

# Chemical Boltzmann machines

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Master thesis in Mathematics

This master thesis firstly presents a binary stochastic network known as a Boltzmann machine and how learning is performed through the methods of gradient descent and annealing. It also presents fast simulated annealing in details. Then, it introduces chemical recreations of Boltzmann machines, known as chemical Boltzmann machines. Three chemical constructions, the DCBM, ECBM and TCBM and their properties are presented. The main results are that the DCBM and ECBM are exact implementations of a Boltzmann machines and the TCBM is only an approximative implementation. Lastly, the concept of associative memory for a recursive network is discussed and bounds about the maximal memory capacity are given. The notions of cycles and parasitic fixed points related to associative memory are also treated.

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