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Review of selected legal issues related to the development of quantum technology: challenges and regulatory aspects

Abstract

In the era of the Fourth Industrial Revolution, quantum technology is entering the scene with the promise of radically changing the technological paradigm. Quantum computing, simulation, quantum communications and the combination of this technology with artificial intelligence are opening up new horizons of innovation that could revolutionize various industries. Along with its enormous potential, this technology brings legal, ethical and social challenges that require detailed analysis and an interdisciplinary approach. The industrial deployment of quantum technology entails dilemmas regarding human rights, cyber security and national security, as well as the risk of exacerbating inequality, technological exclusion and algorithmic discrimination. With regard to artificial intelligence enhanced by quantum computing technology, we can speak of a completely new facet of the problem of the opacity of algorithms, which is determined not only by the cognitive limitations of the human mind, but stems from the indefinability of the world described by the laws of quantum mechanics. In light of the above, the thesis can be advanced that the classical approach to the principle of transparency and the postulates of creating algorithms that will clearly present the path to the final result, which are part of the broad current of creating ethical and explainable artificial intelligence, may prove difficult to realize in relation to Quantum AI. In the era of the Fourth Industrial Revolution, we are therefore faced with the challenge of implementing new instruments for testing, certifying and inspecting algorithms, such as tools for analyzing and visualizing the results of quantum algorithms, which will be suited to the specifics of Quantum AI and ensure the ethical correctness of the systems. This article will identify selected areas of application of quantum technology, and thus the potential benefits and risks of quantum technology, and also analyze the need to develop ethical and legal standards that allow for the sustainable and socially responsible development of these disruptive technologies.

Keywords: quantum technology – quantum cryptography – quantum communication – quantum artificial intelligence – black box problem