Title: **Non-von Neumann computing using networks of optical parametric oscillators**

Abstract: Combinatorial optimization problems are central in numerous important application areas, including operations and scheduling, drug discovery, finance, circuit design, sensing, and manufacturing. There is a long history of attempts to find alternatives to current von Neumann-computer-based methods for solving such problems, including neural networks, DNA computing, and most recently adiabatic quantum computation and quantum annealing.

Networks of coupled optical parametric oscillators (OPOs) are an alternative physical system, with an unconventional operating mechanism, for solving the Ising problem, which is an NP-hard optimization problem. We have realized a fully-programmable 100-spin Ising machine using a network of OPOs, and with it can solve many different Ising problem instances. Our design supports all-to-all connectivity among the implemented spins via a combination of time-division multiplexing and measurement feedback.

In this talk I will describe our work on constructing Ising machines using OPO networks with feedback, and will present the experimental results from our first prototype system.