**Speaker:**
Petar Popovski
Professor, Aalborg University, Denmark

**Title:**
Wireless Communication and Sensing as enablers of Physical AI

**Abstract:**
With the advent of 5G technology, the notion of latency got a prominent role in wireless connectivity, serving as a proxy term for addressing the requirements for real-time communication. As wireless systems evolve toward 6G and embrace Artificial Intelligence (AI), the ambition to immerse the digital into physical reality will increase. This will eventually lead to Physical AI, referring to intelligent systems that interact with the physical world in real time, making decisions from multimodal sensor updates traversing heterogeneous, unreliable wireless links. This talk will present the concept of timing in wireless communication systems and its relation to Physical AI in terms of information generation, processing, transmission, and reconstruction. Inspired by multisensory perception in humans, the talk will introduce Temporal Windows of Integration (TWI) for wireless systems that combine sensing and communication and show their role in determining causality and simultaneity in perceptive wireless networks. It will be shown how TWI serve as a unifying framework to enforce three timing primitives essential for decision-time coherence, namely simultaneity, causality, and usefulness. Next, considering the problem of multimodal inference, adaptive TWIs enable a neuro-inspired, non-blocking inference paradigm that dynamically adjusts to stochastic delays across heterogeneous streams, outperforming state-of-the-art methods on audio-visual tasks. A key takeaway is that future Base Stations must embed timestamping functionality enforcing chronology, simultaneity, and causality, ensuring trustworthy and coherent Physical AI operation.

**Bio:**
Petar Popovski (IEEE Fellow) is a Professor at Aalborg University, where he heads the section on Connectivity and is Director of CLASSIQUE, a center for classical communication in quantum systems. He also holds the position of a Visiting Excellence Chair at the University of Bremen and Visiting Professor at University of Sts. Cyril and Methodius (UKIM) in Skopje. He received his Dipl.-Ing (1997) and M. Sc. (2000) degrees in communication engineering from UKIM, Skopje and the Ph.D. degree (2005) from Aalborg University. He received an ERC Consolidator Grant (2015), the Danish Elite Researcher award (2016), IEEE Fred W. Ellersick prize (2016), IEEE Stephen O. Rice prize (2018), Technical Achievement Award from the IEEE Technical Committee on Smart Grid Communications (2019), the Danish Telecommunication Prize (2020) and Villum Investigator Grant (2021). He authored the book ``Wireless Connectivity: An Intuitive and Fundamental Guide", published by Wiley in 2020. He was the Chair of the IEEE Communication Theory Technical Committee and Editor-in-Chief of IEEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS. His research interests are in communication theory.