



Russell Berrie Nanotechnology Institute
Technion - Israel Institute of Technology



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"The Rebirth of Analog Computing"

Monday,
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13:45 refreshments
14:00 lecture

**Solid State Institute
Seminars Room**

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TECHNION
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Title:
The Rebirth of Analog Computing

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Abstract:

About seventy years ago, analog computing was regarded as having equal prospects as digital computing. Operational amplifiers could provide analog differentiation and integration functions. Nonetheless analog computing disappeared, being unable to provide the precision and dynamic range required for solving real problems.

The emergence of Deep Learning has been accompanied by the realization that only modest precision is sufficient for the inference step. This has taken us from regular Floating Point, to half-precision (16 bits), to quarter-precision, and with some difficulty even single-bit precision. The race is on for specialized hardware accelerators, whose acronyms have transitioned from CPU→GPU→TPU→IPU. For example, 8-bit precision analog can provide analog matrix multiplication in Deep Learning accelerators, which is now being pursued commercially.

I will examine three different potential forms of analog computing.

- (a) analog matrix multipliers for Deep Learning.
- (b) analog, not digital simulated annealing for solving Ising type problems.
- (c) adiabatic computing, (classical not quantum), also for solving Ising type optimizations.

One of the limitations for Ising problems is that the analog couplings demand precision that grows with problem size. It appears that, already at 1% analog precision, interesting Ising problems can be addressed.