Empowering AI Innovations for Tomorrow: Workshop on Edge Computing with TinyML

Abstract:
The rapid advancements in artificial intelligence (AI) and the growing adoption of edge computing have unlocked opportunities to address critical global challenges through sustainable innovation. Tiny Machine Learning (TinyML), a cutting-edge field where edge computing meets IoT and AI, enables resource-constrained devices to process data locally and make real-time decisions without reliance on centralized systems. This workshop will explore how TinyML is revolutionizing AI by democratizing its applications in industries such as agriculture, healthcare, manufacturing, and environmental sustainability.
Participants will gain hands-on experience, learn from case studies, and discuss emerging trends in TinyML. The workshop aligns with the theme "AI Innovations for a Better Tomorrow" by showcasing the transformative potential of TinyML in advancing pervasive and real-world AI applications.

Objectives

- Introduce participants to the fundamental concepts of TinyML and its role in edge computing.
- Provide practical experience with development kits and tools such as Edge Impulse for TinyML implementation.
- Demonstrate real-world applications and case studies showcasing TinyML's impact across industries.
- Facilitate discussions on ethical, scalable, and sustainable innovations in TinyML.
- Foster collaboration and networking within the TinyML and edge AI community.
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Motivation:
With the rising demand for low-latency, energy-efficient AI applications in resource-constrained environments, TinyML offers an ideal solution to address these needs. From reducing carbon footprints to optimizing industrial processes, TinyML represents a sustainable and cost-effective technology that democratizes AI for widespread real-world adoption.

Intended Audience:

- Undergraduate and graduate students in AI, computer science, and engineering.
- Researchers and professionals exploring IoT, edge computing, and machine learning.
- Developers and practitioners interested in deploying AI at the edge.
- Enthusiasts passionate about sustainable technology and innovative applications of AI.

Description of Topics
Topics to be Covered

1. **Introduction to TinyML and Edge Computing**
    - Overview of TinyML concepts, challenges, and opportunities.
    - Key features: low power consumption, cost efficiency, and real-time processing.
2. **Hands-On Experience with TinyML Development Kits**
    - Practical implementation using tools like Edge Impulse.
    - Deploying AI models on microcontroller-based devices for real-world applications.
3. **Real-World Applications of TinyML**
    - Sustainable Environmental Control in Smart Poultry Farming.
    - Carbon Footprint Estimation.
    - Predictive Maintenance in Industry 4.0.
    - Estimating Shelf Life of Date Palm Fruits.
    - Real-Time Anomaly Detection in Oil & Gas Operations.
4. **Emerging Trends, Challenges, and Ethical Considerations in TinyML**
    - Scalability, sustainability, and privacy concerns.
    - Advancements in hardware and software for TinyML.
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Session Duration:
Two sessions of 3 Hours: This duration will provide sufficient time for comprehensive coverage of topics, hands-on activities, and interactive discussions.

Relevance and Importance:
The topics covered in this workshop address the urgent need for sustainable, efficient, and real-time AI solutions across industries, aligning perfectly with the conference theme. TinyML offers a transformative approach to making AI accessible and impactful in resource-constrained environments.

Content Outline and Schedule

Time	Topic	Speaker
9.00 – 9.30	Welcome and Introduction to TinyML and Edge Computing	-**Dr.Ali Alzahrani**
9:30 – 12.30	Hands-On Experience with TinyML Development Kits	-**Dr.Ramasamy**
13:30 - 14:30	Case Studies and Real-World Applications	-**Dr.Ramasamy**
14:30 - 14:45	Challenges, Trends, and Ethical Considerations	**-Dr.Ramasamy**
14:45 - 15:00	Q&A and Networking	**-Dr.AA & Dr.Rama**

Speaker Information

Speakers: Ali Saeed Alzahrani and Ramasamy Srinivasagan
Affiliation: Computer Engineering, CCSIT, King Faisal University, KSA

Biography:

Dr.ALI ALZAHRANI received the B.E. degree in computer engineering from Umm Al-Qura University, Mecca, Saudi Arabia, and the M.Sc. and Ph.D. degrees in computer engineering from the University of Victoria, BC, Canada, in 2015 and 2018, respectively. He is currently an Associate Professor with the Department of Computer Engineering, King Faisal University. His research interests include hardware security, speech processing, Deep Learning encryption processors, image processing, and systems-on-chip.

Dr. Ramasamy is an esteemed academic and researcher at the College of Computer Science and Information Technology, King Faisal University. As the first TinyML Academic Lead in Saudi Arabia, Dr. Ramasamy has spearheaded numerous workshops on TinyML for students, faculty, and industry professionals across India, Ethiopia, and Saudi Arabia. With four published research articles in collaboration with the KFU Research Center, he is actively advancing the field of TinyML and edge computing. Dr. Ramasamy is also involved in cutting-edge research projects leveraging edge computing technologies. Serving as an NVIDIA Ambassador since 2021, he has trained over 500 participants, helping them earn NVIDIA certifications. Additionally, he contributed as a Technical Assistant for NVIDIA GTC from 2022 to 2024, showcasing his dedication to empowering the AI and ML community.