LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)
Accredited by NAAC & NBA (Under Tier - I) and ISO 9001:2015 Certified Institution Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
http://www.lbrce.ac.in, Phone: 08659-222933, Fax: 08659-222931
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

REPORT
on
AICTE Sponsored Online Short Term Training Program
on
"Mixed Signal Design Approaches for Artificial Intelligence Processors"
Series – 3 (1st March 2021 to 6th March 2021)

Department of ECE of Lakireddy Bali Reddy College of Engineering (Autonomous), has organized AICTE Sponsored Online Short Term Training Program (STTP) on "**Mixed Signal Design Approaches for Artificial Intelligence Processors**" under the coordinator-ship of Dr. Srinivasulu Gundala. The Program was conducted as Series - 3 of three series scheduled from **01-03-2021 to 06-03-2021.**

ABOUT AICTE – STTP:

All India Council for Technical Education (AICTE) was set up in November 1945 as a national-level apex advisory body to conduct a survey on the facilities available for technical education and to promote development in the country in a coordinated and integrated manner. And to ensure the same, as stipulated in the National Policy of Education (1986), AICTE was vested with: Short Term Training Program (STTP) intends to conduct faculty trainings through financial assistance from AICTE to enable faculty members in the field of technical education to introspect and learn techniques that can help prepare students for active and successful participants in a knowledge society.

OBJECTIVES of STTP:

The objectives of the training program are:

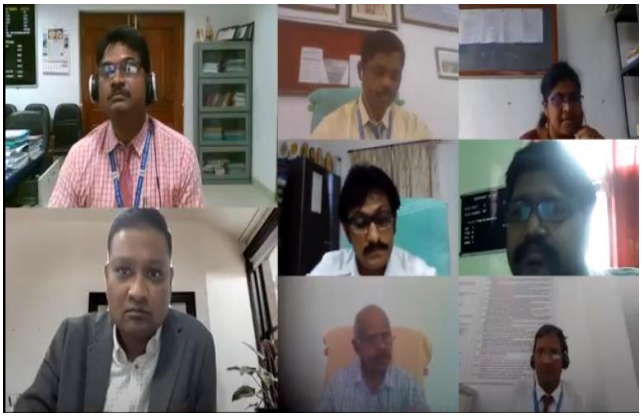
- To alleviates the Design and analysis of Energy efficient Voltage & Data converters, Behavioral modeling of Analog and Mixed signal IC
- To Design aspects of Analog and Mixed Signal IC, Case studies on RF IC and AI Processors.
- To provides platform to enhance the skills towards Design and development of intelligent computational systems for the Teaching faculty.

Date: 1st March 2021

Inauguration:

STTP was inaugurated on 1st March 2021 at 9:30 AM by **Dr. Y. Amar Babu,** HOD of ECE and Convener of STTP along with chief guest of the programme Dr. Hitesh Shrimali, Associate Professor, School of Computing and Electrical Engineering, IIT Mandi, Principal of LBRCE **Dr. K. Appa Rao**, and Coordinator of STTP **Dr. Srinivasulu Gundala.**

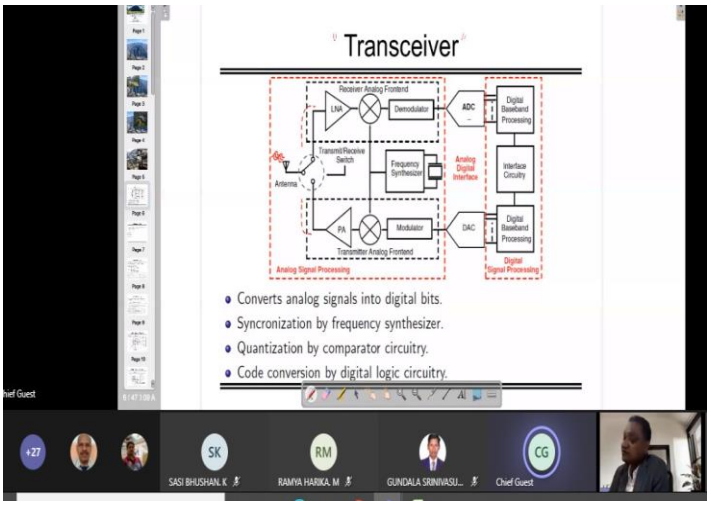
Dr. Srinivasulu Gundala, has welcomed all the delegates and participants to the STTP. In his speech, he highlighted the main objectives and importance of this Short-Term Training Programme. Along with this, he gave a brief introduction about selection process and eligibility for awarding the certificate.

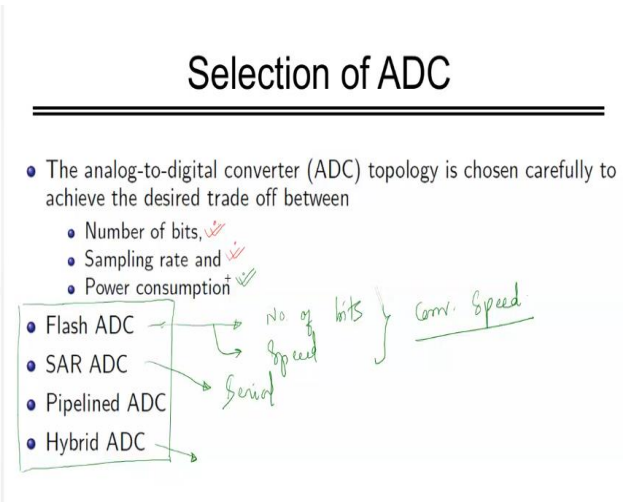


Day 1: 1st March 2021 [FN]

Topic : Design and Modelling of Energy efficient Hybrid Data Converters
Resource Person : Dr. Hitesh Shrimali, Associate Professor, School of Computing and Electrical Engineering, IIT Mandi

The resource Person Dr. Hitesh Shrimali, Associate Professor, School of Computing and Electrical Engineering, IIT Mandi, started his presentation by giving design challenges for low-power CMOS high-speed analog-to-digital converters (ADCs), basic ADC converter architectures are described with particular focus on their suitability for the construction of power-efficient hybrid ADCs. Highlighted the key concepts of Low resolution ADCs, which can be employed to improve the energy efficiency (EE) of a wireless receiver since the power consumption of each ADC is exponentially related to its sampling resolution and the hardware complexity.

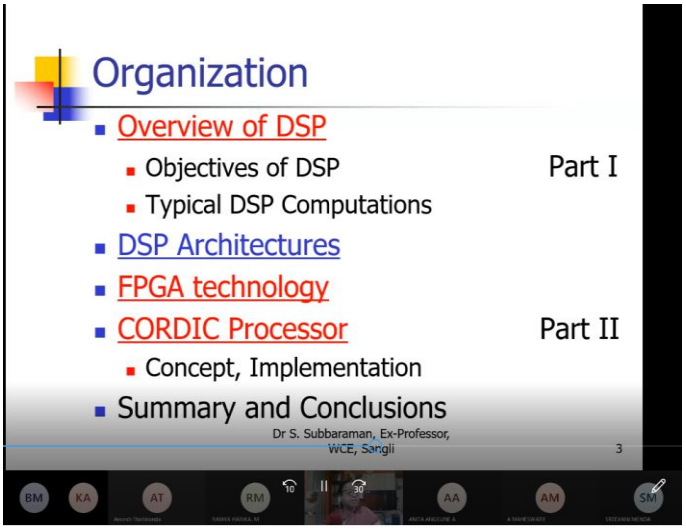




Day 1: 1st March 2021 [AN]

Topics : Case studies on VLSI Architectures for Mixed signal applications.
Resource Person : Dr. Saila Subbaraman, Dept. of ECE, WCE, Sangli

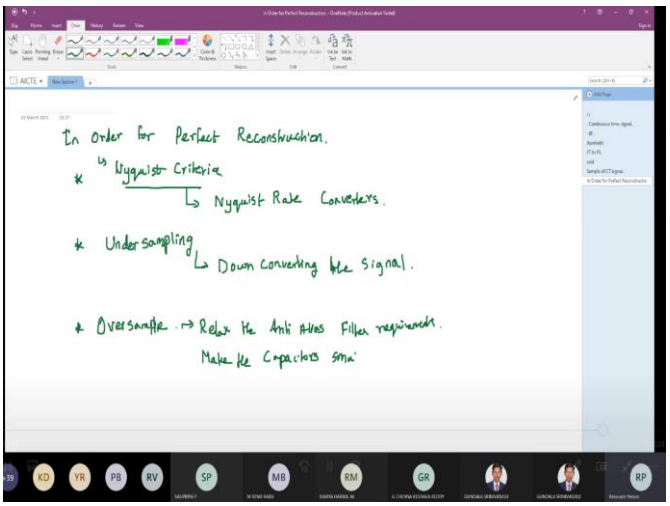
The resource Person **Dr. Saila Subbaraman,** Dept. of ECE, WCE, Sangl has discussed about emerging applications and address on recent breakthroughs in the VLSI architecture design for DSP, including design and analysis of signal processing algorithms and architecture, performance analysis of signal processing systems, VLSI design methodology, design of arithmetic circuits and VLSI components used in signal processing. The high integration of system ICs has large silicon areas of digital blocks. However, the analog and mixed-signal blocks are still the bottleneck of the VLSI implementation due to nature of the analog design works.



Day 2: 2nd March 2021 [FN]

Topics : Challenges in mixed signal design
Resource Person : Dr. Rakesh Kumar P., Dept. of Electrical Engineering, IIT Delhi

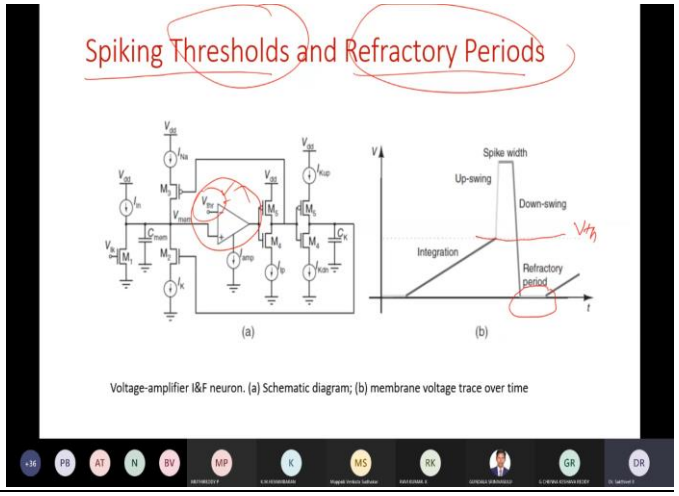
The resource Person Dr. Rakesh Kumar, Dept. of Electrical Engineering, IIT Delhi, started his demonstration by giving today's on-chip Analog/Mixed-Signal and RF (A/RF) systems have reached a limit of size and complexity where transistor-level SPICE and Fast SPICE simulation approaches cannot deliver a verification solution on time. Challenges include, of course, circuit size, but also the heterogeneous nature of the A/RF systems, their architectural complexity and demanding specifications. Such challenges can only be surmounted by moving to a level of abstraction above that of the transistor. The benefits of this approach are illustrated with examples based on new tools that work at the Analog System Implementation (ASI) level of abstraction and which favor schematic, rather than language-based, descriptions of the A/RF system.



Day 2: 2nd March 2021 [AN]

Topics : Case studies on Mixed signal techniques based Machine learning system
Resource Person : Dr. Sakthivel R., School of Electronics Engineering. VIT Vellore

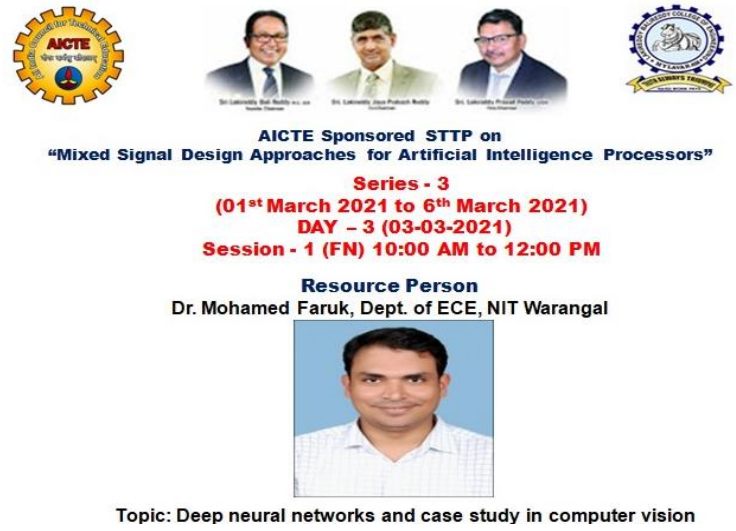
The resource Person Dr. Sakthivel R., School of Electronics Engineering, VIT Vellore, explored insights of Artificial intelligence methods used in different interdisciplinary areas. The method of machine learning and data mining for testing and fault diagnostics in analog/mixed-signal integrated circuits. The case study results for analog filters are demonstrated and discussed. The proposed method and approach can be used according to the design-for-testability flow for analog/mixed-signal integrated circuits.

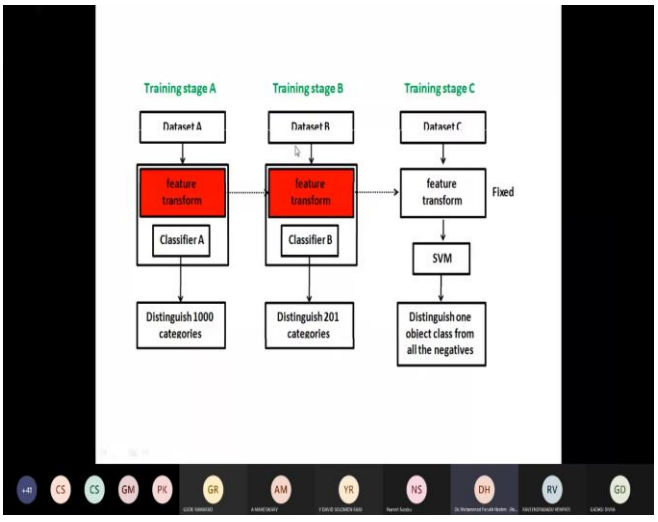


Day 3: 3rd March 2021 [FN]

Topics : Deep neural networks and case study in computer vision
Resource Person : Dr. Mohamed Faruk, Dept. of ECE, NIT Warangal

The resource Person Dr. Mohamed Faruk, Dept. of ECE, NIT Warangal, started his discussion on the field of study on deep neural networks, enabling machines with its own ability called Computer Vision (CV). CI and AI models to recognize anything in visual data – objects, concepts, faces, and actions. That's AI computer vision. AI currently has deployed over 2,400 AI models. Number of patented Dense Classification image analysis enables contextual perceptions which are modeled after human visual perception. By understanding context, how AI can select the appropriate models and type of search to return faster results with higher accuracy. This capability provides computer vision with speed, accuracy, flexibility and scaling.

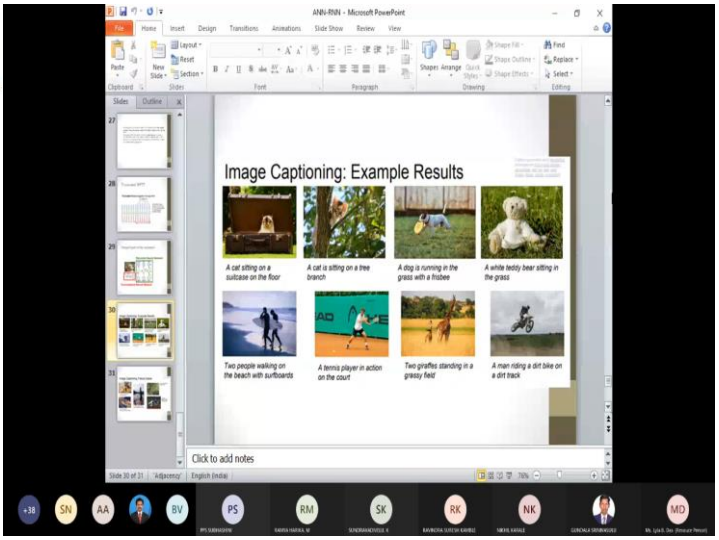




Day 3: 3rd March 2021 [AN]

Topics : Neural networks and Machine Learning Algorithms
Resource Person : Mrs. Lyla B. Das, Dept. of ECE, NIT Calicut

The Resource Person Mrs. Lyla B. Das, Dept. of ECE, NIT Calicut, in his lecture described about machines learning algorithms. Machines have brains; their brains are able to solve the sorts of problems that, until recently, humans were uniquely good at. Neural networks, as the name suggests, are modeled on neurons in the brain. They use artificial intelligence to untangle and break down extremely complex relationships. Neural networks are one of the learning algorithms used within machine learning. They consist of different layers for analyzing and learning data. Every hidden layer tries to detect patterns on the picture. When a pattern is detected the next hidden layer is activated.



Day 4: 4th March 2021 [FN]

Topics : Power management strategies for Mixed signal circuits
Resource Person : Dr. K. Venkata Ramanaiah, Dept. of ECE, Yogi Vemana University

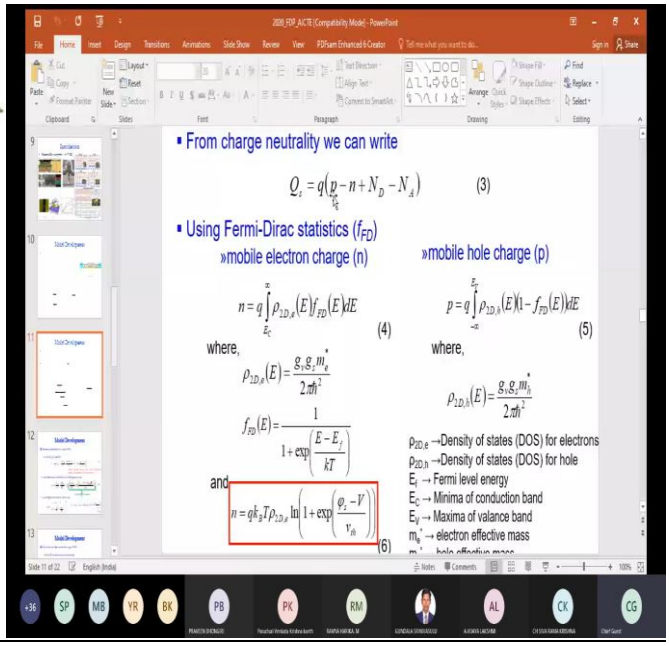
The resource person Dr. K. Venkata Ramanaiah, Dept. of ECE, Yogi Vemana University, in his presentation discusses on analog DFT techniques and methodologies used in integrated power management (PM) systems to overcome challenges of mixed-signal SoC qualification. Systems on Chip (SoC) designs today have a large number of power domains regulated by complex on-chip power management logic. The power management logic is primarily digital in nature, but it relies on analog components such as Low Dropout Regulators (LDO) and Phase-Locked Loops (PLL) for delivery of regulated voltages and clock frequencies. In low power designs, such analog components may also be powered down at times, and hence power domains are defined around modules containing these components. The digital brain of the power management logic must correctly consider the latencies of the analog components in the power management fabric while switching the power domains driven by these components.

Day 4: 4th March 2021 [AN]

Topics : Compact Modeling of Semiconductor devices
Resource Person : Dr. Chandan Yadav, Dept. of ECE, NIT Calicut

Dr. Chandan Yadav Dept. of ECE, NIT Calicut, started the discussion on Compact Model development of semiconductor devices. Semiconductor device modeling creates models for

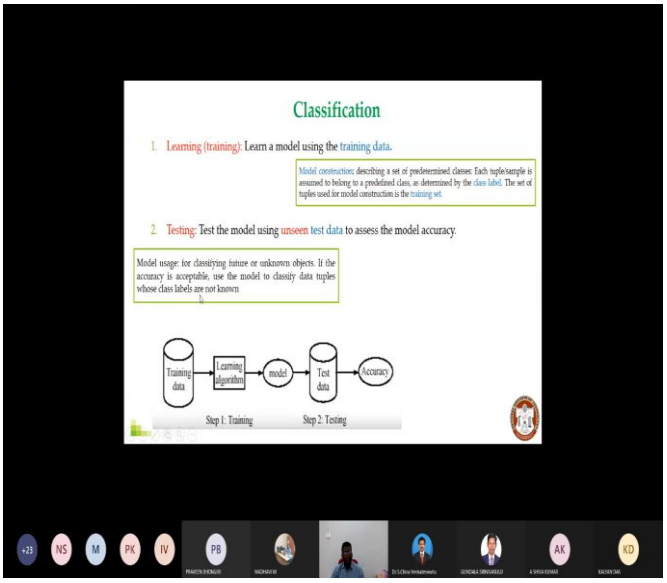
the behavior of the electrical devices based on fundamental physics, such as the doping profiles of the devices. His presentation highlights are device physics, partition model specific regions and assign EC elements, element formulation and error determination, modified nodal analysis to implement compact model and model testing for extreme bias/parameter combinations. Model customization for foundry for test-structure preparation, characterization, parameter extraction, model validation and design kit preparation for specific EDA tool.



Day 5: 5th March 2021[FN]

Topics : Supervised and unsupervised learning algorithms
Resource Person : Dr. Varun Gopi, Dept. of ECE, NIT Tirucharapalli

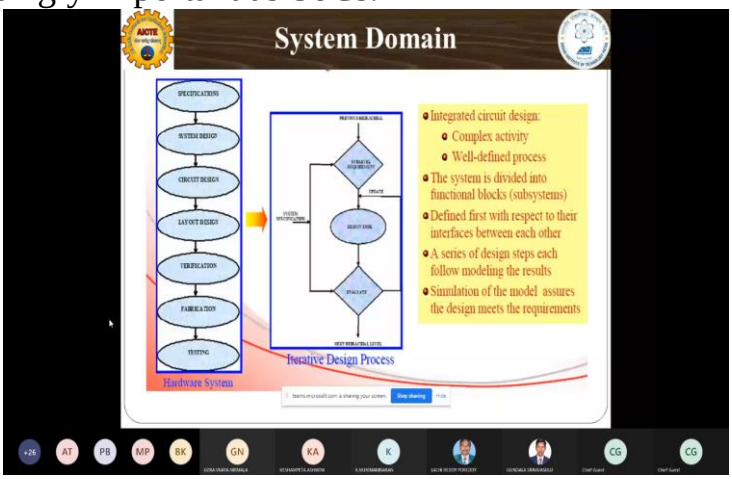
The resource Person Dr. Varun Gopi, Dept. of ECE, NIT Tirucharapalli, in his lecture explained about the supervised learning, unsupervised learning algorithms and the classification and regression supervised learning problems, about the clustering and association unsupervised learning problems. Good number of example based algorithms used for supervised and unsupervised problems. A problem that sits in between supervised and unsupervised learning called semi-supervised learning.



Day 5: 5th March 2021[AN]

Topics : Design aspects of analog and mixed signal ICs
Resource Person : Dr. Saurabh Kumar Pandey, Dept. of Electrical Engineering, IIT Patna

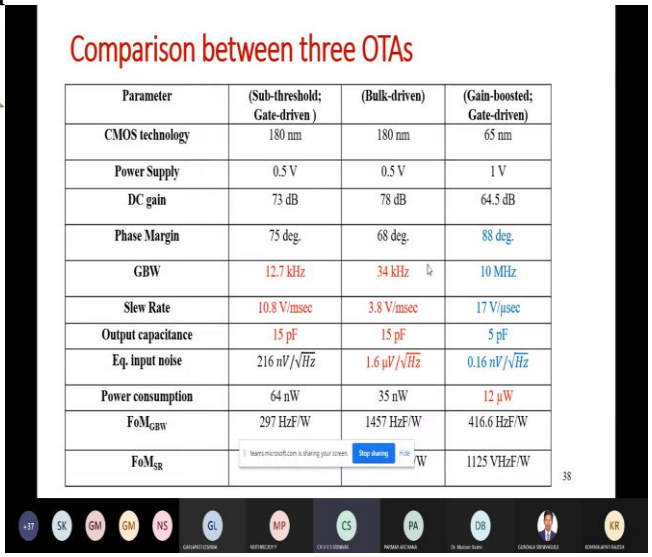
The resource Person Dr. Saurabh Kumar Pandey, Dept. of Electrical Engineering, IIT Patna, given demonstration on the Modern ICs, the modern ICs are often composed of elements from each domain. This is increasingly the case with compact and sophisticated wireless communications and sensing hardware, such as automotive radar, where a single device performs a wide range of sensing, processing, conversion, mathematical manipulation, storage, decision making, and communication. These mixed-signal designs usually involve several teams that must work with some unifying EDA tool that ensures each aspect of the design follows process constraints. This is increasingly important as SoCs.



Day 6: 6th March 2021[FN]

Topics : Design strategies for Low power analog IC design
Resource Person : Dr. Mudasir Bashir, Infineon Technologies, Austria

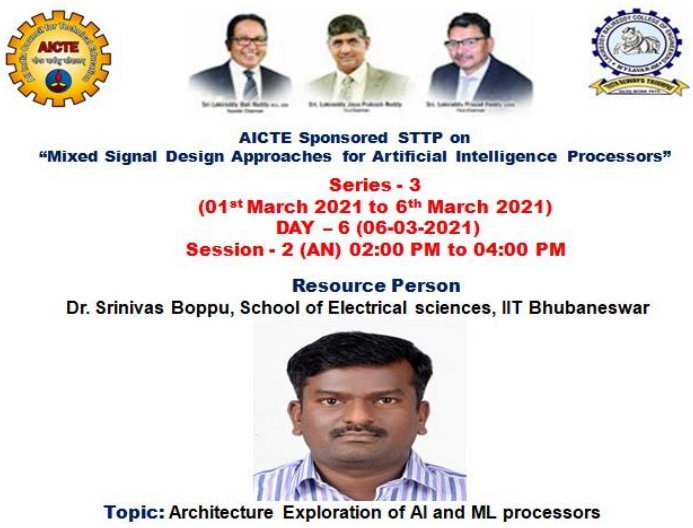
The resource Person Dr. Mudasir Bashir, Infineon Technologies, Austria, in his discussion described about Design strategies for analog integrated circuits for the reduction of stochastic errors and systematic errors are normally not consistent with design strategies which take into account power dissipation, voltage range and current range. The combination of transfer quality, low voltage and low power must be considered during the whole design process. There are good reasons to choose current as the information-carrying quantity in the case of low-voltage low-power design constraints. He focuses on the influence of the transfer quality on that choice. To obtain power-efficient transfer quality, indirect feedback is shown to be a good alternative to traditional feedback techniques.

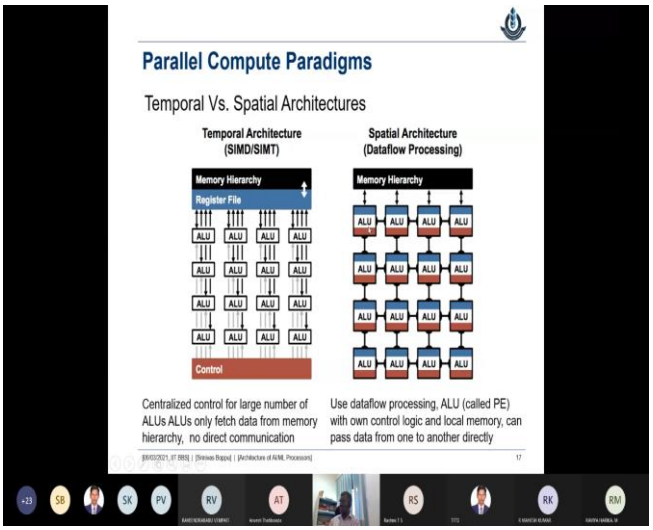


Day 6: 6th March 2021[AN]

Topics : Architecture Exploration of AI and ML processors
Resource Person : Dr. Srinivas Boppu, School of Electrical sciences, IIT Bhubaneswar

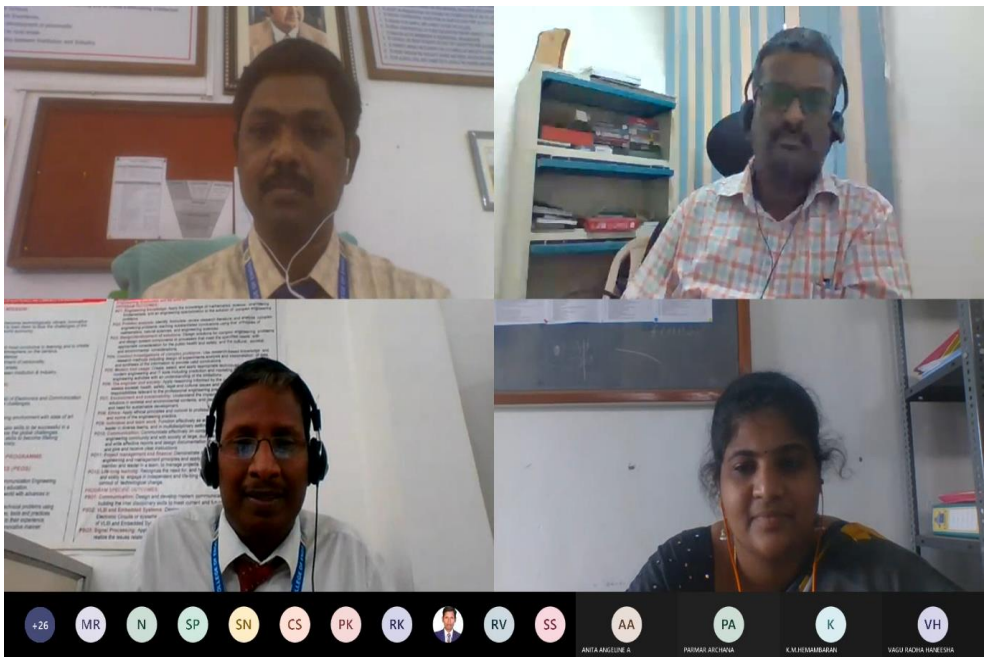
The resource Person Dr. Srinivas Boppu, School of Electrical sciences, IIT Bhubaneswar**,** in his lecture described about RL & Deep Learning: Deep reinforcement learning is the combination of reinforcement learning (RL) and deep learning. This field of research has been able to solve a wide range of complex decision-making tasks that were previously out of reach for a machine. Thus, deep RL opens up many new applications in domains such as healthcare, robotics, smart grids, finance, and many more. This manuscript provides an introduction to deep reinforcement learning models, algorithms and techniques. Particular focus is on the aspects related to generalization and how deep RL can be used for practical applications. We assume the reader is familiar with basic machine learning concepts.





Date: 6th March 2021: Valedictory Session:

STTP Valedictory Session held on 6th March 2021 at 3:45 PM by Coordinator of STTP **Dr. Srinivasulu Gundala,** Convener of STTP **Dr. Y. Amar Babu** along with Principal of LBRCE **Dr. K. Appa Rao,** chief guest of the programme **Dr. Srinivas Boppu, School of Electrical sciences, IIT Bhubaneswar**, and Participants.



Dr. K. Appa Rao in his valedictory addressing, conveyed his wishes to all the participants of STTP, congratulated the Program Convener Dr. Y. Amar Babu and Coordinator Dr. Srinivasulu Gundala for organizing the STTP in a successful manner. Further, he appreciated all the Teaching and Non-Teaching Staff Members of ECE Department for promoting such kind of development programme. He also motivated to keep learning new technologies coming in future for the career growth as well as organizational growth.

At the end of the valedictory session, vote of thanks was given by Dr. Srinivasulu Gundala, Coordinator of the STTP in which he has been paid his gratitude to AICTE for sponsoring the STTP program, resource persons for spending valuable time for our participants and sharing the knowledge and all the participants for attending this STTP.

Expressed the gratitude to the **LBRCE management**, Principal **Dr**. **K. Appa Rao,** Dean R & D **Dr. E. V. Krishna Rao** and team, Teaching and non-teaching staff members of ECE dept. and Microsoft Teams online software providers for extending support and for providing us with an environment to complete STTP program successfully.

Feedback from the Participants:

The feedback of the participants was very positive and motivational for the organizers. The participants felt very happy for conducting the STTP on latest trends in Industry. They said that, this program was very useful and helpful for them in their research, in turn guiding students in latest technologies. All the participants appreciated the sessions organized by the department of ECE and the arrangements made by the organizers.

The number of Online registrations by the Faculty members and Research scholars of AICTE approved institutions were 152, on an average 86 participants participated in online sessions, based on the eligibility criteria of the AICTE norms the e-certificates were issued to 70 participants.

15.03.2021

Coordinator
(Dr. Srinivasulu Gundala)

Convener
(Dr. Y. Amar Babu)