to better assessment decisions in various contexts. We will present our work on fairness detection and mitigation methods, and the efforts towards achieving explainability and transparency in AI scoring.

Biography:

Mo Zhang is a senior research scientist in the Research & Development division at ETS. Her scientific work at ETS focuses on writing research, AI scoring, and performance-based assessment design and validation. She currently holds seven US patents and has published extensively in psychometrics and educational assessment field.

A Comparative Assessment of Unsupervised Deep Learning Models for Detecting GPS Spoofing Attacks on Unmanned Aerial Systems

Dr. Tala Talaei Khoei*

Roux Institute at Northeastern University

Abstract:

In today's world, the smart grid stands as a crucial infrastructure, blending traditional power systems with advanced communication. However, this integration introduces a host of security vulnerabilities that can compromise the safety of the grid. So, Intrusion Detection Systems (IDS) emerge as indispensable tools for safeguarding smart grids against cyber threats, and when coupled with Artificial Intelligence (AI) techniques, their effectiveness amplifies significantly. At its core, an IDS monitors network traffic and system activities, aiming to identify and respond to malicious behavior or unauthorized access promptly. In the domain of smart grids, where massive volumes of data traverse across network nodes, the need for robust IDS is paramount. AI techniques, including machine and deep learning, bolster the capabilities of IDS by enabling them to detect anomalies, recognize patterns, and adapt to evolving threats in real-time. One of the primary advantages of AI-based IDS lies in their ability to analyze vast datasets swiftly, distinguishing normal network behavior from suspicious activities with high accuracy. Moreover, AI empowers IDS to learn from past incidents, continuously refining their detection mechanisms to stay ahead of sophisticated cyber-attacks. This adaptive nature is critical for smart grids, where the threat landscape is dynamic, and adversaries constantly innovate their tactics. The integration of these Systems with Artificial Intelligence techniques is indispensable for fortifying the resilience of smart grids against cyber threats. Thus, investing in AI-driven IDS becomes not only a necessity but also a cornerstone for ensuring the stability of energy infrastructure in the digital age.

Biography:

Dr. Tala Talaei Khoei is a professor in the Khoury College of Computer Sciences at Northeastern University, based at the Roux Institute. Prior to joining Khoury College in 2024, she received her doctorate in Electrical Engineering from the University of North Dakota, where she also worked as a graduate teaching and research assistant. She also got her Master of Information Technology from Southern New Hampshire University. Her research interests encompass inclusivity in computer science, integrating computational thinking and data science education, data science and mining, artificial intelligence, deep learning, and reinforcement learning. Notably, she has a track record of publications in top-tier journals and high- ranked conferences and was awarded Best Paper Presenter at the 13th IEEE UEMCON. She also served in several IEEE conferences, such as SmartNet, ICMI and several others.

Unlocking Learning Potential: Assessing the Impact of Virtual Reality on Student Performance - work in Progress

Seta Boghikian Whitby*
Yehia Mortagy

University of La Verne, CA USA

Abstract:

Virtual reality (VR), Augmented Reality (AR), and Metaverse present an added tool to support both teaching and learning. The purpose of the study is to measure the effect on students' learning and performance when using Virtual Reality (VR). The sample include both traditional and Adult undergraduate students in two separate sessions of the same class. The study investigates three different learning outcomes: 1. learning outcome between traditional teaching modality compared to teaching using VR modality; 2. the difference between traditional students compared to Adult undergraduate students; and 3. the effect of prior VR experience. The experiment is a semi-quasi experiment will be conducted by the same professor and in the same semester. In a lab setting, one session will utilize VR and the other session will be conducted in the traditional format. Student learning measurements include: pre-test, post-test (final exam), laboratory experiments, and two surveys. The researchers hypothesize that Adult students will equally benefit in their performance from using the VR modality compared to traditional students. A second hypothesis is that traditional students who utilize VR will significantly improve their performance. Future objective is to train K-12 teachers to utilize VR in their lesson plans.

Biography:

Dr. Seta Boghikian-Whitby is a Professor and Chairperson of the Computer Science and Computer Engineering Department at the University of La Verne, La Verne, CA. Professor Whitby earned her Ed.D. in Organizational Leadership, Master's Degree in Information Science, Master's Degree in Computer Education, and a Bachelor's of Science Degree in Computer Science and Computer Engineering. Professor Whitby has been teaching at the University of La Verne as a Professor for 40 years. She is the recipient of faculty of distinction award. In addition to teaching and extensive research experience, she is heavily active and involved in the university governance structure.

Dr. Yehia Mortagy received B.Sc. in Aeronautical Engineering in 1974, MBA from UCLA in 1979, and Ph.D. in AI application in Management of Information Systems from the Claremont Graduate School in 1997.

His research interest includes data analytics, quantitative systems, and online education, His publications include " An Analytical Investigation of the Characteristics of the Dropout Studentsin Higher Education", (2018) ; "Student Profile and its effects on Online and Hybrid course" in Ng, E. (editor) "Comparative Blended Learning Practices and Environments" Idea Books, 2009 and "The Strategic Information Systems (SIS)" in the Information Systems Encyclopedia, Bidgoli, H. (editor) Academic Press 2003.

Towards Knowledge Transfer across Models in Federated Learning

Minh N. H. Nguyen[1*]
Huy Q. Le[2]

Vietnam – Korea University of Information and Communication Technology, Vietnam Kyung Hee University, South Korea

Abstract:

Emerging cross-device artificial intelligence (AI) applications require a transition from conventional centralized learning systems toward large-scale distributed AI systems that can collaboratively perform complex learning tasks. In this regard, federated learning (FL) lays out a novel learning mechanism for building distributed machine learning systems for multiple clients to collaboratively train a generalized global model without sharing their private data. In this talk, we cover various designs of FL to cope with different perspectives of FL systems from algorithm and practical settings towards better generalization abilities of client models for realizing robust personalized Federated Learning (FL) systems, efficient model aggregation methods for dealing with the consequences of non-i.i.d. properties of client's data, often referred to as statistical heterogeneity and small local data samples from the various data distributions. We developed novel approaches for knowledge transfer between the global model and local models regarding single modal data as well as multimodal data. Utilizing a variety of recent techniques such as knowledge distillation, contrastive learning regularization, class-based prototype representation open a promising direction to for transfer knowledge across models and modal encoders. In addition, we show the efficiency of advanced strategies for FL systems such as pretraining, clustering, lightweight model design, and self-organizing hierarchical structure. To this end, FL exhibits a promising scheme for future personalized AI applications in global performance, and personalized performance while guaranteeing user privacy.

Biography:

Minh N. H. Nguyen (M'20) received Ph.D. degree in Computer Science and Engineering from Kyung Hee University, South Korea, in 2020. He continued PostDoc with Federated Learning and Democratized Learning at Intelligent Networking lab, Kyung Hee University, South Korea. He is currently a lecturer and in charge of Research Program of Digital Science and Technology Institute at Vietnam - Korea University of Information and Communication Technology, Vietnam. He received the best KHU Ph.D. thesis award in engineering in 2020. He had publications in premier ACM/IEEE journals and conference. His research interests include wireless communications, federated learning, NLP, and computer vision.

Scalable and Efficient HD Map Production Platform based on THMA (Tencent HD Map AI System)

Chao Zheng[1*]
Xu Cao [2]

[1]*T Lab, Tencent map, Beijing, China.*
[2]*Center of Data Science, New York University, New York, United States*

Abstract:

High-definition (HD) maps, which are centimeter-level maps collected through laser sensors, have become vital for progress and safety of the self-driving system, as they provide precise depictions of the surrounding environment.

The production of HD maps demands a high level of quality, which necessitates considerable manual human effort in creating annotations. This can be a time-consuming and expensive process for the map industry. To alleviate the burden of manual annotation, various artificial intelligence (AI) algorithms have been developed to pre-label HD maps. However, there is a noticeable discrepancy between AI algorithms and traditional manual HD map production pipelines in terms of accuracy and robustness.

Moreover, constructing large-scale annotated data sets and advanced machine learning algorithms for AI-based HD map automatic labeling systems can be resource-intensive. In this presentation, we will introduce the Tencent HD Map AI (THMA) system. This innovative system is an end-to-end, AI-based, active learning HD map labeling system capable of producing and labeling HD maps on a scale of hundreds of thousands of kilometers.

In the THMA system, we train AI models using supervised, self-supervised, and weakly supervised learning to achieve the high accuracy and efficiency demanded by downstream users. We are also exploring the LLM and LLVM algorithms to develop the THMA2.0 system, with the aim of creating the next generation of HD maps, Tencent HDair maps. We will also introduce some of our research results.

Biography:

Chao Zheng leads the Computer Vision Research team at Tencent Map, with a long-standing dedication to the field of autonomous driving. His research interests span across artificial intelligence, computer vision, and machine learning, with a particular focus on 3D perception and reconstruction within autonomous driving. His research achievements have been published in multiple top-tier conferences, including CVPR, AAAI, ICCV, ECCV, and WACV, with one of his co-authored papers earning the IAAI Application Innovation Award.

Unleashing Intelligence: Exploring New Horizons for Natural and Synthetic Minds

Danilo Vasconcellos Vargas*

Kyushu University, Japan

Abstract:

Intelligence, whether biological or artificial, serves as a foundational pillar of society, distinguishing us as human beings. Despite its significance, comprehending and reasoning about intelligence can often challenge common sense. In this presentation, we embark on a journey to unravel the complexities of intelligence. The first part delves into the surprising lack of robustness and adaptivity in even the most accurate AI models, prompting the need for a novel paradigm. We outline a robust and adaptive AI approach as a solution to this issue. In the second part, we shift our focus to enhancing education and fostering reasoning abilities. By addressing conflicts and fostering collaborative augmented reasoning, we pave the way for improved education. Moreover, we explore the alignment between our efforts and the Sustainable Development Goals (SDGs) and provide a glimpse into future undertakings. Join us as we uncover new horizons for intelligence and explore their impact on education, reasoning, and the broader pursuit of societal well-being.

Biography:

Danilo Vasconcellos Vargas, Associate Professor at Kyushu University and CEO & Founder of MiraiX, specializes in AI, evolutionary computation, and complex adaptive systems. His work, featured in top journals like MIT Press's Evolutionary Computation, earned him accolades, including the IEEE Transactions on Evolutionary Computation Outstanding 2022 Paper award.An active contributor, he presented tutorials at conferences like GECCO2018 and IJCAI2020. His research was featured in many news channels including BBC. Leading the Laboratory of Intelligent Systems in Japan, he envisions a new era of robust AI. Explore his work on his Website (http://lis.inf.kyushu-u.ac.jp/) and Lab Page, and MiraiX (www.miraix.org)

Vision-and-language Navigation with Open-vocabulary Detection and Structured Representation

Yizhou Yu[1*]
Ganlong Zhao[12]
Guanbin Li[2]
Weikai Chen[3]

[1]*The University of Hong Kong, China*
[2]*Sun Yat-sen University, China*
[3]*Tencent Games, China*

Abstract:

Recent advances in Iterative Vision-and-Language Navigation (IVLN) introduce a more meaningful and practical paradigm of VLN by maintaining the agent's memory across tours of scenes. Although the long-term memory aligns better with the persistent nature of the VLN task, it poses more challenges on how to utilize the highly unstructured navigation memory with extremely sparse supervision. Towards this end, we propose OVER-NAV, which aims to go over and beyond the current arts of IVLN techniques. In particular, we propose to incorporate LLMs and open-vocabulary detectors to distill key information and establish correspondence between multi-modal signals. Such a mechanism introduces reliable cross-modal supervision and enables on-the-fly generalization to unseen scenes without the need of extra annotation and re-training. To fully exploit the interpreted navigation data, we further introduce a structured representation, coded Omnigraph, to effectively integrate multi-modal information along the tour. Accompanied with a novel omnigraph fusion mechanism, OVER-NAV is able to extract the most relevant knowledge from omnigraph for a more accurate navigating action. In addition, OVER-NAV seamlessly supports both discrete and continuous environments under a unified framework. We demonstrate the superiority of OVER-NAV in extensive experiments.

Biography:

Yizhou Yu (Fellow, IEEE) received the Ph.D. degree from the University of California at Berkeley. He is a professor with The University of Hong Kong and was a faculty member with the University of Illinois at Urbana–Champaign for 12 years. His current research interests include AI foundation models, AI-based multimedia content generation, AI for medicine, and computer vision. He has served on the program committee of many leading international conferences, including CVPR, ICCV, and SIGGRAPH. He has also served on the editorial board of IEEE Transactions on Pattern Analysis and Machine Intelligence and IEEE Transactions on Image Processing.

Prediction simplified model for dynamic system simulation

Sie Long Kek*

Universiti Tun Hussein Onn Malaysia, Pagoh Campus, Muar, Johor, MALAYSIA

Abstract:

Recently, the rise of machine learning has attracted the interest of research communities. The fundamentals and applications of machine learning have been well-defined. In this talk, we focus on predicting the solution of a dynamic system through solving a simplified model. To do so, a least squares optimization problem is introduced over the simplified model extracted from the dynamic

system. By considering the first-order necessary conditions, the updating rule is derived to calculate the state transition matrix iteratively, in turn, to minimize the objective function, which is the differences between the model and the system. The computation performance is measured in a mean square error, and the calculation procedure is summarized as an iterative algorithm. Some practical examples from engineering and finance are illustrated, and their simulation results are demonstrated. Finally, a concluding remark is made, and future research is recommended.

Biography:

Sie Long Kek, PhD, CQRM, is currently a senior lecturer in the Department of Mathematics and Statistics, Faculty of Applied Sciences and Technology, Universiti Tun Hussein Onn Malaysia (Pagoh Campus). His research interests include optimization and control, operational research and management science, modelling and simulation, parameter estimation, Kalman filtering and computational mathematics. He has published over 50 papers in refereed journals and six (6) book chapters. He is a reviewer for peer-reviewed research journals. He has hosted two (3) research projects supported by the Ministry of Education Malaysia. He has supervised five (5) master's and three (3) Ph.D. students.

Deep Learning-Based Diagnostics: Analyzing Mechanical Vibrations and Human Voice for Condition Assessment

Yong Oh Lee*

Dept. of Industrial and Data Engineering, Hongik University, South Korea

Abstract:

We introduce a novel diagnostic approach that uses deep learning to analyze machine vibrations and human speech to assess health conditions, focusing on bearing failure detection and laryngeal cancer diagnosis. In this work, we introduce a method for detecting bearing failures by imaging biaxial vibration signals through nested scatter plots and then using a CNN-based model. This based model not only classifies the current state of the bearing, but also predicts future failure points by utilizing temporal patterns captured in the vibration data. For laryngeal cancer diagnosis, this work explores the use of Mel-Frequency Cepstral Coefficient (MFCC) transformations of speech recordings, specifically the vowel sound /a/ and reading passages known as "walking paragraphs". These transformed speech signals are then analyzed using a CNN to identify potential indicators of cancer. By treating sound as a series of vibrations, this study effectively applies image transformation and CNN analysis to a variety of use cases, demonstrating the versatility of vibration signal analysis in medical and mechanical diagnostics. The integration of these techniques demonstrates the potential of deep learning to improve the accuracy and predictive power of condition assessment, and can make important contributions to both mechanical engineering and medical diagnostics.

Biography:

Dr. Yong Oh LEE is as an assistant professor in the Department of Industrial and DataEngineering at Hongik University, South Korea. He earned his Ph.D. in Computer Engineering from Texas A&M University and has amassed considerable experience at leading institutions such as Samsung Electronics and the Korea Institute of Science and Technology Europe. Dr. Lee's research primarily focuses on leveraging deep learning and generative models across a broad spectrum of fields, including mechanical engineering, civil engineering and biomedical engineering.

Role of AutoML in Business Analytics

Mihaela Muntean*

West University of Timisoara, Romania

Abstract:

Business Analytics is an umbrella term for various data analysis techniques that are incorporated in data-driven decision making processes, performance optimization and business strategy. It involves collecting, processing, and analyzing data from various sources to uncover patterns, trends, and relationships that can help businesses understand their operations, optimize processes, identify opportunities, and mitigate risks. Machine learning (ML) plays a vital role in increasing the capabilities of business analytics by enabling more accurate predictions, deeper insights, and automated decision-making based on large and complex datasets. Automated Machine Learning (AutoML): provides methods and processes to make ML available for non-machine learning experts, to improve efficiency of machine learning and to accelerate research on ML. It automates the selection, composition and parameterization of machine learning models. We aim to analyze the potential of AutoML for applications within business analytics, which could help to increase the adoption rate of ML. The use of AutoML in different business contexts supports our scientific approach.

Biography:

Mihaela MUNTEAN is professor of Business Information Systems at the West University of Timisoara and a Ph. D. supervisor in the field of Economic Informatics. Starting with year 2022, professor Mihaela Muntean joined the Doctoral School of Economics and Business Administration, West University of Timisoara. Her research activity includes topics like Business Intelligence and Analytics, Data Management, Decision Support Systems, Agile Development Frameworks. Over 70 papers in indexed journals, conference proceedings, and the involvement with success in 8 multi-annual national research grants/projects are sustaining her contributions in the research fields mentioned above.

Trustworthy AI to support reliable AI-based system design and deployment

Juliette Mattioli[1*]
Patricia Besson[1]

Thales, France

Abstract:

The accelerated developments in the field of Artificial Intelligence (AI) point to the need to consider 'trust' as a design principle rather than an option. Furthermore, the design of AI-based critical systems, e.g. in avionics, mobility, defence, healthcare, finance, critical infrastructure, etc., requires proof of their trustworthiness. Thus, a sound AI systems deployment depends on safe and secure delivery of the specified functionalities, stakeholder expectations and maintenance. Furthermore, ethics, accountability and liability issues are gaining attention. The talk will highlight the importance of trustworthy AI engineering with a sound end-to-end methodology and tools to support the entire lifecycle of an AI system. This includes analysing and meeting the expectations and specifications of stakeholders (such as regulatory and standardisation bodies, customers and end users), and assessing and managing AI-related risks to maintain the trustworthiness of the system of interest, such as safety and security. The aim is to ensure system compliance with requirements and constraints, to assess and manage risks associated with AI technologies, and to maintain trustworthiness between stakeholders and the system of interest (e.g. RAMS - Reliability, Availability, Maintainability, Safety - characteristics). Moreover, trustworthiness assessment have to be considered at every phase of the system lifecycle, including sale and deployment, updates, or maintenance. It is expected that full trustworthiness in AI systems can only be established if the technical measures to establish trustworthiness are flanked by specifications for the governance and processes of organizations that use and develop AI.

Biography:

Juliette Mattioli joined in 1990 Thomson-CSF as a graduate student and obtained in 1993, her PhD in AI-based computer vision. In 1996, she worked on Symbolic AI. From 2001 to 2016, she led several research labs at Thales on Symbolic and Hybrid AI. In 2012, she became a senior expert in AI at Thales

Group Level. She was one of the five representatives of France at the conference of G7 innovators in 2017. Recognised for her knowledge of industrial AI issues, she contributes in trustworthy AI engineering to accelerate the industrial deployment of AI-based solutions in critical systems.

After a thesis on pattern recognition for automatic speaker detection in audiovisual sequences at the EPLF in 2007, Patricia Besson was an AI researcher at the CNRS & the University of Aix-Marseilles from 2007 to 2013. She then became head of a data science team at Safran Engineering Services, with a strong expertise in data fusion. Since 2019, Patricia has been the head of the Reasoning and Analysis in Complex Systems Lab at Thales, focusing on validity, explainability, safety and responsibility in AI to overcome the problems of trustworthy AI design for critical systems.

Forecasting the Risk in Financial Markets. AI vs Stochastic Processes. A Comparison

Michele Bonollo[1*]
Antonio Menegon[2]
Alessandra Scotti[3]

[1]*Politecnico di Milano, Italy*
[2]*iason ltd, ItalyYY*
[3]*Banca IntesaSanPaolo, Italy*

Abstract:

Most of the applications related to AI forecasting techniques aim to predict some very concrete observable quantities, such as stock prices, energy consumption, interest rates and so on. Briefly, the target is anticipating the level of some financial, economic, or physical variable. The banking sector must face some more involved and sophisticated challenges, due to its quite complex regulation. A recent example comes from the forthcoming Fundamental Review of the Trading Book (FRTB) regulation, where the banks are admitted adopting their internal statistical models for measuring market risk if the desks in the financial portfolio tree satisfy the Profits and Loss Attribution Test (PLAT). The bank must show that the distribution of the PLs as estimated by the risk management models are close to the actual PLs of the accounting systems. This closeness is verified by two statistical tests, namely the Kolmogorov-Smirnov Test (shape of the distribution) and the Spearman rank correlation index (to capture monotone dependency). If the calculation of these test is just a deterministic process, the hard challenge is to predict the value of these tests, to implement some remediation / improvement activity. In fact, the regulation defined some thresholds by a RAG (red, amber, green) logic. The banks do not want to enter in the red zone, as it implies a higher capital constraint. In our study, bases on longitudinal real data, we compare some prediction techniques from time series theory vs more recent AI proposal, to get a comprehensive view of advantages and drawbacks of each technique.

Biography:

Michele Bonollo worked both in the advisory sector and in the banks, as an executive in some large and medium banks, responsible for the risk management department or ICT risk management applications. After his PHD in Statistics, he also continued an intense academic activity, teaching and giving seminars in dozens of Italian and European universities. Currently he is fellow at Politecnico di Milano. He published more than 20 papers in scientific journals. His research is related to advanced quantitative techniques in the risk management field, spanning from stochastic processes to machine learning and artificial intelligence.

Transforming Industries using AI: New Advancements and Tales from the Field

Ahmed Farahat[1*]

Hitachi America, Ltd. R&D, Santa Clara, CA

Abstract:

Industrial AI is concerned with applying Artificial Intelligence (AI), Machine Learning (ML), and related technologies to solve real-world problems in industrial and societal domains. Industrial AI use cases can be broadly categorized into horizontals such as maintenance and repair, operations, quality, and supply chain, with applications across various verticals. In this talk, I will present new advancements in using AI to transform industries. I will showcase sample use cases such as predictive maintenance, repair recommendations, and visual inspection for maintenance and repair optimization; predictive quality and root cause analysis for quality control; and demand forecasting and inventory optimization for supply chain management. I will also discuss recent applications of generative AI, such as the generation of troubleshooting trees from service manuals and process knowledge discovery for operations optimization. Finally, I will discuss the challenges and open problems in applying AI technologies to industries, and how the AI community can shape the future of the next industrial and societal revolution.

Biography:

Dr. Ahmed Farahat is a Principal Research Scientist at the Industrial AI Laboratory at Hitachi America, Ltd. R&D. He holds a Ph.D. degree from the University of Waterloo in Canada, as well as M.Sc. and B.Sc. degrees from Cairo University in Egypt, all in Computer Engineering. Ahmed is deeply passionate about applying AI and advanced technologies to solve complex challenges in industry, aiming to foster significant societal advancements. He has co-invented over 25 patents and contributed to more than 30 scholarly papers.

Building A Profitable Financial Strategy Through Forecasting of Realtime Stock Market Report Analysis

Oluwafemi Oladapo Adeleke*

Data Science Tech Institute, France

Abstract:

In today's dynamic and competitive financial landscape, the ability to build a profitable financial strategy through real-time stock market analysis is paramount. This project delves into the significance of forecasting in the context of developing robust financial strategies, emphasizing the critical role of real-time stock market report analysis.

The project utilizes a Streamlit backed application to extract data from Yahoo Finance and Facebook Prophet Python API to retrieve real-time ticker data to highlights the crucial aspects of data accuracy, timely information acquisition, and the integration of advanced computational models in generating reliable forecasts.

This application includes two main tabs: one for comparing the performance of multiple stocks, and another for predicting the future price of a single stock. By examining case studies and empirical data, this study underscores the importance of leveraging cutting-edge technologies, such as artificial intelligence and machine learning algorithms, to enhance the accuracy and reliability of stock market predictions. It also sheds light on the role of risk management strategies and the significance of diversification in building a resilient and profitable financial portfolio.

Furthermore, the findings underscore the value of informed decision-making based on real-time stock market analysis, highlighting its potential to foster sustainable financial growth and mitigate the volatility inherent in today's financial markets. This project work serves as a guide for investors, financial analysts, and market participants seeking to develop effective financial strategies grounded in comprehensive and timely market forecasting. Whether you are a seasoned investor or just starting out, this application can help you make informed decisions and build a successful financial strategy.

Biography:

Adeleke Oluwafemi Oladapo, a renowned IT professional in the field of Computer and Data Engineering Technology, was born in the vibrant city of Lagos, Nigeria. He embarked on his educational journey at The Federal Polytechnic Offa, where he attained a National Diploma and Higher National Diploma in Computer Engineering Technology, further solidifying his passion for technology and its applications. Subsequently, he pursued his Postgraduate Diploma at Ladoke Akintola University of Technology in Ogbomosho, Nigeria, honing his skills and expertise in the intricacies of Computer Engineering.

Fuelled by an unyielding drive for excellence, Adeleke sought to expand his horizons internationally, leading him to pursue a comprehensive education at the prestigious Data Science Tech Institute Nice, France. His dedication and commitment to the field of data engineering were evident as he recently graduated with first class from the institute, equipped with advanced knowledge and proficiency in cutting-edge data analysis and technology.

Advancing Signal Processing through Transfer Learning Innovations in Health Industry

Azadeh Kooshesh'*
Prof. Dr.-Ing. Alke Martens'
Robin Nicolay[3]

'Rostock University, Germany
**Rostock University, Germany*
[3]Rostock University, Germany

Abstract:

Our investigation addresses the critical deficit of high-fidelity electrocardiogram (ECG) datasets essential for detecting heart anomalies in advanced medical applications. In cardiology, capturing seismocardiograms (SCG) through sensors like watches and phones during human activity is more practical than obtaining ECGs. One approach to addressing the transformation of SCG to ECG is through transformation architectures. Among the various models proposed, we selected the Convolutional Neural Networks (CNN) Autoencoder SCG-to-ECG architecture developed by Haescher et al. for its promising potential. We aimed to enhance the efficiency and accuracy of this architecture by incorporating domain adaptation within the framework of transfer learning. Additionally, we optimized the pretrained model weights through weight pruning, as opposed to traditional fine-tuning methods. This dual strategy of domain adaptation and weight pruning not only improves the model's ability to generalize across different datasets but also reduces computational complexity while maintaining high diagnostic accuracy.

Our results demonstrate that the Autoencoder pretrained model improved the main pipeline by 14.3%, the Temporal Convolutional Network (TCN) by 13.3%, the CNN by 9%, and the ECG Net by 10%. By leveraging domain adaptation, our model adapts to target domains, enhancing generalization and robustness across diverse data distributions. Furthermore, employing weight pruning before transferring weights to the main pipeline optimizes model efficiency without compromising diagnostic fidelity. This approach streamlines model complexity and enhances computational efficiency, making it better suited for large-scale datasets. Our holistic strategy, combining domain adaptation with weight pruning, represents a paradigm shift in healthcare signal processing, poised to revolutionize diagnostic accuracy and patient care outcomes.

Biography:

Azadeh Kooshesh is an accomplished Machine Learning Engineer and AI Developer based in Rostock, Germany. Currently she is studying for a master's degree in computer science from Rostock University. Azadeh has played significant roles at Fraunhofer-Gesellschaft IGD , Nordex SE and PwC, leading impactful ML projects in field deep learning and infrastructure developments. An advocate for women

in technology, Azadeh is actively involved in initiatives like Women Tech Maker and has earned several prestigious awards, including first place at the LLM TUM Hackathon @Microsoft, the Women Developer Academy Google Award, the Siemens WomenHackathon, and first place in a Hackathon by Ocean Technology Campus focusing on ML and cloud technologies. Additionally, she holds an Inventor Membership in the International Federation of Inventors' Associations in Switzerland.

Need of Business Domain Specific Least Cybersecurity Controls Implementation (BD-SLCCI) Framework for Small and Medium Businesses

SMB/SME/MSME/Startup companies need tailored cybersecurity controls framework which is easy to adopt, less time consuming to adhere, and relatively less expensive to implement

Dr. Shekhar Ashok Pawar*

DBA, Swiss School of Business and Management Geneva Geneva, Switzerland

Abstract:

Various cyber threats are rising across industries, including Small and Medium Enterprises (SMEs). Though there are various good cybersecurity standards and frameworks available in the global market, still many cyber news from each corner of the world talking about increasing sophisticated cyber-attack. According to recent studies, one out of five cyber-attacks is targeting SMEs. Even though SMEs are relatively small in individual size, they run maximum global economy, contributing maximum part of GDP and big employment opportunities. As compared to large organizations, SMEs generally have limited resources and very different priorities of their specific business domains. With increasing digitization in SMEs, it has increased the cyber-attack surface. Existing cybersecurity standards and frameworks are not flexible enough for aligning with the business goals of SMEs, rather those are more focused on the hundreds of controls that need to be implemented to get certified to a certain level of global cybersecurity maturity definition by that standard or framework. Using a research survey, in this paper authors are going to assess on current cybersecurity posture of SMEs and problems faced by them with regards implementation of cybersecurity. Also, the authors will propose a new cybersecurity framework to resolve those problems. This new solution will be designed on core cybersecurity concepts such as Defense in Depth (DiD) and prioritization in Confidentiality, Integrity, and Availability (CIA Triad) keeping business-specific goals and demand of domain at the center of implementation.

Biography:

Dr. Shekhar Ashok Pawar founder & CEO of SecureClaw Inc., USA and GrassDew IT Solutions, India. He is a doctorate in the cybersecurity domain at SSBM Geneva, Switzerland. He has completed his executive management from SJMSOM, IIT Bombay, and engineering in electronics and telecommunications from Mumbai University. Some of his certifications include Certified Information Systems Auditor (CISA), Certified Ethical Hacker (CEH), Computer Hacking Forensic Investigator (CHFI), ISO 27001 – Lead Auditor, PCI DSS Implementer, Diploma in Cyber Laws, Microsoft Certified Professional (MCP), Certified Blockchain Developer, Certified ATM for CMMi Assessment, DSP & Applications – IIT Madras, and Diploma in Industrial Electronics. He is also the popular as an author.

Radiomics analysis for bone and soft tissue tumors

Ronnie Sebro MD, PhD[1,2,3*]

[1]Department of Quantitative Health Sciences Division of Biostatistics, Mayo Clinic, Jacksonville, FL, USA
[2]Department of Orthopedic Surgery, Mayo Clinic, Jacksonville, FL, USA
[3]Department of Radiology, Mayo Clinic, Jacksonville, FL, USA.

Abstract:

Radiomics analysis has emerged as a promising approach in oncology, offering insights into tumor

characterization, prognostication, and treatment response assessment. We review advancements in radiomics analysis specifically applied to bone and soft tissue tumors. Bone and soft tissue tumors present a diagnostic challenge due to their diverse histological subtypes and overlapping imaging features. Radiomics leverages high-dimensional quantitative features extracted from medical images to capture tumor heterogeneity beyond what is visible to the human eye. We explore the utility of radiomics in (1) differentiating myxomas, a benign soft tissue tumor from myxofibrosarcomas, a malignant tumor using MRI, (2) differentiating benign from malignant nerve sheath tumors and (3) differentiating benign from malignant bone lesions seen on radiographs, and present the research results of these analyses. Furthermore, we discuss the integration of radiomics with conventional imaging, machine learning tools, and clinical data to develop predictive models for patient outcomes. We discuss limitations and challenges such as standardization of image acquisition and feature extraction protocols, as well as validation of radiomic biomarkers in multicenter cohorts need to be addressed for clinical translation. In summary, radiomics analysis holds great promise in enhancing the management of bone and soft tissue tumors by providing quantitative imaging biomarkers for improved diagnosis, prognosis, and treatment planning. Continued research efforts are warranted to validate the clinical utility of radiomics and facilitate its integration into routine oncological practice.

Biography:

Ronnie Sebro, M.D., Ph.D., is an internationally-renowned statistician, geneticist and musculoskeletal radiologist. His research focuses on using artificial intelligence and machine learning to improve diagnosis osteoporosis, sarcomas and other tumors, and other musculoskeletal conditions. He has published over 100 scientific journal papers and lectured nationally and internationally. He is the Deputy Editor of Radiology: Artificial Intelligence, Associate Editor for BMC Musculoskeletal Disorders, and Associate Editor for the Journal of Imaging Informatics in Medicine. He is currently a PI in the Center for Augmented Intelligence at the Mayo Clinic.

Optimal Transport Embeddings for Machine Learning

Gustavo Kunde Rohde*

University of Virginia, VA, USA

Abstract:

Modern machine learning techniques have evolved into a practical discipline enabling numerous advances in data analysis. Despite recent advances, difficulties with interpretability, stability, need for large training datasets, robustness to out of distribution examples, high computational and energy costs, remain. Many of these difficulties result from the fact that the input data classes are usually nonlinear, and no precise information is available as to how exactly this nonlinearity can be accounted for. In this talk I will explain that in certain problems related to signal and image analysis and classification these difficulties can be ameliorated by adopting a physics-based model for how data classes are generated. Starting from such model, we will explain a set of mathematical techniques for representing input data that can convexify input data classes and makes it possible to solve the classification problem using simple (e.g. linear) machine learning techniques. Based on the mathematics of optimal transport, the new representation techniques can be viewed as invertible transforms (representations, embeddings) for signal and image data. They have well-defined mathematical techniques and can convexify data classes emanating from certain physical situations. Computational examples relating to the classification of diverse signal and image databases, and comparison to other deep learning techniques, show these emerging transport representations/embeddings can classify data with the same or better accuracy but with significant benefits in terms of lower computational complexity, needing less training data, robustness to out of distribution examples, and interpretability.

Biography:

Gustavo K. Rohde is a professor of Biomedical Engineering, and Electrical and Computer Engineering at the University of Virginia. He is/has been an editorial board member for the IEEE Transactions on Image

Processing, Cytometry part A, BMC Bioinformatics, IEEE Journal of Biomedical and Health Informatics, IEEE Signal Processing Letters, and Sampling Theory, Signal Processing, and Data Analysis. He was program co-chair for IEEE ISBI 21, and regular member of the BDMA NIH study section. He was an ISAC council member from 2014-2016. Hi research interests are in mathematical modeling, signal/image processing, pattern recognition and machine learning.

Achieving Configuration Security through Moving Target Defense

Shuvalaxmi Dass, PhD*

University of Louisiana at Lafayette, USA

Abstract:

Software systems and applications are designed with many configuration parameters that contribute to various functionalities such as architecture, virtualization, performance, security, privacy, and system interactions. However, software misconfiguration can result in system vulnerabilities and susceptibility to security attacks. The Open Web Application Security Project, a nonprofit foundation, considers security misconfiguration as one of the top risks to cybersecurity. One of the major challenges such software systems face is they are generally built to operate with relatively static configurations over extended periods. This static approach can result in system vulnerabilities that may be exploited by adversaries during the reconnaissance stage, increasing the likelihood of successful attacks. In this talk, I will address the above cybersecurity challenge by applying machine learning algorithms to enhance the security and robustness of misconfigured software systems. I will present a "Reinforcement Learning-based Game Model" to automate the dynamic Moving Target Defense (MTD) strategy for safeguarding vulnerable software from adversarial attacks. Finally, I will conclude my talk with exciting future directions in the field of AI and MTD in cybersecurity.

Biography:

Dr. Shuvalaxmi Dass is an assistant professor in the School of Computing and Informatics at the University of Louisiana at Lafayette, USA. She received her PhD. in Computer Science from Texas Tech University in 2021 where she was an AT&T Research Fellow. Her research work lies at the intersection of Machine Learning, Evolutionary algorithms, and software cybersecurity. She has published in top IEEE and ACM conferences such as COMPSAC, SAC, and Big Data. She is a recipient of 2019 CRA-W Grad Cohort Workshop for Women Scholarship, 2024 Women in cybersecurity (WiCys) faculty scholarship. Recently, she became an EC-Council Certified Ethical Hacker.

Assisting Clinical Diagnosis: Fuzzy Probability Trees, an Interpretable AI Model

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Vincenzo L'imperio[3]
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Abstract:

Transparency and interpretability are crucial in AI research, particularly in healthcare. We developed a

new innovative approach, Fuzzy Sets in Probability Trees (FPT), which merges probabilistic trees and fuzzy logic. This approach is fully interpretable, allowing clinicians to generate and verify the entire clinical decision process. FPT extends the framework of Probabilistic Decision Trees by incorporating uncertainty about the data and allowing for a flexible description of vague variables. Thus, FTPs enable the incorporation of domain knowledge in the form of fuzzy membership functions to probabilistic trees, generating an AI method aligned with the way humans reason. Furthermore, FPTs can represent circumstances or explanations that cannot be represented with other techniques (e.g., Bayesian networks), paving the way to a novel form of interpretable AI that allows clinicians to generate, control, and verify the entire diagnosis procedure. By mimicking medical professionals' reasoning, FPT was applied to classify thyroid nodules and predict chronic kidney disease progression, yielding interpretable results beneficial to clinicians. Integrating probabilistic trees and fuzzy reasoning brings significant nuances that are lost when using the crisp thresholds set by probabilistic decision trees. Estimating uncertainties and counterfactuals reduce misdiagnoses, ensuring AI systems align with human reasoning. We show that FPT and its predictions can assist clinical practice in an intuitive manner, using a user-friendly interface specifically designed for this purpose. This alignment respects and understands medical professionals, fostering confidence in AI's integration into healthcare.

Biography:

I am a research fellow at the University of Milano-Bicocca and part of the Bicocca Bioinformatics Biostatistics Bioimaging (B4) Centre. I graduated in mathematics at the University of Milano in 2016. I completed my PhD in Biostatistics and Clinical Research at the University of Milano-Bicocca in 2019. My work focuses primarily on developing innovative statistical methods to improve the search for biomarkers in biomedical research to try and translate the findings generated from basic research into tests that can be integrated into the routine clinical workflow. Moreover, my research focuses on incorporating human language uncertainty within the algorithm.

AI-operated Virtual Testers-generative AI & LLM Agents Bring Ground Breaking Capabilities into the Testing World

Tal Barmeir, CEO*

BlinqIO

Abstract:

Artificial intelligence has become a significant and disruptive force in the field of DevOps. Software testing, in particular, is experiencing a substantial transformation. Companies that embrace these changes stand to gain strategic advantages in terms of product release times and quality, thus enhancing their competitiveness.

In this presentation we will cover the first ever virtual testers operated solely by AI without any human intervention are introduced into the software testing market with huge implications:

- HR aspects: Significant shift in testing team headcount and structure

- Pipeline management: on demand capacity of virtual testers removes the challenges of peak and low in software testing

- Global capabilities: Multi lingual (50 languages) capabilities become the new standard with AI engines supporting all languages seamlessly

- All purpose - device agnostic and front end technology agnostic: the virtual tester handles seamlessly all devices and technologies sticking to the business logic

Biography:

Tal Barmeir CEO and co-founder

Tal co-founded and CEO of Experitest (acquired by NASDAQ:TPG) a SaaS B2B Software DevOps company. Prior to that Tal held various leadership roles inc Accenture (London) NYSE:ACN, Comverse (Israel) Head of Marketing in the Services Division Hi Tech Strategy Manager and more. In addition, Tal served as Lieutenant in the IDF (Israeli Military) and was selected to serve in peace negotiations.

Tal holds a MBA INSEAD Fontainebleau (France), MA Economics (Summa Cum Laude), Tel Aviv University, LLM Law (Magna Cum Laude), Tel Aviv University. Tal participated in the Interdisciplinary Program for Outstanding Students, Tel Aviv University (top 20 students in Tel Aviv University)

The Impact of AI on the Market to Product feedback loop in the technology industry.

Devika Naik*
Nagesh Gulkotwar
Khyathi Balusu
Ronan Chen

Google Inc

Abstract:

The technology industry's swift evolution has seen AI become a transformative force in various aspects of product development and market analysis. This paper explores the transformative effects of AI on the market-to-product feedback loop, critical for market responsiveness in the tech sector. The market-to-product feedback loop enables rapid product changes based on market insights, ensuring products are customer-focused. However, the process is hampered by time-consuming data collection, scalability issues, and potentially inaccurate or biased insights. These challenges hinder companies' ability to adapt to market shifts. AI can address these challenges by automating data analysis, enhancing scalability, minimizing bias and improving communication for informed decision-making. The paper utilizes a qualitative research approach, conducting online interviews with 20 participants across multiple process oriented roles in the US technology sector (e.g., product managers, analysts, customer success managers etc.). The literature review explores current AI methodologies which includes but is not limited to Generative AI, Natural Language Processing and Sentiment Analysis to offer research context. Data collection was conducted through Google Forms, facilitating the identification of trends related to the study's objectives. The research identified that the market to product feedback loop had various stages (feedback capture, data retrieval, ticket management, data analysis, recommendations) and proposed AI-powered refinements which can significantly improve traditional approaches to feedback based product development. The research concluded that AI is poised to revolutionize the market-to-product feedback loop, empowering technology companies to better navigate market changes, innovate rapidly, and deliver products that meet consumer expectations.

Biography:

- Devika Naik | Product Technology Manager | Emerging Ads
- Devika specializing in launching AI enabled emerging advertising products globally
- Nagesh Gulkotwar | Program Manager | Google Search
- Nagesh specializes in Ads integrations into the Search Page (including Ads in LLMs), Web Features and Customer Support
- Khyathi Balusu | AI/ML Engineer | Vertex AI
- Khyathi specializes in architecting GCP Vertex AI solutions, leveraging features like AutoML and custom model training to optimize end-user experiences
- Ronan Chen | Business Intelligence Analyst | Google Finance
- Ronan specializes in leveraging data processing and analysis with advanced AL solutions to tackle compliance challenges in digital payments.

Realistic Human Avatars at Synthesia

Vittorio Ferrari*

Synthesia, Switzerland

Abstract:

At Synthesia we want to make video creation easy for everyone, without needing cameras, actors, studios or microphones. The user can select an avatar and enter the text the avatar should say. Our technology then generates a full performance, including speech, animating the avatar to match that speech, and rendering it photorealistically into a video. In this talk I will provide some insights about how we technically realize our avatars, chart our journey towards more expressive and engaging avatars, and present ActorsHQ, a dataset of high-quality multi-view recordings of humans performing very diverse poses and motions.

Biography:

Vittorio Ferrari is the Director of Science at Synthesia, where he leads R&D groups developing cutting-edge generative AI technology. Previously he led research groups at Google (Principal Scientist), the University of Edinburgh (Full Professor), and ETH Zurich (Assistant Professor). He co-authored over 160 scientific papers and won the best paper award at ECCV in 2012. He received the prestigious ERC Starting Grant, also in 2012. He led the creation of Open Images, one of the most widely adopted computer vision datasets. While at Google he contributed technology to several major products. He was PC for ECCV'18, GC for ECCV'20.

Immersive Learning using Metaverse: Transforming the Education Industry through Extended Reality

Dr Gayathri Karthick*

York St John University, London, UK

Abstract:

Parents are frequently concerned about their children spending excessive time on phones and tablets for gaming. However, instead of maintaining this environment, we should strive to transform it into a learning phase and encourage innovation. Also, in the wake of the COVID-19 pandemic, a significant shift has been observed in the education landscape, with a predominant migration towards online platforms by educational institutions. We noticed that students love using phones, Tablets and computers and prefer them over traditional teaching methods. For example, instead of paper-based exams, they prefer online submissions, attendance through apps, lecture delivery, group presentations, etc. Based on these observations, we thought: How can the Metaverse be used to create more engaging and interactive learning experiences? Over the past few decades, technological advancements have significantly impacted Education and transformed traditional teaching and learning methods. Extended Reality (XR) is one of the most promising innovations in this area. XR is a buzzword that includes Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR). These technologies offer immersive and interactive experiences that enable users to interact with Virtual objects and environments, blurring the lines between the physical and digital worlds. This research proposes implementing an academic curriculum within the metaverse aimed at achieving successful learning outcomes and emphasizing the significance of the education industry.

Biography:

Dr. Gayathri Karthick, I am a Lecturer, FHEA, Postgraduate Research Supervisor (PGR), and Module Director at the School of Science and Health at York St John University, London, UK. I have over ten years of experience in both academic and organizational settings. I completed my MSc and PhD in Computer Science from Middlesex University, London. I have contributed significantly to scholarly discourse

throughout my career by publishing impactful research papers, articles, patterns, and reputable journals. My research interests include Secure Cloud Environments, Big Data Analytics, Mixed Reality, and Intelligent Media Edge Computing. Additionally, I review papers from reputable conferences and journals.

Natural Language in Visual Generative Artificial Intelligence

Peixi Xiong[1*]

[1]*Intel Labs, USA*

Abstract:

Natural language plays a pivotal role in Visual Generative Artificial Intelligence (AI), serving as a bridge between human inputs and machine understanding. The ability to interpret and generate images based on textual input enhances the accessibility and usability of AI systems. However, the integration of natural language and visual modalities presents significant challenges. The first challenge is the understanding of complex logical prompts, which requires deep comprehension of context, semantics, and the intricacies of language. Current models often struggle with format-intricate or logic-rich prompts, leading to misinterpretations. The second challenge is the natural language-vision alignment, which demands mapping between textual input and visual content. Achieving this alignment is difficult due to the inherent differences between language and visual data. The third challenge involves evaluation metrics. Most evaluations remain qualitative due to the generative nature of the task and the ambiguity in natural language, making it hard to develop standardized and objective measures of performance. Current approaches in Visual Generative AI, such as DALL-E and CLIP, have made significant strides by leveraging large-scale datasets and advanced network architectures. These models exhibit impressive capabilities in generating coherent and contextually relevant images from prompts. Nonetheless, they also have limitations, including biases in the training data, a lack of fine-grained control over generated outputs, and the aforementioned challenges. Natural language understanding is crucial in this domain because it provides a flexible and expressive means for users to communicate their needs and preferences to the system. By improving natural language understanding, Visual Generative AI can produce more accurate and personalized visual content, bridging the gap between human knowledge and machine capabilities. This presentation includes the current state of natural language understanding in Visual Generative AI, highlighting its challenges, strengths, and areas for future research.

Biography:

Peixi Xiong received her B.Sc. degree from The University of Manchester, UK, and both her M.S.and Ph.D. degrees from Northwestern University, USA. She completed her Ph.D. in 2022, specializing in Multimodality Feature Representation, and has contributed several patents and publications in this field. Since completing her studies, she has been a Research Scientist at Intel Labs, focusing on 3D scene generation and 3D scene representation. Additionally, she is an active member of Women at Intel Labs (WIL).

Student Viewpoints on the Use of ChatGPT in Learning Discrete Mathematics

Wen-Jung Hsin*
Marina Perdiguero Martí

Park University, USA

Abstract:

Since its debut for public use in November 2022, ChatGPT, alongside other Generative Artificial Intelligence tools, has swiftly gained popularity across various educational disciplines, holding the potential to significantly transform pedagogical approaches. This study examines the impact of ChatGPT on learning Discrete Mathematics, a fundamental course in Computer Science education, with a specific

emphasis on student viewpoints.

Rather than merely having students use ChatGPT without guidance, this research actively encourages students to incorporate ChatGPT into their learning process, employing it as a tool to address specific inquiries related to their coursework through thoughtfully designed prompts.

Following this integration, a survey is conducted to assess the influence of ChatGPT on students' educational experiences in the course. The findings reveal a discernible trend: Students express favorable opinions regarding the incorporation of ChatGPT into their learning environment. Particularly, students overwhelmingly agree that ChatGPT offers practical applications or real-life examples illustrating the utilization of concepts from Discrete Mathematics. This insight is invaluable, as theoretical knowledge often appears less meaningful and short-lived unless it can be applied and utilized in practical scenarios. ChatGPT's ability to bridge this gap is highly beneficial to the students within the educational context.

Overall, spanning from improving understanding to aiding in problem-solving, and further extending to the practical application of concepts in real-world scenarios, ChatGPT emerges as a valuable resource, enhancing the educational experience for students as they navigate the challenges of Discrete Mathematics coursework.

Biography:

Dr. Wen-Jung Hsin is a Full Professor in the Department of Computer Science and Information Systems at Park University in Parkville, MO, USA. With over 25 years of teaching experience in this field, her primary research focus lies in Computer Science Education. She has authored more than 35 papers and delivered numerous presentations at various Computer Science conferences, including the Association for Computing Machinery's (ACM) Special Interest Group on Computer Science Education (SIGCSE) Technical Symposium, and the Consortium for Computing Sciences in Colleges (CCSC) regional conferences, among others.

Face Expression of Personality

Srikar kodavati[1*]
Funda Durupinar[2]

University of Massachusetts Boston, USA

Abstract:

This research aims to understand how personality traits impact facial expressions and generate facial animations based on input personalities using a data-driven approach. We use the First Impressions dataset, which comprises video clips of YouTubers speaking to the camera. The dataset is annotated with the perceived personalities of the people in the video. We first extract Action Units (AUs) from the videos. Aus describe combinations of facial muscle movements that generate expressions. Wethen extract emotions and the speech transcripts and feed them into a attention based diffusion model along with the personality labels. The denoising process is trained to generate AUs over frames as output. Our preliminary studies via time-series analysis AUs show correlations between personality traits and changes in Aus. The generations are then mapped onto a 3D graphical facial model and animated using the Unity game engine.

Biography:

I am pursuing my PhD in the field of computer science from university of Massachusetts Boston. And my future interests are pursuing research in the fields of AI and machine learning.

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