

Eshel Faraggi and Daniel T. Robb. "Locally converging algorithms for determining the critical temperature in Ising systems." *Physical Review B* 78, 134416 (2008). 6 pages.

**Abstract.** We introduce a class of algorithms that converge to criticality automatically, in a way similar to the invaded cluster algorithm. Unlike the invaded cluster algorithm, which uses global percolation as a test for criticality, these local algorithms use an average over local observables, specifically the number of satisfied bonds, in a feedback loop which drives the system toward criticality. Two specific algorithms are introduced, the average algorithm and the locally converging Wolff algorithm. We apply these algorithms to study the Ising square lattice and the Ising Bethe lattice. We find reasonable convergence to the critical temperature for both systems under the locally converging Wolff algorithm. We also re-examine the phase diagram of the dilute two-dimensional (2D) Ising model and find results supporting our previously reported conclusions regarding the existence of a local regime of magnetization below the percolations threshold. In addition, the presented algorithms are computationally more efficient than the invaded cluster algorithm, requiring less CPU time and memory.