

"Quantum Computing versus Classical Analog Algorithms"

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Abstract:

Recently, at least six well-funded quantum computing startups have emerged, in addition to some large internal efforts in major companies on quantum information processing. It appears that the initial emphasis is not on the Shor Algorithm, which would require billions of qubits, but rather on optimization algorithms that aim to solve the Ising problem, that could possibly be done with as few as one hundred qubits. The Ising problem in magnetism is a surrogate for major np-hard problems like financial portfolio optimization, the traveling salesman problem, protein folding, etc.

The question arises whether there are classical machines that could solve the same problem, without the need for the complexity of quantum bits. There is reason for optimism, since the Ising problem itself can be set up classically. This talk will explore the kind of circuits and components that can solve optimization problems.

Biography:

Eli Yablonovitch is Director of the NSF Center for Energy Efficient Electronics Science (E3S), a multi-University Center headquartered at Berkeley. Yablonovitch introduced the idea that strained semiconductor lasers could have superior performance due to reduced valence band (hole) effective mass. With almost every human interaction with the internet, optical telecommunication occurs by strained semiconductor lasers. In his photovoltaic research, Yablonovitch introduced the $4(n^2)$ ("Yablonovitch Limit") light-trapping factor that is in worldwide use, for almost all commercial solar panels. His mantra that "a great solar cell also needs to be a great LED", is the basis of the world record solar cells: single-junction 28.8% efficiency; dual-junction 31.5%; quadruple-junction 38.8% efficiency; all at 1 sun. He is regarded as a Father of the Photonic BandGap concept, and he coined the term "Photonic Crystal". The geometrical structure of the first experimentally realized Photonic bandgap, is sometimes called "Yablonovite". His startup company Ethertronics Inc., has shipped over 1.7 billion cellphone antennas. He is a Co-Founder of Luxtera Inc., the world leader in Silicon Photonics. He has been elected to the NAE, the NAS, and as Foreign Member, UK Royal Society. Among his honors is the IEEE Edison Medal, the Buckley Prize of the American Physical Society, and the Isaac Newton Medal of the UK Institute of Physics.

