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Patent Litigation and the Rise of Quantum Computing: What to Watch for in the Next Decade

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A recent Patent Trial and Appeal Board decision related to hybrid quantum computing paves the way for more quantum computing-related patents, and potential litigation.

Quantum computing is an important and evolving form of computing that has yet to be truly realized. Classical computing is, fundamentally, governed by the ability to store information in a bit, a binary unit represented by a one or a zero. In contrast, quantum computing is governed by a quantum bit, or qubit, which can represent an infinite, continuous number of possible states. For example, while 2 bits can store four combinations (00, 01, 10, or 11), 2 qubits can store all four combinations simultaneously. Hybrid quantum-classical computing ("HQC") involves using both quantum computing and classical computing together in a system for one to address the shortcomings of the other. At its core, both types of computing are well known and rely on mathematical concepts making patent claims on a HQC highly susceptible to patent ineligibility attacks.

The recent Patent Trial and Appeal Board ("PTAB") decision, *Ex parte Yudong Cao*, provides insight for patent applicants faced with Patent Office rejections of HQC claims. In the instant case, Yudong Cao was the co-founder and CTO of Zapata Computing, Inc., a now-defunct startup that specialized in quantum computing and artificial intelligence. Cao's patent application relates to an HQC system that solves linear systems by splitting them into subsystems using classical computing, solving the subsystems using quantum computing, and synthesizing the outputs of the quantum computer using a classical computer.

The Examiner had rejected the HQC claims under Section 101 of the Patent Act as directed to the abstract idea of mathematical relationships, and because the additional elements of the claim — "on a quantum computer, controlling a plurality of qubits, according to the set of circuit parameters

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