UC Berkeley

Lead investigator:

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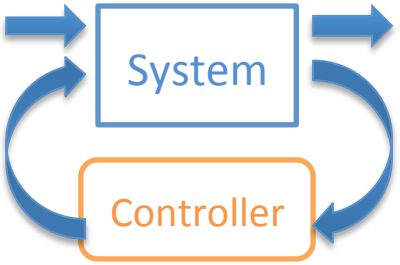
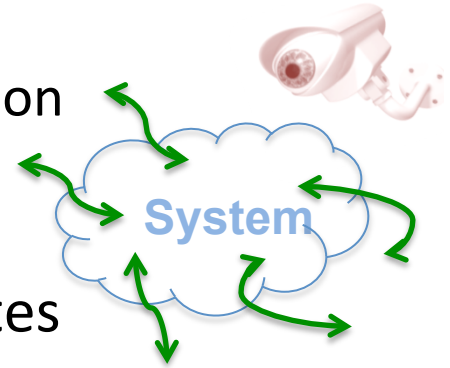
Research areas of interest



- Measurement-based quantum feedback control
  - state stabilization, noise reduction, robust quantum annealing
  - deterministic with average state locally optimal (ASLO) strategies
  - improve on measurement-based probabilistic state preparation

- Reservoir engineering
  - engineer dissipative dynamics for autonomous evolution to steady state



- Smart measurements for estimation of quantum states and fluctuations

- Alternative quantum annealing algorithms

Qualifications/Capabilities

- **Quantum Control Theory**
  - Open loop control, pulse design for quantum memory/gates
  - Adaptive (learning) and optimal control theory, including numerical optimization
  - Measurement-based control, measurement-based quantum feedback control
  - Autonomous control and reservoir engineering
  - Many applications to flux qubits, transmon qubits, cavity-QED, spin qubits
- **Modeling and simulation**
  - Modeling and simulation of open quantum systems, including SC qubits & cavity-QED
  - Numerical optimal control methods
  - Convex optimization, maximum entropy methods, compressed sensing
  - Quantum Monte Carlo simulation methods, esp. gr. state of many-bosons in double well
- **Quantum information theory**
  - Quantum simulation with unitary/non-unitary dynamics and controls
  - Measurement theory; weak, continuous, multi-variable, adaptive measurements
  - Hamiltonian parameter estimation and optimal experiment design
  - Quantum tomography, state and process estimation, state discrimination/ distinguishability
  - Macroscopic quantum states, characterization, bounds on evolution
  - Quantum fluctuations, quantum phase transitions, qu. Fisher information, qu. metrology


Research group we seek to join

We seek an **experimental group** implementing quantum annealing (QA) with needs for

- design of advanced annealing protocols taking advantage of quantum feedback control and reservoir engineering to ensure error mitigation and robustness,
- advanced measurement design including weak, multi-spin and collective measurements
- design of new QA protocols, making use of e.g., fluctuations, dynamic reservoir engineering, external control fields…

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