Restricted Kirchhoff Machines

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Contrastive Local Learning Networks learn AI tasks on their own, without a processor, using local rules to update internal parameters such as conductances in resistor networks. So far, laboratory versions have implemented supervised learning. Here we suggest a design for using networks of linear resistors to implement Restricted Boltzmann Machines for unsupervised learning and generative tasks; we dub these Restricted Kirchhoff Machines, or RKMs.

We simulate the training of the machine on the MNIST dataset, providing a proof of concept of its learning capabilities.

Finally, we compare the scaling behavior with size of the hidden layer of the time, power, and energy consumed per operation for RKMs and RBMs programmed on CPU and GPU platforms.