2019 IEEE Rochester Section - Joint Chapters Meeting

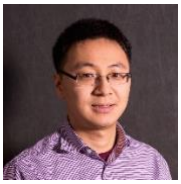
Rochester Institute of Technology Louise Slaughter (SLA) Building, Rochester, NY

Event Information and Registration: https://events.vtools.ieee.org/m/190998

April 9th, 2019

IEEE Rochester Section ExCom Meeting, Room 2140	3:00 – 4:00 PM
Registration and Refreshments, Rooms 2240 - 2230	4:00 – 4:30 PM
Chapter Technical Presentations I, Rooms 2120, 2130 or 2140	4:30 – 5:30 PM
Chapter Technical Presentations II, Rooms 2120, 2130 or 2140	5:30 – 6:30 PM
Student Poster Session, Rooms 2210 & 2220	5:30 – 7:00 PM
Networking (cash bar), Rooms 2210 & 2220	6:15 – 7:15 PM
Dinner & Keynote Presentation, Rooms 2240 - 2210	7:15 – 9.00 PM

Technical Presentations: Session I (4:30 – 5:25 PM)



Cache Side-Channel Attack and Defense on Mobile and IoT Devices **(SLA 2120)**
Ziming Zhao, RIT

The model-based elasticity imaging for abdominal aortic aneurysm modeling **(SLA 2130)**
Michael Richards, RIT

Power-Efficient Datacenter Networks with Server-to-Server Millimeter-Wave Wireless Communications **(SLA 2140)**
Amlan Ganguly, RIT

Technical Presentations: Session II (5:30 – 6:25 PM)

The case for Software Defined Radio (SDR) in Industrial IoT **(SLA 2120)**
Aaron Roof, Vanteon Wireless Solutions

1500 – That's a lot of STEM Volunteers **(SLA 2130)**
Jon Kriegel, STEM Bridges & RES

Achieving Optimal EMC-best practices for Printed Circuit Board Component Selection, Stack-up, Trace Routing, and Signal Return Path Management **(SLA 2140)**
Jim Herrmann, AppliedLogix

Keynote Presentation: *The Chandra X-Ray Observatory (7:30 – 8:30 PM in 2240-2210)*
Jon Kriegel, PhD | Director, STEM Bridges

POSTER SESSION (*5:30 – 7:00 PM in 2220 – 2230*)
Local research will be on display.

Technical sessions are free to attend for IEEE members. Registration is required to attend dinner & keynote.

Please register at the following link: https://events.vtools.ieee.org/meeting_registration/register/190998

2019 IEEE ROCHESTER SECTION JOINT CHAPTERS MEETING

KEYNOTE LECTURE: THE CHANDRA X-RAY OBSERVATORY

Dr. Jon Kriegel

Director, STEM Bridges

Tue, April 9th, 2019 @ 7:30 PM

Rochester Institute of Technology – Louise Slaughter Hall

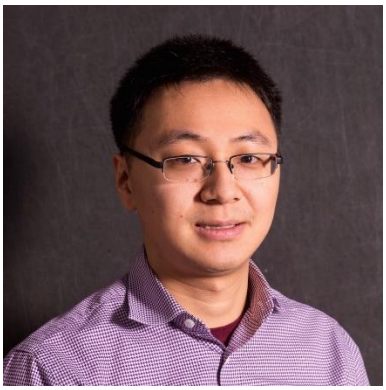
RIT Center for Integrated Manufacturing Studies (CIMS)

The technical sessions are free to attend for IEEE members. Reservations are required to attend the dinner and keynote.

Abstract: 90% of the Matter in the Universe, we cannot see … until NOW! The third in NASA's Series called *The Great Observatories*, images with X-Rays have revealed some of the unseen matter! This talk will expose the audience to the intended uses for this satellite telescope, and its place in the evolution of our knowledge of the Universe. Launched in July of 1999, The Chandra Telescope is being used to study the X-Ray properties of distant Galaxies, neutron stars, black holes, quasars, and other high-energy sources. X-Rays are absorbed by the Earth's atmosphere, so our only knowledge of cosmic X-Ray sources, comes from previous satellites like the High Energy Astronomy Observatory (HEAO-2), also known as the Einstein Observatory: launched in the 1970's. Images from these early satellites, sparked many questions, and triggered the need for the increased capability Chandra represents. Instead of reflecting, X-Rays would pass right through conventional glass mirrors, so this telescope utilizes grazing-incidence optics to focus incident rays through a focal length of 10 meters. Chandra is almost 50 feet long, 14 feet in diameter, and weighs 10,000 pounds. In spite of the absence of an atmosphere, the telescope will be maintained at 50 ± 2.5 F° while in space. In addition to imaging capability, Chandra carries two diffraction gratings, allowing spectrographic separations of incident rays, for temperature and chemical composition analysis of distant, high-energy sources. The speaker was part of the design team at Eastman Kodak Company, where the telescope was designed, fabricated, and assembled. This presentation will cover the technological advances made in creating the most perfect reflective surfaces ever produced; in establishing strain-free mounts for 450-pound mirrors; in assembling and aligning multi-story components, in Class-100 clean-room conditions, and other "solutions" which advanced the state-of-the-art called mechanical engineering. This presentation includes several images returned by this Telescope, which represent a 100 X improvement over our previous imaging and information gathering capability, in these very significant, high-energy wave-lengths.

Bio: Jon Kriegel has 40 years design engineering experience, working for several blue-chip corporations including 27 years at Eastman Kodak. Jon has contributed to the design of business products from copiers and ink-jet printers, to the Chandra Telescope, in the NASA Series called the Great Observatories. Mr. Kriegel holds 5 US patents. Jon has accumulated more than a decade of teaching experience as a faculty member at both Rochester Institute of Technology and Monroe Community College. Jon served for four years, as the Chair of the Rochester ASME Section, and has presented a number of papers at ASME Conferences. Concerned about America's loss of technical competence, Jon has been a player in several local and national programs, focused on improving the delivery of mathematics and science, to students of all ages. He is a member of the Finger Lakes STEM Hub, the Seneca Waterways Boy Scout Council and the Rochester Council of Scientific Societies. Jon was the 2004 and 2017 President of the Rochester Engineering Society, and spokesperson and Chair of a local engineering competition focused on Middle School students, known as the E3 Fair. (E3 stands for Engineering, Exploration and Experimentation). As a retiree, Jon has spearheaded the RES STEM Bridges Initiative to place people with a STEM backgrounds, in local school classrooms, as Volunteer STEM Coaches.

2019 IEEE ROCHESTER SECTION JOINT CHAPTERS MEETING



LECTURE: CACHE SIDE-CHANNEL ATTACK AND DEFENSE ON MOBILE AND IOT DEVICES

Dr. Ziming Zhao

Computing Security Dept., Rochester Institute of technology

Tue, April 9th, 2019 @ 4:30 PM

Rochester Institute of Technology – Louise Slaughter Hall

RIT Center for Integrated Manufacturing Studies (CIMS)

The technical sessions are free to attend for IEEE members. Reservations are required to attend the dinner and keynote.

Abstract: It is found that existing and powerful cache side-channel attacks on Intel architectures, including Prime+Probe, are ineffective on mobile and Internet-of-things (IoT) devices powered by ARM architectures. The trust in ARM's hardware-isolated execution environments, namely TrustZone, was also reinforced by these findings. However, those discoveries do not rule out novel and more sophisticated cache side-channel attacks that leverage overlooked hardware features. In this talk, I will present a novel Prime+Count attack that can be used to built reliable covert channels between the normal and secure world of TrustZone, which breaks one of its fundamental security guarantees. On the other hand, protections that can defeat previous cache side-channel attacks on Intel architectures are not necessarily effective in mitigating novel cache attacks on ARM platforms. Such solutions attempt to mitigate attacks by explicitly or implicitly creating a private space, in which constant-time access to sensitive data is assured. However, some of the attempts utilize hardware features available only on certain Intel processors. In this talk, I will also discuss a defense against cache side-channel attacks that can protect against both dedicated cache (L1) and shared cache (L2) attacks on mobile and IoT devices.

Bio: Ziming Zhao is an assistant professor at the computing security department of RIT. He received the PhD degree in computer science from Arizona State University in 2014. His research foci include system and software security, network security, usable and user-centric security, cybercrime and threat intelligence analytics. His research has led to 45+ publications in security conferences and journals, including IEEE S&P, ACM CCS, USENIX Security, NDSS, ACSAC, TISSEC, etc. He won a best paper award in ACM CODASPY 2014 and IEEE ITU Kaleidoscope 2016. He directs the CyberspACe securiTy and forensIcs lab (CactiLab, http://cactilab.info/).

2019 IEEE ROCHESTER SECTION JOINT CHAPTERS MEETING

LECTURE: MODEL-BASED ELASTICITY IMAGING FOR ABDOMINAL AORTIC ANEURYSMS MONITORING

Dr. Michael Richards

Biomedical Engineering, Rochester Institute of technology

Tue, April 9th, 2019 @ 4:30 PM

Rochester Institute of Technology – Louise Slaughter Hall

RIT Center for Integrated Manufacturing Studies (CIMS)

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Abstract: The necessity of surgical intervention of abdominal aorta aneurysms is based on a risk-reduction paradigm primarily relying on trans-abdominal ultrasound (US) measurements of the maximum diameter of an AAA. Model-based ultrasound elastography, or elasticity imaging, is an adjunct imaging technique that can be used to measure changes in the mechanical properties of AAA vessels and potentially provide point of care information on the stress within the tissue. Out hypothesis is that this information may be used by clinicians to improve risk assessment for surgical interventions. We present results of validation studies comparing modulus reconstructions with known solutions are performed from simulations, experimental results of tissue-mimicking phantom studies, and initial clinical results. We show that our techniques can identify changes in tissue stiffness that maybe used as a surrogate for the relative health of AAA tissue. I will also discuss the necessary steps for estimating stress in these vessels using this technique.

Bio: Dr. Richards received his Bachelor of Science with in Biomedical Engineering from the University of Rochester followed by a PhD in Biomedical Engineering from Boston University. His postdoctoral training was completed in the Department of Radiology, Basic Radiological Sciences Division at the University of Michigan and at the University of Rochester, Department of Electrical and Computer Engineering. He worked as Research Assistant Professor in the Department of Surgery, Division of Vascular Surgery for 5 years. Dr. Richards' laboratory focuses on the biomechanics of soft tissues and measuring the changes in mechanical properties of diseased tissues using clinical imaging modalities. The computational aspects of the lab are centered around developing improved motion estimation algorithms and novel methods for solving the inverse problems associated with elasticity imaging. Specific applications include investigation into the tendon mechanics of pathologies, such as Achilles tendinopathy and Osgood-Schlatter's disease, and the mechanical changes associated with healing and scar formation in tendons. His lab also has an ongoing project studying the mechanical property changes associated with abdominal aortic aneurysm growth.

2019 IEEE ROCHESTER SECTION JOINT CHAPTERS MEETING

LECTURE: POWER-EFFICIENT DATACENTER NETWORKS WITH SERVER-TO-SERVER MILLIMETER-WAVE WIRELESS COMMUNICATIONS

Dr. Amlan Ganguly

Computer Engineering, Rochester Institute of technology

Tue, April 9th, 2019 @ 4:30 PM

Rochester Institute of Technology – Louise Slaughter Hall

RIT Center for Integrated Manufacturing Studies (CIMS)

The technical sessions are free to attend for IEEE members. Reservations are required to attend the dinner and keynote.

Abstract: Datacenters have evolved to be an important part of the digital lifestyle in the modern world. As a part of cloud computing platforms, datacenters provide large storage banks and processing power for cloud-based services. According to a 2016 report from Lawrence Berkeley National Laboratory, it is projected that the power consumption of all datacenters in the USA is going to be 73 billion KWh per year by 2020 and the power consumption of the Datacenter Network (DCN) will continuously increase to support the increasing demand for bandwidth. Keeping this high-fidelity network active, often constructed from legacy switching fabrics, consumes 10 to 50% of the total IT power of the datacenter depending on server utilization. This demonstrates the immediate need to improve efficiency and power consumption of datacenters in general and DCNs in particular. To address the design issues of traditional datacenters, wireless datacenter architectures are being investigated. The capability of the unlicensed millimeter-wave (mm-wave) bands such as the 60GHz band, to deliver multi-gigabit data rates has led to the design and development 60GHz wireless DCNs.

In this talk we will explore a wireless DCN architecture capable of establishing direct communication links between thousands of servers in a datacenter. This architecture eliminates the power-hungry switching fabric required in traditional tree-based DCNs thereby, reducing the power consumption of DCNs by an order of magnitude. Through network-level simulations using NS-3 we will demonstrate that this server-to-server wireless DCN is capable of providing comparable performance as that of traditional DCNs for various types of applications, while reducing the power consumption significantly. In addition to wireless DCNs, we will also discuss the opportunities and advantages of inter-chip wireless communication within servers in the datacenter. We will also explore future research directions that need to be undertaken to improve the performance of wireless DCNs.

Bio: Dr. Amlan Ganguly is an Associate Professor in the department of Computer Engineering at Rochester Institute of Technology, Rochester, NY. His research interests are in power and energy efficiency of interconnection networks for computing systems such as datacenters, multi-chip systems and embedded platforms. His current primary focus is in millimeter-wave wireless interconnection networks for datacenters and inter-chip communications. He received the US National Science Foundation Faculty Early CAREER Development Award in 2015-2016 for his research on wireless datacenter networks. His research is funded by US NSF, Toyota Material Handling North America (TMHNA). He serves on the editorial board of the Elsevier Journal of Sustainable Computing (SUSCOM) and MDPI Journal of Low Power Electronics and Applications (JLPEA). He is a member of the organizing committee of the International Network-on-Chip Symposium (NOCS), International Conference on Green and Sustainable Computing (IGSC) and the Workshop on System-Level Interconnect Prediction (SLIP). He also routinely serves on the Technical Program Committee for several conferences and symposia. He has published over 60 technical papers in reputed peer-reviewed journals, conferences and workshops.

2019 IEEE ROCHESTER SECTION JOINT CHAPTERS MEETING

LECTURE: THE CASE FOR SOFTWARE DEFINED RADIO (SDR) IN INDUSTRIAL IOT

Dr. Aaron J. Roof

Chief Technology Officer, Vanteon Wireless Solutions

Tue, April 9th, 2019 @ 4:30 PM

Rochester Institute of Technology – Louise Slaughter Hall

RIT Center for Integrated Manufacturing Studies (CIMS)

The technical sessions are free to attend for IEEE members. Reservations are required to attend the dinner and keynote.

Abstract: Though the name Industrial Internet of Things (IIoT) is new, IIoT has evolved from SCADA and other proprietary wireless sensor technologies. Most IIoT applications require the use of extremely low cost, low power, and small form factor radios that are connected to battery powered sensors in sparse applications like agriculture, oil and gas fields, meter reading, smart grid component health/fault monitoring and so on. Most of these applications utilize the 900 MHz unlicensed industrial band for wireless communications. The FCC requires the use of spread spectrum in this band and frequency hopping is typically deployed for interference avoidance. As IIoT evolves there is a need to connect legacy systems with newer protocols. Learn how a Software Defined Radio (SDR) offers many benefits over traditional solutions from protocol flexibility, channelization, low cost, low power, future proofing, etc. This presentation describes the challenges of IIoT and explores the benefits of SDR in meeting those challenges.

Bio: Aaron Roof is a Ph.D. graduate from the State University of New York at Buffalo (UB) in Electrical Engineering with a focus in Communications and Signal Processing. His area of research is in Software Defined Radio and Signal Classification for which he is a patent holder. Aaron is the Chief Technical Officer at Vanteon Corporation where he has worked since 2003. In addition to his Ph.D., he also received a M.S. degree from UB in 2008 and a B.S. degree in Electrical Engineering from Rochester Institute of Technology in 1994 where he is now a member of the faculty as an adjunct professor. He has 20+ years of experience working in the area of wireless communication systems and Software Defined Radio.

2019 IEEE ROCHESTER SECTION JOINT CHAPTERS MEETING

LECTURE: 1500 - THAT'S A LOT OF STEM VOLUNTEERS

Dr. Jon Kriegel

Director, STEM Bridges

Tue, April 9th, 2019 @ 7:30 PM

Rochester Institute of Technology – Louise Slaughter Hall

RIT Center for Integrated Manufacturing Studies (CIMS)

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Abstract: In the '90s, Eastman Kodak put 1500 technical volunteers into Rochester City School classrooms for 2-hour visits, twice per week, for a period of several years. The goal was to provide the classroom-teacher with a way to stay current with our ever-changing technology. Between these visits and a five-week, summer, hands-on teacher-training session, this goal was achieved. Can we, as a technical Society, with a larger work-force, (perhaps even some of the same people), do less? The dream of the RES STEM Bridges (stem-bridges.org) initiative is to tap members of the technical community to become Volunteer STEM Coaches. The RES has access to over three-thousand engineers in Upstate NY. Some of them are retirees, and many more will join those ranks, as the Baby-boomers retire. Maybe that means classroom visits, or individual mentoring, (see photos above), or interface and delivery options you can help us define; but as a minimum, we are anxious to create a mailing list that connects members of all the RES affiliates, including the RES itself, with STEM solution-ideas from all possible sources. One path I like is to have you visit the school of your choice, (instead of one where you have no personal connection), to give a talk on a topic of your choice, (perhaps some significant success from your career). The RES currently has an Engineering-based Explorer Troop, and is involved with the Dr. Walter Cooper Academy, where volunteers do literacy tutoring. Integrating new school-based support with teacher-goals, (as dictated by Common Core), will not be easy. The STEM guidelines for Common Core are just now being written, and we could perhaps influence how that effort evolves. Most importantly, we need to connect with school systems, the RMSC, Finger Lakes STEM, STEM Smart and the un-ending string of sister organizations interested in STEM activities, and deliver the Tech-savvy volunteer people-power to make all of these efforts succeed. I know of no more likely organization than the RES, to fill those shoes. We are anxious to connect Engineers, Physicians, Entrepreneurs, Manufacturers etc. with STEM teachers, for STEM support during actual class-time. Having practiced this STEM support for ten years, I've learned that integrating this school-based STEM support with teacher-STEM-goals turns out to be easy and enjoyable. Most importantly, we have the opportunity to provide the tech-savvy, volunteer, people-power to make STEM delivery real. I know of no more likely organization than the RES, to fill those shoes! It turns out there are already fourteen versions of this initiative (Volunteer STEM Professionals visiting actual classrooms), operating in nine States across America.[1]

Bio: Jon Kriegel has 40 years design engineering experience, working for several blue-chip corporations including 27 years at Eastman Kodak. Jon has contributed to the design of business products from copiers and ink-jet printers, to the Chandra Telescope, in the NASA Series called the Great Observatories. Mr. Kriegel holds 5 US patents. Jon has accumulated more than a decade of teaching experience as a faculty member at both Rochester Institute of Technology and Monroe Community College. Jon served for four years, as the Chair of the Rochester ASME Section, and has presented a number of papers at ASME Conferences. Concerned about America's loss of technical competence, Jon has been a player in several local and national programs, focused on improving the delivery of mathematics and science, to students of all ages. He is a member of the Finger Lakes STEM Hub, the Seneca Waterways Boy Scout Council and the Rochester Council of Scientific Societies. Jon was the 2004 and 2017 President of the Rochester Engineering Society, and spokesperson and Chair of a local engineering competition focused on Middle School students, known as the E3 Fair. (E3 stands for Engineering, Exploration and Experimentation). As a retiree, Jon has spearheaded the RES STEM Bridges Initiative to place people with a STEM backgrounds, in local school classrooms, as Volunteer STEM Coaches.

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[1] AAAS US Volunteer Programs https://www.aaas.org/senior-scientists-and-engineers/us-volunteer-programs

2019 IEEE ROCHESTER SECTION JOINT CHAPTERS MEETING

LECTURE: ACHIEVING OPTIMAL EMC - BEST PRACTICES FOR PRINTED CIRCUIT BOARD COMPONENT SELECTION, STACK-UP, TRACE ROUTING, AND SIGNAL RETURN PATH MANAGEMENT

Jim Herrmann

Founder & Managing Partner, AppliedLogix LLC

Tue, April 9th, 2019 @ 4:30 PM

Rochester Institute of Technology – Louise Slaughter Hall

RIT Center for Integrated Manufacturing Studies (CIMS)

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Abstract: This technical session will identify common Printed Circuit Board (PCB) design pitfalls and present a set of component selection, PCB stack-up and trace routing best practices for achieving optimal Signal Integrity (SI), Power Integrity (PI), and Electromagnetic Compatibility (EMC). The key electrical and electromagnetic principles that are at the core of both the common problems and the best practices will be highlighted.

Bio: Mr. Jim Herrmann is the Founder and a Managing Partner at AppliedLogix, LLC., a Rochester based embedded electronics and software design services firm. Jim wields 30+ years of hands-on experience designing high performance embedded electronics subsystems. Over his Engineering career, he has played a leading role in defining and delivering cutting-edge electronics products that have earned industry awards, customer acclaim, and marketplace success. Jim received his BSEE degree from the State University of New York at Buffalo, and his MSEE degree from the University of Rochester. Jim holds (4) US Patents and is an active member of the Rochester, NY chapter of the IEEE. LinkedIn Profile: http://www.linkedin.com/in/jamesfherrmann.