

DCAS 2024



17th IEEE Dallas Circuits and Systems
April 19-April 21, 2024, Dallas, Texas

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General Chairs' Welcome

It is our great pleasure to welcome you to the 2024 IEEE Dallas Circuits and Systems Conference (DCAS 2024) in Dallas, Texas. We are all honored to organize DCAS 2024 in Dallas this year and extend our welcome to attendees from around the globe to this exciting city. We hope that you enjoy what the conference has to offer this year, both for the scientific discussions, and for the social events.

Dallas is one of the fastest growing urban areas in America, with one million residents coming to the region every seven years. It is also one of the most demographically diverse and young cities in the country, which imbues the city with a friendly, outgoing sense of hospitality and genuine civic pride. Here you will find a large collection of international corporations, nationally recognized sports teams, and world class shopping. The Dallas Arts District and the many parks and gardens throughout Dallas will provide you with opportunities to enjoy the local culture while you are here.

DCAS2024 brings together VLSI circuit researchers, practitioners, developers, and users from all over the world to explore cutting-edge ideas and results. It provides an environment to conduct intellectual discussions. From its inception, DCAS has established itself as a forum to exchange ideas. Its reputation continues to grow and is reflected in the prestigious technical program of high-quality papers, workshops, tutorials, panel discussion and prestigious keynote addresses.

DCAS 2024 would not have been possible without the help of numerous volunteers. We first want to thank all the authors who have submitted their work to DCAS – without their commitment DCAS 2024 would never have been possible. We also thank the program chairs, the program committee and the entire IEEE organization for their dedication and commitment. Special thanks go to Ms. Erica Glover and her team for the wonderful handling of the organization. Last but not least, we would like to express our gratitude to our generous sponsors of the conference, listed in the program, for their valuable support.

We hope that you will find this program interesting and thought-provoking and that the conference will provide you with a valuable opportunity to share ideas with other researchers and practitioners from institutions around the world. We wish you a pleasant and enjoyable stay in Dallas, Texas.

Dr. Benjamin Carrion Schaefer

DCAS 2024 General Chair
University of Texas at Dallas

Dr. Premananda Indic

DCAS 2024 General Vice-Chair
University of Texas at Tyler

Program Chairs' Welcome

Welcome to the 17th IEEE Dallas Circuits and Systems Conference!

On behalf of the Technical Program Committee of the 17th IEEE Dallas Circuits and Systems conference (DCAS 2024), it is a great honor and privilege for us to welcome you to Denton, Texas, USA.

The DCAS 2024 program is continued to be offered in a hybrid format with the first day having exclusively online presentations and the two consecutive days taking place in person.

The technical program this year consists of 7 keynote speakers from academic and industry, academic presentations, special sessions and for the first time a workshop on Tiny ML. Its regular technical program covers the traditional areas of interest of the Circuits and Systems (CAS) Society.

The technical program committee has put particular efforts in organizing the student poster competition as one of the main missions of DCAS is to give graduate students the opportunity to showcase their research.

We would like to thank the special session organizers, session chairs, and reviewers for making this conference memorable. Our biggest thanks go to the authors and participants of the conference.

We believe that DCAS 2024 will be an exciting forum to learn about new technologies and exchange of ideas. We hope everyone finds the conference engaging, enlightening, and inspiring!

Ifana Mahbub

University of Texas at Dallas

Jungkwun Kim

University of North Texas

Prabha Sundaravadivel

University of Texas Tyler



Dr. Eren Kurshan

Head of AI/ML Research & Methodology Morgan Stanley

Rebuilding AI: Hardware and Systems Approach for Next Generation AI and AGI

Artificial Intelligence encounters three grand challenges: The Energy Challenge, characterized by a troubling and unsustainable rise in training energy consumption; The Alignment Challenge, where jailbroken and misaligned AI pose significant safety and societal threats; and The AGI Challenge, involving the transition to Artificial General Intelligence, of fully integrated, coherently functioning modalities and higher level functions.

I argue that effective tackling these challenges relies on system design. To enhance energy efficiency, it is essential to leave the current restrictive view of AI as a software only solution and embrace fully integrated system design and novel hardware technologies, such as neuromorphic computing. Addressing alignment challenges involves recognizing the pivotal role of system architecture in moral decision-making, echoing the human brain's reliance on signal comparators, feedback mechanisms, and control functions, without which it will be nearly impossible to achieve alignment. System design also proves essential for advancing AGI solutions from multiple narrow AI models to integrated co-processing and high-level AGI functions.



Prof. Jason Cong

Professor Computer Science University of California Los Angeles (UCLA)

Space and Time Co-Optimization in Electronic Design Automation

In the conventional electronic design automation (EDA) flow, space and time decisions of logic operations are carried out in separate steps. In this talk, I shall show that co-optimization of space and time can be highly beneficial. In particular, I shall present our recent work on TAPA, which is a task-parallel dataflow high-level synthesis (HLS) framework that couples with physical planning. TAPA improves the final clock frequency by 2X and compiles 7X faster than Vitis HLS. TAPA framework won two Best Paper Awards at FPGA'21 and FPGA'22, and has been used successfully for developing efficient accelerators for a large number of applications, including stencil computation, graph processing, systolic arrays, and sparse linear algebra. If time permits, I shall also discuss other EDA tools developed in my lab which applies space and time co-optimization successfully, including systolic array synthesis and quantum layout synthesis.



Prof. Ioannis Savidis

Associate Professor Drexel University

AI/ML for EDA: The Current and Future of Learning Algorithms in Analog and Digital Physical Design

In the ever-evolving landscape of Electronic Design Automation (EDA), the integration of Artificial Intelligence (AI) and Machine Learning (ML) has emerged as a transformative force. This keynote presentation delves into the dynamic intersection of AI/ML and EDA, exploring the state-of-the-art techniques shaping the analog and digital physical design space. Machine learning, specifically deep learning, has the potential to significantly improve the accuracy, speed, efficiency, and reliability of EDA tasks such as circuit modeling, simulation, layout design, and optimization. Delving into such cutting-edge advancements, we will explore how AI/ML promises to transcend traditional paradigms, with the goal of enabling designers to navigate complexities with unparalleled efficiency and accuracy.



Prof. Sung Jin Kim
Professor University of Louisville

Nanophotonics: Facilitating Interdisciplinary Research for Biomedical and Energy Applications

Nanophotonics investigates the behavior of light on nanometer scales as well as interactions of nanometer-sized objects with light. The fascinating light-matter interactions in nanoscale structures allow us tailored and efficient device functions and extremely sensitive responses. The Kim group at the University of Louisville focuses on nanophotonics and device research for sensing and energy applications using plasmonic nanostructures or various nanomaterials such as quantum dots, metal oxide nanoparticles, and ferroelectric nanoparticles. We have developed a plasmon field-effect transistor (FET) that directly converts the surface plasmon resonance energy into the electrical current with controlled signal amplification. Using this new device structure, we have successfully demonstrated an ultrawideband photodetection and biomedical sensing platform using plasmon FET. We also explore a novel mechanism for next-generation energy harvesting devices using solution-processable nanocrystal quantum dots and ferroelectric nanomaterials. The solution process-based approaches with nanomaterials enable the advanced manufacturing of various devices for in-space use. Collaborative research projects across different disciplines will be presented and show how our interdisciplinary team uses ideas and approaches to develop innovative and sustainable technologies for a healthy and energy-efficient society.



Sarmad Dahir

Sr. Principal Application Engineer Cadence Design Systems

Stratus High-Level Synthesis enables full-flow hardware design automation and optimization

In this presentation we will explain the advantages of constructing digital hardware using Higher-Level Languages such as C++/SystemC, or MathWorks MATLAB-code. These higher-level models are synthesized directly to Hardware using the full Cadence Digital Implementation Solution. We will delve into the design space exploration and optimization and explain how the Cadence Stratus HLS technology along with Logic-Synthesis (Genus), RTL Power Analysis (Joules), Equivalence Checking (Jasper), and Machine Learning (Cerebrus) can produce optimal production quality hardware and dramatically decrease the design implementation cycle. As a result, the overall design Power, Performance, and Area are optimized while significantly shortening the project Schedule at the same time.

What will you learn

Embedded machine learning, also known as TinyML, is the field of machine learning when applied to embedded systems. You'll learn:

- How to collect high-frequency data from real sensors
- Use signal processing to clean up data
- Build a neural network classifier
- How to deploy your model back to a device.



IEEE DCAS 2024
TINY ML
WORKSHOP

REGISTER NOW



20TH AND 21ST
APRIL 2024

The University of Texas at Dallas
(In-person)

Discover the power of TinyML
and be a part of the future of
edge computing

You can also register using the below link:
<https://ieeedcas2024.eventbee.com/>

Program – Friday, April 19 (Online)

Start time	Session	Presentation/Paper Title			
9:30am	Keynote Speaker #1 (Virtual)	Dr. Eren Kurshan		Rebuilding AI: Hardware and Systems Approach for Next Generation AI and AGI	
10:30am	Session #A-1 Virtual Special Session Emerging topics in Hardware Security I Session Organizers Dr. Ava Hedayatipour and Dr. Soheil Salehi	Paper #	82 Optimizing ASCON Permutation in Multi-Clock Domains with Chisel: Resource Efficiency and Critical Path Reduction Mohamed El-Hadedy, Russell Hua, Kazutomo Yoshii and Wen-Mei Hwu California State Polytechnic University Pomona, University of Illinois at Urbana-Champaign, Argonne National Laboratory	Session # B-1 Virtual Special Session From Bits to Protection using Emerging Techniques: Machine Learning and Hardware Security Session Organizer Dr. Hadi M Kamali	75 Hardware Attacks on ReRAM-based In-Memory Artificial Intelligence Accelerators Masoud Heidary, Biresh Kumar Joardar University of Houston
10:50am			81 Automated Hardware Logic Obfuscation Framework Using GPT B. Saber Latibari, S. Ghimire, M. A. Chowdhury, N. Nazari, K. I. Gubbi, A. Sasan1, H. Homayoun, and S. Salehi University of California Davis, University of Arizona		68 Side-Channel Attack (SCA) Power Leakage Analysis on Edge-Pursuit Comparator Circuit Mohamed E Aly, P. V. Ankunda, J. Ung, Wen-Mei Hwu California State Polytechnic University Pomona, University of Illinois at Urbana-Champaign
11:10am			77 Securing IoMT with K3S and Hybrid Cryptography: Advancing Embedded System Security through Post-Quantum Approaches Mohamed E Aly, P. V. Ankunda, J. Ung, Wen-Mei Hwu California State Polytechnic University Pomona, University of Illinois at Urbana-Champaign		73 Unraveling Sensor Correlations in Multi-Sensor Wearable Devices for Smart Anomaly Detection R.Yasaei, A. A. Zargari, M. A. Faruque and F. Kurdahi University of Arizona, University of California Irvine
11:30am	Break				

Program – Friday, April 19 (Online)

11:40am	<p>Session # A-II Virtual Special Session Efficient IoT designs and applications Session Organizers Dr. Benham Askarian and Dr. Tooraj Nikoubin</p>	<p>Paper #</p>	<p>79 A Comprehensive Comparison of IoT Soil Moisture Sensors for Agricultural Applications S. Grant, A. Harden, K. Coggins, D. Parker, F. Tabei and B. Askarian West Texas A&M University</p>	<p>Session #B-II Virtual Special Session Emerging topics in Hardware Security II Session Organizers Dr. Ava Hedayatipour and Dr. Soheil Salehi</p>	<p>Paper #</p>	<p>67 Efficient Pseudo Random Number Generator (PRNG) Design on FPGA Sonia Akter, Kasem Khalil and Magdy Bayoumi University of Louisiana at Lafayette, University of Mississippi, Assiut University</p>
12:00pm			<p>36 TinyML Powered Drone in Agriculture Application Y. S. H. Annadata, V. Moganarengam and T. Nikoubin The University of Texas at Dallas</p>			<p>80 Securing Photovoltaic Panels: A Survey R. Mahto and J. Dofe California State University Fullerton</p>
12:20pm			<p>Integrating IoT and Machine Learning for Enhanced Monitoring and Control in Aquaponics S. Grant, A. Harden, K. Coggins, F. Tabei and B. Askarian West Texas A&M University</p>			<p>74 Reconfigurable Run-time Hardware Trojan Mitigation for Logic-Locked Circuits J. Maynard and A. Rezaei California State University Long Beach</p>
12:40pm						<p>78 Enhancing System Security via Physical Unclonable Functions via Pneumatic Digital Logic C. Nwakeze, S. Ahrar, A. Ahmed, and A. Hedayatipour California State University Long Beach</p>
1:00pm	End of Day 1					

Program – Saturday, April 20 (UT Dallas)



Start time	Session		Presentation/Paper Title
8:30am	Registration and breakfast		
9:15am	Welcome and opening remarks		
9:30am	Keynote Speaker # 3	Prof. Jason Cong	Space and Time Co-Optimization in Electronic Design Automation
10:30am	Break		
10:40am	Session #A-III Research Paper Session Making hardware design easy	Paper #	47 Investigating the Effect of Hyper-Parameter Settings on Simulated Annealing-based High-Level Synthesis Design Space Exploration Baharealsadat Parchamdar and Benjamin Carrion Schaefer The University of Texas at Dallas
11:00am			49 VeriPy: A Python-Powered Framework for Parsing Verilog HDL and High-Level Behavioral Analysis of Hardware Md Imtiaz Rashid and Benjamin Carrion Schaefer The University of Texas at Dallas
11:20am			76 TinyML Powered Drone in Agriculture Application Y. S. H. Annadata, V. Moganarengam and T. Nikoubin The University of Texas at Dallas
11:40am			66 SMOOT: Saliency Guided Mask Optimized Online Training (Virtual) Ali Karkehabadi, Houman Homayoun and Avesta Sasan The University of California Davis
			60 Physical Modeling of Perimeter-Gated SPADs in Standard Deep Submicron CMOS Processes Sajid Hasan and Mst Shamim Ara Shawkat Florida International University
			40 Tuning an Acoustic Metamaterial Using Iso-geometric Analysis and Evolutionary Shape Optimization Tahsin Khajah and K. Parys The University of Texas at Tyler, USDA
			22 Learnings from Electrical and Functional Interoperability Validation of a PCIe Gen4 16Gbps High-Speed Serial Link in Server Platforms Sudeep Puligundla, Xiaoqing Wang, Sitaraman Iyer, Eric Lee, Christopher Daffron, Moises Puga Nathal and Chad Neill Intel Corporation
			62 Analytical Modeling of Perimeter Gated SPAD-based LiDAR Sensor Nahin Irfan and Mst Shamim Ara Shawkat Florida International University
12:00pm	Lunch Break		

Program – Saturday, April 20 (UT Dallas)



1:00pm	Industry Presentation	Sarmad Dahir		Stratus High-Level Synthesis enables full-flow hardware design automation and optimization		
2:00pm	Keynote #3	Prof. Ioannis Savidis		AI/ML for EDA: The Current and Future of Learning Algorithms in Analog and Digital Physical Design		
3:00pm	Student Poster Competition					
4:00pm	Session #A-IV Research Paper Session Towards efficient electric vehicles design	Paper #	16 Effect of Forced Heat Convection on Heat Transfer for Bipolar MVDC Power Cables in Envisaged Wide-Body All-Electric Aircraft Md Asifur Rahman, Anoy Saha and Mona Ghassemi The University of Texas at Dallas	Session #B-IV Research Paper Session Machine learning in circuit design and optimization of embedded systems	Paper #	10 Identification of Optimal Time Domain Features for Machine Learning based Fault Classification Mutlu Mete and Vehbi Akin Texas A&M Commerce, Murphy High-School
4:20pm			28 An Optimal Approach to Fabricate MVDC Multilayer Insulation Systems as Flat Samples for Wide-Body All-Electric Aircraft Saikat Chowdhury, Arian Azizi, Anoy Saha, Md Asifur Rahman, Mona Ghassemi and Jane Lehr The University of Texas at Dallas, University of New Mexico Albuquerque			33 Multi-Modal Interactions of Mixed Reality Framework Danah Omary and Gayatri Mehta University of North Texas
4:40pm			21 NASA N3-X Aircraft DC Power System Design Farzana Islam and Mona Ghassemi The University of Texas at Dallas			11 Investigating the Impact of Signal Resolution on Machine Learning based Multi-Class Fault Detection Mutlu Mete and Vehbi Akin Texas A&M Commerce, Murphy High-School
5:00pm	Networking Reception					

Program – Sunday, April 21 (UT Dallas)



Start time	Session		Presentation/Paper Title		
8:30am	Registration and breakfast				
9:30am	Keynote Speaker # 4	Prof. Sung Jun Kim		Nanophotonics: Facilitating Interdisciplinary Research for Biomedical and Energy Applications	
10:30am	Session #A-V: Research Paper Session Novel circuit designs	Paper #	59 pH-Responsive Microneedle Actuator Array For Precise Wound Healing: Design, Actuation, Light Filtering, and Evaluation Mahsa Rastegar Pour, Jun Ying Tan, Rana Saha, Albert Kim and Jungkwun Kim University of North Texas	Session #B-V: Virtual Special Session: Flexible sensors and systems with applications in healthcare, precision agriculture, and environmental monitoring	69 Unveiling Piezoelectric Properties of CsPbCl ₃ Perovskite for Flexible Nanogenerator Design A. A. Khan, M. M. Rana, M. Almadhoun, M. H. Bagheri, M. F. Al Fattah and D. Ban University of Waterloo
10:50am			64 A Comparative Study of 3D Printed Bowtie and Monopole Antennas for Ka-Band Md Mufassal Ahmad, Jun Ying Tan, Cheolbok Kim and Jungkwun Kim University of North Texas		70 Chemically Functionalized High-Performance Lead Free Piezoelectric Nanogenerator for flexible electronics M.M. Rana, A. A. Khan, M.H. Baghari, M.R. Islam. S. Tabassum and D. Ban University of Waterloo
11:10am			34 A 2.98 dB NF, 2.52 mW Low Noise Amplifier for a Brain Neuromodulation Implant Sakib Reza and Ifana Mahbub The University of Texas at Dallas		71 3D printed Shape Memory Allow Wire Embedded Actuator M. N. Islam, M. B. Gonzalez, S. Tabassum and K.M. M. Billah The University of Texas Tyler, University of Houston
11:30am			53 Broadband, Reconfigurable Transmit-Reflect-Array (TRA) With 1-Bit Phase Shift and Bidirectional Beam Steering Think Le, Son Vu and Hung Luyen University of North Texas		72 Signal Conditioning Circuit for 3D Printed Flexible Strain Sensor for Hand Orthosis Application S. Mohapatra and Y. Tadesse The University of Texas at Dallas
11:50am			53 A Novel PAM4 Duobinary Optical Receiver (virtual) Ahmed Abdel-Aziz, Mostafa Ahmed and Mohamed El-Nozahi Ain Shams University		

Program – Sunday, April 21 (UT Dallas)



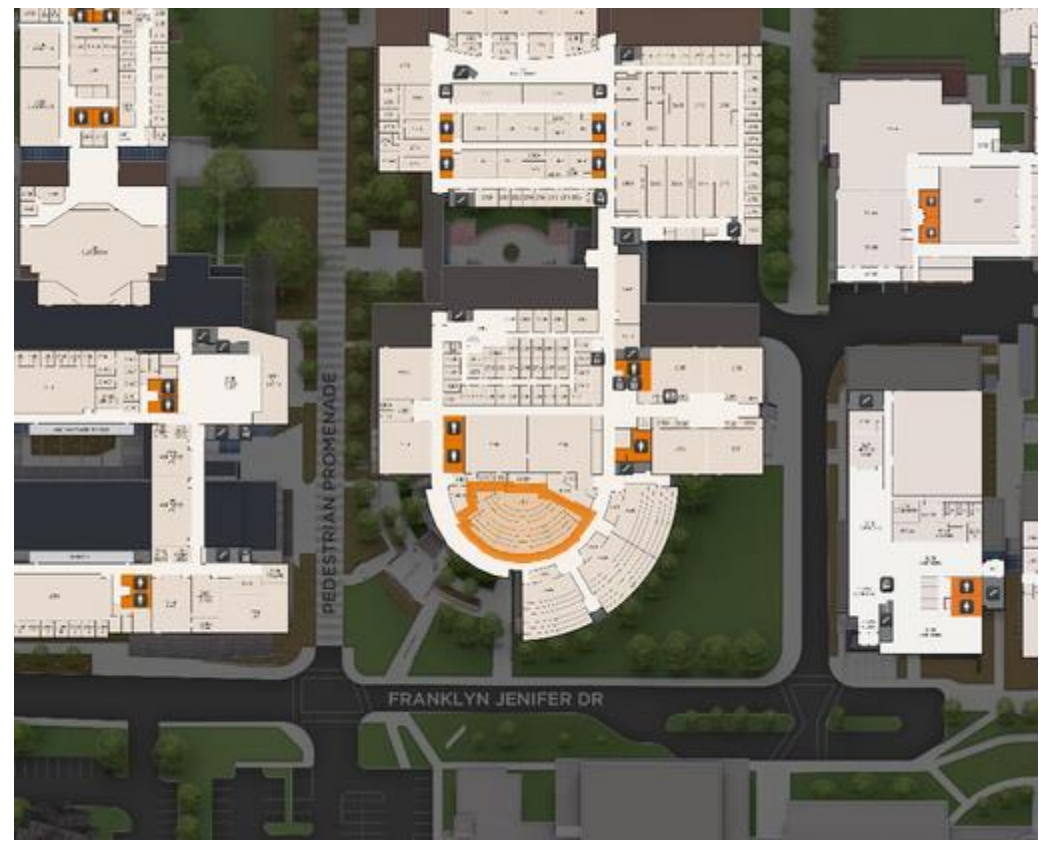
12:10pm	Lunch Break					
1:10pm	Session #A-VI: Research Paper Session Transmission Lines Design an optimizations	Paper #	55 Location of Shield Wires for Unconventional High-Capacity Transmission Lines Saikat Chowdhury, Babak Porkar and Mona Ghassemi The University of Texas at Dallas	Session #B-VI: Research Paper Session: Efficient embedded systems and applications	Paper #	15 A Biomimetic Ankle-Foot Prosthesis for Improving Postural Balance in Lower Limb Amputees: A Proof-of-Concept Study Sirsendu Sekhar Mishra, Deepak Joshi and Bijaya Ketan Panigrahi Indian Institute of Technology Delhi
1:30pm			54 A Test System Meeting Requirements under Normal and Contingency Conditions at Multiple Loadings for Transmission Expansion Planning Bhuban Dhamala and Mona Ghassemi The University of Texas at Dallas			6 An Efficient Hardware Design of CoAP Protocol for The Internet of Things (virtual) Kasem Khalil, Tamador Mohaidat, Mahmoud Darwich, Ashok Kumar and Magdy Bayoumi University of Mississippi, University of Mount Union, University of Louisiana at Lafayette
1:50pm			17 Nanodielectric Fluids for Power Transformer Cooling and Insulation: A Review Sai Pavan Kalakonda and Mona Ghassemi The University of Texas at Dallas			
2:10pm	Conference closing and award ceremony					

Posters

1. Chaitali Sathe, **Machine Learning-Based Approximate Modeling of Redacted Circuit**
2. James Jenkins, Omar Madera, Cristian Guerrero, Ken King Man Siu, Amir Jafari and Trevor Exley, **Comprehensive Motor Control System for Treadmill with Adjustable Stiffness**
3. Jun Ying Tan, Albert Kim and Jungkwun'Jk' Kim, **AN OPTIMIZATION OF PERFORATION DESIGN ON A PIEZOELECTRIC-BASED SMART STENT FOR BLOOD PRESSURE MONITORING AND LOW-FREQUENCY VIBRATIONAL ENERGY HARVESTING**
4. Jun Ying Tan, Malea Williams, Santosh Kumar Mandal, Anna Bottiglieri, Aabila Tharzeen, Rahul Sheth, Balasubramaniam Natarajan, Punit Prakash and Jungkwun'Jk' Kim, **DEVELOPMENT OF A MULTI-MODAL ELECTROCHEMICAL SENSING (MES) DEVICE FOR REAL-TIME MONITORING OF TUMOR MICROENVIRONMENT PARAMETERS IN CANCER IMMUNOTHERAPY**
5. Danah Omary, **Multiple Modalities in Customizable, Accessible Mixed Reality Framework**
6. Md Imtiaz Rashid, **Making Legacy Hardware Robust against Side Channel Attacks via High-Level Synthesis**
7. Alena Fisher and Sarbagya Ratna Shakya. **An Edge Computing Based Elderly Fall Detection System using Wearable Devices**
8. Mohammad Solaiman, Rhythem Tahrin, Shah Zayed Riam, Elvis Sangmen and Shawana Tabassum, **Innovative Development of a Flexible Humidity Sensor for Uninterrupted Monitoring of Humidity Levels within Tomato Plants**
9. Tasnim Sarker and Shawana Tabassum, **A Photonic Crystal Sensor for Endoscopic observation in Plant**

The 17th Dallas Circuits and Systems Conference will be held at the University of Texas at Dallas in Richardson, Texas USA from April 19, 2024, to April 22, 2023. The first day of the conference will be online (April 19)

Address of the Conference Venue
The University of Texas at Dallas
Engineering and Computer Science South (ECSS)
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Richardson, Texas, 75080, USA



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