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The Restricted Boltzman Machine: Phase Diagram, Generation and Interpretability

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The Restricted Boltzmann Machine(RBM) was introduced many years ago as an extension of the Boltzmann Machine (BM) (or the inverse Ising problem). In BM, one aimed to infer the couplings of an Ising model such that it reproduces the statistics of a given dataset. Within such an approach, it is necessary to specify the structure of the interacting variables in order to correctly reproduce the moments of an empirical target distribution. The RBM is more general in this sense and can potentially balance correlation statistics of any order thanks to its bipartite structure that mixes observable nodes and latent ones that are not observed in the dataset. In this talk, I will introduce this generative model and show how it can model very complex datasets. I will then discuss in detail the various characteristics such as the phase diagram, the learning behavior, and the connection between the parameters of the models and the effective interactions between variables.

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