

# **2020 IEEE International Symposium on Smart Electronic Systems (iSES 2020) (Formerly iNiS)**

**Chennai, India  
14 – 16 December 2020**



**IEEE Catalog Number: CFP20C48-POD  
ISBN: 978-1-6654-4639-6**

**Copyright © 2020 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

|                         |                   |
|-------------------------|-------------------|
| IEEE Catalog Number:    | CFP20C48-POD      |
| ISBN (Print-On-Demand): | 978-1-6654-4639-6 |
| ISBN (Online):          | 978-1-6654-0478-5 |

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# 2020 IEEE International Symposium on Smart Electronic Systems (iSES) (Formerly iNiS) **iSES 2020**

## Table of Contents

|                                       |  |
|---------------------------------------|--|
| Message from General Chairs .xiv..... |  |
| Message from Program Chairs .xvi..... |  |
| Organizing Committee .xvii.....       |  |
| Program Committee .xix.....           |  |
| Steering Committee .xxii.....         |  |
| Panel .xxiii.....                     |  |
| Keynotes .xxv.....                    |  |

### Session 01: Nanoelectronic VLSI and Sensor Systems 1 (NVS-1)

|  |  |
|--|--|
| Design and Implementation of 1024 Point Pipelined Radix 4 FFT Processor on FPGA for Biomedical Signal Processing Applications .1.....  |  |
| <i>Aditya Sankaran (National Institute of Technology, Tiruchirappalli, India), M. Srikanth Reddy (National Institute of Technology, Tiruchirappalli, India), Arunkumar K. R. (National Institute of Technology, Tiruchirappalli, India), and Bhaskar M. (National Institute of Technology, Tiruchirappalli, India)</i> |  |
| A Digital Front-End for Remotely Located Resistive Sensors .7.....   |  |
| <i>Elangovan K (Indian Institute of Space Science and Technology, India) and Anoop C. S. (Indian Institute of Space Science and Technology, India)</i>   |  |
| Influence of Conducting Filament Dimension on the Performance of ReRAM Device in the SET State .13.....  |  |
| <i>Om Prakash Das (NIT Silchar, India) and Shivendra Kumar Pandey (NIT Silchar, India)</i>   |  |
| Circuit Design for K-Coloring Problem and its Implementation on Near-Term Quantum Devices .17.....   |  |
| <i>Amit Saha (University of Calcutta, India), Debasri Saha (University of Calcutta, India), and Amlan Chakrabarti (University of Calcutta, India)</i>  |  |

## Session 02 : Hardware/Software for AI, Robotics, and Automation 1 (AIR-1)

- Heart Rate and Breathing Rate Calculated from Cheeks and Lips Using Green and Derived Colors from Video .23.....  
*Dibyajyoti Biswal (University of Kentucky, USA), Mohammad Javad Mollakazemi (University of Kentucky, USA), Brooke Place (University of Kentucky, USA), and Abhijit Patwardhan (University of Kentucky, USA)*
- An Ensemble Classifier Model to Predict Credit Scoring - Comparative Analysis .27.....  
*Safiya Parvin A (Vellore Institute of Technology, India) and Saleena B (Vellore Institute of Technology, India)*
- Changes in Coherent Activity between EEG and Various Frequency Components of Music While Listening to Familiar and Unfamiliar Songs .31.....  
*Dibyajyoti Biswal (University of Kentucky, USA), Mohammad Javad Mollakazemi (University of Kentucky, USA), and Abhijit Patwardhan (University of Kentucky, USA)*

## Session 03: Nanoelectronic VLSI and Sensor Systems 2 (NVS-2)

- Game Theory Based Energy Efficient Routing in Cognitive Radio Wireless Sensor Networks .35.....  
*Prativa Rai (Sikkim Manipal University, India), Mrinal Kanti Ghose (GLA University, India), and Hiren Kumar Deva Sarma (Sikkim Manipal University, India)*
- Characterization of Charge Plasma-Based Junctionless Tunneling Field Effect Transistor (JL-TFET) .40.....  
*Nafis Mustakim (Shahjalal University of Science and Engineering, Bangladesh), Sazzad Hussain (Shahjalal University of Science and Engineering, Bangladesh), and Jibesh K. Saha (Shahjalal University of Science and Engineering, Bangladesh)*
- Signal Transmission and Reflection Losses of Cylindrical and Tapered Shaped TSV in 3D Integrated Circuits .44.....  
*Chopali Chanchal Sahu (International Institute of Information Technology, India), Shivangi Chandrakar (International Institute of Information Technology, India), and Manoj Kumar Majumder (International Institute of Information Technology, India)*
- Sensitivity Assessment of Nanoscale Double Gate MOSFET Based Biosensor Using Numerical Simulation .48.....  
*Thriveni Gokuraju (Vellore Institute of Technology, India) and Kaustab Ghosh (Vellore Institute of Technology, India)*

## Session 04 : Hardware/Software for AI, Robotics, and Automation 2 (AIR-2)

- Comparison of Dynamic Control Model of Autonomous Underwater Vehicle Guidance .51.....  
*Manoj Srivatsn (VIT University, India), Sakthivel Gnanasekaran (VIT University, India), Saravanakumar D (VIT University, India), Jegadeeshwaran R (VIT University, India), and Sivakumar R (VIT University, India)*

Simultaneous Localization and Mapping of Mobile Robot using GMapping Algorithm .56.....  
*Marshal Revanth C (Vellore Institute of Technology, Chennai Campus, India), Saravanakumar D (Vellore Institute of Technology, Chennai Campus, India), Sakthivel G (Vellore Institute of Technology, Chennai Campus, India), and Jegadeeswaran R (Vellore Institute of Technology, Chennai Campus, India)*

Predicting Sentiments to an Accuracy Matching the Gesture Recognized for the Specially-Abled .61.....  
*Jaganath Prasad Mohanty (National Institute of Technology Rourkela, India), Ayas Kanta Swain (National Institute of Technology Rourkela, India), and Kamalakanta Mahapatra (National Institute of Technology Rourkela, India)*

Smart Home Sensor Anomaly Detection Using Convolutional Autoencoder Neural Network .67.....  
*Tyler Cultice (University of Kentucky, USA), Dan Ionel (University of Kentucky, USA), and Himanshu Thapliyal (University of Kentucky, USA)*

## **Session 05: Special Session - Hardware Accelerators for AI and Machine Learning**

Design of Hardware Accelerators for Fractal Based Machine Learning Applications .71.....  
*Soumyajit Poddar (Indian Institute of Information Technology Guwahati, India), Amal Thomas K (Indian Institute of Information Technology Guwahati, India), and Gaurav Kumar (Cyrrup Solutions Pvt. Ltd., India)*

An Efficient NoC-Based ANN Framework for Epileptic Seizure Recognition .75.....  
*Ayut Ghosh (National Institute of Technology, India), Arka Prava Roy (National Institute of Technology, India), Ramapati Patra (National Institute of Technology, India), Ashis Kumar Mal (National Institute of Technology, India), and Hemanta Kumar Mondal (National Institute of Technology, India)*

Extreme Gradient Boosting for Limb Position Invariant Myoelectric Pattern Recognition .81.....  
*Suman Samui (National Institute of Technology Rourkela, Odisha, India), Anand Kumar Mukhopadhyay (Indian Institute of Technology Kharagpur, India), Pratik Kailash Ghadge (National Institute of Technology Rourkela, Odisha, India), and Gaurav Kumar (Cyrrup Solutions Pvt Ltd, Hyderabad, India)*

Forearm Orientation Invariant Analysis for Surface Myoelectric Pattern Recognition .86.....  
*Anand Mukhopadhyay (Indian Institute of Technology, India), Soumyajit Poddar (Indian Institute of Information Technology, India), and Suman Samui (Indian Institute of Technology, India; National Institute of Technology, India)*

## **Session 06: Hardware for Secure Information Processing 1 (SIP-1)**

A Novel Machine Learning Based Method for Deepfake Video Detection in Social Media .91.....  
*Alakananda Mitra (University of North Texas, USA), Saraju Mohanty (University of North Texas, USA), Peter Corcoran (National University of Ireland, Galway), and Elias Kougianos (University of North Texas, USA)*

|  |  |
|--|--|
| Implementation Vulnerability Analysis: A Case Study on ChaCha of SPHINCS .97.....                      |  |
|  | <i>Varun Satheesh Kumar (SASTRA University) and Dillibabu Shanmugam (Society for Electronic Transactions and Security)</i>   |
| Cyber Security Protocol for Secure Traffic Monitoring Systems using PUF-Based Key Management .103..... |  |
|  | <i>Vikramkumar Pudi (Indian Institute of Technology Tirupati, India), Srinivasu Bodapati (Indian Institute of Technology Mandi, India), Sachin Kumar (Nanyang Technological University, Singapore), and Anupam Chattopadhyay (Nanyang Technological University, Singapore)</i> |
| Design and Analysis of Secure Quasi-Adiabatic Tristate Physical Unclonable Function .109.....          |  |
|  | <i>Hemavathy S (VIT Chennai) and V S Kanchana Bhaaskaran (VIT Chennai)</i>   |

## **Session 07: Hardware/Software for Internet of Things and Consumer Electronics 1 (IoT-1)**

|  |  |
|--|--|
| Near Real-Time Occupancy Detection for Smart Building Emergency Management: A Prototype .115   |  |
|  | <i>Sarthak Khoche (International Institute of Information Technology – Bangalore (IIIT-B), India), Sasirekha GVK (International Institute of Information Technology – Bangalore (IIIT-B), India), Jyotsna Bapat (International Institute of Information Technology – Bangalore (IIIT-B), India), and Debabrata Das (International Institute of Information Technology – Bangalore (IIIT-B), India)</i> |
| Study of RTPPS Algorithm in UWB Communication Medium for a Surveillance System to Protect Agricultural Crops from Wild Animals .121..... |  |
|  | <i>Siddhanta Borah (National Institute of Technology Nagaland, India), R. Kumar (National Institute of Technology Nagaland, India), and Subhradip Mukherjee (National Institute of Technology Nagaland, India)</i>   |
| Energy Efficient Digital Circuits Using Hybrid MTJ and CNTFET .127.....  |  |
|  | <i>Annapurna Raina (Vellore Institute of Technology, India), Shirin Dewan (Vellore Institute of Technology, India), and Reena Monica P (Vellore Institute of Technology, India)</i>  |

## **Session 08: Hardware for Secure Information Processing 2 (SIP-2)**

|  |   |
|--|---|
| Fast and Comprehensive Simulation Methodology for Layout-Based Power-Noise Side-Channel Leakage Analysis .133..... |   |
|  | <i>Lang Lin (ANSYS, USA), Dinesh Selvakumaran (ANSYS, USA), Deqi Zhu (ANSYS, USA), Norman Chang (ANSYS, USA), Calvin Chow (ANSYS, USA), Makoto Nagata (Kobe University, Japan), and Kazuki Monta (Kobe University, Japan)</i>                                   |
| Lightweight and Attack-Resilient PUF for Internet of Things .139.....  |   |
|  | <i>Akshayhari Rajan (Amrita Vishwa Vidyapeetham \ India) and Sriram Sankaran (Amrita Vishwa Vidyapeetham \ India)</i>   |
| Symmetric Function Based Memristive Polimino PUF with Enhanced Security .143.....                                  |   |
|  | <i>Subhashree Basu (St. Thomas' College of Engineering and Technology, Kolkata, India), Malay Kule (Indian Institute of Engineering Science and Technology, Shibpur), and Hafizur Rahaman (Indian Institute of Engineering Science and Technology, Shibpur)</i> |

Tandem Deep Learning Side-Channel Attack against FPGA Implementation of AES .147.....  
*Huanyu Wang (KTH Royal Institute of Technology, Sweden) and Elena  
Dubrova (KTH Royal Institute of Technology, Sweden)*

## **Session 09: Hardware/Software for Internet of Things and Consumer Electronics 2 (IoT-2)**

Securing a Vehicle Fleet Management through Blockchain and Internet of Things .151.....  
*Sudip Maitra (Central Michigan University, USA), Prasanth Yanambaka  
(Central Michigan University, USA), Ahmed Abdelgawad (Central Michigan  
University, USA), and Kumar Yelamarthi (Central Michigan University,  
USA)*

An Implementation of AR Enabled Digital Twins for 3-D Printing .155.....  
*C Sundara Paripooranan (National Institute of Technology -  
Tiruchirapalli, India), Abishek R (National Institute of Technology -  
Tiruchirapalli, India), Vivek Duraisamy Chandrasekaran (National  
Institute of Technology - Tiruchirapalli, India), and Karthik S  
(National Institute of Technology - Tiruchirapalli, India)*

Classification of Normal and Abnormal ECG Signals using Support Vector Machine and Fourier  
Decomposition Method .161.....  
*Ashish Kumar (Vellore Institute of Technology, India), Virender Kumar  
Mehla (Bennett University Greater Noida, India), Harshit Tomar  
(Bennett University, India), Manjeet Kumar (Delhi Technological  
University, India), and Rama Komaragiri (Bennett University, India)*

A 1 V, 39  $\mu$ W, 5-Bit Multi-Level Comparator Based Flash ADC .167.....  
*Nitish Kumar (National Institute of Technology Goa, India), Siddharth  
R. K. (National Institute of Technology Goa, India), Nithin Kumar Y.  
B. (National Institute of Technology Goa, India), and Vasantha M. H.  
(National Institute of Technology Goa, India)*

Control Flow Integrity in IoT Devices with Performance Counters and DWT .171.....  
*Ananda Biswas (Iowa State University, USA), Zelong Li (Iowa State  
University, USA), and Akhilesh Tyagi (Iowa State University, USA)*

## **Session 10: Hardware/Software for Vehicular Intelligent Systems 1 (VIS-1)**

A LoRa Based Reliable and Low Power Vehicle to Everything (V2X) Communication Architecture.177  
*Khandaker Foysal Haque (Central Michigan University, USA), Ahmed  
Abdelgawad (Central Michigan University, USA), Prasanth Yanambaka  
(Central Michigan University, USA), and Kumar Yelamarthi (Central  
Michigan University, USA)*

Condition Monitoring of a IC Engine Fault Diagnosis using Machine Learning and Neural  
Network Techniques .183.....  
*Naveen Kumar P (VIT Chennai, India), Sakthivel G (VIT CHENNAI, India),  
Jagadeeshwaran R (VIT Chennai, India), and SaravanaKumar D (VIT  
Chennai, India)*

|  |  |
|--|--|
| Vibration-Based Fault Detection in a Hydraulic Brake System using Artificial Immune Recognition System with Statistical Features .190.....   |  |
| <i>Alamelu Manghai T. M. (Vellore Institute of Technology, India), Jegadeeshwaran R (Vellore Institute of Technology, India), Sakthivel G (Vellore Institute of Technology, India), Saravanakumar D (Vellore Institute of Technology, India), and Sivakumar R (Vellore Institute of Technology, India)</i> |  |
| A Novel Monocular Camera Obstacle Perception Algorithm for Real-Time Assist in Autonomous Vehicles .196.....   |  |
| <i>Aakanksha Vivek Gadagkar (Indian Institute of Science, India) and L. Umanand (Indian Institute of Science, India)</i>   |  |

## Session 11: Research Demo Session (RDS)

|   |  |
|---|--|
| Good-Eye: A Device for Automatic Prediction and Detection of Elderly Falls in Smart Homes .202.   |  |
| <i>Laavanya Rachakonda (University of North Texas, USA), Saraju Mohanty (University of North Texas, USA), and Elias Kougianos (University of North Texas, USA)</i>    |  |
| Stress-Lysis: An IoMT-Enabled Device for Automatic Stress Level Detection from Physical Activities .204.....  |  |
| <i>Laavanya Rachakonda (University of North Texas, USA), Saraju P. Mohanty (University of North Texas, USA), and Elias Kougianos (University of North Texas, USA)</i> |  |
| A Fast and Accurate Deep Learning Framework for EMG-PR Based Upper-Limb Prosthesis Control.... 206  |  |
| <i>Sidharth Pancholi (MNIT, India) and Amit Joshi (MNIT, India)</i>   |  |

## Session 12: Energy-Efficient, Reliable VLSI Systems 1 (ERS-1)

|   |  |
|---|--|
| Performance Evaluation of Via-Free Non-Spiral Planar Microcoils for Biomedical Wireless Links .208.....   |  |
| <i>Krishnapriya S (Muthoot Institute of Technology and Science), Rama Komaragiri (Bennett University), and Suja K J (NIT Calicut)</i>   |  |
| Efficient Hardware Implementation of Decision Tree Training Accelerator .212.....   |  |
| <i>Rituparna Choudhury (Indian Institute of Technology, India), Shaik Rafi Ahamed (Indian Institute of Technology, India), and Prithwijit Guha (Indian Institute of Technology, India)</i>  |  |
| A 1.8 V, Mode-Configurable Hybrid Smart ADC .216.....   |  |
| <i>Tejas J Shahane (National Institute of Technology Goa, India), Siddharth R. K. (National Institute of Technology Goa, India), Nithin Kumar Y. B. (National Institute of Technology Goa, India), and Vasantha M. H. (National Institute of Technology Goa, India)</i> |  |



## Session 13: Special Session - Integrated Circuits, Systems for Emerging Electronic Systems

- A Microcontroller-Based Electrochemical Discharge Machining (ECDM) Equipment for Micro-Drilling of Quartz Substrates .221.....  
*Saranya S (Vellore Institute of Technology, India) and Ravi Sankar A (Vellore Institute of Technology, India)*
- A 60 GHz, 50 mW, 3dB Noise Figure Receiver Frontend Using UMC 40 nm CMOS Technology .227  
*Pritesh Kumar Yadav (Indian Institute of Information Technology, India), Prashant Kumar (Indian Institute of Information Technology, India), Ankita Verma (Indian Institute of Information Technology, India), Sunanda Ambulker (Indian Institute of Information Technology, India), and Prasanna Kumar Misra (Indian Institute of Information Technology, India)*
- Construction of Telemetric Ultrasound Measurement System with Robot .232.....  
*Takeshi Moriya (Tokyo Institute of Technology, Japan), Naruki Shoji (Tokyo Institute of Technology, Japan), Wongsakorn Wongsaroj (Tokyo Institute of Technology, Japan), Hideharu Takahashi (Tokyo Institute of Technology, Japan), and Hiroshige Kikura (Tokyo Institute of Technology, Japan)*
- GENERIK: An Objective Function Optimization Approach to Inverse Kinematics .238.....  
*Sudarshan S Harithas (B.M.S College of Engineering), Harish V Mekali (B.M.S College of Engineering), and Sowmya Sunkara (B.M.S College of Engineering)*

## Session 14: Energy-Efficient, Reliable VLSI Systems 2 (ERS-2)

- A Self-Powered Long-Range Wireless IoT Device Based on LoRaWAN .242.....  
*Hari Bhusal (University of Agder, Grimstad, Norway), Pankaj Khatiwada (University of Agder, Grimstad, Norway), Ajit Jha (University of Agder, Grimstad, Norway), Soumya J (BITS-Pilani, India), Sagar Koorapati (Intel, USA), and Linga Reddy Cenkeramaddi (University of Agder, Grimstad, Norway)*
- Performance Analysis of 8-Point Approximate DCT Architecture Using Conventional and Hybrid Adders .246.....  
*Vaithyanathan Dhandapani (National Institute of Technology Delhi, India), Rajhans Kolhe (National Institute of Technology Delhi, India), Alok Kumar Mishra (National Institute of Technology Delhi, India), Britto Pari J (Institute of Science and Technology, India), and Kumaraj K (Loyola-ICAM College of Engineering and Technology (LICET), India)*
- Power Efficient Dynamic Comparator for High Speed Digital Circuit .250.....  
*Sushil Kumar Jain (Poornima University, India) and Amit Mahesh Joshi (Malaviya National Institute of Technology, India)*
- Authenticating Resilience of RTL Codes against Power Side Channel Leakages .256.....  
*Jaganath Prasad Mohanty (National Institute of Technology Rourkela, India) and Kamalakanta Mahapatra (National Institute of Technology Rourkela, India)*

## Session 15: Special Session - Integrated Circuits, Systems for Emerging Electronic Systems

- Hardware Software Co-Simulation of an AES-128 Based Data Encryption in Image Processing Systems for the Internet of Things Environment .260.....  
*Kusum Lata (The LNM Institute of Information Technology, India) and Sandeep Saini (The LNM Institute of Information Technology, India)*
- Impact of Power Handling Capability on Material Selection of RF-MEMS Switches Using MCDM Techniques .265.....  
*Raj Kumari (NIT Hamirpur) and Mahesh Angira (NIT Hamirpur)*
- Local Clock Glitching Fault Injection with Application to the ASCON Cipher .271.....  
*Surya G (Amrita Vishwa Vidyapeetham, India), Paolo Maistri (Grenoble University, France), and Sriram Sankaran (Amrita Vishwa Vidyapeetham, India)*

## Session 16: Hardware/Software for Internet of Things and Consumer Electronics 2 (IoT-3)

- A 1.8 V Quadrature Phase LC Oscillator for 5G Applications .277.....  
*Sanmitra Bharat Naik (National Institute of Technology Goa), Siddharth R. K. (National Institute of Technology Goa), Anirban Chatterjee (National Institute of Technology Goa), Nithin Kumar Y. B. (National Institute of Technology Goa), Vasantha M. H. (National Institute of Technology Goa), and Ramnath Kini (Symmid Corporation, Malaysia)*
- Design and Analysis of Low Power and High Speed FinFET Based Hybrid Full Adder/Subtractor Circuit (FHAS) .281.....  
*Ramkumar E (VIT Chennai), Gracin D (VIT Chennai), Bhuvana B P (VIT Chennai), and V S Kanchana Bhaaskaran (VIT Chennai)*
- A Distributed Framework for Real Time Object Detection at Low Frame Rates with IoT Edge Nodes .285.....  
*Lakshmikavya Kalyanam (University of South Florida), Vishalini Laguduva Ramnath (Oklahoma State University), Srinivas Katkooi (University of South Florida), and Hao Zheng (University of South Florida)*
- Novel Bit-Sliced Near-Memory Computing Based VLSI Architecture for Fast Sobel Edge Detection in IoT Edge Devices .291.....  
*Rajeev Joshi (University of South Florida), Md Adnan Zaman (University of South Florida), and Srinivas Katkooi (University of South Florida)*

## Session 17: Student Research Forum (SRF)

- Design of Monopole Antenna and Half-Wave Dipole Antenna for Wi-fi Applications by Enhancing Gain .297.....  
*Kriti Kulshrestha (ABES Engineering College, India), Rakhi Kumari (ABES Engineering College, India), and Manidipa Roy (ABES Engineering College, India)*

Optimized S-Box Architectures of PRESENT Cipher for Resource Constrained Applications .304...  
*Ruby Mishra (National Institute of Technology, Rourkela, India),  
Manish Okade (National Institute of Technology, Rourkela, India), and  
Kamalakanta Mahapatra (National Institute of Technology, Rourkela,  
India)*

Voice Usability Scale: Measuring the User Experience with Voice Assistants .308.....  
*Dilawar Shah Zwakman (King Mongkut's University of Technology  
Thonburi, Thailand), Debajyoti Pal (King Mongkut's University of  
Technology Thonburi, Thailand), Tuul Triyason (King Mongkut's  
University of Technology Thonburi, Thailand), and Chonlameth  
Arpnikanondt (King Mongkut's University of Technology Thonburi,  
Thailand)*

Designing of an Optimization Technique for the Prediction of CTS Outcomes using Neural  
Network .312.....  
*Shuchi Nagaria (IIIT Delhi, India) and Sujay Deb (IIIT Delhi, India)*

**Author Index 317**.....