MemComputing [1, 2] is a novel physics-based approach to computation that employs time non-locality (memory) to both process and store information on the same physical location. Its digital version [3, 4] is designed to solve combinatorial optimization problems. A practical realization of digital memcomputing machines (DMMs) can be accomplished via circuits of non-linear dynamical systems with memory engineered so that periodic orbits and chaos can be avoided. A given logic problem is first mapped into this type of dynamical system whose point attractors represent the solutions of the original problem. A DMM then finds the solution via a succession of elementary instantons whose role is to eliminate solitonic configurations of logical inconsistency (“logical defects”) from the circuit [5, 6]. I will discuss the physics behind memcomputing and show many examples of its applicability to various combinatorial optimization and Machine Learning problems demonstrating its advantages over traditional approaches [7, 8]. Work supported by DARPA, DOE, NSF, CMRR, and MemComputing, Inc.
