**INDIN 2024 Special Session Proposal**

**Title of the Proposal:** Distributed and Intelligent Edge Computing (IEC) for Industrial IoT

**-The name, a photo, a very short bio, contact details and IEEE IES membership of the Session**

Organizer: *Organizer 1: Prof. Mikael Gidlund, Mid Sweden University, Sweden*

*Organizer 2: Assoc. Prof. Tao Zheng, Beijing Jiaotong University, China*

*Organizer 3: Ass. Prof. Kyi Thar, Mid Sweden University*



**Mikael Gidlund (****mikael.gidlund@miun.se****)** is a Professor in Computer Engineering at Mid Sweden University since 2014. Before that, he was at ABB Corporate Research as responsible for research and strategy in wireless automation. Prof. Gidlund has pioneered the Industrial WSN area and has more than 30 patents (pending and granted) and published more than 100 articles in the subject of Industrial IoT. During 2018-2020 he was vice-chair for IEEE IES TC on Cloud and Wireless Systems for Industrial Applications. He has successfully arranged more than **15 special sessions and tutorials** at INDIN, IECON, ICIT an ETFA. Since 2018, he is also an associate editor for IEEE TII and since 2021 he is an associate editor for JESTIE. He was a **keynote speaker** at IEEE INDIN, Lemgo, Germany, 2023.



**Tao Zhen** (zhengtao@bjtu.edu.cn) is an associate professor in Electrical Engineering at Beijing Jiaotong University and his main research interests are Industrial IoT and wireless connectivity. He has vast experience in experimental work related to Industrial IoT, especially in Edge computing and communications for railway systems. He also has previous experience in organizing special sessions at various conferences.

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**Kyi Thar** (kyi.thar@miun.se) is an assistant professor at Mid Sweden University and received his Ph.D. in Computer Engineering from Kyong-Hee University, Korea, in 2020. Dr Kyi Thar is a leading expert in artificial and network intelligence for Industrial IoT and is a rising star within the IES society within that area. He also has some previous experience in conference organizations.

**-Technical Outline of the Session and Topics:**

Future Industrial IoT networks and the forthcoming 6G networks envision ubiquitous computing and connectivity which will lead to massive growth in data traffic and billions of edge nodes connected with each other. To avoid delays and single point of failure in huge networks, edge devices are now widely employed for various applications, such as industrial automation, intelligent transportation systems, surveillance, and home automation. However, in many scenarios, sophisticated artificial intelligence (AI) algorithms are required consuming significant amount of processing power and occupying large storage size which may exceed the available resources of typical edge devices. To overcome this challenge, recent delay sensitive, distributed, and intelligent trends in computing paradigms, such as TinyML, Federated Learning, Mobile edge Computing, Multiaccess Edge Computing, Edge Computing, Fog Computing and Computational Offloading are under research, aiming to optimize latency, computing complexity, and resourceful utilization of bandwidth, thus giving rise to a potential research direction of distributed and Intelligent Edge Computing (IEC). Due to significant tasks expected to be handled in future IIoT and 6G networks, IEC is deemed to play an important role. To support distributed AI applications on the edge computing platform, efficient life-cycle management and closed-loop automation tools are required to manage the highly heterogeneous computing elements in edge computing (e.g., embedded devices, intelligent base stations, edge and fog, servers, etc.) Also, novel methods are needed to ensure IEC security against attacks, the privacy of the data their models and their trustworthiness, avoiding erroneous decisions and ensuring high performance AI/ML models.

**Topics of the Session**

o *IEC solutions for Industrial IoT and Beyond 5G (B5G) communication networks*

o *Distributed or collaborative intelligence for IIoT and B5G communication networks, such as federated learning and TinyML.*

* *Explainable AI and Trustworthy AI in edge computing*
* *Digital twins for Industrial IoT and IEC*
* *AI based edge computing resource allocation and management*
* *Communication protocols designed for IEC*
* *Solutions towards zero-touch service orchestration across IIoT and B5G with IEC*
* *Intelligent computation offloading*
* *Energy efficiency in IEC*
* *Joint optimization of computing, network, and storage resources of edge devices in IIoT*
* *Latency and bandwidth management in IEC*

o *Security and trust in IEC*

o *On-demand resource allocation and task scheduling for IEC*

o *Joint optimization of sensing, computing, communicating for IEC*

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-**IEEE IES Technical Committee Sponsoring the Special Session (if any):**

We are in discussions with the IEEE IES TC on Cloud and Wireless Systems for Industrial Applications.

-**Other:**