

Keynote-1

Title : Everything You wanted to Know about Smart Healthcare

Speaker : Prof. Saraju P. Mohanty,

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Abstract:

The healthcare system has gradually evolved from traditional healthcare to telemedicine, connected-health (cHealth), electronic health (e-health), mobile-health (mHealth), to smart health (sHealth). The importance of the smart healthcare involving telemedicine and mobile health is strongly evident from the situations in the hospitals during the coronavirus disease (COVID-19) outbreak. Smart healthcare built using Internet-Medical-Things (IoMT) is a key component in smart cities and smart villages which can provide effective and optimal healthcare facilities to the patients. IoMT, a specific instance of IoT, is a configurable dynamic network of networks, available anywhere, anytime, by anything and anyone. Smart healthcare is further expanding with the help of healthcare Cyber-Physical System (H-CPS) that integrates IoMT, electronic health record (EHR), and machine learning (ML) analytics obtained from sensor data and EHR. H-CPS consists of various components including sensors, biosensors, body sensors, electronics, wearables, implantables, networks, EHR, ML analytics, middleware, firmware, and software. This talk will present detailed insight of IoMT based smart healthcare built as a H-CPS. The talk will address many questions about H-CPS based smart healthcare including: (1) What is IoMT? (2) What is Healthcare CPS? (3) What are the challenges of design and operation of H-CPS? (4) What are some smart healthcare examples? (5) What roles H-CPS can play during pandemic?

Speaker Biography:

Dr. Saraju P. Mohanty is a Professor at the University of North Texas. Prof. Mohanty's research is in "Smart Electronic Systems" which has been funded by NSF, SRC, US Air Force, IUSSTF, and Mission Innovation. He



has over 20 years of research experience on security and protection of media, hardware, and system. He introduced the Secure Digital Camera (SDC) in 2004 with built-in security features designed using Hardware-Assisted Security (HAS) or Secure by Design (SbD) principle. He is widely credited as the designer for the first digital watermarking chip in 2004 and first the low-power digital watermarking chip in 2006. He has authored 400 research articles, 4 books, and 7 granted and pending patents. His Google Scholar h-index is 44 and i10-index is 170 with 8100 citations. He is a recipient of 13 best paper awards, Fulbright Specialist Award in 2020, IEEE Consumer Technology Society Outstanding Service Award in 2020, the IEEE-CS-TCVLSI Distinguished Leadership Award in 2018, and the PROSE Award for Best Textbook in

Physical Sciences and Mathematics category in 2016. He has delivered 11 keynotes and served on 12 panels at various International Conferences. He has been serving on the editorial board of several peer-reviewed international journals, including IEEE Transactions on Bigdata and IEEE Transactions on CAD as well as EiC of IEEE Consumer Electronics Magazine during 2016-2021. He served as the Chair of the IEEE-CS Technical Committee on VLSI (TCVLSI) during 2014-2018 and served on the Board of Governors of the IEEE Consumer Technology Society during 2019-2021. He is the founding steering committee chair for the IEEE International Symposium on Smart Electronic Systems (iSES), steering committee vice-chair of the IEEE-CS Symposium on VLSI (ISVLSI), and steering committee chair of the OITS International Conference on Information Technology (OCIT).

Keynote-2 (Industrial Talk)

Title : Tech Trends Impacting Business

Speaker : Satendra Singh

CTO, Propelld, Bengaluru, India

Abstract:

Financial Technology companies have driven innovations and solutions in the finance sector which is rapidly disrupting the ways consumer financial services and products are delivered. There are now more than 26000 fintech companies operating internationally and about 30% of all banking customers use at least one financial service. The talk touch upon all the tech trends changing the fintech space. The technologies like blockchain distributed ledger and smart contracts power the Technology behind cryptocurrencies. Digital Banking (Neobanks) and mobile Payments are eradicating the needs of the physical branch and endless paperwork. Robotic Process Automation to automate the back-office functions to allow people to focus more on innovations and value-adding activities. AI and ML applications to perform risk assessment, forecasting, Robo-advisor for personalized investment suggestions, real-time video analysis for customer liveness check for KYC processes and chatbots to provide basic customer service queries are a few trending adoptions. Regulatory technologies to keep track of compliance and data sharing, one such example is the Account Aggregator framework in India to access financial data to different parties in the financial ecosystem.

Speaker Biography:

Satendra Singh is Chief Technology Officer at Propelld. He has 10 years of experience in development, building tech architecture, managing developer teams, building start-ups, and network security. Previously, he co-founded customer feedback management company, Voyce which was sold to Exotel. He has handled Indian team of renowned UK based company Travel Republic. He has obtained "Master of Science" from International Institute of Technology Bangalore and interested in pursuing research in distributed architectures, data science and solving some of the great problems and provide optimal and easy to use solutions. Has published papers in area of Processing Large Scale LiDAR Point Clouds and got best paper award in "2020 IEEE India Geoscience and Remote Sensing Symposium (InGARSS)" for paper titled "A Distributed System for Multiscale Feature Extraction and Semantic Classification of Large-scale LiDAR Point Clouds".



Keynote-3

Title : Smart education in post-pandemic era

Speaker : Prof. Baek-Young Choi

University of Missouri – Kansas City (UMKC)

Abstract:

Education is an essential component of human life beyond K-12 and college education. This Covid-19 pandemic, together with recent technology advancements, has been dramatically changing many aspects of our lives, especially our education. Many longstanding questions and debates in learning and teaching, such as effective modes of education, appear to be clear now, and further questions are being opened up. In this talk, we will examine the changes of perceptions on learning modes discovered during this pandemic, the evolving roles of Learning Management Systems, the use of technologies in education, including Artificial Intelligence and Virtual Reality, as well as the inequity issue of education. The open questions and future directions of educations will also be discussed.

Speaker Biography:

Dr. Baek-Young Choi is a Professor at the University of Missouri – Kansas City (UMKC). Prior to joining the University of Missouri – Kansas City, Dr. Choi held positions at Sprint Advanced Technology Labs, and the University of Minnesota, Duluth, as a postdoctoral researcher, and as a 3M McKnight distinguished visiting assistant professor, respectively. She published three books on network monitoring, storage systems, and cloud computing. She has been a faculty fellow of the National Aeronautics and Space Administration (NASA), U.S. Air Force Research Laboratory’s Visiting Faculty Research Program (AFRL-VFRP) and Korea Telecom’s - Advance Institute of Technology (KT-AIT). She is an associate editor for IEEE Consumer Electronics Magazine and was an associate editor for IEEE Internet-of-Things Journal, Springer Journal of Telecommunication Systems, Elsevier Journal Computer Networks. Her research interests generally lie in the broad area of networking and communications, with specific emphasis on Internet-of-Things, software-defined networking, cybersecurity, smart city technologies. She is a senior member of ACM and IEEE, and a member of IEEE Women in Engineering.



Keynote-4

Title : Machine Learning and Data Analytics Applications in Power Engineering

Speaker : Prof. R. Nagaraja,

Founder and Managing Director of M/s. Power Research & Development Consultants Private Limited, Bengaluru, INDIA

Abstract:

Introduction of various Intelligent Electronic Devices (IEDs), sensors and other network controls for smarter operation of the electric grid has resulted in massive data explosion. With an exponential growth in volume and diversity of data sources, developing an effective data management system using big data analytics is imperative. Consolidating such a volume of data, processing them and arriving with needed business insights is quite challenging. Commercially available Big Data framework and tools enable power engineers in achieving this efficiently. The implementation of applications in power engineering calls for systematic approach in defining the solution by leveraging appropriate tools and frameworks. Some of the proven applications are managing smart meter data, monitoring the distribution grid, renewable energy forecasting, Wide Area Measurement, Protection and Control (WAMPAC) tools, optimizing energy trading enabling higher penetration of green energy into the grid. The talk addresses as how the machine learning and data analytics applications in power engineering are enabling to have a more secure, reliable and resilient electrical grid.

Speaker Biography:

Dr. R. Nagaraja is the founder and Managing Director of M/s. Power Research & Development Consultants Private Limited, Bangalore, INDIA. He has vast experience of 30 years in the field of power system simulation and consulting. His specialization includes Power System Analysis, Operations, Power Engineering Education and Power System Protection. He has conducted several power system studies and analyzed many grid disturbances both in India and outside country.



He is the architecture and chief mentor for the design and development of the MiPower – Power system analysis software package widely used by Electric utilities, Industries, Consultants and Educational Institutions for power system analysis and research purposes.

Dr. R. Nagaraja has worked in the smart grid sphere and has guided the development of tools as part of SCADA and EMS in power industry.

Dr. R. Nagaraja is Senior Member of IEEE and past Chapter Representative for Power Engineering Society (PES) for R-10 West Chapters. He is also the past chair for PES India Chapters Council. He has contributed to IEEE by holding various positions and also as Chair for IEEE PES, Bangalore Chapter. Dr. R. Nagaraja has conducted several workshops and technical programs and delivered lectures throughout the world. He was the co-chair for the first edition of World Utility Summit WUS-2016 and Chair for the second edition of WUS-2018. Dr. R. Nagaraja has guided several Masters and PhD students.

Keynote-5

Title : Micro-architectural Support to Defend Against Software Attacks

Speaker : Prof. Srinivas Katkooi

University of South Florida (USF), Tampa, FL

Abstract:

Control-flow attacks ranging from classical stack-based buffer overflow to sophisticated return-oriented programming (ROP) cleverly exploit the vulnerability in the software to gain control over it. Recently, Spectre and Meltdown attacks show that the architecture itself can be a loophole that can be exploited to leak the secret data otherwise inaccessible. In this talk, we address several software as well as hardware-related vulnerabilities with micro-architecture based countermeasures to secure the system against control-flow attacks and speculation-based cache probe attacks. Firstly, we present a novel run-time approach to extract program variables' memory information from instructions to create cache-like structure, variable record table (VRT). We modify pipeline architecture to utilize VRT to detect stack as well as heap buffer overflow attacks. Execution time per test case is five or more orders of magnitude less in this approach. We further use the VRT information as a novel approach to verify back-edge control-flow integrity (CFI) by comparing with actual variables usage once control returns from a function. Secondly, we encode the basic block and its adjacent block(s) of a control flow graph (CFG) with equidistant hamming labels at the instruction level for full CFI enforcement. Encoded CFG helps in significant ROP gadget search space reduction (up to 99.28%). Lastly, we present a novel approach to defend miss speculation based cache probing attacks by identifying vulnerable cache addresses during speculative memory access. We record such memory access in VRT to verify unauthorized access from within and outside of the process in real-time. The additional instruction overhead in this approach is zero.

Speaker Biography:

Srinivas Katkooi is a CSE faculty at the University of South Florida (USF), Tampa, FL. His research group is actively conducting research on related topics such as low power digital VLSI design, reliable system



design, Internet-of-Things (IoT), smart embedded systems, smart transportation, smart healthcare, etc. Dr. Katkooi has directed 17 doctoral dissertations and 41 Master's Theses. Dr. Katkooi serves on technical committees of several VLSI and embedded conferences and is associate editor of several smart embedded systems journals. To date, he published over 150 peer-reviewed journal and conference papers, 1 book, 2 book chapters, and holds 1 US patent. Five (5) papers he has co-authored were nominated for best paper awards at 2003 ASP-DAC, 2014 IFIP/IEEE VLSI SOC, 2019 AsianHOST, 2020 IEEE iSES, and 2021 IFIP IoT conferences. Two (2) papers he co-authored are recognized with the best paper award at 2020 IEEE iSES symposium and 2021 IFIP IoT conference. Among notable professional service, Dr.

Katkooi served on ACM SIGDA Board (2010- 2013) as Treasurer, as an Associate Editor of IEEE Transactions on VLSI (2006-10), the vice-chair of IFIP Working Group 10.5 on Design and Engineering of Electronic Systems (2015-2020). Dr. Katkooi served as the General Chair of several conferences, 2019 2nd IFIP IoT and 2020 IEEE iSES, and Program Chair of 2021 ISVLSI, and 2021 IFIP IoT. He is a Senior Member of ACM and IEEE. As of December 2021, per Google Scholar, his research publications had 2217 citations, with an h-index of 23, and an i10-index of 48.

Keynote-6

Title : AI for Personalized Education

Speaker : Prof. Mukesh Mohania

Professor (CSE) and Dean (IRD), IIIT Delhi

Abstract:

Online courses and learning systems have been gained tremendous popularity over the last few years. While their ease of access and availability make them a very useful medium for knowledge sharing and learning, they do not keep the learners and their learning abilities in mind. The “one size fits all” approach to learning content and the question paper does not work in a large virtual classroom consisting of diverse students with different skill profiles, learning styles, aptitude and capabilities. In a traditional classroom, teachers who interact closely with students are in a position to evaluate the pace and depth of the curriculum being taught and can also suggest learning content to students not being able to cope with the general classroom teaching. Such suggestions and guidance are absent in current online learning systems. In this talk, we aim to address how AI can help in (1) making content smarter through learning content analytics and automatic content tagging, (2) generating the diverse, but semantically related, questions for evaluating the students’ knowledge, (3) assisting in short answers evaluation, and finally (4) understanding the students’ learning style/capacity through learning data analytics, thus enabling the adaptive and personalized education on Big Data platform.

Speaker Biography:



Mukesh Mohania is a Professor (CSE) and Dean (IRD) at IIIT Delhi. He has 20+ years of experience in IT Architect and Innovation and has held senior technical and business leadership roles in IBM Research in India and Australia. His innovations center on Information (structured and unstructured data) integration, master data management, AI for entity analytics, blockchain data management, and developing complex systems and applications in these areas. Over the course of his career, he has led a succession of successful projects that produced technology and products in use across the industry today, as well as influential and frequently cited technical work and patents. He holds 60+ granted patents and published 100+ technical papers in International Conferences and has widely participated in Industry forums. For these accomplishments, IBM recognized him as an “IBM Distinguished Engineer”, “Master Inventor”, “Member of IBM Academy of Technology”, “Best of IBM”. He has received several IBM corporate and research level awards, such as, “Excellence in People Management”, “Outstanding Innovation Award”, “Technical Accomplishment Award”, “Leadership By Doing”, and many more. He is a founding project director of DST sponsored Technology Innovation Hub (TIH) on ‘Cognitive Computing and Social Sensing’ at IIIT Delhi and received Rs100Cr for 2021-2025. He has held several visible positions, like ACM Distinguished Scientist (2011-), VLDB Conference Organizing Chair (2016), DASFAA General- co-chair (2022), ER PC co-chair (2022), ACM India Vice-President (2015-17), ACM Distinguished Service Award Committee chair (2017-2018), Adjunct Professors/Industrial R&D board at various top universities in India and Australia, and many more, and has received IEEE Meritorious Service Award and ACM Outstanding Service Award.