

# ***Quantum Computing and Neuroscience for 6G/7G Networks: Survey***

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*Abstract- Recently significant effort has been invested in studying commonalities of human brain operation and advanced algorithms for machine learning to answer the question: Can the learning mechanisms, identified in the operation of the brain, be mimicked in artificial neural networks to enhance the learning efficiency with simultaneous reduction in complexity and power consumption.*

*At the same time, machine learning algorithms, on their own right, become increasingly complex, resulting in complex neural networks. To speed up the machine learning algorithms, research on 7G networks will be looking for new computing technologies, like quantum (q-) computing (QC), and new models for complex networks that will enable us to efficiently control/optimize the processes run on them.*

*In this paper, under the umbrella of well-established complex networks theory, we provide a unified presentation of how quantum computing, implemented on near-future computers, can enable solving various problems in the above disciplines, otherwise difficult to solve by using classical (c-) approaches. The emphasis is on the commonalities in QC applications and modeling for the different systems listed above. For 7G network designers, the survey is expected to provide an insight into how much the research results in natural, QC based sciences can be integrated into new network paradigms to support above initiatives.*

*The paper is designed to be used as a seed material for setting up a research group in this field, be a base for the initial research papers of the group and the first project proposals to NSF solicitations in this field.*

*Index terms: 7G networks, new paradigms in modern communication systems, QC, ML, complex networks, n-Sci, q- biology and q-chemistry for brain modeling, tensor networks, synchronization.*

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