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Special Session

Towards Machine-Learning Based Secure and Efficient 5G and Beyond Disaggregated Networks

Organizing Projects	MARSAL (https://www.marsalproject.eu)
Structure	1 h 30 – 3 h , 5-10 papers short or long and few keynotes
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Background and Motivation

5G changes the landscape of mobile networks in a profound way, with an evolved architecture supporting unprecedented capacity, spectral efficiency, and increased flexibility. The adoption of Edge Computing and the paradigm shift from centralized architectures (e.g., based on C-RAN) towards multiple tiers of Edge nodes and a virtualized and, possibly, cell-free RAN (vRAN) currently pose a lot of challenges. This is mainly due to the fact that these infrastructure resources belong to different administrative domains, operate in parallel in the same network areas and are usually shared between competing flows, computations, and data in static and/or statically multiplexed manner. Thus, it is clear that targeted innovation activities need to take place to fully exploit key technological developments towards a disaggregated infrastructure model. In this perspective, a unified and hierarchical infrastructure is essential in order to provide an intelligent management of

communication, computation and storage resources, which can be further enhanced by incorporating efficient Machine-Learning (ML) algorithms. Furthermore, ML can play a significant role in the automatic monitoring and synchronization of resources, while facilitating the implementation of ground-breaking applications in network and data security and privacy and the integration of several new technologies in an efficient manner. Due to the autonomous decision-making capabilities and benefit of learning from its environment, ML has the potential to optimize the operation of a 5G network while improving energy efficiency. However, there are still several open challenges that need to be addressed to build highly secure and efficient networks in 5G and Beyond (B5G) systems and the focus of this Special Session is to address these.

Topics of Interest

This special session aims at bringing together scientists and practitioners to discuss the solutions, opportunities, and challenges in the design of secure and efficient 5G and B5G disaggregated networks. This event will focus on, but will not be limited to, the following subjects of interest:

- AI-based 5G network slicing and optimization
- Design and implementation of RAN architectures for disaggregated networks
- Self-Driven Virtual Elastic Infrastructures via multi-objective optimization
- Machine learning – from deep learning and reinforcement learning to federated learning— for network security
- ML-driven slice security mechanisms in multi-tenant infrastructures
- Innovations in MANO platforms
- Data security and privacy in multi-tenant infrastructures
- Federated learning for network slicing
- Distributed ML for Privacy and Network Security
- ML and Blockchain technologies for trust-less multi-tenant slicing
- Decentralized AI schemes for network slicing energy-efficiency
- Decentralized resource management for network slicing
- ML based Anomaly Detection for 5G and Beyond Networks
- Hardware Accelerated, ML-based data plane security and malicious traffic detection
- Artificial Intelligence aided optimization of massive MIMO and related RAN technologies
- End-to-end deep learning models for wireless communication
- Machine learning driven design and optimization of modulation and coding schemes
- Machine learning techniques for channel estimation, channel modeling, and channel prediction
- Machine learning for ultra-reliable and low latency communications
- Low complexity and approximate learning for power and compute reductions