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Twinning for Excellence in Adaptive Edge AI – AIDA4Edge

2nd Stakeholder Forum

Edge AI across Application Domains

Date: July 9, 2026
Location: Hybrid event (online and in person – room 155)
Time: 10:00 – 12:30
Link: https://tinyurl.com/kfpdpbz6

Agenda of the 2nd Stakeholder Forum	
10:00 – 10:05	**Opening Session**
10:05 – 10:35	**Prof. Theocharis Theocharides** (University of Cyprus): "***From Sensing to Rescue: Low-Power Robotic Vision at the Edge for Emergency Operations***"
10:35 – 11:00	**Dr. Marko Milivojčević** (The Academy of Applied Studies Polytechnic, Belgrade, Serbia): "***Edge AI for Smart Traffic Monitoring: Privacy-Preserving Acoustic Classification of Vehicle Powertrains***"
11:00 – 11:25	**Mihajlo Milovanović**, **Toplica Jakimov** (Beehold company Niš, Serbia): "***Bringing Edge AI to Precision Agriculture: Acoustic Monitoring of Honey Bees***"
11:25 – 11:50	**Assist. Prof. Đorđe Damnjanović, Assistant Dejan Vujičić** (Faculty of Technical Sciences Čačak, University of Kragujevac, Serbia): "***Edge AI System for Real-Time Speech Command Recognition***"
11:50 – 12:20	**Dr. Vladimir Despotović** (Luxembourg Institute of Health): "***Multimodal digital biomarker for asthma: Complementary roles of vocal, clinical and demographic factors***"
12:20 – 12:30	**Closing Session**

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Prof. Theocharis Theocharides

Department of Electrical and Computer Engineering

KIOS Research and Innovation Center of Excellence

University of Cyprus

University of Cyprus

Title: From Sensing to Rescue: Low-Power Robotic Vision at the Edge for Emergency Operations

Abstract: Autonomous robotic platforms such as UAVs, ground robots, and mobile sensing systems can play a critical role in emergency response by supporting search and rescue, disaster mapping, infrastructure inspection, damage assessment, and situational awareness in environments that may be dangerous or inaccessible to humans. This talk will discuss how low-power edge computer vision can enable such robots to detect people, vehicles, hazards, damaged structures, blocked routes, fire or smoke regions, and other mission-relevant information directly in the field, without relying on continuous cloud connectivity. The talk will first examine the key challenges of robotic vision in emergency scenarios, including limited onboard energy, constrained computation, real-time latency requirements, degraded visibility, occlusion, smoke, dust, darkness, adverse weather, unreliable communication, and safety-critical operation. It will then present enabling edge AI solutions, including lightweight neural networks, object detection, semantic segmentation, scene classification, anomaly detection, sensor fusion, model compression, adaptive inference, and energy-aware perception pipelines for embedded robotic platforms. Finally, the talk will identify future challenges in robust multimodal perception, low-power AI acceleration, trustworthy and secure edge inference, human-in-the-loop decision support, collaborative multi-robot mapping, and adaptive vision systems capable of operating reliably under uncertainty and mission constraints.

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Marko Milivojčević

The Academy of Applied Studies Polytechnic, Belgrade, Serbia

THE ACADEMY OF APPLIED STUDIES POLYTECHNIC

Title: Edge AI for Smart Traffic Monitoring: Privacy-Preserving Acoustic Classification of Vehicle Powertrains

Abstract: The growing deployment of intelligent transportation systems is driving the need for monitoring solutions that are accurate, scalable, and respectful of user privacy. This presentation demonstrates how Edge AI and acoustic sensing can be combined to automatically classify internal combustion engine vehicles according to their powertrain using sound alone, eliminating the need for camera-based identification or access to vehicle registration databases. The presented solution integrates a dedicated acoustic data acquisition system with advanced signal processing, psychoacoustic analysis, and machine learning techniques to distinguish between gasoline and diesel vehicles under realistic operating conditions. The presentation outlines the complete development workflow, from the design of a novel sound acquisition methodology and creation of a real-world acoustic dataset to the implementation and evaluation of conventional and deep learning models for reliable audio classification. Through practical application scenarios — including adaptive ventilation in parking facilities, intelligent traffic management, environmental monitoring, and smart city infrastructure—the presentation illustrates how Edge AI can enable privacy-preserving, cost-effective, and intelligent transportation solutions while supporting more sustainable urban mobility.

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Mihajlo Milovanović
Toplica Jakimov

Beehold

Title: Bringing Edge AI to Precision Agriculture: Acoustic Monitoring of Honey Bees

Abstract: Edge AI technologies are enabling a new generation of intelligent environmental monitoring systems by combining embedded sensing, on-site data acquisition, and artificial intelligence to deliver timely insights while reducing communication requirements, energy consumption, and deployment costs. This presentation demonstrates how these technologies can be applied to precision agriculture through the development of an intelligent monitoring system for honey bee activity. The presented solution integrates Raspberry Pi-based edge devices equipped with MEMS microphones for continuous outdoor audio acquisition with advanced signal processing and machine learning techniques for the automatic detection and recognition of bee presence under realistic environmental conditions. As part of its ongoing evolution, the system is being extended with an event-based vision sensor, enabling the fusion of acoustic and visual information to improve the robustness and reliability of pollinator monitoring in complex outdoor environments. The presentation highlights the complete technological workflow — from embedded data acquisition and multimodal sensing to robust acoustic feature extraction and conventional and deep learning models for intelligent data analysis — and discusses the challenges of reliable operation in dynamic natural soundscapes. By showcasing a practical Edge AI application that supports non-invasive pollinator monitoring, the presentation illustrates how intelligent sensing technologies can contribute to sustainable beekeeping, biodiversity conservation, and data-driven precision agriculture, while demonstrating the broader potential of multimodal Edge AI for real-world environmental monitoring applications.

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Assist. Prof. Đorđe Damnjanović
Assistant Dejan Vujičić

Faculty of Technical Sciences Čačak
University of Kragujevac, Serbia

Title: Edge AI System for Real-Time Speech Command Recognition

Abstract: Edge Artificial Intelligence (Edge AI) enables intelligent data processing directly on embedded devices, reducing latency, preserving privacy, and eliminating dependence on cloud infrastructure. This paper presents an Edge AI solution for real-time speech command recognition deployed on a Raspberry Pi 5 platform. The proposed system combines Mel spectrogram-based audio preprocessing with a lightweight convolutional neural network (CNN) optimized for embedded inference. The model was trained and evaluated using the Google Speech Commands Dataset, including ten speech commands together with silence and unknown classes, achieving a testing accuracy of 96.05% and macro-averaged precision, recall, and F1-score of approximately 95%. The complete inference pipeline executes locally on the embedded device, enabling low-latency, privacy-preserving, and real-time speech recognition without relying on cloud services. The obtained results demonstrate that deep learning models can be efficiently deployed on affordable edge hardware while maintaining high recognition performance, making the proposed solution suitable for applications in smart manufacturing, human–machine interfaces, robotics, smart homes, and other Industry 4.0 environments where reliable on-device intelligence is required.

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Dr. Vladimir Despotović

Bioinformatics & AI Unit
Luxembourg Institute of Health
Luxembourg

LUXEMBOURG INSTITUTE OF HEALTH

Title: Multimodal digital biomarker for asthma:

Complementary roles of vocal, clinical and demographic factors

Abstract: Asthma affects over 260 million people worldwide, yet diagnosis remains dependent on spirometry and specialist assessment, limiting accessibility in primary care and low-resource settings. Voice biomarkers offer a promising non-invasive alternative, enabling scalable screening via smartphones and, ultimately, edge devices deployable at the point of care without requiring cloud connectivity or centralised infrastructure. In this talk, we present a multimodal Mixture-of-Experts framework that adaptively fuses acoustic embeddings from multiple vocal tasks with structured clinical and demographic data. Rather than combining modalities through fixed rules, the architecture learns to dynamically weight each modality based on the individual's clinical presentation — shifting reliance between voice and clinical features according to symptom burden in a transparent and interpretable manner. We discuss the implications of adaptive multimodal fusion for digital respiratory health, and the potential for voice-based screening of asthma to complement existing diagnostic pathways in accessible and explainable ways.