Call for Special Sessions

We invite proposals for Special Sessions on emerging and innovative topics **Electrical and Electronics Engineering.**

Special Sessions Proposal Requirements

Special Session proposals must include the following items:

- **Title**: A concise and descriptive title of the proposed session.
- **Organizers**: Names, affiliations, contact email, and short biographies of each organizer, a clear pic, including relevant professional experience. We accept proposals with no more than 4 organizers.
- **Abstract (maximum 250 words)**: A summary of the motivation behind the proposed topic, how the topic will be addressed by the committed papers, the expected impact, and justification for adopting a special session format.
- **List of Reviewers**: Names, affiliations, contact email, and short background introduction

Proposal Evaluation

Proposals will be evaluated based on:

Relevance and novelty of the topic Expected impact and quality of the submissions Diversity and expertise of the organizers and contributing authors

All papers submitted to special sessions will undergo the same rigorous peer-review process as regular submissions. For program arrangement purposes, papers may be reassigned between regular sessions and special sessions.

submit your proposal to link: http://hgg922om6hjbwthb.mikecrm.com/gELciBc

Or scan the QR code to get it

Paper submission link: https://easychair.org/my/conference?conf=iceee20270

ICEEE publication record: https://ieeexplore.ieee.org/xpl/conhome/1827404/all-proceedings

Some references for special sessions.

Special Session 1: AI-Enabled Power System Stability and Resilience

Abstract: Modern power systems are undergoing rapid transformation due to inverter-based resources, extreme weather events, and cyber-physical threats. This special session focuses on the application of artificial intelligence and machine learning to power system stability assessment, resilience enhancement, and real-time security monitoring. Topics of interest include physics-informed neural networks for transient stability prediction, reinforcement learning for wide-area damping control, graph neural networks for topology-aware state estimation, and explainable AI for operator decision support. The session also welcomes hybrid approaches that combine model-based methods with data-driven techniques to address the limitations of purely black-box models. Emphasis is placed on practical validation using realistic test systems, hardware-in-the-loop setups, and utility-scale case studies. This session aims to bring together researchers and practitioners to discuss how AI can make future power grids more stable, adaptive, and resilient under uncertainty.

Topics:

1. Physics-informed neural networks for transient stability prediction
2. Reinforcement learning for wide-area damping control
3. Graph neural networks for topology-aware state estimation
4. Explainable AI for power system operator decision support
5. AI-based fault detection and localization in transmission networks
6. Deep learning for short-term voltage stability assessment
7. Digital twins and AI for grid resilience under extreme events
8. Transfer learning for cross-system stability prediction
9. AI-assisted protection coordination in inverter-dominated grids
10. Real-time security assessment using streaming PMU data and ML

Special Session 2: Foundation Models and Large Language Models for Smart Grid Operations

Abstract: Recent advances in foundation models and large language models (LLMs) have opened new possibilities for smart grid operation, maintenance, and human-machine interaction. This special session explores how LLMs, vision-language models, and time-series foundation models can be adapted to power system tasks such as outage report analysis, operator assistance, maintenance log summarization, and regulatory document processing. Topics include prompt engineering and fine-tuning for power system terminology, retrieval-augmented generation over grid codes and standards, multimodal models for combining SCADA data with textual reports, and safety and hallucination mitigation in safety-critical energy applications. The session also addresses computational challenges, privacy concerns, and the need for domain-specific benchmarks. We welcome both theoretical contributions and applied case studies that demonstrate reliable and trustworthy use of foundation models in smart grid environments, including distribution automation, demand response, and asset management.

Topics:

1. LLM-based operator assistance for control room decision-making
2. Retrieval-augmented generation over grid codes and standards
3. Fine-tuning foundation models for power system terminology
4. Multimodal models combining SCADA data and textual reports
5. Time-series foundation models for load and renewable forecasting
6. Hallucination detection and mitigation in safety-critical energy AI
7. Privacy-preserving LLM deployment for utility data
8. Benchmarking LLMs on power system fault diagnosis tasks
9. LLM-driven automation of maintenance and inspection reports
10. Conversational AI for demand response and customer engagement

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Special Session 3: Digital Twins and AI for Power Electronics and Drives

Abstract: Digital twins are becoming a key enabler for design, monitoring, and predictive maintenance of power electronics converters and electrical drives. This special session focuses on the integration of digital twin technology with AI and machine learning to create self-adapting, self-diagnosing, and self-optimizing drive systems. Topics include real-time simulation and co-simulation frameworks, data-driven model updating, remaining useful life estimation for power semiconductors, and AI-based fault diagnosis for multilevel converters and permanent magnet machines. The session also covers virtual commissioning, hardware-in-the-loop validation, and edge computing for deploying lightweight AI models on embedded drive controllers. Applications in electric vehicles, renewable energy conversion, and industrial automation are particularly welcome. By combining physics-based models with data-driven intelligence, digital twins can significantly improve reliability, efficiency, and safety of power electronic systems, and this session aims to showcase the latest research and industrial practices.

Topics:

1. Real-time digital twins for multilevel converters
2. AI-based remaining useful life estimation for power modules
3. Data-driven model updating for electrical machines
4. Edge AI for embedded drive controllers
5. Virtual commissioning of power electronics systems
6. Fault diagnosis in PMSM drives using digital twins
7. Co-simulation of thermal and electrical domains with ML
8. Digital twins for electric vehicle traction inverters
9. Reinforcement learning for digital twin-based control tuning
10. Hardware-in-the-loop validation of AI-enabled drive systems

Special Session 4: Generative AI for Renewable Energy Forecasting and Planning

Abstract: Generative artificial intelligence, including diffusion models, generative adversarial networks, and variational autoencoders, is emerging as a powerful tool for renewable energy forecasting, scenario generation, and planning under uncertainty. This special session focuses on generative approaches for solar irradiance, wind power, and hybrid renewable systems, with emphasis on probabilistic forecasting, extreme event simulation, and spatio-temporal correlation modeling. Topics include conditional generation for day-ahead and intra-day forecasts, generative models for creating synthetic weather scenarios, and AI-based planning of distributed generation and storage. The session also addresses evaluation metrics for generative forecasts, uncertainty quantification, and integration with unit commitment and economic dispatch. We welcome contributions that demonstrate how generative AI can improve the accuracy, diversity, and usefulness of renewable energy predictions for grid operators, market participants, and planners, while also discussing computational cost, data requirements, and interpretability challenges in real-world deployment.

Topics:

1. Diffusion models for probabilistic solar irradiance forecasting
2. GANs for synthetic wind power scenario generation
3. Conditional generative models for intra-day renewable forecasts
4. Extreme weather scenario generation for grid planning
5. Spatio-temporal generative models for distributed PV
6. Uncertainty quantification in generative energy forecasts
7. Generative AI for hybrid renewable system sizing
8. Integration of generative forecasts into unit commitment
9. Evaluation metrics for generative renewable predictions
10. Interpretability of generative models in energy planning

Special Session 5: Edge Intelligence and TinyML for Smart Buildings and IoT

Abstract: The proliferation of IoT sensors in smart buildings has created new opportunities for edge intelligence and TinyML, where machine learning models run directly on resource-constrained devices. This special session explores the design, deployment, and evaluation of TinyML solutions for smart building applications, including occupancy detection, HVAC optimization, lighting control, and anomaly detection in energy consumption. Topics include model compression, quantization, pruning, and knowledge distillation for microcontroller-class hardware, as well as federated learning for privacy-preserving building analytics. The session also covers energy harvesting and ultra-low-power inference, wireless communication protocols for edge AI, and integration with building management systems. We welcome work on real-world deployments, benchmarking of TinyML frameworks, and novel applications that combine edge intelligence with cloud-based digital twins. The goal is to advance the state of the art in making smart buildings more responsive, energy-efficient, and user-centric through embedded AI.

Topics:

1. TinyML for occupancy and activity recognition in buildings
2. Model compression for microcontroller-based HVAC control
3. Federated learning for privacy-preserving building analytics
4. Ultra-low-power inference with energy harvesting sensors
5. Edge AI for anomaly detection in building energy data
6. Knowledge distillation for smart lighting systems
7. Benchmarking TinyML frameworks on building IoT devices
8. Wireless protocols for edge AI in smart buildings
9. Integration of edge intelligence with building digital twins
10. Real-world deployment and evaluation of TinyML in buildings

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Special Session 6: AI-Driven Cybersecurity for Cyber-Physical Power Systems

Abstract: Cyber-physical power systems are increasingly vulnerable to sophisticated cyberattacks that can disrupt grid operations, cause physical damage, and threaten national security. This special session focuses on AI-driven approaches for detecting, mitigating, and responding to cyber threats in power systems, including false data injection attacks, GPS spoofing, and malware targeting SCADA and IoT devices. Topics include machine learning for intrusion detection in substation networks, deep learning for anomaly detection in PMU and SCADA data, reinforcement learning for adaptive defense strategies, and graph-based methods for attack propagation analysis. The session also addresses adversarial machine learning, where attackers manipulate AI models themselves, and the need for robust and explainable security solutions. We welcome contributions on testbeds, co-simulation platforms, and standards for AI-based cybersecurity in energy systems. The goal is to foster interdisciplinary research that combines power system engineering, cybersecurity, and AI to protect critical energy infrastructure.

Topics:

1. ML-based intrusion detection for substation networks
2. Deep learning for false data injection attack detection
3. Reinforcement learning for adaptive cyber defense in grids
4. Graph-based analysis of attack propagation in power systems
5. Adversarial robustness of AI models in energy security
6. Explainable AI for cyber-physical incident response
7. AI-driven GPS spoofing detection in synchrophasor networks

8. Testbeds and co-simulation for AI-based grid cybersecurity
9. Anomaly detection in SCADA data using autoencoders
10. Standards and certification for AI in energy cybersecurity

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Special Session 7: Self-Supervised and Transfer Learning for Power Quality and Harmonics

Abstract: Power quality issues such as harmonics, voltage sags, and transients are increasingly complex due to the proliferation of power electronic converters and renewable energy sources. This special session explores self-supervised and transfer learning techniques for power quality monitoring, disturbance classification, and harmonic source identification. Unlike traditional supervised learning, self-supervised methods can leverage large amounts of unlabeled data from smart meters and power quality monitors, while transfer learning enables adaptation across different sites, networks, and operating conditions. Topics include contrastive learning for power quality event representation, pretraining on synthetic and real waveforms, domain adaptation for cross-grid generalization, and few-shot learning for rare disturbance types. The session also covers edge deployment of lightweight models for real-time power quality analysis and integration with active filters and power factor correctors. We welcome contributions that demonstrate improved accuracy, robustness, and scalability compared to conventional approaches, as well as open datasets and benchmarking efforts.

Topics:

1. Contrastive self-supervised learning for power quality events
2. Transfer learning for cross-site harmonic source identification
3. Domain adaptation for power quality monitoring across grids
4. Few-shot learning for rare power quality disturbances
5. Pretraining on synthetic waveforms for event classification
6. Edge deployment of self-supervised models for power quality
7. Self-supervised anomaly detection in smart meter data
8. Transfer learning for active filter control tuning
9. Open datasets and benchmarks for power quality AI
10. Integration of self-supervised learning with power factor correction

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Special Session 8: AI for Electric Vehicle Charging, V2G, and Transportation Electrification

Abstract: The rapid growth of electric vehicles (EVs) is transforming transportation and creating new challenges and opportunities for power systems. This special session focuses on AI and machine learning for EV charging infrastructure, vehicle-to-grid (V2G) services, and transportation electrification. Topics include reinforcement learning for smart charging scheduling, demand response and valley filling, prediction of charging demand and user behavior, and optimization of charging station placement and sizing. The session also covers AI for bidirectional power flow, battery health-aware charging, and integration of EVs with renewable energy and smart grids. We welcome contributions on multi-agent systems for coordinated charging, federated learning for privacy-preserving user data, and digital twins for charging infrastructure. Applications in public transit, logistics fleets, and residential charging are particularly relevant. The goal is to accelerate the deployment of intelligent, grid-friendly, and user-centric EV charging solutions that support decarbonization of transportation and enhance power system flexibility.

Topics:

1. Reinforcement learning for smart EV charging scheduling
2. Demand prediction and user behavior modeling for charging
3. AI for V2G bidirectional power flow optimization
4. Battery health-aware charging using machine learning
5. Optimal placement and sizing of charging stations with AI
6. Multi-agent systems for coordinated fleet charging
7. Federated learning for privacy-preserving EV data
8. Digital twins for EV charging infrastructure
9. Integration of EVs with renewable energy and storage
10. AI for transportation electrification in public transit

Special Session 9: Neuromorphic and Brain-Inspired Computing for Power Electronics Control

Abstract: Neuromorphic and brain-inspired computing offers ultra-low-power, event-driven processing that is well suited for real-time control of power electronics and drives. This special session explores the application of spiking neural networks, memristive devices, and neuromorphic hardware to power electronic control, fault diagnosis, and sensor fusion. Topics include event-based control of DC-DC and DC-AC converters, spiking neural networks for motor drive control, memristor-based analog computing for model predictive control, and neuromorphic vision sensors for condition monitoring. The session also addresses the co-design of power electronics and neuromorphic circuits, as well as tools and frameworks for training and deploying spiking models on embedded platforms. We welcome contributions that demonstrate advantages in latency, energy efficiency, and adaptivity compared to conventional digital control. By bridging neuroscience-inspired computing and power electronics, this session aims to open new research directions for highly efficient, resilient, and intelligent energy conversion systems.

Topics:

1. Spiking neural networks for DC-DC converter control
2. Event-based control of DC-AC inverters
3. Memristor-based analog computing for MPC
4. Neuromorphic vision sensors for condition monitoring
5. Co-design of power electronics and neuromorphic circuits

6. Ultra-low-power spiking controllers for motor drives
7. Training and deployment tools for neuromorphic control
8. Fault diagnosis using brain-inspired learning
9. Latency and energy benchmarking of neuromorphic control
10. Adaptive neuromorphic control under varying loads

Special Session 10: Physics-Informed Machine Learning for Electromagnetic Compatibility and High Voltage Engineering

Abstract: Physics-informed machine learning (PIML) is emerging as a powerful paradigm for electromagnetic compatibility (EMC) and high voltage engineering, where pure data-driven models often lack physical consistency and generalization. This special session focuses on PIML approaches that embed Maxwell's equations, circuit laws, and insulation physics into neural networks and other learning models. Topics include physics-informed neural networks for electromagnetic transient simulation, AI-assisted design of high voltage insulation systems, data-driven prediction of partial discharge and breakdown, and hybrid models for EMI/EMC analysis in power electronics. The session also covers uncertainty quantification, inverse problems, and optimization under physical constraints. We welcome contributions that demonstrate improved accuracy, interpretability, and reliability compared to black-box models, as well as applications in transformers, cables, switchgear, and power electronic converters. The goal is to advance the integration of physics and AI for safer, more reliable, and more efficient high voltage and EMC engineering.

Topics:

1. Physics-informed neural networks for EMTP simulation
2. AI-assisted design of high voltage insulation systems
3. Data-driven prediction of partial discharge and breakdown
4. Hybrid models for EMI/EMC analysis in converters
5. Uncertainty quantification in PIML for high voltage
6. Inverse problems in EMC using physics-informed learning
7. Optimization of switchgear design with physical constraints
8. PIML for transformer and cable condition monitoring
9. Interpretable AI for electromagnetic compatibility testing
10. Integration of Maxwell solvers with neural networks