

The 13th International Conference on Intelligent Human Computer Interaction

December 20th-22nd, 2021



The IHCI is an annual international conference in the Human-Computer Interaction field, where we explore research challenges emerging in the complex interaction between machine intelligence and human intelligence. This is the thirteenth event which has a theme on “Intelligent Interaction Beyond Physical Limits”, having special tracks related to the main theme of the conference.



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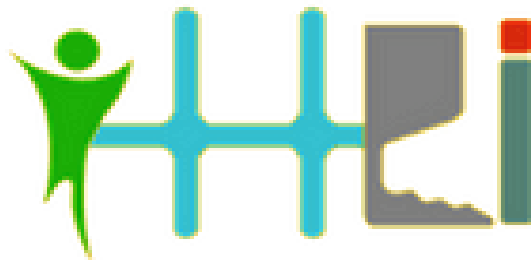
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Jong-Hoon Kim, Madhusudan Singh, Javed Khan,
Uma Shanker Tiwary, Marigankar Sur, Dhananjay Singh

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Preface

The science and technology of Human Computer Interaction (HCI) has taken a giant leap forward in the last few years. This has given impetus to two opposing trends. One divergent trend is to organize separate conferences on focused topics such as, ‘Interaction Design and User-Centered Design, etc., which earlier would have been covered under HCI. The other convergent trend is to assimilate new areas in HCI conferences, such as, ‘Computing with Words’, ‘Prosocial Agents Development’, and ‘Attention based Applications’ etc. IHCI-2021 is one of the rare conferences focusing on those issues of ‘Intelligence’ and ‘Human Computer Interaction’ which exist at the cross-roads of the above mentioned trends. It is a privilege to present the proceedings of the 13th International Conference on Intelligent Human Computer Interaction (IHCI-2021) organized by the Kent State University during December 20-22, 2021 at Design Innovation Hub at Kent State University, Ohio, Kent, USA. The IHCI is an annual international conference in the Human-Computer Interaction field, where we explore research challenges emerging in the complex interaction between machine intelligence and human intelligence. This is the thirteenth event which has a theme on “Intelligent Interaction beyond Physical Limits”, having 12 special tracks related to the main theme of the conference as well as general topics in the IHCI fields.

Out of 138 submitted papers, 66 papers were accepted for oral presentation and publication by the Program Committee which was based on the recommendations of at least 3 experts’ reviewers. The proceedings are organized in nine sections corresponding to each track of the conference. The 13th IHCI conference included five keynote speakers and ten invited talks with twenty nine powerful expert session chairs & six forum organizers who have worked in both industry and academia to attract more than 200 participants have emerged as the foremost worldwide (more than 22 countries) gathering of academic researchers, graduate students, top research think tanks and industry technology developers. Therefore, we do believe that the biggest benefits to the participant is the actualization of their goals in the field of HCI. That will ultimately lead to greater success in business, which is ultimately beneficial to the society. Moreover, our warm gratitude should be given to all the authors who submitted their work to IHCI-2021. During the submission, review, and editing stages, the Easy chair conference system proved very helpful. We are grateful to the technical program committee (TPC) and local organizing committee for their immeasurable efforts to ensure the success of this conference. Finally we would like to thank our speakers, authors, and participants for their contribution in making IHCI-2021 a stimulating and productive conference. This IHCI conference series cannot achieve yearly milestones without their continued support in future.

December 2021

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Keynote Speakers

Joint Plenary Speech

Developing Tools to Assist Content Creators in Improving the Accessibility of PDF Documents

Jonathan Lazar (University of Maryland, USA)

Rajiv Jain (Adobe Research, USA)

Keynote Speech

Toward diverse, heterogeneous cyberphysical interfaces that generalize compositionally

Brygg Ullmer (Clemson University, USA)

Keynote Speech

Organizing in the age of Organic Machines

Youngjin Yoo (Case Western Reserve University, USA)

Keynote Speech

Quantum Computing: A Pathway for the Next Decade

S.S. Iyengar (Florida International University, USA)

Joint Plenary Speech

Developing Tools to Assist Content Creators in Improving the Accessibility of PDF Documents

Abstract

There are trillions of PDFs in the world today making it one of the most commonly used document formats. However, many PDF documents are inaccessible for people with disabilities, creating barriers in education, science, commerce, e-government, and recreation. Documents in PDF format are considered harder to make accessible than documents in other formats, primarily due to the insufficient tools available to assist content creators. In this plenary presentation, we 1) give a background on PDF accessibility and the impact on the lives of people with disabilities, 2) describe existing research and previous efforts on PDF accessibility, 3) describe our research and development of Ally, a new tool to assist content creators in remediating their PDF files for accessibility, 4) describe our research into understanding document structure and its potential application in improving PDF accessibility 5) describe future directions in PDF accessibility, including closer interaction between tool development and ML approaches.

Prof. Jonathan Lazar (University of Maryland, USA)

Jonathan Lazar is a professor in the College of Information Studies (iSchool) at the University of Maryland. Dr. Lazar joined the iSchool in 2019, after 19 years as a professor of computer and information sciences at Towson University, where he served as director of the information systems program for 14 years. Dr. Lazar has authored or edited 13 books, including *Research Methods in Human-Computer Interaction* (2nd edition, co-authored with Heidi Feng and Harry Hochheiser), *Ensuring Digital Accessibility Through Process and Policy* (co-authored with Dan Goldstein and Anne Taylor), *Disability, Human Rights, and Information Technology* (co-edited with Michael Stein), *Universal Usability: Designing Computer Interfaces for Diverse User Populations*, and *Web Usability: A User-Centered Design Approach*. His 14th book, *Accessible Technology and the Developing World*, will be published by Oxford University Press in mid-2021. He has published over 150 refereed articles in journals, conference proceedings, edited books, and magazines, and has been granted two US patents for his work on accessible web-based security features for blind users. He frequently serves as an adviser to government agencies and regularly provides testimony at federal and state levels, and multiple US federal regulations cite his research publications. He has been on the executive Board of the Friends of the Maryland Library for the Blind and Physically Handicapped since 2009, was co-chair of the Cambridge University Workshop on Universal Access and Assistive Technology (CWUAAT) from 2012-2020, and has been on the program committee of the ACM Conference on Accessible Computing (ASSETS) most years since 2006. Dr. Lazar is the general chair of the ASSETS 2021 conference. Dr. Lazar is the associate director of the Trace Center and is a faculty member in the Human-Computer Interaction Lab

Dr. Rajiv Jain (Adobe Research, USA)

Rajiv Jain is a Senior Research Scientist in the Document Intelligence Lab in Adobe Research, where his research focuses on understanding the layout, content, and interaction with documents. Prior to joining Adobe, Rajiv was a consultant at DARPA, where he helped establish the Media Forensics Program that worked toward securing digital imagery. He previously served for 10 years as a researcher for the Department of Defense where he works on projects around large scale systems, computer vision, and network security. He received his PhD in computer science from the University of Maryland, College Park.

Keynote Speech

Toward diverse, heterogeneous cyberphysical interfaces that generalize compositionally

Abstract

Among books, we have grown accustomed to diversity and heterogeneity in both form and content. For physical editions, they are hardbound, softbound, ringbound, and looseleaf; large and small; occasionally jewel-encrusted; and sometimes incorporating pages with rich mechanics, electronics, and computing. Digital editions of books – whether plaintext or diverse hypermedia variations – richly complement (not strictly replacing) their physical editions. We will discuss efforts toward related ecologies for diverse, heterogeneous computational interfaces with both virtual and physical editions. We will further consider how network externalities, bringing the powers of synergistic exponential growth, might be reached through generalized composition, decomposition, and recomposition. As lenses and prisms, we will use medieval illuminated canon tables, Philips' 1942 MONIAC, and Apollo mission control; Halasz and Berners-Lee's Hypertext 1991 presentations; heuristics of Buxton and Dahlberg; and examples from our work and IHCI.

Prof. Brygg Ullmer (Clemson University, USA)

Brygg Ullmer is Chair of the Human-Centered Computing (HCC) Division and Professor within the School of Computing at Clemson University, where he also leads the Tangible Visualization group. Ullmer completed his Ph.D. at the MIT Media Laboratory (Tangible Media group) in 2002, where his research focused on tangible user interfaces. He served as an Associate Professor at Louisiana State University, jointly within the CCT and Computer Science. Prior to that, he held a postdoctoral position in the visualization department of the Zuse Institute Berlin, internships at Interval Research (Palo Alto) and Sony CSL (Tokyo), and has been a visiting lecturer at Hong Kong Polytechnic's School of Design. His research interests include tangible interfaces, computational genomics (and more broadly, interactive computational STEAM), visualization, and rapid physical and electronic prototyping. He also has a strong interest in computationally-mediated art, craft, and design, rooted in the traditions and material expressions of specific regions and cultures.

Keynote Speech

Organizing in the age of Organic Machines

Abstract

Throughout the history, human design and use tools to augment or replace its innate abilities. In this short essay, drawing upon the work Bergson and Deleuze, I will try to characterize the emerging socio-technical environments as organic machines and make a few speculative observations on new forms of organizing that is likely to replace digital platforms. A key defining characteristic of organic machines is their unrepeatability. I argue that the emergence of global digital infrastructure, autonomous algorithms, user-generated data and cloud-based computing resources create a condition for unrepeatable run-time computational performativity. I then argue that with the emergence of organic machines, organizations will need to acquire new types of capabilities. I suggest four such capabilities: inferential, predictive, generative, and embodiment capabilities. With these capabilities, firms will be able to identifying both structural and temporal contingencies of user needs, and being able to match precisely such contingencies by algorithmically mobilize material and non-material resources at or near the point of use. I refer to this emerging form of organizing as a meta-hierarchy as it envelops both a platform ecosystem as a quasi-market, with multiple traditional vertically integrated hierarchies and net-enabled organizations.

Prof. Youngjin Yoo (Case Western Reserve University, USA)

Youngjin Yoo, PhD, is the Elizabeth M. and William C. Treuhaft Professor of Entrepreneurship and professor of information systems in the Department of Design & Innovation at the Weatherhead School of Management, Case Western Reserve University. He is the faculty director of xLab. He is also a WBS Distinguished Research Environment Professor at Warwick Business School, UK, and a visiting professor at London School of Economics and Political Science, UK. He is an AIS Fellow.

Before returning to Case Western Reserve University, he was the Harry A. Cochran Professor of Management Information Systems and the founding director of the Center for Design+Innovation at the Fox School of Business, Temple University, where he was also the founder and principal investigator of Urban Apps & Maps Studios, an interdisciplinary initiative for digital urban entrepreneurship in Philadelphia. Previously, he was the Lewis-Progressive Chair of Management at Case Western Reserve University. He has taught digital innovation strategy at the Indian School of Business, Aalto University in Finland, and the Korean Advanced Institute of Science and Technology. He was a summer research fellow at NASA in the summer of 2001 and spent a year as a research associate in 2003-2004 at NASA Glenn Research Center. He was also a visiting professor at the Chalmers University of Technology in Sweden, Viktoria Institute in Sweden, Hitotsubashi University in Japan, Hong Kong City University, Yonsei University, Korea, and Tokyo University of Science, Japan. He was Innovation Architect at University Hospitals of Cleveland, overseeing the digital transformation efforts at one of the largest teaching hospital systems in the country.

Keynote Speech

Quantum Computing: A Pathway for the Next Decade

Abstract

This talk covers a detailed direction for developing a Roadmap in the discipline of Quantum Computing for the next Decade. Over the past two decades, the science of computing has changed drastically both in the context of theory and applications. Dr. Iyengar is going to cover his experiences of four decades in areas of Sensor Fusion, Quantum Computing and theory of Machine Learning and AI for various applications. The duration of the talk is 1 hour and there will be time for discussions after the seminar.

Prof. S.S. Iyengar (Florida International University, USA)

Dr. S. S. Iyengar, PhD, D.Sc (h.c.), (ACM Fellow, IEEE Fellow, AAAS Fellow, NAI Fellow, AIMBE Fellow), IBM Distinguished Faculty Award, is a pioneer in the field of distributed sensor networks/sensor fusion, computational aspects of robotics and high performance computing. He has published over 600 research papers and has authored/edited 22 books published by MIT Press, John Wiley & Sons, Prentice Hall, CRC Press, Springer Verlag, etc. These publications have been used in major universities all over the world. He has many patents and some patents are featured in the World's Best Technology Forum in Dallas, Texas. His research publications are on the design and analysis of efficient algorithms, parallel computing, sensor networks, and robotics. During the last four decades has supervised over 55 Ph.D. students, 100 Master's students, and many undergraduate students who are now faculty at Major Universities worldwide or Scientists or Engineers at National Lab/Industries around the world. He has also had many undergraduate students working on his research projects. Dr. Iyengar is a member of the European Academy of Sciences, a Life Fellow of IEEE, a Fellow of ACM, a Fellow of AAAS, a Fellow of the National Academy of Inventors NAI and a Fellow of Society of Design and Process Program (SPDS), Fellow of Institution of Engineers (FIE), a Fellow of the American Institute for Medical and Biological Engineering (AIMBE), was awarded a Distinguished Alumnus Award of the Indian Institute of Science, Bangalore, and the IEEE Computer Society Technical Achievement for the contributions to sensor fusion algorithms, and parallel algorithms.

Session -1 A: The principle and practice of human-centered AI

Session Chairs:

Dr. Jee Hang Lee (Samgmyung University, South Korea)

Dr. Eui-Chul Lee (Samgmyung University, South Korea)

Dr. Jee Hang Lee (Samgmyung University, South Korea)

Jee Hang Lee is an assistant professor (2020-) in the Department of Human-Centered Artificial Intelligence, Sangmyung University, Seoul, KR. Before joining, he was a research assistant professor in the Department of Bio and Brain Engineering at KAIST, KR (2017-2020), where he was a winner of KI HST postdoc fellowship (2017-2018). Prior to joining KAIST, he was a Research Associate at University of Bath, UK (2015-2016). He received his Ph.D. in AI from University of Bath, UK, in 2015. Before coming back to academia, he was a Senior Engineer at Samsung Electronics (2005-2010), and Researcher at Hangul & Computer Inc (2000-2005). His research interests include reasoning and decision making based upon brain-inspired artificial intelligence.

Dr. Eui-Chul Lee (Samgmyung University, South Korea)

Since March 2012, he has been Associate Professor in the Department of Human-Centered AI at Sangmyung University, Seoul, Korea. His research interests include computer vision, image processing, pattern recognition, and human computer interface (HCI).

Invited Speaker: Dr. DVK Vasudevan (University of Hyderabad, India)

Dr. DVK Vasudevan, Fondly called as Violinvasu is a combination of a performer and an educationist in the field of Indian Music. He belongs to the lineage of Tyagaraja Sishya Parampara, who has got his training from Legendary Violinist Padmashree Awardee "Nadasudharnava" Dr. Annavarapu Ramaswamy. He has performed all over the world in prestigious festivals like Namaste France, World Wood Festival, Living Heritage Festival, Sankat Mochan Festival, HTAMF, Telugu Cultural Festival. Vasu teaches music at University of Hyderabad. He is well qualified in both Indian and western music with a Doctoral degree in music and an 8th grade from Trinity College London. He also rendered his services as Cultural adviser and Visiting Faculty to IIITH, IITH. He has international research publications and books to his credit. He is one of the most sought after carnatic violin teachers with more than 15000 followers across the globe. He also initiated the project sabarmati sangeeth to teach human values through music and conducted free workshops for one lakh students including juveniles.

He is a recipient of Rashtrapati Award (Abdul Kalam), International Award for Young People (Buckingham Palace), Adama Sahas Puraskar (National Adventure Club, Chandigarh), Samaikya Bharat Gaurav Puraskar (Madras Telugu Academy), Young Achievers Award (Rotary), Youth Award for Outstanding work in Music (Government of A.P) Ugadi Puraskaram from SiliconAndhra.

Talk Title:

Scope of Research in Indian Music with regard to Signal Processing, Machine Learning, Cognitive Science and Therapy

Abstract

Music has been an integral part of mankind. Though music has been primarily considered as a performing art, There are many other important areas of the art form that help the society progress positively. 'Music Research' is one of such important areas that have a lot of scope for innovation and development.

A lot of work across the globe in general and in the West in particular has been happening in music research. But unfortunately, Being one of the ancient, complex yet sophisticated systems in the world that dates back to 2500 BC, there is not much development in the field of Indian music research, particularly in the areas of Music Technology, Cognition and Therapy. In this talk, I would like to discuss the importance of Interdisciplinary education and research in India, and the scope of research in Indian music related to Signal Processing, Machine Learning, Cognitive Science and Therapy. I would highlight few problems related Signal Processing like Teaching and learning tools, Music Recording Software, Pickups and Synthesis, Raga Recognition, that supports Indian Music Education and performance, Machine Learning and Deep Learning problems like Recreating Classical music patterns, lyrics of Vaggeyakaras (Poet Composers), Recommendation systems to give proper suggestions in Classical music search that leads to E commerce, Cognitive Science and Therapy, problems like Impressions of Indian music on Human brain, Creating patterns that change the mood of a person, Basic Rhythm and Note patterns that can work on Hypertension and Anxiety, Raga and Rasa (Mood) A long way to go, Importance of time in singing ragas with respect to human receptivity and ecstasy and the most mishandled subject "Indian Music Therapy".

Papers:**Facial Recognition Technologies: A Survey and Comparison of Systems and Practical Applications**

Tauheed Khan Mohd, Nicholas Muskopf-Stone, Georgia Votta, Joshua Van Essen and Aira Peregrino
Augustana College, Rock Island, IL 61201, USA

Abstract

Through recent years, facial recognition technology has become increasingly relevant in a widespread area of applications. There are numerous approaches to facial recognition technology, each best-suited for different types of practices. A survey which compares the infrared, thermal, and deep learning methods is performed in this study. Each method is evaluated based on its speed, accuracy, and efficiency and is given an overall percentage of reliability. Further, we examine the advantages and disadvantages of each method and assess what common usage of each method would be in a practical setting. We find a point of commonality between each method type where accuracy and efficiency must strike a balance, further compounded by the practical applications of each method. Our findings show that

while there is an ideal method of facial recognition for each individual application, there is no ideal method that applies to every application

Touching Minds: Deep generative models composing the digital contents to practice mindfulness

So Hyeon Kim¹, Ji Hun Kim², Jung Ahn Yang², Jung Yeon Lee² and Jee Hang Lee²

Department of AI & Informatics¹,

Department of Human-Centered AI²,

Sangmyung University, Seoul, Republic of Korea

Abstract

Interest in the proper treatment of mental health has been rapidly growing under the steep changes in society, family structure and lifestyle. COVID-19 pandemic in addition drastically accelerates this necessity worldwide, which brings about a huge demand on digital therapeutics for this purpose. One of the key ingredients to this attempt is the appropriately designed practice contents for the prevention and treatment of mental illness. In this paper, we present novel deep generative models to construct the mental training contents based upon mindfulness approach, with a particular focus on providing Acceptance and Commitment Therapy (ACT) on the self-talk techniques. To this end, we first introduce ACT script generator for mindfulness meditation. With over one-thou-sand sentences collected from the various sources for ACT training practices, we develop a text generative model through fine-tuning on the variant of GPT-2. Next, we introduce a voice generator to implement the self-talk technique, a text-to-speech application using the ACT training script generated above. Computational and human evaluation results demonstrate the high quality of generated training scripts and self-talk contents. To the best of our knowledge, this is the first approach to generate the meditation contents using artificial intelligence techniques, which is able to deeply touch the human mind to care and cure the mental health of individuals. Applications would be main treatment contents for digital therapeutics and meditation curriculum design.

Remote Monitoring of Disability: A Case Study of Mobility Aid in Rohingya Camp

Suzana Brown¹, Faheem Hussain², Achilles Vairis³, Emily Hacker⁴ and Maurice Bess¹

SUNY Korea, Incheon 21985, South Korea¹

Arizona State University in Tempe, AZ, USA²

Hellenic Mediterranean University, Greece³

University of Utah, Salt Lake City, Utah, USA⁴

Abstract

Abstract. Examining disability within the context of displacement is a vital area of study. Additionally, further study of assistive technology devices for refugees with disabilities and those in low-resource settings presents the opportunity to dramatically improve the safety and medical welfare of people with disabilities. Mobility Aid project is a pilot study in a Rohingya refugee camp with refugees who have suffered debilitating injuries and need to use crutches to walk. The goal of the project is to improve remote monitoring of disability in the context of displacement. It could be extended to many other environments where people walk with crutches on uneven and muddy terrain.

Effect of time window size for converting frequency domain in real-time remote photoplethysmography extraction

Yu Jin Shin¹, Woo Jung Han¹, Kun Ha Suh² and Eui Chul Lee¹

Dept. of Human-Centered Artificial Intelligence, Sangmyung University,
Seoul, South Korea¹

R&D team, Zena Inc., Seoul 04782, Korea²

Abstract

Abstract. Remote-photoplethysmography (rPPG) is an attractive technology that can measure vital signs at a distance without contact. Previous remote-photoplethysmography studies focused mainly on eliminating the artifact such as motion but finding the optimal setup or hyperparameters are also an important factor influencing the performance. As one of them, window size is the length of the signal used to calculate the vital signs once in a spectral method and has not been analyzed in detail in previous works. In general, the use of a long window size increases the re-liability of the estimations, but it cannot reflect continuously changing physiological responses of human. Also, using too short window size increases uncertainty. In this paper, we compare and analyze the pulse rate estimation results according to window sizes from short to long using CHROM, which is one of the popular rPPG algorithms. Results on the PURE dataset showed that the longer the window size, the higher the SNR and the lower the RMSE. At a window size of about 4 seconds (120 frames), the SNR was switched from negative to positive and an acceptable error rate (RMSE <5) was observed.

Development of Application Usability Evaluation Scale for Seniors

Changhee Seo¹, Jin Suk Lee² and Jieun Kwon¹

Sangmyung University, Seoul 03016, Republic of Korea¹

Dongguk University, Seoul 04620, Republic of Korea²

Abstract

Purpose: Applications for seniors are emerging because of the increasing number of seniors due to an aging society and popularization of smartphones by the 4th industrial revolution. The purpose of this paper is to establish a usability evaluation scale to develop more convenient and useful applications for seniors.

Research design, data and methodology: For this study, first, the necessity of developing an application usability evaluation scale for seniors is discussed by examining the definition and context of seniors. Second, the primary usability evaluation factors were derived from collecting the factors of usability evaluation such as applications, seniors and conducting in-depth interviews with experts. Third, the second usability evaluation factors were derived through survey and statistical analysis based on the usability evaluation factors. Results: As a result, the usability evaluation scale was established with five factors. Cognition, Navigation, Feedback, Error, Aesthetic - and 20 items. Conclusions: This study can be the basis for guidelines of development and design in applications for seniors. Therefore, not only the young generation but also seniors can feel convenience in their daily lives by using customized applications for seniors.

Session -1 B: Immersive and Tangible interface

Session Chairs:

Dr. Jong-Ha Lee (Keimyung University, South Korea)

Dr. Byoung Chul Ko (Keimyung University, South Korea)

Dr. Jong-Ha Lee (Keimyung University, South Korea)

Prof. Jongha Lee, Director of The Center for Advanced Technical Usability and Technologies, says this center is selected as Center for Usability Evaluation of Elderly Friendly Products, we will make efforts to maximize effectiveness of verification and improvement of usability evaluation to producers of elderly friendly products through the linkage of professional manpower at College of Medicine, Keimyung University and Daegu Techno Park.

Dr. Byoung Chul Ko (Keimyung University, South Korea)

Byoung Chul Ko received his B.S. degree from Kyonggi University, Suwon, Korea, in 1998 and M.S. and Ph.D. degrees in Computer Science from Yonsei University, Seoul, Korea, in 2000 and 2004, respectively. From 2004 to 2005, he was a senior researcher at Samsung Electronics, Suwon, Korea, where he worked on the Ubiquitous Robot Companion (URC) project on the subject of robot event detection and face recognition using a camera. He is currently a professor in the Department of Computer Engineering and Vice Dean of College of Engineering, Keimyung University, Daegu, Korea. He received the several excellent paper awards from the Korean Institute of Information Scientists and Engineers (KIISE). Furthermore, he was selected as the best researcher and lecturer in 2013, 2014, 2015, 2018, and 2019 at Keimyung University. His current research interests include interpretable machine learning, deep model compression, vision-based image understanding, and advance driver assistance systems.

Invited Speaker: Dr. Jay Lee (Youngstown State University, USA)

Jay (Ju Yup) Lee is an assistant professor and program coordinator in Hospitality management at Youngstown State University. He gained his doctoral education at Iowa State University's hospitality management graduate program, an internationally recognized ACPHA accredited institution. He also attained a culinary degree from the Culinary Institute of America, the world's premier culinary college. Dr. Lee is an exceptional hospitality management educator and active chef. His research is motivated by new technology adaption in the foodservice industry. He recently conducted a research project investigating the impact of new cooking technology (Sous-vide) adoption in foodservice education. Also, ongoing research topics are implementing HACCP (Hazard Analysis Critical Control Point) and AI (artificial intelligence) in small-sized restaurant operations and developing a smart chef uniform using IoT (Internet of Things).

Talk Title: A New paradigm of chef attire: Smart Chef Uniforms

Abstract

The chef's outfit is typically composed of a double-breasted jacket, checked pants, a chef's hat, and neckerchief. The white color chef uniform is considered standard, and most professional chefs are still inheriting the customs to signify the high regard for their occupation. Cleanliness impression to the customers is another prominent reason a traditional white chef uniform is still widespread as a symbol of personal hygiene. However, surprisingly, this chef outfit began in 1822 when French

artist Marie-Antoine Careme released a sketch called "Le Maitre d'Hotel Francais." The majority of kitchen staff still wear the same pieces from the last 1800s.

Therefore, there is a considerable gap in chef outfit improvement research. Only a few studies have been conducted about chef uniforms in the literature. Some researchers examined different types of design, comfort, fit, and protection or the needs and expectations of chefs wearing them in terms of productivities. Notably, Ehnes et al. designed a focus group interview using culinary arts students and asked them questions about comfort, injuries, and protective chef uniform in their kitchen. This study identified that longer sleeve chef jackets arose problems in personal hygiene and job-related accidents. Also, Black et al. analyzed female chef jackets based on the Functional, Expressive, Aesthetic (FEA) Consumer Needs model. The research suggested a prototype of chef uniforms that improved the FEA in the kitchen by the female chef.

Despite these studies, the foodservice industry is still behind in improving chef uniforms. We are undergoing the fourth industrial revolution in emerging technologies. In order to improve work efficiencies and safety, another sector is putting a lot of effort into applying artificial intelligence (AI), Big data analytics, Internet-of-Things (IoT), robotics, fifth-generation wireless technologies, and quantum computing. These massive waves will change the way we live, work, and how we generate and distribute value. Commercial foodservice is where the researchers can apply a ton of recent technologies. The convergence of new technology and chef uniform will be ideal for refining productivity, safety, and sanitation.

The purpose of this study is to conceptualize a new paradigm of chef uniforms using new technologies. The findings will help literature and manufacturers to develop new chef uniforms meeting the expectations and needs of chefs.

Papers:

Design of a VR-Based Campus Tour Platform with a User Friendly Scene Asset Management System

Stefan Hendricks, Alfred Shaker and Jong-Hoon Kim
Advanced Telerobotics Research Lab, Computer Science
Kent State University, Kent, Ohio, 44242, USA

Abstract

Virtual reality tours have become a desire for many educational institutions due to the potential difficulties for students to attend in person, especially during the COVID-19 pandemic. Having the ability for a student to explore the buildings and locations on a university campus is a crucial part of convincing them to enroll in classes. Many institutions have already installed tour applications that they have either designed themselves or contracted to a third party. However, they lack a convenient way for non-maintainers, such as faculty, to manage and personalize their classrooms and offices in a simple way. In this paper, we propose a platform to not only provide a full virtual experience of the campus but also feature a user-friendly content management system designed for staff and faculty to customize their assigned scenes. The tour uses the Unity3D engine, which communicates to a university server hosting a custom .NET API and SQL database to obtain information about the virtual rooms through a role-based access system to the faculty and staff. We believe this system for managing tour scenes will solve both time and expense for the tour development team and allow them to focus on implementing other features, rather than having to fulfill requests for editing locations in the tour. We expect this framework to function as a tour platform for other universities, as well as small businesses and communities. We seek to demonstrate the feasibility of this platform through our developed prototype application.

Based on small sample testing, we have received overall positive responses and constructive critique that has played a role in improving the application moving forward.

Usability Analysis for Blockchain-based Applications

Sanil Gandhi, Yogesh Patil, Laxman Netak and Harsha Gaikwad
Department of Computer Engineering,
Dr. Babasaheb Ambedkar Technological University, Lonere-Raigad, 402103.

Abstract

In this digitization phase, several new applications are developed by developers and used by end-users to complete their needs. But very few applications remain popular among users depending on the functional working of an application, such as the mobility of the application, its user-friendliness, pop-up advertisements. The Non-functional requirements such as space required in the memory, security aspects fulfill by application, etc. Blockchain Technology is an emerging trend in the market, and many developers are developing enormous applications in various domains. Human-Computer Interaction (HCI) will play a significant role in designing a graphical user interface. In this paper, we will discuss the opportunities and challenges faced by the developers while working on the different projects.

Evaluating Accuracy of the Tobii Eye Tracker 5

Tauheed Khan Mohd, Andrew Housholder, Jonathan Reaban, Aira Peregrino, Jordan Thompson and Georgia Votta
Augustana College, Rock Island, IL 61201, USA

Abstract

Eye-tracking sensors are a relatively new technology and currently has use as an accessibility method to allow those with disabilities to use technology with greater independence. This study evaluates the general accuracy and precision of Tobii eye-tracking software and hardware, along with the efficacy of training a neural network to improve both aspects of the eye-tracker itself. With three human testers observing a grid of data points, the measured and known point locations are recorded and analyzed using over 250 data points. The study was conducted over two days, with each participant performing four trials each. In this study, we use basic statistics and a k-means clustering algorithm to examine the data in depth and give insights into the performance of the Tobii-5 eye-tracker. In addition to evaluating performance, this study also attempts to improve the accuracy of the Tobii-5 eye-tracker by using a Multi-Layer Perceptron Regressor to reassign gaze locations to better line up with the expected gaze location. Potential future developments are also discussed

A comparison of input devices for gaming: Are gamepads still useful in PC environment?

Yunsun A. Hong¹, Soojin O. Peck¹ and Ilgang M. Lee²

Cognitive Engineering Lab, Department of Psychology, Yonsei University, Seoul, Republic of Korea¹

Department of Psychology, Yonsei University, Seoul, Republic of Korea²

Abstract

As the PC has emerged as a new video game platform since its rapid performance progress, the cross-platform compatibility has grown to prominence for developers and designers. Besides, the number of users who want to use their gamepads, which is the conventional input devices of video game consoles, has been gradually increasing. This study was designed to compare the performance and usability of two input devices, the gamepad and the keyboard-mouse setup, the traditional setup used by most PC users, by task type and difficulty level. The goal of this study is to explore the interface design guidelines for each device. In this study, we measured the reaction time for the performance and the perceived workload for usability. The results indicated that the keyboard-mouse setup showed higher performance than the gamepad in general, and that the difference by the difficulty level was intensified in the physical task group. However, this tendency was not found in the cognitive task group. The keyboard-mouse setup also showed lower mental demand and physical demand than the gamepad. This result suggests that designers should not require too many simultaneous inputs when designing interfaces for gamepads, and that users should understand the characteristics of each device, in order to choose the one appropriate for their intended goals.

Evaluation Accuracy of Leap Motion Controller Device

Tauheed Khan Mohd, Anas Akkar, Sam Cregan, Yafet Zeleke, Chase Fahy and Parajwal Sarkar

Augustana College, Rock Island, IL 61201, USA

Abstract

As Human-Computer Interaction has continued to advance with technology, Augmented Virtuality (AV) systems have become increasingly useful and improve our interaction with technology. This article addresses the effectiveness of the Leap Motion Controller at capturing this interaction, as well as present new ways to improve the experience. First, we will present and discuss data from test trials with human input to show how accurately the Leap Motion Controller represents the user's hand motion. This will provide the background information needed to understand our proposal for the potential changes and modifications to the device that would improve the Human-Computer Interaction. This will also provide insight into how implementing deep learning could improve the accuracy of this device. Improving the accuracy of the Leap Motion Controller could lead to an increased usage of the device in games and it could also potentially be used for educational purposes. While it has a long way to go, the Leap Motion Controller could potentially become an incredible source for virtual environments in academia, the world of rehabilitation, and for recreational use.

Session -2 A: Intelligent Interaction and Visualization

Session Chairs:

Dr. Perugu Shyam (National Institute of Technology Waranga, India)

Dr. Preethi Ananthachari (Woosong University, South Korea)

Dr. Perugu Shyam (National Institute of Technology Waranga, India)

Dr. Perugu Shyam pursued his doctoral research and secured Ph.D from University of Hyderabad, Hyderabad, Telangana state, in 2014. He then moved to the School of Information Technology, Jawaharlal Nehru Technological University Hyderabad located in Hyderabad, Telangana as Assistant Professor where he designed and framed the syllabus for M.Tech Bioinformatics(2010-13).

He later served as a Scientist in the Department of Biomedical Informatics Center, National Institute of Nutrition, Hyderabad (2013 - 2018) where he has developed Nutrition Atlas, Count What You Eat, Food-Borne Surveillance Portal, Molecular Property Diagnostic Suite, and developed several tools which were sponsored by the Govt of India and Launched by the Union Health Ministry, India. Currently, he is working as an Assistant Professor in the Department of Biotechnology, NIT Warangal.

Dr Shyam's research interests are in the areas of Machine learning approaches, experimental and computational biology, Systems Biology, computer-aided molecular drug design and discovery. Dr Shyam has made fundamental contributions to the area of non-covalent drug interactions and developed several important concepts in this area. His group is interested in applying the data science approaches, and also developing indigenous software tools for various medical and health applications. Several of his computational predictions have seen experimental realization.

Dr. Preethi Ananthachari (Woosong University, South Korea)

Assistant Professor, Woosong University, South Korea. Research Interests: Mobile Computing, Machine Learning, Chaos Theory, Wireless Sensor Networks etc., 12 years experience. Worked as a Project Fellow under Major Research Project funded by UGC, India. Worked As an Assistant Professor in VIT University, India.

Invited Speaker: Dr. Dimple Kaur (Applied Natya Therapy, USA)

Dr. Dimple Kaur (Ph.D.) is the creator of Applied Natya Therapy, a practicing Psychotherapist and a Master Trainer in Clinical Hypnotherapy. Her pioneering work in integrating the ancient wisdom of Natya Shastra with Modern Psychology, has brought therapeutic benefits for a number of physical, mental, emotional and even spiritual matters. She has been working with various universities as a faculty member in the areas of Behavioral Sciences and Performing Arts. She is the Founding Director of Imatter Institute of Behavioral Sciences and Sumangali Arts, both dedicated to bringing out the human potential using ancient wisdom along with preserving & promoting cultural heritage, and mental well being of people through research in arts and science. She has directed multiple professional dance and theatre productions. Her solo shows Main Amrita, Rape Unreported, Kali Darpanam, Aatm Rati are continuing their tour across India and Abroad.

Dr. Dimple Kaur has been awarded with multiple awards and recognitions including Women's Excellent Achievement Award, Best Woman Performer, Kalpashree West Kensington Award, Nritya Ratna Award, Nritya Tharragai Award, Lasya Mohini Award, National Theatre Excellency Award.

Talk Title: Use of Artificial Intelligence (AI) in Assisting Therapy and Rehabilitation

Abstract

For a long time, we as scientists have been observing physical aspects of body movements and have been successfully imitated it in robots. However, translating the human emotion into machine learning is what is the next frontier of human quest as it will open up significant opportunities in overall health and emotional well being. Let's take the example of myocardial infarction and rehabilitation. We all know that depression or depressed state after myocardial infarction is the largest psychological barrier to rehabilitation. What happens in this psychological barrier is FEAR. Fear of being debilitated, dependent or death. There is no physical pain or ongoing pain but an unseen fear. Till now we have checked all the physical manifestations of this fear like pupil dilation, Heart Rate Variability, Galvanic skin response and many more. We have covered all grounds in identifying the physical manifestations of these mental issues. The question now arises of How do we release them. What is the route of changing the fear? It is not a one step process of informing the patient - if you're feeling scared and I ask you don't feel scared will stop feeling scared ? – that is not a solution to this issue. This cannot be solved with a three-step machine coding as there is lot more going on, which is not physical in nature and has to do with multiple other aspects

Papers:

XRTI: eXtended Reality based Telepresence Interface for Multiple Robot Supervision

Naomi Wang and Jong-Hoon Kim
Advanced Telerobotics Research Lab, Computer Science
Kent State University, Kent, Ohio, 44242, USA

Abstract

The XRTI system is an immersive augmented reality (AR) interface proposed to support the supervision of a robot team by providing a highly optimized and accessible method of robot system monitoring. Its design takes advantage of the augmented reality space to enhance the capacity of a single human supervisor to simultaneously monitor multiple telepresence robots. Its 3D data visualization capabilities use extended reality space to display environmental, sensory, and maintenance data provided by the robot over a wrap-around view to prevent data negligence due to human error. By increasing the accessibility of crucial data, the XRTI system aims to reduce cognitive overload of an on-site supervisor. It provides an interactive interface to assist the user's data comprehension and is customizable to a user's preference to prioritize certain data categories. This research can be further optimized to support NASA's exploration extravehicular mobility units (xEMU) in the AARON (Assistive Augmented Reality Operational and Navigation) System. This paper provides proof of concept for the XRTI system.

A novel methodology for assessing and modeling manufacturing processes: a case study for the metallurgical industry

Jan Reschke¹, Diego Gallego-García², Sergio Gallego-García² and Manuel García-García²
SMS group GmbH, Mönchengladbach 41069, Germany¹
UNED, Madrid 28040, Spain²

Abstract

Historically, researchers and practitioners have often failed to consider all the areas, factors, and implications of a process within an integrated manufacturing model. Thus, the aim of this research was to propose a holistic approach to manufacturing processes to assess their status and performance. Moreover, using the conceptual model, manufacturing systems can be modelled, considering all areas, flows, and factors in the respective areas of production, maintenance, and quality. As a result, the model serves as the basis for the integral management and control of manufacturing systems in digital twin models for the regulation of process stability and quality with maintenance strategies. Thus, a system dynamics simulation model based on the conceptual model is developed for a metallurgical process. The results show how the monitoring of all flows together with the optimal strategies in the quality and maintenance areas enable companies to increase their profitability and customer service level. In conclusion, the conceptual approach and the applied simulation case study allow better decision making, ensuring continuous optimization along the manufacturing asset lifecycle, and providing a unique selling proposition for equipment producers and service engineering suppliers as well as industrial companies.

Pneumonia Classification using Few-Shot Learning with Visual Explanations

Shipra Madan¹, Anirudra Diwakar^{1,1}, Santanu Chaudhury^{1,3} and Tapan Gandhi¹

Indian Institute of Technology, Delhi, India¹
All India Institute of Medical Sciences, Delhi, India²
Indian Institute of Technology, Jodhpur, India³

Abstract

Deep learning models have demonstrated state of the art performance in varied domains, however there is still room for improvement when it comes to learning new concepts from little data. Learning relevant features from a few training samples remains a challenge in machine learning applications. In this study, we propose an automated approach for the classification of Viral, Bacterial, and Fungal pneumonia using chest X-rays on a publicly available dataset. We employ distance learning based Siamese Networks with visual explanations for pneumonia detection. Our results demonstrate remarkable improvement in performance over conventional deep convolutional models with just a few training samples. We exhibit the powerful generalization capability of our model which once trained, effectively predicts new unseen data in the test set. Furthermore, we also illustrate the effectiveness of our model by classifying diseases from the same genus like COVID-19 and SARS.

User Experience Design for Defense Systems with AI

Sunyoung Park¹, Hyun K. Kim^{1,2}, Yuryeon Lee¹, Gyuwon Park² and Danbi Lee²

Department of Artificial Intelligence Convergence
Kwangwoon University, 20 Kwangwoon-ro, Nowon-gu, Seoul 01897, Korea¹

School of Information Convergence
Kwangwoon University, 20 Kwangwoon-ro, Nowon-gu, Seoul 01897, Korea²

Abstract

As artificial intelligence (AI) is applied at an increasing frequency in various fields, the number of studies on the user experience (UX) design of human-AI interaction is also increasing. However, the results of these studies on AI UX design principles are insufficient for actual AI systems. In light of this fact, the purpose of this study was to upgrade the UX design of a defense system that uses AI technology to detect land changes and targets. In order to upgrade the UX design of this AI system, a three-step procedure was executed. First, AI UX principles were derived by analyzing literature related to human-AI interaction. Second, ideation was performed to improve the interface. Finally, the results of the ideation were utilized to construct the UX prototype of the AI system with Adobe XD. The results of this study are expected to be used as fundamental data for future research that will develop UX principles and advanced methods for AI systems.

Multilayer Tag Extraction for Music Recommendation Systems

Sameeksha Gurrala, Naagamani Molakathaala, Shankhanil Ghosh, Yashasvi R P, Sayan Das, Jageet Suryawanshi, Pralhad Kolambkar, Pranay Raj, Amarjeet Kumar, Rajesh Thalla and Sri Harsha Navundru

School of Computer and Information Sciences, University of Hyderabad

Abstract

With hundreds and thousands of songs being added to online music streaming platforms everyday, there is a challenge to recommend songs that the users decide to hear at any given time. Classification of songs plays a vital role in any recommendation system and when it comes to Indian music, there are a lot of parameters to be taken into consideration. The proposed paper takes into account this task and through recent advancement in data processing and signal processing, we have tried to use classification processes on Indian music based on various parameters. These parameters include metadata of music, sentimental values, as well as technical features. India being a diverse country with multiple culture values, is home to variety of local music. At various instances, these various classification parameters play significant roles especially when local music is involved in the process of recommendation. Classifying Indian music based on such parameters will lead to better results and also aid to be an improvement in recommendation system for Indian music.

Interactive Visualization and Capturing Geo-Coded Multimedia Data on Mobile Devices

Deepshikha Bhati¹, Md Amiruzzaman², Suphanut Jamonnak¹ and Ye Zhao¹

Kent State University, Kent, OH 44242, USA¹
West Chester University, West Chester, PA 19383, USA²

Abstract

In digital community applications, geo-coded multimedia data including spatial videos, speech, and geo-narratives are collected and utilized by community users and researchers from multiple fields. It is often preferred that these data can be captured, visualized, and explored directly on mobile phones and tablets interactively. In this paper, we present a Geo-Video Mobile Application (GVM App) that collects geo-coded multimedia data for experts to process and analyze over an interactive visual exploration. This mobile App integrates user interactivity, AI-based semantic image segmentation, and audio transcription for effective data extraction and utilization. Then visualization functions are designed to quickly present geographical, semantic, and street view visual information for knowledge discovery. The users of this tool can include community workers, teachers, and tourists, and also span across multiple social disciplines in digital humanity studies.

Session -2 B: Cognitive Learning Analytics

Session Chairs:

Dr. Arvind W Kiwelekar (Dr Babasaheb Ambedkar Technological University-Lonere, India)

Dr. Julio Ariel Hurtado Alegria (University of Cauca, Colombia)

Dr. Roopak Tamboli, (Saarland University, Germany)

Dr. Arvind W Kiwelekar (Dr Babasaheb Ambedkar Technological University-Lonere, India)

Arvind W Kiwelekar is working as a Professor in Computer Engineering at Dr Babasaheb Ambedkar Technological University (DBATU) Lonere, India. He has thirty years of teaching and research experience. His research areas of interest include diverse topics, including Artificial Intelligence, Blockchain Technology, ICT for Sustainable Development (ICT4SD), Learning Analytics, Machine Learning, Ontological Modelling, and Software Architecture. He has published several book chapters, journal papers and research papers in peer-reviewed leading international conferences. He received research fellowships from IBM, the Indian Academy of Sciences and MHRD.

He is graduated with PhD (2012) from the Indian Institute of Technology Bombay, ME from VJTI (1999) and B E (1991) from Marathwada University. He has been the founder Head of the Department of Computer Engineering at DBATU for twenty years. He has also served as the Registrar. He also served for a short duration on research projects at C-DAC and TIFR.

He received grants to establish Teachers Training Center at DBATU from the Indian Ministry of Education and establish industry-sponsored research programs from ATA Freight. The alumni of DBATU has constituted an award naming after him the 'AWK prize' to recognize his dedicated efforts for teaching at DBATU.

Dr. Roopak Tamboli, (Saarland University, Germany)

Roopak R. Tamboli, is a postdoctoral researcher advised by Prof. Dr.-Ing. Thorsten Herfet at Saarland University, where he works on semantic analysis of light field media. He received his PhD degree from Indian Institute of Technology Hyderabad (IITH) in 2020. Prior to this, Roopak received his Master's degree (M.Tech) in 2015 from IITH and a Bachelor of Engineering (B.E.) degree (2010) Walchand College of Engineering Sangli, Maharashtra, India.

His work includes generation of multiview content, true-to-scale 3D reconstruction from 2D views, subjective and objective methods for assessing perceptual quality of super-multiview content visualized on projection-based lightfield (LF) displays. Previously, he explored sparse representations and compressed sensing of electrocardiogram signals.

Invited Speaker: Dr. Prasad Onkar (Indian Institute of Technology Hyderabad, India)

Dr. Prasad S. Onkar is an Assistant Professor in the Department of Design, Indian Institute of Technology Hyderabad, India. Prior to this, he was Assistant Professor at Department of Design at Indian Institute of Technology Guwahati, India. He was also a Visiting Researcher (Erasmus-Mundus HERITAGE Fellow) at Virtual Prototyping Lab in the Department of mechanical Engineering at Politecnico di Milano, Milan, Italy. He completed his PhD in Computer-Aided Conceptual Design from Centre for Product Design and Manufacturing (CPDM), Indian Institute of Science Bangalore, India. He holds Master of Technology (M. Tech.) degree in Product Design and Manufacturing from

Visvesvaraya Technological University, Belgaum, Karnataka, India, and Bachelor of Engineering (B. E.) degree in Mechanical Engineering from Karnatak University, Dharwad, Karnataka, India. His research Interests are in Virtual Reality, Haptics, Interaction Design, Product Design, 3D Printing, Affect-Cognition interaction, Design Innovation, etc

Talk Title:

Virtual Reality and Haptic Technologies for Enhancing Cognitive Learning of Children

Abstract

Abstract. Advanced interfaces like Virtual Reality (VR) and haptics have been greatly influencing the way the educational content is being disseminated. Literature presents explorations of VR and haptic based interactive systems for educational contexts. But their influence on cognitive and affective responses are still being explored. In this context, case studies are presented on cognitive learning concepts and affective responses like spatial awareness, mental rotation, immersion and gestural interactions of school children in India. One of the case studies provides insights into the spatial perceptions of children in the age group of 9-10 years through 360° image, VR environment, experienced through cardboard Head Mounted Display (HMD). Other case studies emphasize the role of haptics in cognitive development through transformation of 3D shapes, and affective responses to immersive VR content. These case studies provide possible directions of research in both development of novel interfaces and their impact on cognitive and affective development of children.

Papers:

A Cognitive Assessment of MOOC learners through EEG Analysis

Varsha Lokare, Laxman Netak and Narendra Jadhav

Department of Computer Engineering,
Dr Babasaheb Ambedkar Technological University
Lonere-Raigad 402103 India

Abstract

Massive Open Online Courses (MOOCs) are becoming increasingly popular in recent years. In a virtual world, examining the cognition processes of the students is a real hassle. The primary goal of this study is to examine the influence of MOOCs on learning. This study presents a Cognitive Model based on brain signals for predicting the most effective MOOCs video lecture. In this work, students' brain signals collected using an Electroencephalogram (EEG) device while watching MOOCs videos are used to classify their level of confusion using a publicly available dataset. The video that causes the least amount of confusion in the majority of students has been chosen as the best. This paper proposes and analyses the Cognitive Model for MOOCs Learning. A Deep Learning-based Artificial Neural Network Model has been created to predict student confusion levels. The methodology has been built using 10K fold cross-validation and shown to be 97 % accurate in predicting students' misunderstandings while watching MOOCs videos. The proposed Cognitive Model will aid in the evaluation of MOOCs course performance.

Research of the Deep Learning Model for Denoising of ECG Signal and Classification of Arrhythmias

Ji-Yun Seo¹, Yun-Hong Noh² and Do-Un Jeong¹

¹Dongseo University, 47 Jurye-ro, Sasang-gu, Busan 47011, Korea¹

Busan Digital University, 57 Jurye-ro, Sasang-gu, Busan 47011, Korea²

Abstract

In this paper, we propose a DL model that can remove noise signals and classify arrhythmias for effective ECG analysis. The proposed DL model removes noise included in the signal by inputting the ECG signal divided by a specific time into the DAE, and inputs the noise-removed signal to the CNN model to distinguish the normal ECG signal from the arrhythmic ECG signal. The model was trained using the MIT-BIH Arrhythmia DB and the MIT-BIH Noise Stress Test DB, and the performance of the DL model was evaluated with two experiments by constructing a separate evaluation data set that is not used for training. The first experiment compared the noise removal performance of the implemented DAE model and PanTompkins' QRS detection algorithm, and the second experiment performed the classification performance evaluation of the implemented CNN model. As a result of performance evaluation of the proposed DAE model, SNR_imp was 9.8310, RMSE was 0.0446, and PRD was 20.8869. In addition, as a result of classification performance evaluation, the accuracy was 98.50%, the recall rate was 98.0%, the precision was 98.99%, and F1 was 98.50%.

Validating Pre-Requisite Dependencies through Student Response Analysis

Manjushree D. Laddha, Swanand Navandar and Laxman Netak

Department of Computer Engineering
Dr. Babasaheb Ambedkar Technological University
Lonere, Raigad-402103, India

Abstract

Students in the examination are not able to solve the complex skill problem because of forgetting the basic skills or not mastery in basic skill or infrequent use. Students also have problems with advanced courses due to weakness with basic skills. One of the challenges for an instructor is to find the reason why students are not able to solve complex skill problems. The reason may be a lack of prerequisite skills or has not mastered the complex skill or some combination of both. This paper presents the dependencies of prerequisite skills on the post requisite skills. Three assessments are conducted. The assessments is designed based on the skills required for the computer programming course. Basic assessments is a prerequisite to the intermediate skill assignment. Both these assessments are prerequisites to the complex skills assessments. Based on the students' responses, the analysis is carried out. As these variables are the categorical type of variables for that purpose Chi-Squared test is applied. It is observed that there is a statistically significant dependency is present between prerequisite skills and post requisites skills.

Application of VR to the Educational System of South Korea

Yeun Soo Choi, Mingeon Kim, Ahhyun Ryu, Seowon Park and Sunwoo Kim

Cogito Research, Seoul, Republic of Korea (South Korea)

Abstract

Since the breakout of Covid-19, the number of online classes skyrocketed as conducting in-person classes in school has been discouraged. This led to the sudden shift into the adaption of online classes, blurring the line between traditional in-person classes and modern technology. In the Republic of Korea, the nation where it is known for its speed of Internet and high rate of digital natives amongst its citizen, there have been numerous attempts to incorporate virtual reality (VR) into the existing curriculum but has not been getting satisfactory results back. Through interviews and research, this paper tries to assess the current position of VR in the marketplace and suggest possible solutions that can support the expansion of the system into the school. The main purpose of this essay is to analyze whether Google Arts and Culture, one of the most accessible VR assimilated educational platforms, can be blended into the Korean education programs.

Architectural view of non-face-to-face experiential learning through the immersive technologies

Vinayak Mukkawar¹, Laxman Netak¹ and Valmik Nikam²

Department of Computer Engineering
Dr. Babasaheb Ambedkar Technological University
Lonere, Raigad-402103, India¹

Department of Information Technology
Veermata Jijabai Technological Institute
Mumbai-400019, India²

Abstract

The significant disruption caused by the COVID-19 pandemic prohibits the face-to-face teaching-learning process. This pandemic forced the students to utilize online i.e. non-face-to-face mode of education via different platforms available on the internet. The use of the internet allows students to use e-learning resources to learn things from anywhere and at any time. The ease of use makes these systems more favorable amongst the learner. The traditional way of face-to-face teaching-learning with the utmost learning rate is no longer beneficial in the pandemic situation. Many of the teaching institutes use online aids for content delivery. No doubt, all these platforms are far better to provide knowledge and educate the students, but these platforms do not focus on the active participation of students in an online class like teacher observe the students concentration in a physical classroom. Monitoring the engagement of students in the online mode of education seems to be difficult, but can be achieved through the use of immersive technology. This paper provides an architectural view of the online teaching-learning system with the use of Virtual Reality to achieve better engagement of students in the virtual classroom through immersion.

Simulation model of a spare parts distribution network in the Airline Industry for reducing delays and improving service levels: a Design of Experiments Study

Javier Gejo-García, Diego Gallego-García, Sergio Gallego-García and Manuel García-García

UNED, Madrid 28040, Spain

Abstract

Currently, delays are the most common cause of airline disputes. One of the factors leading to these situations is the distribution of spare parts. The efficient management of the spare parts distribution can reduce the volume of delays and the number of problems encountered and therefore maximize the consumer satisfaction levels. Moreover, airlines are under pressure due to their tight competition, a problem that is expected to grow worse due to the COVID-19 pandemic. By carrying out efficient maintenance and distribution management along the supply chain, authorities, airlines, aircraft manufacturers, and consumers can obtain various benefits. Thus, the aim of this research is to perform a design of experiments study on a spare parts distribution network simulation model for the aviation industry. Based on this model, the effect of the input parameters and their interactions can be derived. Moreover, the findings are converted to a combined methodology based on simulation and design of experiments for the design and optimization of distribution networks. This research study thereby provides an approach to identify significant factors that could lead to a better system performance. In conclusion, this proposed approach enables aircraft maintenance systems to improve their service by minimizing delays and claims, reducing processing costs, and reducing the impact of maintenance on customer dissatisfaction.

Session -3 A: HCI in E-Health Monitoring and Management

Session Chairs:

Dr. Suzana Brown (State University of New York-Korea (SUNY Korea), South Korea)

Dr. Mark D. Whitaker (State University of New York-Korea (SUNY Korea), South Korea)

Dr. Suzana Brown (State University of New York-Korea (SUNY Korea), South Korea)

Professor Suzana Brown is currently an Assistant Professor at the Department of Technology and Society at SUNY Korea. Professor Brown holds a Ph.D. in Interdisciplinary Telecommunications from the University of Colorado in Boulder, USA. Her interdisciplinary research explores how modern telecommunications influence business models and contribute to sustainable development. She works in the area of Assistive technology, Health and mobile technology, Internet of things (IoT), ICT for Development and Refugee Entrepreneurship. Dr. Brown taught at universities in the USA, Rwanda, and South Korea

Dr. Mark D. Whitaker (State University of New York-Korea (SUNY Korea), South Korea)

Dr. Mark D. Whitaker (PhD, Sociology, UW-Madison, USA, 2008) is an Assistant Professor of Environmental Sociology and author of two books (Toward a Bioregional State (2005), and Ecological Revolution (2009)). He has lived and worked in Korea for 12 years, teaching at 3 universities. He has given keynote addresses (International Conference on the Smart City and Future of Human Community) and won research awards from the US National Science Foundation, the Korean Science Foundation, and currently the Korean National Research Foundation (2020-2023) in support of his global online sustainability project called Commodity Ecology that blends sustainability foresight, virtual and real civic participation, business incubation, and a more democratic risk assessment. From 2015, he teaches at the Department of Technology and Society, Stony Brook University, SUNY Korea, Songdo, Incheon. Toward sustainability, he researches interactions between environment, technology/materials, and society in modern states. Additionally, he employs comparative historical methods for what can be learned about our long-term chosen patterns of environmental problems and sustainability via deeper historical analysis. In 2019, he presented at the United Nations Secretariat in New York City and the Asian Development Bank in Manila, Philippines, about his model for sustainability called Commodity Ecology (prototype: <https://commoditywheel.softlabsgroup.in>), a mobile virtual community platform to achieve the SDGs by reaching instantly and cheaply a public of over 5 billion mobile phones as of 2019. The United Nations Academic Impact Office (UNAI) ranked “Commodity Ecology” as first in a list of applied implementation models for SDG #12 (Ensure sustainable consumption and production patterns), and was the only idea in the category with its own UNAI.

Invited Speaker: Dr. Jan-Willem van 't Klooster

Dr. ir. Jan-Willem van 't Klooster is managing director of BMS Lab, the innovation lab of the Faculty of Behavioural, Management and Social sciences (BMS) at the University of Twente. He is responsible for the lab staff of 12 FTE, over 600 m2 lab spaces, a mobile laboratory, and over 200 project requests from researchers on a yearly basis in (mainly ICT-mediated) behavioural science innovation. He has coordinated multiple national and European projects and work packages, including EFRO, EU, and EIP AHA research projects. He obtained a PhD in health informatics in 2013 on personalized sensor- and actuator-based e-health services and has (co)authored over 30 journal and conference publications.

Talk Title:

Studying the Future of Work

Abstract

The convergence of 3-D user interface technologies, such as Augmented- and Virtual Reality, AI, and Internet of Things, leads to novel ways of working and fast opportunities to innovate both daily (remote) working life and research-over-distance. In the current timeframe, this is more needed than ever. In this context, the innovation lab of the Faculty of Behavioural, Management and Social sciences (BMS) at the University of Twente provides a platform infrastructure with a plethora of opportunities to experiment and test new paradigms. In this presentation, we will explore these paradigms and demonstrate appealing examples.

Papers:

Three Decision Points Towards Vetting a More Ideal Online Technical Platform for Monitoring and Treating Mental Health Problems Like Depression and Schizophrenia

Mark Whitaker, Nara Hwang, Durdonakhon Usmonova, Kangrim Cho and Nara Park
State University of New York, Korea (SUNY Korea), Incheon, Songdo, South Korea

Abstract

To improve Information Communication Technology for Development (ICT4D) in e-health applications means getting the maximum advantage at the minimum cost to purveyors and consumers. This is a conceptual and empirical paper arguing three informed decision points, taken in order, should happen whenever maximizing advantages of health diagnostics and/or treatment facilitation via online platforms. Three kinds of data are important to know beforehand to create informed decisions to maximize beneficial uses of online technology to aid mental health: (1) how do you define the etiology of mental health problems; (2) how do you define who should be helped as a priority, and (3) how do you make decisions technically to fit the former two points? Since serving patients is more important than technical profiteering, these three critical decision points mean primary medical choices of diagnosis and secondary social demographic research should guide a more conditioned tertiary technical use, instead of vice versa that regularly leads to cutting patients to fit a predetermined and thus misaligned technological investment. Due to limitations of space, only the third vetting point is analyzed in detail. The current state of the art for how to reach patients best via Internet-connected technologies for monitoring and treating depression and

schizophrenia is analyzed. Policy advice on platform design is given from this vetting procedure that might later be scaled worldwide.

AI based Convenient Evaluation Software for Rehabilitation Therapy for Finger Tapping Test

Seung-min Hwang¹, Sunha Park², Na-yeon Seo³, Hae-Yean Park³ and Young-Jin Jung^{1,4}

Interdisciplinary Program of Biomedical Engineering, Chonnam National University¹
Yeosu-si, Republic of Korea

Occupational Therapy Graduate School, Yonsei University, Won-Ju, Republic of Korea²

Depf. of Occupational Therapy, Yonsei University, Won-Ju, Republic of Korea³

School of Healthcare and Biomedical Engineering, Chonnam National University⁴

Abstract

Among the clinical features of Parkinson's disease, It's important to evaluate Bradykinesia. In order to evaluate Bradykinesia, a Finger Tapping Test included in the kinematic test item on the Unified Parkinson's Disease Rating Scale is employed. For the accuracy of evaluation, there is a need for a tool that can perform a Finger Tapping Test based on quantitative data. In this study, An AI based novel approach to evaluate a human motion function quantitatively was suggested and demonstrated for use of rehabilitation therapy using Mediapipe. For a preliminary experiment, the finger tapping test was employed to evaluate its clinical utilization. The developed software showed results that were very consistent with the expert's evaluation opinion. The AI based developed software showed the high potential for clinical use as a quantitative evaluation tool that is cost-effective & easy to use.

A Smart Wearable Fall Detection for Firefighters using V-RNN

Xiaoching Chai¹, Boon Giin Lee¹, Matthew Pike¹, Renjie Wu¹ and Wanyoung Chung²

Human-Computer Interaction Laboratory, School of Computer Science, University
of Nottingham Ningbo China, Ningbo, China¹

Department of Electronic Engineering, Pukyong National University, Korea²

Abstract

Falling is one of the leading causes of death among firefighters in China. Fall detection systems (FDS) have yet to be deployed in firefighting applications in China, negatively impacting the safety of firefighters in the fire-ground. Despite many studies exploring FDSs, few have explored the application of multiple sensors, or applications outside of geriatric healthcare. This study proposes a smart wearable FDS for detecting firefighter falls by incorporating motion sensors in nine different positions on the firefighter's personal protective clothing (PPC). The firefighter's fall activities are detected by a proposed RNN model combined with a Boyer-Moore Voting (BMV) Algorithm (V-RNN) and a fall alert can be issued at an early phase. The results indicated that the proposed FDS with optimized parameters achieves 97.86% and 98.20% in sensitivity and accuracy, respectively.

CycleGAN based Motion Artifact Cancellation for Photoplethysmography Wearable Device

Long Nguyen¹, Jong-Jin Kim², Boon-Giin Lee³ and Wan-Young Chung¹

Department of AI Convergence, Pukyong National University, South Korea¹

Department of Electronic Engineering, Pukyong National University, South Korea²

School of Computer Science, University of Nottingham Ningbo China, Ningbo, China³

Abstract

Motion artifacts (MA) in photoplethysmography (PPG) signals is a challenging problem in signal processing today although various methods have been researched and developed. Using deep learning techniques recently has demonstrated their performance to overcome many limitations in traditional ones. In this study, we develop a protocol to build the PPG dataset and a cycleGAN-based model which can use to remove MA from PPG signals at the radial artery. We verified that the assumption of noisy PPG signals is a linear combination of clean PPG and accelerator (ACC) signals is not strong enough. Our evaluation of the CycleGAN model for reconstructing PPG signals at the radial artery which consisted of two opposite phases was feasible but the quality of signals needs more further research.

Analysis on the Possibility of Telehealth on its Further Extension and Possible Limitations

Yeun Soo Choi, Mingeon Kim, Ahhyun Ryu, Seowon Park, Jason Kim and Seongbin Lee

Cogito Research, Seoul, Republic of Korea (South Korea)

Abstract

The popularization of medical devices in households and video calls during the COVID-19 pandemic have set grounds for the necessary conditions for telehealth to thrive. This allowed for patients with chronic diseases to be treated without the need for physical contact with a clinician and to access professional medics regardless of time. However, due to concerns for the safety of sensitive data of patients and both the quality and accuracy of medical treatment provided, telehealth was and is set to become strictly regulated. Finding the necessary technologies to facilitate mobile medical treatment as a viable option for those who struggle with attaining physical presence in hospitals is, therefore, necessary to maintain telehealth. This research aims to conduct user research on how to improve telehealth services to better serve the elderly population.

Session -3 B: Machine Learning for HCI

Session Chairs:

Dr. Surya Kanth V Gangasetty (KL University, India)

Dr. Nagamani Molakatala (University of Hyderabad, India)

Dr. Surya Kanth V Gangasetty (KL University, India)

Dr. Suryakanth V Gangashetty is a faculty member at KL University Green Field Vaddeswaram, Guntur District, and Andhra Pradesh, India. He has completed his PhD (in Neural Network Models for Recognition of Consonant-Vowel Units of Speech in Multiple Languages) from IIT Madras in 2005. Before joining to KL University, he has worked as a member of faculty at IIIT Hyderabad, Telangana, from 2006 to 2020. Previously he has worked as a Senior Project Officer at Speech and Vision Laboratory, IIT Madras. He has worked as a member of faculty at BIET Davangere Karnataka, from 1991 to 1999. He has also worked as a visiting research scholar at OGI Portland (USA) for three months during the summer of 2001. He has done his post-doctoral studies (PDF) at Carnegie Mellon University (CMU) Pittsburgh (PA, USA) during April 2007 to July 2008. He is a author of about 150 papers published in national as well as international journals, conferences, and edited volumes. He is a life member of the CSI, IE, IUPRAI, ASI, IETE, ORSI, and ISTE. He has reviewed papers for reputed journals and conferences. His research interests include Speech Processing, Neural Networks, Machine Learning, Natural Language Processing, and Artificial Intelligence. He was local Organizing Chair for the INTERSPEECH-2018 conference which has happened in India in September 2018 held at Hyderabad.

Dr. Nagamani Molakatala (University of Hyderabad, India)

Dr. Nagamani Molakatala did her Ph.D from University of Hyderabad 2019. She is working as Senior Assistant Professor in School of Computer and Information Sciences from University of Hyderabad since 2007. Previously she worked as Police Communication with job profile of handling and maintenance of Communication devices and system. Her Research Interest in IOT, Cognitive Science, Speech and Computer Vision, Musicology and Agricultural research through Technology.

Invited Speaker: Dr. Chakravarthy Bhagvati (University of Hyderabad, Inida)

Dr. Chakravarthy Bhagvati is currently the Dean of the School of Computer and Information Sciences at University of Hyderabad. His research interests are image processing, pattern recognition and deep learning. He published more than 75 papers in refereed conferences and journals. He also works with the School of Medical Sciences in investigating the impact of colour vision deficiencies on the ease of use of popular user interfaces and multimedia design. Dr. Chakravarthy Bhagvati received his PhD in Computer Science from Rensselaer Polytechnic Institute, Troy (NY, USA) and M. Tech in Computer Science from University of Hyderabad. He received his B. Tech in Electronics and Communications Engineering from Jawaharlal Nehru Technological University. He also spent about 5 years working in industry before joining University of Hyderabad in 1998. Dr. Chakravarthy Bhagvati worked on an OCR sytem for Telugu and is currently developing an LSTM-driven OCR system for high accuracy on degraded documents. His research scholars are also working on Telugu offline handwriting recognition. He has successfully supervised 12 PhDs and more than a 100 Masters students. In addition to his academics, he is a member of the Association of Hyderabad Amateur Astronomers (AHAA) and is an avid amateur astronomer.

Talk Title:**Study of Cultural and Technological Aspects of Colour Vision using Deep Learning****Abstract**

Colour is a fundamental feature of human vision system. Colour plays a very important role in human life from its use in the arts to its therapeutic uses. The science of colour is equally interesting and in his book, Kurt Nassau, talks about "fifteen causes of colour" showing its widespread influence in everyday life.

It is natural for Computer Scientists to study colour from an AI perspective given the popularity of AI today. The current revolution can be said to have started with the development of "Deep Learning" which itself was first applied to image processing and colour imagery. However, AI and deep learning have focussed more on image processing and pattern recognition applications than on the study of colour itself.

In today's talk, we look at what colour is and how AI can help gain a better understanding of colour. How do we study the cultural aspects of colour? Why do we perceive certain colours as "positive" and others as "negative"? Why do some colours soothe our feelings? How do we design experiments to deal with such questions?

Finally, we look at the solutions that a study of colour provides us. We look at designing spectacles (eye-glasses) that can improve certain vision impairments such as colour-blindness, tunnel vision caused by glaucoma, the inability to focus on objects at certain distances or in the periphery, etc.

Papers:**Using Mask-RCNN to identify defective parts of fruits and vegetables**

Raghunandan Suddapalli and Perugu Shyam

National Institute of Technology, Warangal, India

Abstract

Fruits and vegetables are a major source of food for humans after cereals. Since the evolution of civilizations, they have been gathered, cultivated and modified according to our needs. During the process of modification and harvesting, there might be diseased variants that are unfit for consumption. Manual removal/segregation of the diseased fruits and vegetables is a time consuming process on a large scale, which could be automated in the near future with the help of artificial intelligence. This could be done by training a machine, using machine learning algorithms, to recognize which fruits and vegetables are fit for consumption and which ones are not, with the help of an annotated dataset. The goal of this study is to introduce a dataset that contains 11 classes of fruits and vegetables that are annotated for instance segmentation tasks and the effectiveness of the dataset in simplifying quality testing and analysis. This paper begins by explaining the usage of Mask-RCNN algorithm, and then explains the properties of the dataset and further discusses the areas of application where the dataset can be used.

Attitude Control for Fixed-Wing Aircraft using Q-Learning

David Richter¹, Lance Natonski¹, Xiaxin Shen² and Ricardo Calix¹

Purdue University Northwest, Hammond IN 46323, USA¹

Purdue University, West Lafayette IN 47907, USA²

Abstract

In recent years, there have been many advances in the field of Reinforcement Learning (RL). RL algorithms have achieved human master abilities in games such as Go, chess, Atari games, etc. The capabilities of RL algorithms have also now been tested in the automated transportation field for self-driving cars and aerial vehicles, where they are used to aid drivers and pilots in various situations. In this paper we apply reinforcement learning models to simulated airplane flight. In particular, we develop and test a reinforcement learning based methodology for airplane stabilization. In essence, through reward functions and Q-Learning based modeling, we analyzed and evaluated how a trained agent can control a simulated Cessna 172 to stabilize itself while in flight. Our results show that, after training, the agent learns to achieve a stable attitude for the airplane. We perform the experiments using QPlane, which incorporates two flight simulators (X-Plane 11 and JSBSim). X-Plane 11 and JSBSim are both realistic flight simulators, independently developed. The trained agent will be trained in JSBSim and tested in both simulators. Results of the analysis are presented and discussed.

Exploiting Federated Learning Technique to Recognize Human Activities in Resource-Constrained Environment

Ahmed Imteaj^{1,2}, Raghad Alabagi³ and M. Hadi Amini^{1,2}

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International University, Miami, FL 33199, USA¹

Sustainability, Optimization, and Learning for Inter Dependent Networks
Laboratory (solid lab), FIU, Miami, FL, 33199, USA²

University of Arizona, 1040 4th St, Tucson, AZ 85721, USA³

Abstract

The conventional machine learning (ML) and deep learning (DL) methods use large amount of data to construct desirable prediction models in a central fusion center for recognizing human activities. However, such model training encounters high communication costs and leads to privacy infringement. To address the issues of high communication overhead and privacy leakage, we employed a widely popular distributed ML technique called Federated Learning (FL) that generates a global model for predicting human activities by combining participated agents' local knowledge. The state-of-the-art FL model fails to maintain acceptable accuracy when there is a large number of unreliable agents who can infuse false model, or, resource-constrained agents that fails to perform an assigned computational task within a given time window. We developed an FL model for predicting human activities by monitoring agent's contributions towards model convergence and avoiding the unreliable

and resource-constrained agents from training. We assign a score to each client when it joins in a network and the score is updated based on the agent's activities during training. We consider three mobile robots as FL clients that are heterogeneous in terms of their resources such as processing capability, memory, bandwidth, battery-life and data volume. We consider heterogeneous mobile robots for understanding the effects of real-world FL setting in presence of resource-constrained agents. We consider an agent unreliable if it repeatedly gives slow response or infuses incorrect models during training. By disregarding the unreliable and weak agents, we carry-out the local training of the FL process on selected agents. If somehow, a weak agent is selected and started showing straggler issues, we leverage asynchronous FL mechanism that aggregate the local models whenever it receives a model update from the agents.

Asynchronous FL eliminates the issue of waiting for a long time to receive model updates from the weak agents. To the end, we simulate how we can track the behavior of the agents through a reward-punishment scheme and present the influence of unreliable and resource-constrained agents in the FL process. We found that FL performs slightly worse than centralized models, if there is no unreliable and resource-constrained agent. However, as the number of malicious and straggler clients increases, our proposed model performs more effectively by identifying and avoiding those agents while recognizing human activities as compared to the state-of-the-art FL and ML approaches.

KeyNet: Enhancing CyberSecurity with deep learning-based LSTM on keystroke dynamics for authentication

Jayesh Soni and Nagarajan Prabakar

Knight Foundation School of Computing and Information Sciences
Florida International University, Miami, FL, USA

Abstract

Currently, everyone accumulates, stores, and processes their sensitive data on computers which makes it essential to protect computers from intrusion. Several approaches employ biometric data such as voice, retinal scan, fingerprints, etc., to enhance user authentication. There is an added overhead of sensors needed to implement these biometric approaches. Instead, an improved and strong password authentication would be cost-effective and straightforward. Keystroke dynamics is the analysis of temporal patterns to validate user authenticity. It is a behavioral biometric that makes use of the typing style of an individual and can be used to enhance the current authentication security procedures efficiently and economically. Such a behavioral biometric system is fairly unexplored compared to other behavioral verifications models. In this study, we focus on applying and training deep learning approach based Long Short Term Memory (LSTM) algorithm in an optimized way to validate temporal keystroke patterns of users for improved password authentication. Our research shows an enhanced authentication rate for the keystroke dynamic benchmark dataset.

Modeling human decision-making delays and their impacts on supply chain system performance: a case study

Diqian Ren, Diego² Gallego-García¹, Salvador Pérez-García¹, Sergio Gallego-García¹ and Manuel García-García¹

UNED, Madrid 28040, Spain¹

University of Dayton, 45469 Dayton, OH, United States¹

Abstract

The interaction between computer systems and humans is largely driven by the decision-making process of human beings. In the interaction process, delays are frequently unseen and therefore unforeseen, and their impacts are not considered as losses or as potential areas for improvement. As a result, the goal of this paper is to design a conceptual model to calculate delays impacts in decision-making interactions between humans and computerized systems. The model considers the sum of delays that occur due to various reasons; these include human delays, interface delays, and computer delays. Moreover, the conceptual model is applied in a supply chain system in which different human decisions interact with the digital planning model of an automotive manufacturer. The purpose of the simulation model is to quantify the loss and improvement potentials depending on the decision process delays in capacity measures in strategic, tactical, and operational planning horizons based on a defined target system. The results obtained show how delays significantly affect the supply chain performance. Finally, a methodological approach is presented for assessing the impacts of the delays in a sensitivity analysis.

Session -4 A: Educational Applications of Interactive Computer Systems

Session Chairs:

Dr. Nagarajan Prabakar (Florida International University, USA)

Dr. Elena Novak (Kent State University, USA)

Dr. Jong-Hoon Kim (Kent State University, USA)

Dr. Nagarajan Prabakar (Florida International University, USA)

Nagarajan Prabakar received the M.Eng. degree in automation from the Indian Institute of Science, Bangalore, and the PhD degree in Computer Science from the University of Queensland, Brisbane, Australia. He is currently an associate professor in the School of Computing and Information Sciences at Florida International University, Miami, USA. His research interests include machine learning-based object detection, anomaly detection for system security, and distributed optimization for real-world problems.

Dr. Elena Novak (Kent State University, USA)

Elena Novak is an Associate Professor of Educational Technology at Kent State University. She earned her Ph.D. in Instructional Systems and Learning Technologies from Florida State University in 2012. Her research examines the intersections of design, technology, and learning. Elena's current projects focus on learning technologies such as 3D printing, social robotics, video games, and game-like learning environments as well as computer science education, design thinking and creativity. Her research aims to provide educators with research-informed guidelines on how to integrate technology in various educational settings. She designs curricula, assessments, and tools to support and evaluate students' learning and creativity. Elena's recent collaboration with the Department of Computer Science has led to the development of the Computer Science endorsement at Kent State University and \$2,000,000 grant from the Ohio Department of Higher Education to support computer science education at Kent State University. Her research has been recognized with several international awards sponsored by the American Educational Research Association as well as Association for Educational Communications and Technology.\

Dr. Jong-Hoon Kim (Kent State University, USA)

Jong-Hoon Kim is an assistant professor of Computer Science and a director of the Advanced Telerobotics Research Laboratory at Kent State University. He received his Ph.D in Computer Science from Louisiana State University on December 2011. He has over 54 peer-reviewed publications and one US Patent. Throughout his years as a researcher, he has been awarded over \$12M grants as a PI, Co-PI, or SI. Dr. Kim has over 8 years academic experience and 6 years industry experience for companies such as IBM. Over 400 worldwide media coverage on TeleBot Research. His research interests are immersive telepresence through hybrid reality (VR, AR, and MR), Intuitive & ergonomic interface design, Efficient co-design of hardware/software in embedded systems for a low-cost robot, Analysis of emotional and affective behavioral

aspects of robot-human interactions, Incorporation of artificial intelligence for assisting smart teleoperations, Management system framework for secure and accountable teleoperations and virtual experiences, Human-Robot Interaction through decentralized & distributed platforms such as smart contracts in Blockchain technology, and Tangible coding education for children

Papers:

Smart Puppet Theatre for Coding Education

Raghav Kasibhatla, Saifuddin Mahmud, Redwanul Haque Sourave, Marcus Arnett and Jong-Hoon Kim

Advanced Telerobotics Research Lab, Computer Science
Kent State University, Kent, Ohio, 44242, USA

Abstract

Many efforts have failed to achieve tangible models of a robotic theatre, as opposed to virtual or simulated theatres, despite many attempts to merge the progress of robotics with the growth of theatre and the performing arts. Many of the initiatives that have achieved significant progress in these domains are on a considerably larger scale, with the primary goal of entertaining rather than demonstrating the interdisciplinary nature of Robotics and Engineering. The purpose of this paper is to correctly unite the principles of Science, Technology, Engineering, Arts, and Mathematics in a small size robotic theatre that will allow for a more portable and changeable exhibition. The Tortoise and Hare play will be performed in the theatre, which is made up of both stage and puppet elements. A pan and tilt lighting system, audio integration via an external device, automated curtains with stepper motors, props, and a grid stage are among the stage's components. A camera tracking module in the light system detects the location of a robot and communicates with the light fixtures to angle the spotlight. A transportable module that interacts wirelessly with its environment, as well as simple moving, decorative puppet cutouts protruding from the module, makeup the smart puppets. The mBlock IDE is used to edit the story in the theatre software, providing for a simple technique of programming the scene. The Smart Mini Theatre's production of the Tortoise and Hare play intends to encourage performing arts students to experiment with robots and programming to create their own shows, in the hopes of inspiring them to pursue Robotics and Engineering as a potential career choice.

Trash Can Brothers: Early Childhood Green Environmental Education through Recycling Robots

Marcus Arnett, Saifuddin Mahmud, Redwanul Haque Sourave and Jong-Hoon Kim

Advanced Telerobotics Research Lab, Computer Science
Kent State University, Kent, Ohio, 44242, USA

Abstract

One of the main concerns of modern life would be the potential risk of irreversible ecological damage. However, due to the lack of focus on the subject within education, this type of risk will only get worse when being left unattended. This is where the robotics system, known as the “Smart Trashcan Brothers”, can provide better environmental consciousness with the current, younger generation attending primary school. This paper goes over the concepts that make up the Smart Trashcan Brothers system, as well with a functional evaluation to verify that the described parts of the robotics system function as intended. From there, a discussion of future works will be brought up with regards to further Child Human Interaction works.

Effects of Computer-Based (Scratch) and Robotic (Cozmo) Coding Instruction on Middle School Students’ Computational Thinking, Competency Beliefs, and Engagement

Shannon Smith, Elena Novak, Jason Schenker and Chia-Ling Kuo

Kent State University, Kent, Ohio, 44242, USA

Abstract

The purpose of this pre-/posttest quasi-experimental study was to examine the effects of coding activities supported by the emotional educational robot Cozmo on seventh grade students’ computational thinking, competency beliefs, and engagement compared to the computer-based program of Scratch. Two versions of the coding curriculum were developed that shared the same content and instructional features but differed in the code blocks used in each program. Two intact classes at a public middle school in the Midwestern United States participated in the study during the regularly scheduled Technology course. One class received the Scratch coding curriculum (n = 21), and the other class received the robotics coding curriculum (n = 22).

Results revealed non-significant posttest differences in computational thinking and competency beliefs among the Scratch and Cozmo interventions. However, students found Cozmo to be significantly more engaging than Scratch. Both interventions significantly improved students’ computational thinking and competency beliefs from pre- to posttest.

This study contributes to the emerging literature on coding education in a public school setting. The positive gains in the cognitive and affective domains of learning can serve as a point of reference for researchers, designers, and educators with the desire to introduce students to coding.

Permission-Educator: App for Educating Users about Android Permissions

Akshay Mathur¹, Ethan Ewoldt², Quamar Niyaz², Xiaoli Yang¹ and Ahmad Javaid²

The University of Toledo, Toledo, OH 43607, USA¹

Purdue University Northwest, Hammond IN 46323, USA²

Abstract

Cyberattacks and malware infestation are issues that surround most operating systems (OS) these days. In smartphones, Android OS is more susceptible to malware infection. Although

Android has introduced several mechanisms to avoid cyberattacks, including Google Play Protect, dynamic permissions, and sign-in control notifications, cyberattacks on Android-based phones are prevalent and continuously increasing. Most malware apps use critical permissions to access resources and data to compromise smartphone security. One of the key reasons behind this is the lack of knowledge for the usage of permissions in users. In this paper, we introduce Permission-Educator, a cloud-based service to educate users about the permissions associated with the installed apps in an Android-based smartphone. We developed an Android app as a client that allows users to categorize the installed apps on their smartphones as system or store apps. The user can learn about permissions for a specific app and identify the app as benign or malware through the interaction of the client app with the cloud service. We integrated the service with a web server that facilitates users to upload any Android application package file, i.e. apk, to extract information regarding the Android app and display it to the user.

An Intelligent System to Support Social Storytelling for People with ASD

Rita Francese, Angela Guercio, and Veronica Rossano

University of Salerno, Italy¹

Kent State University at Stark, USA²

University of Bari, Italy³

Abstract

The number of diagnoses of ASD (Autism Spectrum Disorder) is growing every day. Children suffering from ASD lack of social behaviors, which strongly impacts on the inclusion of the child and his/her own family in the community. Much scientific evidence shows that social storytelling is a valuable tool for developing pro-social behaviors in children with ASD and for articulating their emotional language, empathy, and expressive and verbal communication. To be effective, social stories should be customized for the target user since there exist different levels of ASD. To tackle this issue, this paper proposes an application that supports the semiautomatic creation of social stories. The intelligent system learns the needs of the target user over time and adapts by creating social stories tailored to the ASD level of the disorder. The editor lets non-expert caregivers select the appropriate elements and content representations to be included in the social stories.

Session -4 B: Digital signal and image processing methods

Session Chairs:

Dr. Khakimjon Zaynidinov (Tashkent University of information technologies, Uzbekistan)
Dr. Elmira Nazirova (Tashkent University of information technologies, Uzbekistan)
Dr. Ibrohimbek Yusupov (Tashkent University of information technologies, Uzbekistan)
Dr. Sarvarbek Makhmudjanov (Tashkent University of information technologies, Uzbekistan)

Dr. Khakimjon Zaynidinov (Tashkent University of information technologies, Uzbekistan)

Khakimjon Zaynidinov was born in 1963. He graduated from Furkat secondary school No.20 in Izbaskan district of Andijan region in 1979. In 1984, he graduated from the Tashkent Polytechnic Institute. Diploma in computer science, specialty - systems engineer.

On October 19, 1993 at the Specialized Council of the St. Petersburg State University of Electrical Engineering named after VILenin (Ulyanov) for the degree of Candidate of Technical Sciences for the degree of Candidate of Technical Sciences - Defended his dissertation on "Computers, systems, complexes and networks." On November 28, 1996, Khakimjon Zaynidinov was awarded the title of "Associate Professor" at the department of "Computer Technology and Networks". Kh. Zaynidinov received the degree of Doctor of Technical Sciences on October 8, 2005 at the Academic Council for the award of the degree of Doctor of Science at the Tashkent University of Information Technology. He is the author of more than 150 scientific and methodological works, including: 10 textbook, more than 100 scientific articles (22 on the basis of SCOPUS) and more than 120 theses, 40 software certificates. Since 2016, he has been working as the head of the "Artificial Intelligence" department at Tashkent University of Information Technologies.

Dr. Elmira Nazirova (Tashkent University of information technologies, Uzbekistan)

In 2012 she defended her dissertation on "Mathematical and software for automated systems for determining the performance of oil and gas fields." In 2017, she was awarded the title of Associate Professor in 05.01.04 - "Mathematical and software of computers, complexes and computer networks." In 2019, she defended his doctoral dissertation (DSc) entitled "Mathematical models, a set of numerical methods and programs for the study of the filtration process of liquids and gases".

She has 107 scientific articles, a certificate of official registration of the program for more than 20 computers, 2 textbooks, 5 manuals and about 25 guidelines. Currently, E. Nazirova is leading 5 independent researchers. Within the framework of her scientific activity E.Nazirova is the leader of 1 practical project (№A5-019, 2015-2017), as well as 1 fundamental (№F4-FA-F005, 2012-2016) and 1 practical (BV-Atex-2018). - (399-487), 2018-2020). Science 2015, She has been working as a head of Multimedia technologies department at TUIT.

Dr. Ibrohimbek Yusupov (Tashkent University of information technologies, Uzbekistan)

He was born on July 9, 1991 in Marhamat district of Andijan region. In 2017, he graduated from Tashkent University of Information Technology. He began his career as a methodologist at the Academy of Public Administration under the President of the Republic of Uzbekistan, Department of Information and Communication Technologies in Management. From 2017 to 2020 he worked as an assistant professor at the Department of "Information Technology" of Tashkent University of Information Technology, from 2021 to the present as an associate professor at the department of "Artificial Intelligence". I.Yusupov successfully defended his dissertation for the degree of Doctor of

Philosophy (PhD) in technical sciences on July 15, 2021. Yusupov studied at Soongsil University in South Korea in 2013-2014. In 2020, he completed a 2-month research internship in the Broadband technologies and future trends course under the Indian technical and economic program organized by the Government of India. He is the author of more than 27 scientific and methodological works, including: 1 textbook and more than 8 scientific articles (3 on the basis of SCOPUS) and more than 14 theses, 5 software certificates.

Dr. Sarvarbek Makhmudjanov (Tashkent University of information technologies, Uzbekistan)

He was born on December 22, 1991 in Beruniy district of Karakalpagistan region. In 2017, he graduated from Tashkent University of Information Technology. He began his career as a software programmer at the Academy of Public Administration under the President of the Republic of Uzbekistan, Department of Information and Communication Technologies in Management. From 2017 to 2020 he worked as an assistant professor at the Department of "Information Technology" of Tashkent University of Information Technology, from 2021 to the present as an associate professor at the department of "Artificial Intelligence" in TUIT. Sarvar Makhmudjanov successfully defended his dissertation for the degree of Doctor of Philosophy (PhD) in technical sciences on July 15, 2021. He studied at Soongsil University in South Korea in 2013-2014. He has 25 scientific and methodological works, including: 1 textbook based on IoT and more than 8 scientific articles (2 on the basis of SCOPUS) and more than 14 theses, 4 software certificates.

Papers:

Methods of constructing equations for objects of fractal geometry and R-function method

Shakhzoda Anarova¹ and Ibrohimova Zulaykho²

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Research Institute for the Development of Digital Technologies and Artificial intelligence, Uzbekistan²

Abstract

The paper discusses methods for constructing equations for objects of fractal geometry and method of R-functions. Basic concepts of the theory of fractals, areas of application and their types have been presented. The basic methods of constructing fractals are taken into account: L-system method, system of iterating functions, set theory method, and the R-function method. Equations of complex structures of fractal geometry have been developed based on the R-functions method. Using the of straight-line equation, the equation of a circle and constructive means of the method of R-functions R0: R-conjunctions and R-disjunctions are constructed various kinds of fractals, equations of fractals consisting of intersections of lines, tangencies of circles. Based on these equations, various prefractals were generated by specifying the number of iterations n and the angle of inclination. Equations are constructed for fractal antennas based on the "Cayley tree", fractal ring monopolies and the Sierpinski curve that are used in antenna design. These fractals are very beautiful, which can be used in the creation of computer landscapes, in various illustrations,

in telecommunications, in the textile industry, in drawing patterns in ceramic and porcelain products, as well as in the development of patterns for the modern design of Uzbek national carpets, fabrics, costumes, etc.

Determination of dimensions of complex geometric objects with fractal structure

Zaynidinov Khakimjon¹, Anarova Shakhzoda¹ and Jabbarov Jamoliddin²

Tashkent University of Information Technologies named after Muhammad al-Khwarizmi,
100200, Tashkent city, Republic of Uzbekistan¹

Samarkand State University, Uzbekistan²

Abstract

This article is given to the assurance of the dimensions of complex geometric objects with fractal structures. A detailed depiction of the different mathematical methods for deciding the dimensions of complex geometric objects with a fractal structure and the investigation of errors in determining the fractional measure of complex geometric objects are displayed. The article presents the concept of fractal estimation, properties, topological estimation, estimations of designs and scenes in nature, differences between Hausdorf-Bezikovitch measurement and Mandelbrot-Richardson measurement, fractal measurements. Dimensions of complex geometric objects with several fractal structures have too been identified. In particular, the Mandelbrot-Richardson scale was used to calculate the fractal dimensions of four-sided star fractals, eight-sided star fractals, the Cox curve, and the Given (cap) curves. Hausdorf-Bezikovitch and Mandelbrot-Richardson measurements were used to determine the fractal scale. Most articles describe the study of the properties of complex objects in graphical form. In this article, the measurement properties of complex objects are studied on the premise of mathematical equations and special methods are used to compare and calculate the fractional measurements of fractal structures, as well as the results of a number of experiments at each iteration, which are presented in formulas and charts. In addition, different methods of measuring fractal structure images are presented, as well as information on their practical application.

Performance Analysis of the IBM Cloud Quantum Computing Lab against MacBook Pro 2019

Tauheed Khan Mohd, Alvaro Martin Grande, Rodrigo Ayala, Izan Khan and Prajwal Sarkar

Department of Mathematics and Computer Science, Augustana College, Rock Island, IL
61201, USA

Abstract

Quantum Computing is the conjunction of Quantum Physics, Computer Science, Mathematics and Nanotechnology. While this technology is extremely complex and unexplored, this paper addresses and explains the basic functioning of these devices. Additionally, it covers its most tangible applications nowadays, as well as the short-term

implementation and development of these ones. Our research reflects the experimental performance of IBM's Quantum Computer Cloud Lab. This is an environment designed to interact with IBM's Quantum Computer by using the Jupyter Notebook interface, Conda package and environment manager, and Python. The results of different computations were mirrored on a 2019 MacBook Pro. The outcomes of these experiments were unexpected due to the low performance of this tool.

Algorithms and Service for Digital Processing of Two-Dimensional Geophysical Fields using Octave Method

Hakimjon Zaynidinov¹, Dhananjay Singh¹, Ibrohimbek Yusupov¹ and Sarvar Makmudjanov¹

Tashkent University of Information Technologies named after Muhammad al Khwarizmi,
Tashkent, Uzbekistan¹

Hankuk University of Foreign Languages, Seoul, South Korea²

Abstract

This paper covers new algorithms for digital signal processing of two-dimensional geophysical fields using octave method, which predicts the mineral value of the field in terms of signal energy value. In addition, it addresses and shows a functional scheme of the platform service based on cloud technologies. The essence of the work is that the geophysical data are two-dimensional, so their volume is very large. This requires the use of fast algorithms for digital processing of large amounts of data. Therefore, if we use the octave method effectively, the required result is obtained by calculating the value of the signal energy and comparing the finite difference of these values with its previous value.

Methods for Determining the optional Sampling Step of Signals in the Process of Device And Computer Integration

Hakimjon Zaynidinov¹, Dhananjay Singh², Sarvar Mahkmudjanov³ and Ibrohimbek Yusupov⁴

Tashkent University of Information Technologies named after Muhammad al Khwarizmi,
Tashkent, Uzbekistan

ReSENSE Lab, Department of Electronics Engineering, Hankuk University of Foreign Studies, Seoul, South Korea²

Abstract

In this paper, digital signal processing methods and its solution for HCI were described. Mostly, problems are connected to taking signals or data from real time devices. Data is often serial, stream or etc. device and computer integration in HCI focuses to digital signal processing. Today, the use of interpolation methods in the digital processing of biomedical signals is important, and at the same time allows the detection and diagnosis of diseases as a result of digital processing of biomedical signals. This paper discusses the construction of a signal model using the spline-wavelet interpolation formula for equal intervals in the digital processing of biomedical signals.

Integrated Analogical Signs Generator for Testing Mixed Integrated Circuits

José L. Simancas-García¹, Farid A. Meléndez-Pertuz¹, Harold Combata-Niño¹, Ramón E. R. González², Carlos Collazos-Morales³

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Abstract

This paper presents the design of a functional block for testing analog and mixed-signal integrated circuits. The objective is that this functional block is embedded into an integrated circuit, IC, to generate the stimuli of the analog functional blocks. The result is a simple block with the ability to generate analog stimuli, as evidenced in the simulations carried out.

Session -5 A: Beyond AI: Human-In-The-Loop Intelligence

Session Chairs:

Dr. Uma Shanker Tiwary (IIIT Allahabad, India)

Dr. Madhusudan Singh (Woosong University, South Korea)

Dr. Uma Shanker Tiwary (IIIT Allahabad, India)

Uma Shanker Tiwary is a professor and chair of in the Center of Cognitive Computing at the department of Information Technology at Indian Institute of Information Technology, Allahabad, India. In 1991, he completed his PhD. at department of Electronics Engg. in Institute of Technology, B.H.U. Varanasi, India. He worked in the department of Electronics & Communication, J. K. Institute of Applied Physics & Technology, University of Allahabad from Sept.1988 to June 2002. He is holding the research and teaching experience for more than 30 years in which he is very much involved in: Image Processing, Computer Vision, Medical Image Processing, Pattern Recognition & Script Analysis, Digital Signal Processing, Speech and Language Processing, Wavelet Transform, Soft Computing & Fuzzy Logic, Neuro-computing and Soft-computers, Speech driven computers, Natural Language Processing, Brain Simulation, and Cognitive Science. He is also the steering committee chair of International Conference on Intelligent Human Computer Interaction (IHCI).

Dr. Madhusudan Singh (Woosong University, South Korea)

Madhusudan Singh is an Assistant Professor/Director of ReBlockchain Group at ECIS, Woosong University, South Korea. He is actively involved in entrepreneurial endeavors in Blockchain Technologies with Artificial Intelligence, Information Security, and Autonomous vehicles. And in his career, he has worked as a senior engineer in the R&D division at Samsung Display, Korea, and Research Professor in YICT, Yonsei University, Korea. He serves as a series editor of the Blockchain Technologies in Springer Nature, IEEE Computer Society and ACM Distinguished speaker, a senior member of IEEE societies.

Invited Speaker: Dr. Rajesh Sankaran

Talk Title:

SAGE: National Cyberinfrastructure for Distributed Sensing: Moving Artificial Intelligence to the Edge

Abstract

Geographically distributed sensor networks that include cameras, microphones, LIDAR, and weather and air quality stations can generate such large volumes of data that fast and efficient analysis is best performed by an embedded computer connected directly to the sensor. SAGE is an NSF MSRI project to build a national cyberinfrastructure for programmable edge computing. The SAGE infrastructure allows scientists to write “software-defined sensors” by analyzing the data in-situ, at the edge, at the highest resolution of data. The data from the edge computation are then transmitted to a cloud computing infrastructure where they can be archived and provided to the community as data products or used in real-time to trigger computational models or dynamically modify subsequent edge computation, or monitor for extremely rare events through human in the loop. This new edge computing programming framework gives scientists a new tool for exploring the impacts of global urbanization, natural disasters such as flooding and wildfires, and climate change on natural ecosystems and city infrastructure. SAGE is deploying cyberinfrastructure in

environmental testbeds in California, Colorado, and Kansas and in urban environments in Illinois and Texas. SAGE is open source and provided an open architecture for building intelligent and autonomous sensor networks. This talk will introduce SAGE and AI for the edge as well as long-term project goals and current collaboration and progress on deploying SAGE in NEON.

Papers:

Machine Learning Techniques for Grading Students' Presentations

Jyoti Borade, Arvind Kiwelekar and Laxman Netak

This paper describes the design and implementation of automated techniques for grading students' PowerPoint slides. Preparing PowerPoint slides for seminars, workshops, and conferences is one of the crucial activity of graduate and undergraduate students. Educational institutes use rubrics to assess the PowerPoint slides' quality on different grounds, such as the use of diagrams, text highlighting techniques, and animations. The proposed system describes a method and dataset designed to automate the task of grading students' PowerPoint slides. The system aims to evaluate students' knowledge about various functionalities provided by presentation software. Multiple machine learning techniques are used to grade presentations. Decision Tree classifiers gives 100% accuracy while predicting grade of PowerPoint presentation.

Textual Description Generation for a Vision using Neural Networks

Komal Garg, Varsha Singh and Uma Shanker Tiwary
Indian Institute of Information Technology, Allahabad, India

Abstract

arious methods in machine learning have noticeable use in generating descriptive text for images and video frames and processing them. This area has attracted the immense interest of researchers in past years. For text generation, various models contain CNN and RNN combined approaches. RNN works well in language modeling; it lacks in maintaining information for a long time. An LSTM language model can overcome this drawback because of its long-term dependency handling. Here, the proposed methodology is an Encoder-Decoder approach where VGG19 Convolution Neural Network is working as Encoder; LSTM language model is working as Decoder to generate the sentence. The model is trained and tested on the Flickr8K dataset and can generate textual descriptions on a larger dataset Flickr30K with the slightest modifications. The results are generated using BLEU scores (Bilingual Evaluation Understudy Score). A GUI tool is developed to help in the field of child education. This tool generates audio for the generated textual description for images and helps to search for similar content on the internet.

Using LSTM Models on Accelerometer Data to Improve Accuracy of Tap Strap 2 Wearable Keyboard

Tauheed Mohd and Kristian Mrazek
Augustana College, Rock Island, IL 61201, USA

Abstract

This paper proposes the implementation of three different long short-term memory (LSTM) recurrent neural network (RNN) models to improve the accuracy of the input readings of the Tap Strap 2, a Bluetooth wearable keyboard device. The Tap Strap 2 was found in the previous study to have an undesirably low level of accuracy when it came to outputting the correct characters upon interpreting data from the built-in sensors. In response to this, raw accelerometer data was obtained from the device and used to train an LSTM model. This model would be used to not only determine which features correspond to which characters, but also would use contextual information from past characters to determine which character was most likely pressed whenever the input seems ambiguous. This paper first provides a description of the LSTM RNN used in this experiment. It then evaluates the effectiveness of the models in reducing the accuracy problems of the Tap Strap 2.

Electronic Dictionary and Translator of Bilingual Turkish Languages

Elmira Nazirova¹, Shaxnoza Abidova² and Shaxnoza Yuldasheva¹

Department of Multimedia Technologies, Tashkent University of Information Technologies named after Muhammad al-Khwarizmi, Uzbekistan¹
Tashkent University of Information Technologies named after Muhammad al-Khwarizmi, Uzbekistan²

Abstract

The article presents the IDEF0 model, functional module for the implementation of electronic translation in Uzbek and Karakalpak languages, which belong to the family of Turkic languages, as well as software for electronic translation based on these models and modules.

Technological Evaluation of Virtual and Augmented Reality to impart Social Skills

Vinayak Mulkawar and Laxman Netak

Department of Computer Engineering
Dr. Babasaheb Ambedkar Technological University
Lonere, Raigad-402103, India

Abstract

The global spread of COVID-19 has disrupted education in recent times. Imparting social skills necessary to survive in professional life is becoming increasingly challenging in the post-COVID-19 new normal. The existing online learning platforms which have been primarily developed as a technology for content delivery need to be augmented with

additional features required to impart social skills and provide better learning experiences. In this paper, we provide a technical evaluation of two emerging technologies called augmented and virtual reality from the point of view of imparting social skills such as working as a team member, group-based learning, participating in real-life physical events (e.g., seminars and conferences, group discussion), and carrying out physical experiments in the laboratories. This paper describes the approaches to impart social skills through AR and VR based platforms.

Deep Convolutional Neural Network Approach for Classification of Poems

Rushali Deshmukh¹ and Arvind Kiwelekar²

Department of Computer Engineering, JSPM's Rajarshi Shahu College of Engineering, Pune, 411033, India¹

Department of Computer Engineering, Dr. Babasaheb Ambedkar Technological University Lonere, Raigad - 402103, India²

Abstract

In this paper, we proposed an automatic convolutional neural network (CNN)-based method to classify poems written in Marathi, one of the popular Indian languages. Using this classification, a person unaware of Marathi Language can come to know what kind of emotion the given poem indicates. To the best of our knowledge, this is probably the first attempt of deep learning strategy in the field of Marathi poem classification. We conducted experiments with different models of CNN, considering different batch sizes, filter sizes, regularization methods like dropout, early stopping. Experimental results witness that our proposed approach outperforms both in effectiveness and efficiency. Our proposed CNN architecture for the classification of poems produces an impressive accuracy of 73%.

Session -5-B: Theory & Application of Intelligent Systems in Modelling, Simulation, and Automation

Session Chairs:

Dr. Mohd Helmy Abd Wahab (Universiti Tun Hussein Onn Malaysia, Malaysia)

Dr. Masoud Mohammadian (University of Canberra, Australia)

Dr. Mohd Helmy Abd Wahab (Universiti Tun Hussein Onn Malaysia, Malaysia)

Mohd Helmy Abd Wahab is a Senior lecturer and a former Head of Multimedia Engineering Lab and Intelligent System Lab at the Department of Computer Engineering, Faculty of Electrical and Electronic Engineering, Universiti Tun Hussein Onn Malaysia (UTHM) in 2014 and 2009. He is currently a Principle Research Fellow at Advanced Telecommunication Research Center, Faculty of Electrical and Electronic Engineering, UTHM (2021 – 2025) and Visiting Research Fellow for Center of Excellence on Advanced in Computing, Universiti Malaysia Perlis (UNIMaP) (2021 – 2022). In addition, he was a visiting research fellow at Center of Excellence on Geopolymer and Green Technology under cluster Green ICT, Unimap from 2018 – 2020. He received a Bachelor of Information Technology with Honours from Universiti Utara Malaysia and Master of Science (Intelligent System) from the same university in 2002 and 2004 respectively. He has completed several research grants; won several medals in research and innovation showcases and awarded several publication and teaching awards.

Dr. Masoud Mohammadian (University of Canberra, Australia)

Associate Professor Masoud Mohammadian graduated with a PhD degree from the University of Central Queensland and an Master of Science (Computing) degree from the University of Central Queensland, Australia and his undergraduate degree at the Flinders University, Australia. He taught various undergraduate and postgraduate courses in the areas of computer science and information systems at Edith Cowan University, Monash University and University of Canberra for almost 5 years before joining the University of Canberra in late 1998. Besides teaching, he has been actively pursuing research related to neural networks, fuzzy logic, evolutionary computing, optimization, data analytics, modelling of complex adaptive systems, decision support systems and data security and privacy and their applications in industrial, financial and business problems which involve real time data processing, planning and decision making. His current research also concentrates on the application of computational intelligence techniques for learning and adaptation of intelligent agents and web-based information filtering and data mining. To date, he has edited over 25 books and conference proceedings in Computational Intelligence and Intelligent Agents. He was chair and co-chaired of over 19 international conferences in Computational Intelligence, Intelligent Agents and has written more than 175 refereed publications in the form of books, book chapters, journal articles and conference papers. He has been a keynote speaker at a large number of international conferences in Computational Intelligence, Intelligent Agents, Control, Modelling and optimization. He has received many national and international awards from Australia, Austria and United State of America. He has received an honorary professorship from Amity University in Indian in 2018.

Invited Speaker: Dr. Ujwal Gadiraju

Talk Title:

HealthBytes: Fostering A Sustainable Future for Crowd Work

Abstract

Microtask crowdsourcing marketplaces have gradually flourished over the last decade. The utility of human input in driving advances in machine learning and artificial intelligence, in constructing ground truth datasets in a variety of domains, and in evaluating a plethora of systems is undeniable. With the growing landscape of online work in general, and the rise of paid microtask crowdsourcing in particular, the health and wellbeing of crowd workers is an important concern. A substantial amount of prior work has explored challenges pertaining to improving the effectiveness and efficiency of microtask crowdsourcing from the standpoint of quality. Only a few works however, have attempted to address the pertinent concerns of crowd workers' health and wellbeing. In contrast to traditional work settings where employee health is safeguarded by contractual laws and obligations, the unregulated dynamics of crowdsourcing marketplaces expose crowd workers to a multitude of potential health-related risks. Though recent work has highlighted issues pertaining to the unfair treatment of crowd workers and the abysmal pay for the so called "piecework", little is currently understood about worker health and wellbeing on crowdsourcing platforms. This talk will explore the prevailing psychosocial and mental health of crowd workers on Amazon Mechanical Turk and Prolific to better understand workers' physical and mental health, as well as their needs. Improving worker health on crowdsourcing platforms is a crucial need of the hour to ensure a sustainable future for crowd work.

Papers:

Comparison of various deep CNN models for Land Use and Land Cover classification

Geetanjali Mahamunkar and Laxman Netak

Department of Computer Engineering, Dr. Babasaheb Ambedkar Technological University
Lonere, Raigad-402103, India

Abstract

Activities of identifying kinds of physical objects on lands from the images captured through satellite and labeling them according to their usages are referred to as Land Use and Land Cover Classification (LULC). Researchers have developed various machine learning techniques for this purpose. The effectiveness of these techniques has been individually evaluated. However, their performance needs to be compared against each other primarily when they are used for LULC. This paper compares the performance of five commonly used machine learning techniques, namely Random Forest, two variants of Residual Networks, and two variants of Visual Geometry Group Models. The performance of these techniques is compared in terms of accuracy, recall and precision using the Eurosat dataset. The performance profiling described in this paper could help researchers to select a given model over other related techniques.

A Built-in Concentration Level Prediction Device for Neuro Training System Based on EEG Signal

Ha-Trung Nguyen¹, Ngoc-Dau Mai¹, Jong-Jin Kim² and Wan-Young Chung¹
Department of AI Convergence, Pukyong National University, Busan, South Korea¹
Department of Electronic Engineering, Pukyong National University, Busan, South Korea²

Abstract

This study aims to develop a built-in concentration level feedback system using EEG signals. The system includes an embedded device for electroencephalography (EEG) acquisition from two electrodes mounted at designated positions on the frontal scalp for concentration level prediction. The selected EEG-based feature used in this study is the relative power spectral density (PSD) extracted from five EEG bands (Delta, Theta, Alpha, Beta, Gamma) by using the Fourier Fast Transform (FFT) method. Then, two standard machine learning models, including support vector machine (SVM) and multilayer perceptron (MLP), are trained on the personal computer (PC) with the feature of relative power spectral density (PSD) as input for concentration level prediction. After conducting the performance evaluation, MLP is adopted to deploy on the device for real-time concentration level prediction based on the evaluation. The results have demonstrated the feasibility of our EEG-based built-in concentration level prediction device in real-life applications.

WTM to Enhances Predictive Assessment of Systems Development Practices A Case Study of Oil and Gas Well Drilling Project

Abdulaziz Thawaba¹, Azizul Azhar Ramli² and Mohd. Farhan Md. Fudzee²

Technology and Computer Science, University of Saba Region, Marib, Yemen¹
Computer Science and Information Technology, Universiti Tun Hussein Onn Malaysia, Parit Raja, 86400 Batu Pahat, Johor Darul Takzim, Malaysia²

Abstract

Software engineering has devised several project management metrics to optimize implementation and obtain a product with high efficiency, at less time and cost. Inventors faced many challenges to find measurements that able to anticipate accurate results that help avoid errors and risks in the advanced stages of the project. The systems most affected by any errors during the development process are Safety-Critical systems (SCS), as 60% of failures during operation are due to errors during development. This paper proposes a metric that uses weight and milestones to predict implementation in advanced stages of a project. The proposed metric is called Weighted Test Metric (WTM). WTM enhance the reliability assessment and reduce failures during project development by predicting Standards Achievement (SA) in the next test. WTM results showed that faults can be reduced during the development of a petroleum drilling project to 0.67% and enhance the overall reliability to 99.16% while actual results (98.30%). This paper focuses on "How to enhance reliability assessment and reduce failures during project development activities?". This research raises the question through the application of WTM in the stages of development of the Petroleum Drilling Project.

Face and Face Mask Detection using Convolutional Neural Network

Muhammad Mustaqim Zainal¹, Radzi Ambar^{1,2}, Mohd Helmy Abd Wahab¹, Hazwaj Mhd Poad¹, Muhammad Mahadi Abd Jamil¹, Chew Chang Choon¹

Department of Electronic Engineering, Faculty of Electrical and Electronic Engineering,
Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, Malaysia¹
Computational Signal, Image And Intelligence Research Focus Group,
Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, Malaysia²

Abstract

The COVID-19 outbreak has posed a severe healthcare concern in Malaysia. Wearing a mask is the most effective way to prevent infections. However, some Malaysians refuse to wear a face mask for a variety of reasons. This work proposes a real-time face and face mask detection method using image processing technique to promote wearing face mask. Haar Cascade is used for the face detection to extract the features of the human faces as a method of approach. On the other hand, the face mask detection utilizes convolutional neural network (CNN) to train a model using the MobileNetV2 training model designed using Python, Keras and Tensorflow. OpenCV package was used as the interface for the algorithms to be connected to a web camera. Based on the performance metric calculation of detection rate analysis of the experimental results, the face detection rate is at 90% true and 10% false detection, which shows very good detection rate. Furthermore, the training accuracy and validation accuracy for the face mask detector are efficiently near to 1.0, proving a steady accuracy over the time. Training loss and validation loss are almost near to zero and decreasing over time, reassuring the algorithm performance is accurate and efficient for a datasets of 4000 images.

Evaluating the Efficiency of Machine Learning Algorithms on Public Fall Detection Datasets

Parimala Banda¹, Masoud Mohammadian¹ and Raghavendra Gudur²

School of IT and Systems, University of Canberra, Canberra, Australia¹
School of Design and Built Environment, University of Canberra, Canberra, Australia²

Abstract

Elderly falls are a growing phenomenon observed within the world. According to World Health Organization (WHO), it is the second leading cause of unintentional or accidental deaths among the elderly. Thus, the need for research regarding the development of fall detection systems is imperative. Researchers have utilized various approaches to develop fall detection systems, significant number of which have employed Machine Learning (ML) algorithms for fall detection. In this study, we evaluated the efficiency of six ML algorithms on a public fall detection dataset. A robust deep neural network for fall detection (FD-DNN) is identified to be the current state-of-the-art, it detects falls by using a self-built sensor that consumes low power. By evaluating the efficiency of six machine learning algorithms on a publicly available joint fall detection dataset, the accuracy of the fall detection was increased from 99.17% to 99.88% by using the K-nearest Neighbor indicating that common machine learning algorithms can achieve identical or higher accuracy rendering the complex and expensive deep neural network-based fall detection systems inefficient.

Fuzzy logic based explainable AI approach for the easy Calibration of AI models in IoT environments

Mohammed Alshehri

Department of Information Technology, College of Computer and Information Sciences,
Majmaah University, Majmaah 11952, Saudi Arabia

Abstract

The Internet of Things (IoT) permeates all aspects of human existence shortly. As a result of the IoT, it can now construct a smart world. For this to happen, however, extracting meaningful information from raw sensory input functioning in loud and complicated settings must be addressed to achieve it. For example, bandwidth, processing power, and power consumption must be addressed while building a possible IoT system. Due to the current epidemic, the need for contactless solutions has risen. Possible solutions include a gesture-based control system that protects user privacy and can operate several different appliances simultaneously. When implementing such gesture-based control systems, opaque box artificial intelligence (AI) models are used. This opaque box AI model has shown good performance metrics on in-distribution data when tested in a lab. However, their complexity and opaqueness make them prone to failure when exposed to real-world out-of-distribution input. In contrast to opaque box models, explainable AI models based on fuzzy logic (EAI-FL) demonstrate comparable performance on lab data distributions. The type-2 fuzzy models, on the other hand, are readily calibrated and modified to offer equivalent performance to those attained on the lab in-distribution data in the real world.

Session -6 A: AI-Inspired Solutions for Mental Health Ailments: Prevention, Detection, and Treatment

Session Chairs:

Dr. David (Bong Jun) Choi (Soongsil University, South Korea)

Dr. Hanumant Singh Shekhawat (IIT Guwahati, India)

Dr. Dhananjay Singh (Hankuk University of Foreign Studies, South Korea)

Dr. David (Bong Jun) Choi (Soongsil University, South Korea)

Bong Jun Choi is an associate professor at the School of Computer Science & Engineering and jointly at the School of Electronic Engineering, Soongsil University, Seoul, Korea. Previously, he was an assistant professor at the Department of Computer Science, State University of New York Korea, Korea, and concurrently a research assistant professor at the Department of Computer Science, Stony Brook University, USA. He received his B.Sc. and M.Sc. degrees from Yonsei University, Korea, both in Electrical and Electronics Engineering, and the Ph.D. degree from the University of Waterloo, Canada, in Electrical and Computer Engineering. His current research focuses on distributed artificial intelligence, distributed intelligent energy networks, and security. He is a senior member of the IEEE and a member of the ACM.

Dr. Hanumant Singh Shekhawat (IIT Guwahati, India)

Dr. Hanumant Singh Shekhawat is working at Indian Institute of Technology Guwahati as an Assistant Professor in the Department of Electronics and Electrical Engineering. He did his postdoc from the Department of Electrical Engineering, Eindhoven University of Technology, and The Netherlands. His research was on multi-linear data (tensor) reduction techniques, which has applications in video/speech processing, MRI and (higher dimensional) data analysis. He completed his PhD in Nov 2012, from the Department of Applied Mathematics, University of Twente, The Netherlands. His research was related to optimization problems in sampling and interpolation. He has completed his masters (in 2004) from the Department of Electrical engineering and his bachelor in Electronics and communication engineering (in 2002) from Indian Institute of Technology Bombay and Rajasthan University in India, respectively. After the master degree, he worked in the Texas Instruments India and Sasken Communications India for around four years in the area of electronics, software and algorithm development. He had visiting faculty position in University of Pardubice, Czech Republic during May-June 2019. Currently, his work is related to problems in radar, tensor, speech, signals and systems.

Dr. Dhananjay Singh (Hankuk University of Foreign Studies, South Korea)

Dhananjay Singh is a Full Professor/Director of ReSENSE Labs in the Department of Electronics Engineering at Hankuk University of Foreign Studies (HUFS), Seoul, South Korea. He is co-founder/CTO of VESTELLA and COIKOSITY to provide an innovative solutions based on AI, Blockchain, BigData Analysis and IoT for Smart City Technologies and services. He is the recipient of U.P. NRI award (Apravasi Bharatiya Ratna Puraskar) for the outstanding work in the field of Technology in the year 2019, Varanasi, India. He is a Senior Member of IEEE and ACM societies. He is a series Editor of Springer Blockchain Technologies and Associate Editor of PlosOne Journal.

Invited Speaker: Dr. Ujwal Gadiraju (Delft University of Technology, Netherlands)

Talk Title:

HealthBytes: Fostering A Sustainable Future for Crowd Work

Abstract

Microtask crowdsourcing marketplaces have gradually flourished over the last decade. The utility of human input in driving advances in machine learning and artificial intelligence, in constructing ground truth datasets in a variety of domains, and in evaluating a plethora of systems is undeniable. With the growing landscape of online work in general, and the rise of paid microtask crowdsourcing in particular, the health and wellbeing of crowd workers is an important concern. A substantial amount of prior work has explored challenges pertaining to improving the effectiveness and efficiency of microtask crowdsourcing from the standpoint of quality. Only a few works however, have attempted to address the pertinent concerns of crowd workers' health and wellbeing. In contrast to traditional work settings where employee health is safeguarded by contractual laws and obligations, the unregulated dynamics of crowdsourcing marketplaces expose crowd workers to a multitude of potential health-related risks. Though recent work has highlighted issues pertaining to the unfair treatment of crowd workers and the abysmal pay for the so called "piecework", little is currently understood about worker health and wellbeing on crowdsourcing platforms. This talk will explore the prevailing psychosocial and mental health of crowd workers on Amazon Mechanical Turk and Prolific to better understand workers' physical and mental health, as well as their needs. Improving worker health on crowdsourcing platforms is a crucial need of the hour to ensure a sustainable future for crowd work.

ReSenseNet: Ensemble Early Fusion Deep Learning Architecture for Multimodal Sentiment Analysis

Shankhanil Ghosh¹, Chhanda Saha¹, Souvik Ghosh¹, Nagamani Molakathala² and Dhananjay Singh³

School of Computer and Information Sciences, University of Hyderabad, India¹

Applied Electronics and Instrumentation Engineering, Heritage Institute of Technology, India²

Department of Electronics Engineering, Hankuk University of Foreign studies, South Korea³

Abstract

Multimodal sentiment analysis is an actively emerging field of research in deep learning that deals with understanding human sentiments based on more than one sensory input. In this paper, we propose reSenseNet, an ensemble of early fusion architecture of deep convolutional neural network (CNN) and Long Short term Memory (LSTM) for multimodal sentiment analysis of audio, visual, and text data. Re-SenseNet consists of feature extraction, feature fusion, and fully connected layers stacked together as a three-layer architecture. Instances of the generalized reSenseNet architecture have been experimented on several variants of modalities combined together to form different variations in the test data. Such a combination has produced results in predicting average arousal and valence up to an F1 score of 50.91% and 35.74% respectively.

Analysis of User Interaction to Mental Health Application using Topic Modeling Approach

Ajit Kumar, Bong Jun Choi and Ankit Kumar Singh
Soongsil University, Seoul, South Korea

Abstract

Mental health-related illnesses like depression and anxiety have become a major concern for society. Due to social stigma and unawareness, many such patients lack proper doctors' consultancy, diagnosis, and treatments. Many of such problems arise due to the urban living style, social and family disconnect. Nonetheless, various health-related mobile applications offer ways to minimize the risks by providing an option for remote doctor consultations, connecting to family and friends, or sharing thoughts. To investigate the effectiveness and discover the key issues of such apps, we analyze the user's interaction, discussion, and responses to mental health apps through topic modeling approaches. The experimental results show that many users found many applications helpful and complained mostly about technical issues and business practices. We also evaluated topics and keywords from feedbacks to further improve the application interface and functionalities.

Alzheimer's Dementia Recognition using Mutlimodal Fusion of Speech and Text Embeddings

Sandeep Pandey¹, Hanumant Singh Shekhawat¹, Shalendar Bhasin², Ravi Jasuja^{2,3} and S R M Prasanna⁴

Indian Institute of Technology Guwahati, Assam, India¹
Brigham and Womens Hospital, Harvard Medical School, Boston, MA²
Function Promoting Therapies, Waltham, MA³
Indian Institute of Technology Dharwad, Karnataka, India⁴

Abstract

Alzheimer's disease related Dementia (ADRD) compromises the memory, thinking and speech. This neurodegenerative disease severely impacts the cognitive capability and motor skills of affected individuals. ADRD is accompanied by progressive degeneration of the brain tissue, which leads to impairments in the memory formation, and loss of verbal fluency among other adverse physiological manifestations. Cognitive impairment becomes particular evident over time since it overtly alters the communication with repetitive utterances, confusion, filler words, and inability to speak at a normal pace. Most prevailing methodologies for ADRD recognition focus on mental health scores given by clinicians through in-person interviews, which can potentially be influenced by subjective bias of the evaluation. Accordingly, use of alterations in speech as a robust, quantitative indicator of Alzheimer's progression presents an exciting non-invasive prognostic framework. Recent studies utilizing statistical and deep learning approaches have shown that assessment of ADRD can be effectively done algorithmically, which can serve as an objective companion diagnostic to the clinical assessment. However, the sensitivity and specificity of extant approaches are suboptimal. To this end, we present a multimodal fusion-based framework to leverage discriminative information from both speech and text transcripts. Text transcripts are extracted from speech utterances using the wav2vec2 model. Two fusion approaches are evaluated - score-level fusion and late feature fusion for classifying subjects into AD/ Non-AD categories. Experimental appraisal of the fusion approaches on the Interspeech 2021

ADDreSSo Challenge dataset yields promising recognition performance with the added advantage of a simpler architecture, reduced compute load and complexity.

Exploring Multimodal Features and Fusion for Time-Continuous Prediction of Emotional Valence and Arousal

Ajit Kumar¹, Bong Jun Choi¹, Sandeep Kumar Pandey², Sanghyeon Park³, Seongik Choi,³
Hanumant Singh Shekhawat², Wesley De Neve³, Mukesh Saini⁴, Srm Prasanna⁵ and
Dhananjay Singh⁶

Soongsil University, Seoul, South Korea¹

IIT Guwahati, Assam, India²

Ghent University Global Campus, Incheon, South Korea³

IIT Ropar, Punjab, India⁴

IIT Dharwad, Karnataka, India⁵

ReSENSE Lab, HUFS, South Korea⁶

Abstract

Advances in machine learning and deep learning make it possible to detect and analyze motion and sentiment using textual and audio-visual information at increasing levels of effectiveness. Recently, an interest has emerged to also apply these techniques for the assessment of mental health, including the detection of stress and depression. In this paper, we introduce an approach that predicts stress (emotional valence and arousal) in a time-continuous manner from audio-visual recordings, testing the effectiveness of different deep learning techniques and various features. Specifically, apart from adopting popular features (e.g., BERT, BPM, ECG, and VGGFace), we explore the use of new features, both engineered and learned, along different modalities to improve the effectiveness of time-continuous stress prediction: for video, we study the use of ResNet-50 features and the use of body and pose features through OpenPose, whereas for audio, we primarily investigate the use of Integrated Linear Prediction Residual (ILPR) features. The best result we achieved was a combined CCC value of 0.7595 and 0.3379 for the development set and the test set of MuSe-Stress 2021, respectively.

Emotion recognition from brain signals while listening to music

Sreeja S R and Puneeth Yashasvi Kashyap Apparasu

Department of Computer Science and Engineering

Indian Institute of Information Technology Sri City, Andhra Pradesh, India

Abstract

Emotions are simple, yet complex windows to the brain. Music and emotions are associated closely together. There are few things that stimulate the brain the way music does. It can be used as a powerful tool to regulate one's emotions. In recent years, emotion detection using brain waves has become an active topic of research. Various researchers are implementing different feature extraction techniques and machine learning models to classify the emotion

by predicting the measurement of the electroencephalography signals. Many researchers are working on improving the accuracy of this problem and employing different techniques. In our study, we looked into achieving good scores by trying to predict the actual 4 emotional quadrants of the 2 dimensional Valence-Arousal plane. We evaluated and looked into various feature extraction approaches, modeling approaches and tried to combine best practices in our approach. We used the publicly available DEAP dataset for this study. Features from multiple domains were extracted from the EEG data and various statistical metrics and measures were extracted per channel. In our proposed approach, a one-dimensional convolutional neural network and a two-dimensional convolution neural network model were combined and fed through a neural network to classify the four quadrants of emotions. We did extensive and systematic experiments on the proposed approach over the benchmark dataset. The research findings that may be of significant interest to the user adaptation and personalization are presented in this study.

Session -6 B: Modeling and Metric for HCI

Session Chairs:

Gaurav Tripathi (Bharat Electronics Limited (BEL), India)

Irish Singh (Ajou University, South Korea)

Dr. Gaurav Tripathi (Bharat Electronics Limited (BEL), India)

Gaurav Tripathi received his B.Tech. degree in Computer Science from VBS Purvanchal University, India in 2003 and M. Tech. degree in Information Technology (Specialization: Artificial Intelligence) Indian Institute of Information Technology, Allahabad in 2007 and PhD from Delhi Technological University, India . He currently works as a senior scientist at Bharat Electronics Ltd. India. His research interest includes Internet of Things, Deep Learning, Convolutional Neural Networks based Computer Vision, Fog computing. He has done extensive work in crowd behaviour analysis using deep learning techniques. Currently he has converged his results in to crowd violence in crowd protest environment.

Irish Singh (Ajou University, South Korea)

Irish Singh received her B. Tech degree in the department of Computer Science and Engineering from UP State Technical University, Lucknow, India and M. Tech. degree in the department of Computer Science and Engineering from Birla Institute of Technology, Mersa, India, and pursuing her PhD degree in Software Engineering in the Department of Computer Engineering at Ajou University, Suwon, South Korea under the supervision of Prof. Seok-Won Lee, since Sept. 2015- till date. Her research topic is Adaptive Security for Cloud Networks, Requirement Engineering, Blockchain Technology

Invited Speaker: Garima Bajpai (DevOps Institute, Canada)

Talk Title:

Digital - Twin Ops: Creating Next-Generation imperative for Digital Products

Abstract

Independent research firm Verdantix has predicted that the global digital twin industry will grow from \$787 million in 2020 to \$27.6 billion by 2040. The predicted investments are proportionate to the expected return of investment. Through this talk the presenter intends to highlight two important aspect of Digital twins, first key factors influencing the exponential growth of Digital twins and second enhancing the value of digital twin through Digital-Twin Ops model. Digital-Twin ops or DTOps as referred hereby helps create state of art practices to constantly remove the constraints of the Digital-Twins and improve business value through incrementally developing value added features.

A digital-twin helps to create the next-generation imperative of Digital Products. Digital twins will be accelerators for digital products and its value-added features. It not only offers rapid prototyping & feedback cycle for physical assets but also addresses long view on predicting people choices and behaviors, community transformation and building “what if “scenarios for exponential innovation. In order to assess the factors influencing the exponential growth of Digital Twins, we have to take a long view of the people, communities and economics of future. Future technology integration

into the digital products will heavily rely on integration with Digital Twins be it smart robots, DNA Computing, hyper-personalized products or creating alternate sources of energy, food or transport. It is not premature to say that enhancing the value of digital twin would mean that we would need to look at operating model which is fit for purpose. DTOps creates that promise to build state of art practices for consumers to realize the full potential of Digital twin. The operating model takes key practices from DevOps and DataOps and combines to bring Continuous Agility, Observability and Security to Digital twins. DTOps embracing the three ways from DevOps – flow, feedback and experimentation moves the needle for Digital twins converging the benefits to the common people, the biggest investors.

- Digital Twin agility is about how fast and frequently we convert Digital twin offering into value
 - Digital Twin observability shares the same core objective as application observability, health of your digital twin
 - DTSecOps introduce security as part of the digital twin and integrated into the flow
 - Systems of Digital twins has to be user-friendly, reliable, scalable, secure and maintainable
- Keywords. – DTOps, Digital Twin, Agility, Security, DTSecOps, Observability

Papers:

Mathematical modeling of the nonstationary filtration process of oil in the system of oil deposits related to slow conductor layers

Elmira Nazirova, Abdug'Ani Nematov, Rustam Sadikov and Inomjon Nabiev

Department of Multimedia Technologies,
Tashkent University of Information Technologies named after Muhammad al-Khwarizmi,
DSc, Uzbekistan

Abstract

This paper discusses the mathematical model of the filtration process in the horizontal section of the motion of fluids in a three-layer oil system in a non-homogeneous reciprocal dynamic interaction in a porous medium, their interaction dynamics and the interaction in the layers. The mathematical model of the problem consists of three interconnected differential equations of one-dimensional parabolic type. An efficient computational algorithm for solving the boundary value problem

built on a mathematical model has been developed to determine the main parameters of the filtration process. For the system of finite differences, the formula for finding the solution based on the driving method was determined and an algorithm for finding the driving method coefficients was developed. The formula for finding the values of the pressure function and the driving coefficient at the boundary is defined. Based on the developed algorithm, software was created and computational experiments were conducted, and the results were presented graphically for different situations. Computational experiments were performed on the main parameters of the filtration process of oil in porous media associated with three-layer slurry, as well as the filtration process was analyzed and studied on the basis of the obtained results.

A Novel Metric of Continuous Situational Awareness Monitoring (CSAM) for Multi-Telepresence Coordination System

Nathan Kanyok, Alfred Shaker and Jong-Hoon Kim

Advanced Telerobotics Research Lab, Computer Science
Kent State University, Kent, Ohio, 44242, USA

Abstract. Humans will remain in the loop of robotic systems as the switch from semi-autonomous to autonomous decisions making. Situational awareness is key factor in how efficient a human is in a human-robot system. This study examines the role that visual presentation mediums have on situational awareness of remote robot operators. Traditional display monitors and virtual reality headsets are compared for their ability to provide a user with situational awareness of a remote environment. Additionally, a novel metric Continuous Situational Awareness Monitoring (CSAM) to capture a participant's environmental awareness. Participants are asked to monitor either one or multiple robots as they navigate through a simulated environment. Results indicate that virtual reality as a medium is more efficient in keeping an operator situationally aware of a remote environment.

Gender Detection using Voice through Deep Learning

Vanessa Garza¹ and Madhusudan Singh^{1,2}

School of Technology Studies, ECIS, Woosong University, Daejeon, South Korea¹
Department of AI & Big Data, ECIS, Woosong University Daejeon, South Korea²

Abstract

Particularly in an online or digital environment sometimes it is important to detect gender by other means beyond visual or facial recognition. Which is why this article is about detecting the gender of a person by their voice. With Gender Detection Using Voice, it is easier to implement it to security protocols that require gender detection with better accuracy without having people removing pieces of clothing, masks or accessories for the facial recognition. Also, it can be embedded in medical appliances as it can help detect some vocal pathologies like coughing and breathing differently which also depend on the gender as well as detecting criminals' gender through video surveillance and also in businesses, it can help with customized advertisement. The model measures the voice of males and females for optimal accuracy. Our model achieved an accuracy of 90.95% by using feature extraction upon dataset of 500 hours of voice recordings.

AI-based Syntactic Complexity Metrics and Sight Interpreting Performance

Longhui Zou¹, Michael Carl¹, Mehdi Mirzapour², H  l  ne Jacquenet² and Lucas Nunes Vieira³

Kent State University, Kent OH 44242, USA¹ContentSide, R&D Department, Lyon, 69006, France²

University of Bristol, Beacon House, Queens Road, Bristol, BS8 1QU, UK³

Abstract

Complex syntax may lead to increased cognitive effort during translation. However, it is unclear what kinds of syntactic complexity have a stronger impact on translation performance. In this paper, we employ several syntactic metrics which enable us to explore the impact of syntactic complexity on the quality in English-to-Chinese sight interpreting. We have operationalized syntactic complexity by six metrics, namely, Incomplete Dependency Theory metric (IDT), Dependency Locality Theory metric (DLT), Combined IDT and DLT metric (IDT+DLT), Left Embeddedness metric (LE), Nested Nouns Distance metric (NND), and Bilingual Complexity Ratio metric (BRC). Three professional translators have manually annotated translation errors using MQM-derived error taxonomies, which includes accuracy, fluency, and style errors, each as critical or minor errors. We assessed inter-rater agreement by adopting weighted Fleiss' Kappa scores. We found that there are strong correlations between the IDT and IDT+DLT metrics and sight interpreting errors. We also found that language-specific syntactic differences between English and Chinese such as directions of branching and noun modifiers can have a strong influence on accuracy and critical errors.

Towards Man/Machine Co-Authoring of Advanced Analytics Reports around Big Data Repositories

Amal Babour and Javed Khan

Information Systems Department, Faculty of Computing and Information Technology, King, Abdulaziz University, Jeddah, Saudi Arabia¹

Department of Computer Science, Kent State University, Kent, OH 44240, USA²

Abstract

This paper explores the problem of generating advanced analytical report for gaining sophisticated insight from massive databases by machine assistance. This study shows a model that takes a country-specific scientometric scientific research analysis report as a template and goes into a curated source database to generate a similar insightful report for other countries. The overall process consists of three key phases. The first phase is processing the template report for identifying the generalizable data elements. The second phase is extracting the elements for the selected country from a scholarly database. The third phase is reassembling the high-level report for the new case. A case study on big data analysis is presented for Saudi Arabia scientific research publications. The generated co-authored report was evaluated by 10 human reviewers through assessing several criteria in the report, which achieved a satisfactory evaluation.

Night Vision, Day & Night Prediction with Object Recognition (NVDANOR) Model

Akobir Ismatov¹ and Madhusudan Singh^{1,2}

School of Technology Studies, ECIS, Woosong University, Daejeon, South Korea¹

Department of AI & Big Data, ECIS, Woosong University Daejeon, South Korea²

Abstract

Night vision has been one of the key developments in Computer Vision system as it gave us a key point to modify an area where humans have the least ability to perform. Object detection is reliable and efficient tool to recognize objects in scenarios such as daytime images where the illumination is great. However, night pictures tend to be challenging to recognize for human being and it usually brings us less data than the images that are taken during day due to poor contrast against its background that interfere with clearly recognizing and labeling them. Different models have been proposed for night vision image processing which use denoising, deblurring and enhancing technique however, other methods can be used in order to enhance that picture and make them as usable and understandable as possible. In addition, different prediction methods and models have been developed in order to achieve different degrees of object recognition in that image, still those results and accuracy can be improved for better results. In this paper, we propose a model that can predict which time of the day it is in the picture with help of calculating average brightness on the images of different time periods with HSV. The model includes ResNet-50 and VGG-16 classifiers that can also recognize the objects and buildings in the image with good accuracy. Implementation of deep learning algorithms and image brightness enhancement tools helped us to achieve improved accuracy and better prediction. The model achieved 94% prediction results when it comes to day and night prediction and 93.75% in object detection on night images.

Technical Tutorial

Tutorial 1 - Designing Conversational Human-AI Interactions

Tutorial 2 - Understanding emotion for depression and anxiety detection from text, audio and video using machine learning: a hands-on tutorial

Designing Conversational Human-AI Interactions

Ujwal Gadiraju
Delft University of Technology, Netherlands

Abstract

Conversational interfaces have been argued to have advantages over traditional GUIs due to having a more human-like interaction. The rise in popularity of conversational agents has enabled humans to interact with machines more naturally. There is a growing familiarity among people with conversational interactions mediated by technology due to the widespread use of mobile devices and messaging services such as WhatsApp, WeChat, and Telegram. Today, over half the population on our planet has access to the Internet with ever-lowering barriers of accessibility. This tutorial will showcase the benefits of employing novel conversational interfaces in the domains of Health and Wellbeing, Information Retrieval, and Crowd Computing. We will discuss the potential of conversational interfaces in facilitating and mediating the interactions of people with AI systems. The tutorial will include an interactive component to provide participants with an opportunity to build conversational interfaces.

Understanding emotion for depression and anxiety detection from text, audio and video using machine learning: a hands-on tutorial

David (Bong Jun) Choi, Ajit Kumar, Sandeep Pandey, Shankhanil Ghosh
Soongsil University, South Korea

Abstract

Today mental health is a global concern among youth and working professionals. Due to social stigma, lack of awareness, and unavailability and inaccessibility of proper treatment. Artificial intelligence-based digital solutions have provided diagnosis, early detection, and therapy for many mental health illnesses like depression and anxiety in recent years. This tutorial aims to provide theoretical and hands-on sessions for understanding emotion from text, audio and video using machine learning and deep learning for depression and anxiety detection.

Industry Forum

Organizer: Dr. Gokarna Sharma (Kent State University, USA)

Co-Organizer: Dr. Austin Melton (Kent State University, USA)

Dr. Gokarna Sharma (Kent State University, USA)

Gokarna Sharma is currently an Associate Professor and the director of Scalable Computer Architecture & Emerging Technologies Laboratory (SCALE) in the Department of Computer Science, Kent State University (KSU), Kent, OH, USA. I was an Assistant Professor of Computer Science at KSU from Fall 2015 until Spring 2021. Prior to joining KSU, I was a postdoctoral researcher in the Computer Science and Engineering division (CSE) at Louisiana State University (LSU) in Baton Rouge, LA, USA where I also received Ph.D. in Computer Science under the supervision of Prof. Costas Busch (now at Augusta University, Georgia). I received my dual degree European Master of Science in Computer Science from Faculty of Computer Science at the Free University of Bozen-Bolzano (FUB), Italy and Institute of Computer Languages at the Vienna University of Technology, Austria, under the supervision of Prof. Enrico Franconi and Dr. Peter F. Patel-Schneider. I received my Bachelor's in Engineering in Computer Engineering from Tribhuvan University, Nepal. I interned as a Summer Consultant at Alcatel-Lucent Bell Labs in Summer 2008. I received a US National Science Foundation (NSF) CAREER award in 2021.

Dr. Austin Melton (Kent State University, USA)

Austin Melton is a retired faculty member from the Department of Computer Science and the Department of Mathematical Sciences at Kent State University. His research interests include software measurement, the semantic web, many-valued mathematics, and topological systems.

Chris Conry (RoviSys, USA)

Chris Conry is a Group Manager in the Industrial Artificial Intelligence division at RoviSys. RoviSys is the nation's largest independent integrator improving manufacturing operations in 12 different markets from Pharmaceuticals to Power and Energy. The Industrial Artificial Intelligence division at RoviSys is focused on AI/ML solutions, Data Infrastructure, and Custom Software solutions across all markets.

Aman Singh (COIKOSITY Pvt. Ltd, India)

Aman Singh is a chief project engineer at COIKOSITY Pvt Ltd. Where he is responsible to solve the problems occurring in the detection of gastrointestinal signals to diagnose stomach diseases. He is a graduate in Electrical Engineering from Indian Institute of Technology (IIT) Delhi, India.

Doug Meil (Ontada, USA)

Doug Meil was the founding engineer at Explorys, a healthcare analytics startup acquired by IBM, and also founded the Cleveland Big Data Meetup in 2010.

Rajiv Mishra, (Amaletix, India)

Rajiv Mishra is a neuroscientist with his PhD from Institute of Science and Technology Austria and has worked as scientist at Janssen Belgium (J&J family). He is founder of iOligos Technologies -(a neurotech company with focus on developing a diagnostics platform for neurological disorders specially Alzheimer's Disease) and Amaletix – (a healthcare AI/ML driven analytics company).

Presentation Title: Operators Relationship with AI

Chris Conry
RoviSys, USA

Abstract

Manufacturing Operators are experts in their areas of work. Many spend up to 30 years in the same production line developing an unmatched intuition. Problem is, when these subject matter experts retire, they take that intuition with them. Machine Learning solutions are excellent ways to build an impart that process intuition into a predictive model. Chris Conry will discuss the challenge of gaining the trust of these expert operators to support AI solutions.

Presentation Title: Blockchain Enabled Healthcare Monitoring Medical Device

Aman Singh
COIKOSITY Pvt. Ltd, India

Abstract

We are developing a system which acts as an interface for the doctor to diagnose the diseases of the patient, related to GastroIntestinal Tract or Stomach. It is a non-invasive, portable IoT device. There are some companies who claim to provide EGG signals, but we have upgraded our device with a patent by our company, which categorises the signals obtained from the device into sections, making it easier for the doctor to correctly diagnose the diseases.

Presentation Title:

Challenges of Electronic Health User Interfaces

Doug Meil
Ontada, USA

Abstract

There are many challenges for managing health data, some clinical, some technical, and some cultural. This talk will present a short case study of managing vitals over time.

Presentation Title:

User Experience in the world of Manufacturing

Chris Conry
RoviSys, USA

Abstract

Manufacturing HMI (Human Machine Interface) and SCADA (Supervisory Control and Data Acquisition) systems offer a much more primitive interface compared to modern application interfaces. Chris Conry will cover challenges and strategies to develop design languages and user experiences to create cohesive experiences for operators.

Presentation Title:

Decoding Early Symptoms of Mental Illness with Advanced Technology

Rajiv Mishra Mastishk
Amaletix, India

Abstract

There is a need for the first level mental health screening for individuals at large. Mental health is widely ignored and should be brought in the mainstream of regular checkups. In the 2017, World Health Organization (WHO) survey revealed that India had the world's highest number of people suffering from depression, and the second-highest number of people with anxiety, after China. In another, WHO report, the economic impact of the mental-health crisis in India has been estimated over a trillion dollars in lost productivity between 2012 and 2030.

Unavailability of metric-based screening tools, lack of awareness and empathy, attached social stigma and severe scarcity of trained healthcare workers are some of the key determinants of the mental health problem. What is needed urgently is universal access to the 1st level screening and its inclusion in regular health checks by empowering current work force with technological solutions. Additionally, active policy interventions and resource allocation by the government and putting mental disorders under the ambit of life/health insurance would be required.

“मस्तिष्क” (Mastishk) is envisioned to transform first level screening using advanced artificial intelligence and machine learning analytics bringing in access simplicity through a user-friendly mobile application. This will bring in data from multiple medical and non-medical devices, wearables, IOT sensors, and questions based on standard psychometric testing methods. This will be accessible to all health workers, Individuals, doctors, institutions, and many other stakeholders, be it in Metro Cities, Small Towns or Villages of India.

Presentation Title:

Types of Interaction in Human-Computer Interaction

Austin Melton
Kent State University, USA

Student Forum

Organizer: Dr. Jonathan I. Maletic (Kent State University, USA)

Co-Organizer: Dr. Micheal Collard (University of Akron, USA)

Dr. Jonathan I. Maletic (Kent State University, USA)

Dr. Jonathan I. Maletic is a professor of Computer Science at Kent State University. The research program focuses on the construction of methods, tools, and environments to assist in the evolution of large-scale software systems. Topics of investigations include source code representations, syntactic differencing, textual analysis of software artifacts, program understanding, reverse engineering, program transformation, traceability link recovery and maintenance, mining software repositories, and software visualization to support understanding of large-scale systems.

Dr. Micheal Collard (University of Akron, USA)

Dr. Michael Collard joined UA in 2007. He has several research interests (as listed below), has been a co-author in several publications (selected publications below), and is listed on Google Scholar. Dr. Collard was awarded a \$652,000 grant in 2020 from the National Science Foundation and was also a recipient of the 2020 Mining Software Repositories Foundational Contribution Award.

Behavior Recognition Based on Facial Expressions

Vanessa Garza Enriquez

Woosong University, South Korea

Abstract

Human behavior recognition has become one of the most popular topics as computer vision and our deep learning algorithms are getting better and better each day. Such application can find its use in a variety of fields such as health care, surveillance/security systems, psychological analysis, social media data analysis, entertainment, education, etc. In this case, facial recognition is crucial as it is the main way of classifying human behaviors. However, facial recognition might be overwhelming due to the variety of the current models, possible classifications, different datasets, and coding methods. In this paper, we modulate human behavior by recognizing the facial expression with the help of CNN (Convolutional Neural Network) which enters the family of deep learning models. Our model is prepared to perform in different environments with different subjects as we trained on a variety of datasets with different classes of facial expressions. We tried to improve our model's efficiency and classification's accuracy by implementing different data augmentation, data/noise cleansing and enhancing the training process. Facial expression recognition is done with the help of feature map extraction from the dataset and by training the model (CNN in our case) with those parameters. The feature map includes different emotion classes such as "happiness", sadness", "anger", "Fear", "neutral", etc. Depending on the emotions detected, appropriate behavioral labels will be assigned to the subject.

Reinforcement Learning in the Game of Snake

David Jona Richter
Purdue University Northwest, USA

Abstract

Reinforcement Learning is a part of Machine- and Deep Learning in which the agent learns through direct interaction with the environment, the world it exists in, through trial and error. This approach is widely applicable in control tasks and has seen a large amount of research in recent years. With the gaining popularity and applicability of Neural Network in computation, the field of Reinforcement Learning started implementing such networks as well. This pushed Reinforcement Learning to be able to learn and master much more difficult and complex tasks, which led to the ever gaining popularity of Reinforcement Learning. This work will propose the idea a toolkit for Reinforcement Learning in the game of snake, which will allow for regular Snake gameplay, but also more advanced and complex tasks for the agent to master. This environment will then be used to train Reinforcement Learning agents to master said tasks.

Active Learning based Reinforcement Learning Framework for Unseen Environment

Pamul Yadav
Yonsei University, South Korea

Abstract

Faster adaptability to open-world novelties by intelligent agents is a necessary factor in achieving the goal of creating Artificial General Intelligence (AGI). Current RL framework does not consider the unseen changes (novelties) in the environment. Therefore, in this paper, we have proposed an Active Reinforcement Learning based framework that can be used to develop robust RL algorithms capable of handling both the known environments as well as adaptation to the unseen environments. The proposed framework expands the definition of internal composition of the agent as compared to the abstract definition in the classical RL framework, allowing the RL researchers to incorporate novelty adaptation techniques as an add-on feature to the existing SoTA as well as yet-to-be-developed RL algorithms.

Smart Item Finder From Stores

Sai venkata vybhav Ampabattuni
Kent State University, USA

Abstract

Now a days shopping is the one of the common daily life things. Per day there are millions of people do shopping outside like buying different kind of items like clothing, auto, medicines, groceries, tools, etc. But in some situations, people are facing lot of problems in searching and finding the items in those stores. This problem will be discussed below. Shopping can be a tedious task and stressful when trying to find a product. Shoppers may lose much time in searching for a specific item in different stores. They may find in their first attempt or second or nth or sometimes they cannot get that in the whole day. This is a

case 1 problem. When coming to case 2, sometimes we might not know the product or item name or don't know at what stores that this item will be there. So here the people know only the picture of the product without knowing what the product's right name is.

By analyzing the case 1 and case 2, the main idea is about to create a platform where there will be 2 sources: the shopkeeper source and the customer sources. The shopkeeper should provide the large datasets including the different products/items in their store/shop, the quantity of each product and their respective price along with aisle number where the product is placed. Once these information's are available to the customer, it will be easier for someone to search the item in a nearby location or fixed radius location set by the customer. The customer can go to the store for the item with their comfortable price range. Not only this but also if the customer is not having an idea on the item name by having the picture of that, they can upload the picture of what kind of produce they need so that the picture is converted into label (name of that item in picture) by using some of the AI and ML techniques and finding the location of the store where it is present. By this we can save much amount of time for the customers.

Understanding the Acceptability of Gestures Generated by Social Robots

Aditi Singh
Kent State University, USA

Abstract

Social robots are expected to accompany humans to perform activity of daily living. This includes sharing common space and interaction with humans. Humans interact with each other using verbal and nonverbal means of communication. Nonverbal communication includes eye contact, touch, gestures and facial expression and postures. Social robots are expected to comprehend these nonverbal communications such as human gestures and respond accordingly. The response by robots can be in the form of gestures or verbal such as speech. However, to design a social robot to exhibit similar behavior there is need to be further understand what types of gestures are acceptable or understood by humans. Is there a need for human-like communicative gestures? The gestures generated by social robots can be domain specific such as social robots for elderly care, health care, or child education can have empathy to recognize or comprehend feelings and express the same through a compassionate reaction. There is a need to understand what form of gestures generated by social robots are acceptable and required to have a meaningful conversation. Are social robots expected to show empathy, patience, or frustration?

Multilayer Tag Extraction for Music Recommendation Systems

Sayan Das, Mangala Pranayraj, Thalla Rajesh, and Jagjeet Suryawanshi
University of Hyderabad, India

Abstract

With hundreds and thousands of songs being added to online music streaming platforms every day, there is a challenge to recommend songs that the users decide to hear at any given time. Classification of songs plays a vital role in any recommendation system and when it comes to Indian music, there are a lot of parameters to be taken into consideration. The proposed paper takes into account this task and through recent advancement in data

processing and signal processing, we have tried to use classification processes on Indian music based on various parameters. These parameters include metadata of music, sentimental values, as well as technical features. India being a diverse country with multiple culture values, is home to variety of local music. At various instances, these various classification parameters play significant roles especially when local music is involved in the process of recommendation. Classifying Indian music based on such parameters will lead to better results and also aid to be an improvement in recommendation system for Indian music.

Mobile based Visualization Techniques and Tools for Storytelling

Deepshikha Bhati
Kent State University, USA

Abstract

In digital community applications, geo-coded multimedia data including spatial videos, speech, and geo-narratives are collected and utilized by community users and researchers from multiple fields. It is often preferred that these data can be captured, visualized, and explored directly on mobile phones and tablets interactively. We present a Geo-Video Mobile Application (GVM App) that collects geo-coded multimedia data for experts to process and analyze over an interactive visual exploration. This mobile App integrates user interactivity, AI-based semantic image segmentation, and audio transcription for effective data extraction and utilization. Then visualization functions are designed to quickly present geographical, semantic, and street view visual information for knowledge discovery. The users of this tool can include community workers, teachers, and tourists, and span across multiple social disciplines in digital humanity studies. GVM App enhances and broadens the services of capturing geo-coded multimedia data for digital humanity applications focusing on human-computer interaction. In future work, we plan to use this App for storytelling visualization purposes, integrate more machine learning and visualization techniques for human-computer interaction. The GVM App has a limitation that it needs to access remote servers for AI-based processing of the captured data. The data privacy and security are two issues in such process

Workshop

Applied Natya Therapy (ANT)

Dimple Kaur
ANT, USA

Abstract

The proposed Workshop aims at highlighting how using AI and adopting the principles of ANT we can channelize these physical manifestations ranging from gestures, gaze, gait and TRUE MOMENTS, along with the use of expressions can be monitored observed and applied to change the inner state of the experiencing participants. These movements and gestures are extrapolated from the ancient text which has these patterns in a condensed form which practitioner has to practice to decipher the meaning and the impact.

AI has been making robots and other machinery to imitate human endeavors which cannot be attempted by human limbs like robots or assist with prosthetic limbs the idea of this workshop is how do we make the humans reach their full potential through their Internal ability and power and how AI can assist harness that inner power to help lead the human mind and life towards its highest self-potential.

Computational Thinking, Making, and Acting Education Workshop

Angela Guercio, Jong-Hoon Kim, Jungyoon Kim, and Jakyung Seo
Kent State University, USA

Support Team

Workshop Coordinator: Saifuddin Mahmud
Tech Specialist (SW): Xiangxu Lin
Tech Specialist (HW): Daniel Maher
Student Engagement: Chandra Krishnan, Cleveland School of Science & Medicine

Outreach Workshop – 1: Visual Coding

Angela Guercio, Deepshikha Bhati, Alexis Faudree, Makyla Henninge, Nathaniel Miller, John Sipahioglu, Esha Soni, and Trish Williams

Outreach Workshop – 2: Robotics

Jong-Hoon Kim, Saifuddin Mahmud, Redwanul Sourave, Daniel Maher, and Raghav Kasibhatla

Outreach Workshop – 3: Wearable Technology

Jungyoon Kim, Arthur Smith, Neha, and Garrett Hartley

Outreach Workshop – 4: Theatrical Design for Creating Non-Realistic World

Jakyung Seo, Jaemin Park, and Bethy Winters

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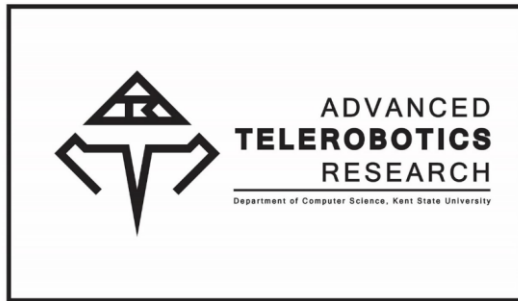


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The 13th International Conference on Intelligent Human Computer Interaction

December 20th-22nd, 2021



The IHCI is an annual international conference in the Human-Computer Interaction field, where we explore research challenges emerging in the complex interaction between machine intelligence and human intelligence. This is the thirteenth event which has a theme on "Intelligent Interaction Beyond Physical Limits", having special tracks related to the main theme of the conference.



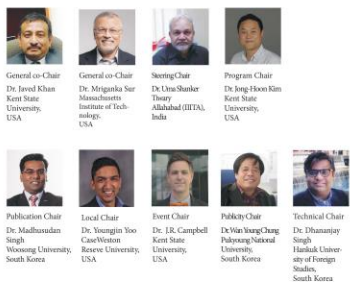
Keynote Speaker



Invited Speakers



Key Organizers



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Conference Program



| | |
|------------------|--|
| 20 th | <p>Keynote: Dr. Jonathan Lazar (University of Maryland) , Dr. Rajiv Jain (Adobe Research)</p> <p>Invited Speakers; Dr. Dimple Kaur (Applied Natya Therapy) , Dr. DVK Vasudevan (University of Hyderabad) , Dr. Jay Lee (Youngstown State University), Dr. Prasad Onkar (Indian Institute of Technology Hyderabad)</p> <ul style="list-style-type: none"> • (Session 1-A) <i>The principle and practice of human-centered AI</i> • (Session 1-B) <i>Immersive and Tangible interface</i> • (Session 2-A) <i>Cognitive Learning Analytics</i> • (Session 2-B) <i>Intelligent Interaction and Visualization</i> • <i>Student Forum, Technical Tutorial-1</i> |
| 21 st | <p>Keynote: Dr. Brygg Ullmer (Clemson University) and Dr. Youngjin Yoo (Case Western Reserve University)</p> <p>Invited Speakers; Dr. ir. Jan-Willem van't Klooster(University of Twente) , Dr. Chakravarthy Bhagvati (University of Hyderabad)</p> <ul style="list-style-type: none"> • (Session 3-A) <i>HCI in E-Health Monitoring and Management</i> • (Session 3-B) <i>Machine Learning for HCI</i> • (Session 4-A) <i>Educational Applications of Interactive Computer Systems</i> • (Session 4-B) <i>Digital signal and image processing methods</i> • <i>Industrial Forum</i> |
| 22 nd | <p>Keynote: Dr. S.S. Iyengar (Florida International University)</p> <p>Invited Speakers; Dr. Rajesh Sankaran (Argonne National Laboratory), Dr. Uweal Gadgiraju (Delft University of Technology) , Dr. Rodrigo da Rosa Righi (University of Vale do Rio dos Sinos), Garima Bajpa (DevOps)</p> <ul style="list-style-type: none"> • (Session 5-A) <i>Beyond AI: Human-In-The-Loop Intelligence</i> • (Session 5-B) <i>Theory & Application of Intelligent Systems in Modeling Simulation, and Automation</i> • (Session 6-A) <i>AI-Inspired Solutions for Mental Health Ailments: Prevention, Detection, and Treatment</i> • (Session 6-B) <i>Modeling and Metric for HCI</i> • <i>Technical Tutorial-2</i> |



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