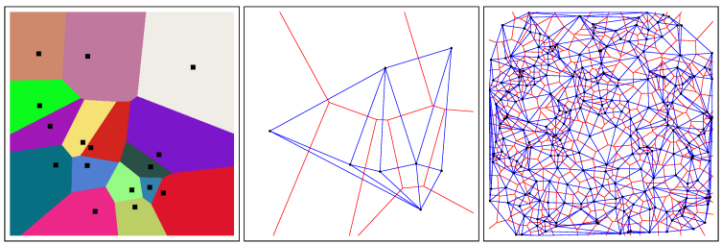

On Voronoi Diagrams on the Information-Geometric Cauchy Manifolds

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On Voronoi Diagrams on the Information-Geometric Cauchy Manifolds

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Abstract

We study the Voronoi diagrams of a finite set of Cauchy distributions and their dual complexes from the viewpoint of information geometry by considering the Fisher-Rao distance, the Kullback-Leibler divergence, the chi square divergence, and a flat divergence derived from Tsallis entropy related to the conformal flattening of the Fisher-Rao geometry. We prove that the Voronoi diagrams of the Fisher-Rao distance, the chi square divergence, and the Kullback-Leibler divergences all coincide with a hyperbolic Voronoi diagram on the corresponding Cauchy location-scale parameters, and that the dual Cauchy hyperbolic Delaunay complexes are Fisher orthogonal to the Cauchy hyperbolic Voronoi diagrams. The dual Voronoi diagrams with respect to the dual flat divergences amount to dual Bregman Voronoi diagrams, and their dual complexes are regular triangulations. The primal Bregman Voronoi diagram is the Euclidean Voronoi diagram and the dual Bregman Voronoi diagram coincides with the Cauchy hyperbolic Voronoi diagram. In addition, we prove that the square root of the Kullback-Leibler divergence between Cauchy distributions yields a metric distance which is Hilbertian for the Cauchy scale families. View Full-Text

Keywords: Cauchy distribution; Fisher-Rao distance; Kullback-Leibler divergence; chi square divergence; Bregman divergence; Jensen-Bregman divergence; Legendre-Fenchel divergence; metrization; Voronoi diagram; hyperbolic geometry; *q*-Gaussian; conformal flattening

Full Paper can be downloaded at: https://www.mdpi.com/1099-4300/22/7/713

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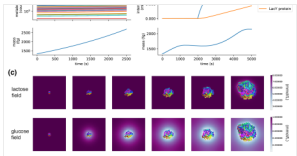

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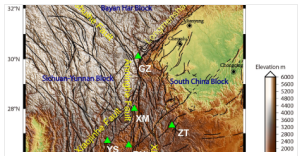

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