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A Fresh Concept of Software-resemblant Hardware to Leap to 6G and Future Networks

Micro/Nanotechnologies as Enablers of Pervasivity

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For a decade, with the uptake of 4G, we have become accustomed to the relentless increase in data and services on the move. The deployment of 5G is advancing crucial key performance indicators (KPIs), along with quality of service (QoS). Setting the horizon to 2030 and later, 6G will take the KPIs to numbers 100–1000 times better than 5G. Yet, the actual disruption of 6G and future networks (FN) will take place following other unprecedented paths.

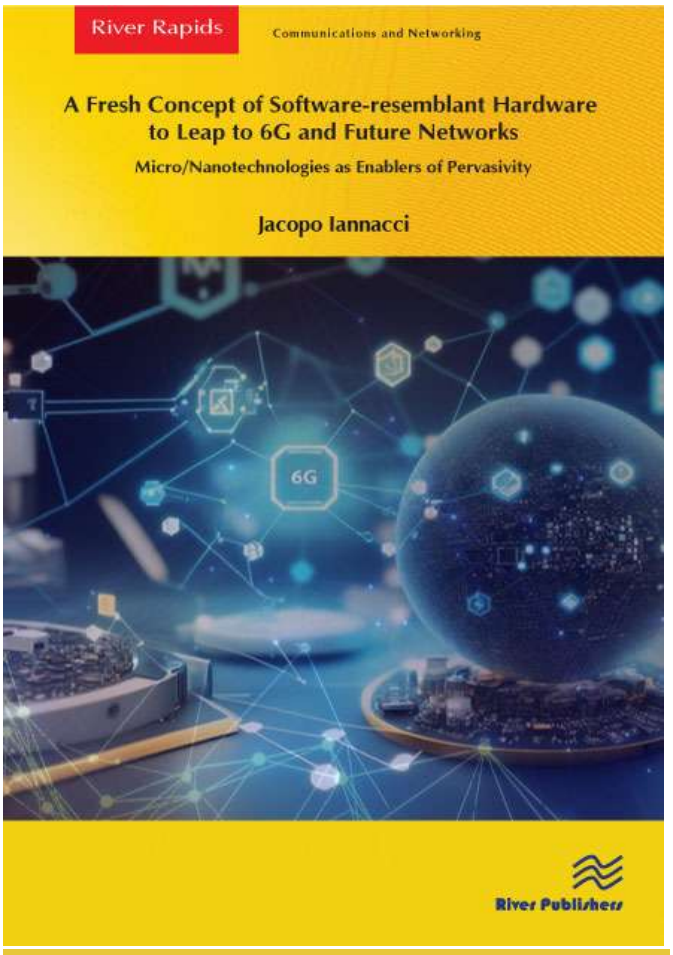
Artificial intelligence (AI) will be exploited in a threadlike fashion, at any level of the network physical infrastructure. This will introduce, to date unknown features, like self-sustaining, self-evolution and high-resilience of small portions of the infrastructure, pioneering the concept of a network of networks. Each segment of the infrastructure will bear a high degree of independence, while working at the same time as a whole, in full orchestration with the rest of the network.

Given such a scenario, this book claims that the established and currently in use paradigms for the design and development of hardware–software (HW–SW) systems, are not appropriate to address the challenges of 6G and, further ahead, of FN. In response, unprecedented design approaches are suggested, relying on a fresh reinterpretation of the standard concept of HW, with specific attention to the network edge and edge intelligence (EI).

This work develops some conceptual tools that may help address the technical challenges resulting from the intricate scenario sketched above. Within the mentioned HW reconceptualization, a pivotal role is forecasted for microtechnologies and nanotechnologies, intended with a broad meaning, which embraces, among others, devices, systems (MEMS/NEMS) and materials.

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