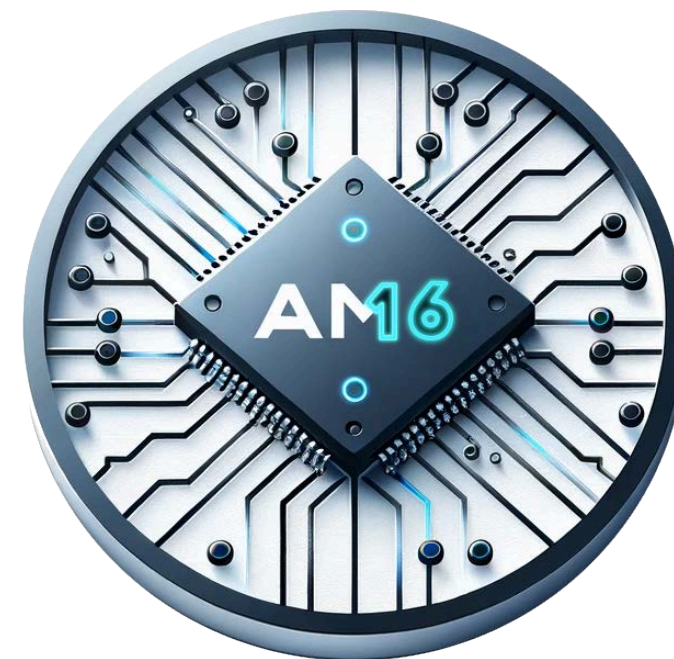


XVI CEI ANNUAL MEETING

May 9th - 10th, 2024



CHALLENGES IN MICROELECTRONIC DESIGN

TOPICS

ADVANCED POWER ELECTRONIC CONVERTERS AND SYSTEMS
EMBEDDED INTELLIGENCE AND IOT
EMERGING APPLICATIONS
MICROELECTRONIC DESIGN, RECONFIGURABLE SYSTEMS AND RISC-V
MODELING, CHARACTERIZATION AND SIMULATION OF COMPONENTS AND POWER CONVERTERS



POSTER SESSIONS (ordered by topic)

Advanced Power Electronic Converters and Systems

Single-Phase Single-Stage PFC Based on a Novel Floating Capacitor Filter for Electric Vehicle Battery Charger Application
Design of high-frequency magnetic components for space applications: litz-wire vs planar technology
Design and optimization of very high voltage magnetic transformer for aerospace applications
Power Loss Analysis of a Flyback Converter at Low Load and No-load Operation
Design and Implementation of a Phase Shift Full Bridge DC/DC Converter with Synchronous Rectification for Space Applications
Mitigation of circulation current in coupled interleaved inverters, based on single current sensor measurement and modulation techniques
Novel Capacitively Isolated Resonant Switched Capacitor Topologies
Control of a propulsion system if DC microgrid with fuel cells, renewable production and batteries
Design of a Resonant Inverter for the RF Generator of a Power Propulsion Unit
Design and control of a DC/DC Converter for RF generator of a Power Propulsion Unit
Design and Optimization of a High Frequency and High Power Transformer Using Neural Network for DAB DC-DC Converter

Embedded Intelligence and IoT

Custom wearable for affective computing
Implementation and Analysis of Neuroevolutionary Algorithms Applied to Solving Atari 2600 Games
Cloud-Edge Continuum Infrastructure for Reconfigurable Multi-Accelerator Systems
Spiking Neural Networks on FPGA
Optimizing Computation Offloading through Reinforcement Learning-Driven Collaboration in IoT Clustered Sensor Networks
Situational Awareness I2X Pipeline Methodology for LiDAR-based Sensor Networks at the Edge of Internet of Things
Multi-sensor Fusion Through Edge Intelligence Awareness for Railway Integrity, Positioning and Localisation
Design and Comparison of Q-learning based Transmission Power Control at the Extreme Edge of Internet of Things
Smart node design for detection of cyber-attacks in IoT at the edge
Phase Detection in Electrical Distribution Networks using Raw Data
Implementing Dynamic Consensus in Internet of Things Nodes for Consensus-Based Secondary Control of DC Microgrids
Event-based optical flow optimized for hardware implementations.
Post-Quantum Cryptography in Large-Scale Wireless Sensor Networks
Affective Computing for fear recognition using physiological signals based on Deep Learning
Implementation of RPL protocol for 6LoWPAN communication in IoT networks

Emerging Applications

DC Microgrid for ekranoplans: Protections modeling and design
High Efficiency DC-DC Converter to Supply RF Power Amplifiers
DC Microgrid for Ekranoplans: Sensor Design for a Dual Active Bridge Control and Protections
Power Management System Design for a Smart Bearing Energy Harvesting Application
A prototype for vagus nerve stimulation
Spiking Neural Networks as digital twins for in Vitro Counterparts
Design and fabrication of a microelectrode array for hosting in vitro neural networks
DC Microgrid for Ekranoplans: General Overview
Integration of blockchain in constrained IoT networks
E-field generator subcutaneous implant for brain tumor treatment in mice

Microelectronic Design, Reconfigurable Systems and RISC-V

Leveraging Incremental Machine Learning for Reconfigurable Multi-Accelerator Systems Modeling under Dynamic Workloads
MLIR-based compilation for automatic acceleration deployment on CGRAS.
Template-Based and Hardware-Accelerated RISC-V ISA Extensions
Integration of a CGRA accelerator with a CVA6 RISC-V core for the cloud-edge continuum
Design Space Exploration and Parametric Generation of Elastic CGRAS using Chisel
CGRAS vs VPUs: A Comparison of RISC-V Coprocessors
Flexible and Configurable RISC-V-Centric Acceleration Platforms for Safety-Critical Applications

Modeling, Characterization and Simulation of Components and Power Converters

FEM study of Resonance Magnetics Image tests. Application for implanted devices.
Characterization of GaN transistors in high-frequency applications
Design and optimization of medium-frequency and high-power transformer for aerospace applications using ANN
Design and optimization of helical coil transformers using ANN
FOGUITOS: Digital Twinning for Real-Time Temperature Monitoring of Power Converters
DC Microgrid for Ekranoplans: HIL implementation of non-Linear Control of DABs in a DC Microgrid for the AIRSHIP propulsion system
Blackbox Model for DC-DC Converters With Strong Nonlinear Dynamics Based on a Polytopic Wiener Hammerstein Structure
Modelling and Optimization of a Wireless Power Transfer System for Implantable Medical Devices using Artificial Neural Networks.

I. Alzuguren
L. Bengoechea
A. Ferrer
A. Gómez

J. Jaramillo

J. Lozano
G. Maldonado
C. Muñoz
G. Núñez
S. Pérez

L. Zhou

R. Andreu
J. Brihuega
I. Díez de Ulzurrun & J. Encinas
L. Fuentes

P. González
R. Hernández
R. Hernández
P. Hita
A. Martín
A. Menac

A. Redondo
C. Sánchez
J. Señor
J. Sun
A. Vidal

M. González
C. Muntean & L. Ruiz
C. Ramos

A. Redondo & F. P. Torrero
V. Rodríguez
H. Rodríguez
H. Rodríguez
L. Ruiz
J. Señor
L. Zagastizabal

J. Encinas
J. Gallego
M. Gómez
J. Granja
Y. Katebzadeh
D. Vázquez
L. Waucquez

J. Amores
D. Cuchillo
D. López
D. López
X. Mo

X. Mo

F. P. Torrero

A. Rodríguez

SHORT COURSES

CEI

Attendees are invited to attend the following short courses:

- **Mastering the Art of High-Frequency LLC Converters** (10:00-13:00h)
Coordinators: D. Ríos (UPM) y M. Vasic (UPM)
- **Open-Source HW/SW Deployment using RISC-V and MLIR** (09:00-13:00h)
Coordinators: A. Otero (UPM) and J. Gallego (UPM)
- **Wireless Power Transfer for Medical Applications** (10:00-13:00h)
Coordinators: R. Ramos (UPM) y M. Jiménez (UPM)

Room C

Registration at CEI Annual Meeting

15:00-15:30

OPENING SESSION

15:30-16:00

Óscar García, ETSII Director
Jorge Portilla, CEI Director

PLENARY SESSION

16:00-18:00

Challenges in Microelectronic Design

José Miguel Pascual (INDRA)
Miquel Moretó (BSC)
Rubén Pérez-Aranda (KDPOF)

CEI LAB TOUR AND POSTER SESSION

18:00-20:30

You will have the opportunity to meet our young researchers, exchange interesting ideas and enjoy beverages and food that will be available during the poster session. Do not miss this great opportunity to know us better.

The poster session will be held in the main lab of Centro de Electrónica Industrial (CEI). Find the list of the posters in the last page.

Sponsored by **ROHDE & SCHWARZ**
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TECHNICAL SESSIONS

9:00-13:30

TECHNICAL SESSION A

9:00-11:00

SESSION CHAIR: A. RODRÍGUEZ / R. RAMOS

- Design and Optimization of a High Frequency and High Power Transformer
Using Neural Network for DAB DC-DC converter **Lufan Zhou**
- MLIR-based compilation for automatic acceleration deployment on CGRAs **Juan Gallego**
- Capacitively Isolated Resonant Switched Capacitor Topologies **Gabriel Maldonado**
- Power Management System Design for a Smart Bearing Energy
Harvesting Application **Fernando Torrero & Alejandro Redondo**
- AIRSHIP: DC Microgrid for Ekranoplans **Luis Ruiz & Celia Ramos**
- Flexible and Configurable RISC-V-Centric Acceleration Platforms for Safety-Critical
Applications **Luis Waucquez**

Coffee Break

11:00-11:30

TECHNICAL SESSION B

11:30-13:30

SESSION CHAIR: G. MUJICA / M. VASIC

- Highly compact magnetic transformer with dedicated thermal management
for aerospace applications **Andrés Ferrer**
- Affective Computing for fear recognition using physiological signals based
on Deep Learning **Junjiao Sun**
- DITTCe Project: Enhancing the Efficiency of a Wirelessly Powered
Medical Implant through Artificial Neural Networks **Álvaro Rodríguez**
- A Microservice-Based Infrastructure for the Integration of Reconfigurable
Accelerators in the Cloud-Edge Continuum **Juan Encinas**
- FOGUITOS: Techniques for Advanced Thermal Modelling for Digital Twins **Xianghao Mo**
- Situational Awareness I2X Pipeline Methodology for LiDAR-based Sensor
Networks at the Edge of Internet of Things **Rogelio Hernández**