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Clustering as Physically Inspired Energy Minimization

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**Highlights**

- We more completely map the energy model of statistical physics onto clustering problem, especially we emphasize the importance of the unary energy term in clustering. Therefore our method can be totally unsupervised.
- Since our energy model is consist of a unary (data) term and a binary (pairwise or smoothness) term, we can thus make a perfect analogy with the energy model used in vision and borrow the concepts, ideas, and schemes (such as the optimization algorithms) from vision field to clustering under this mapping.
- We propose a data point local density estimation method which can account for the datasets with arbitrary shapes and topologies (such as with holes inside).
- We point out that the spectral clustering methods (such as Normalized-cut [22]) use only the binary/pairwise energy term while leaving out the unary/data energy term, therefore their energy model is incomplete compared with ours.

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