

Computational information geometry and visual computing: Publications

Frank Nielsen

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1 Books

- [1] Frank Nielsen. *Practical Introduction to Computer Vision using Java and Processing*. Undergraduate Topics in Computer Science (UTiCS). Springer-Verlag, July 2013.
- [2] Frank Nielsen. *A concise and practical introduction to programming algorithms in Java*. Undergraduate Topics in Computer Science (UTiCS). Springer-Verlag, March 2009. Also translated in Chinese (ISBN: 7302272441, 9787302272441), 2012.
- [3] Frank Nielsen. *Visual computing: Geometry, graphics and vision*. Charles River Media (Thomson Delmar Learning), August 2005.

2 Edited books

- [4] Frank Nielsen and Frédéric Barbaresco, editors. *Geometric Science of Information*. Springer-Verlag, August 2013.
- [5] Frank Nielsen and Rajendra Bhatia, editors. *Matrix Information Geometry*. Springer-Verlag, August 2012.
- [6] Frank Nielsen, editor. *Emerging trends in visual computing*, volume 5416 of *Lecture Notes in Computer Science*. Springer-Verlag, March 2009.

3 Chapters

- [7] Frank Nielsen. Cramer-Rao lower bound and information geometry. In Rajendra Bhatia and C. S. Rajan, editors, *Connected at Infinity II: On the work of Indian mathematicians*, pages 18–37. Texts and Readings In Mathematics (TRIM), Hindustan Book Agency, 2013.
- [8] Frank Nielsen, Meizhu Liu, and Baba C. Vemuri. Jensen divergence-based means of SPD matrices. In *Matrix Information Geometry (MIG)*, pages 111–122. Springer, August 2012.
- [9] Richard Nock, Brice Magdalou, Eric Briys, and Frank Nielsen. Mining matrix data with Bregman matrix divergences for portfolio selection. In Frank Nielsen and Rajendra Bhatia, editors, *Matrix Information Geometry (MIG)*, pages 373–402. Springer, August 2012.
- [10] Paolo Piro, Michel Barlaud, Richard Nock, and Frank Nielsen. k -NN boosting prototype learning for object classification. In Nicola Adami, Andrea Cavallaro, Riccardo Leonardi, and Pierangelo Migliorati, editors, *Analysis, retrieval and delivery of multimedia content*, volume 1 of *Lecture Notes in Electrical Engineering*, pages 37–53. Springer New York, August 2012.

- [11] Olivier Schwander and Frank Nielsen. Learning mixtures by simplifying kernel density estimators. In *Matrix Information Geometry (MIG)*, pages 373–402. Springer, August 2012.
- [12] Frank Nielsen and Richard Nock. Clustering multivariate normal distributions. In *Emerging trends in visual computing (ETVC)*, volume 5416, pages 164–174. Ecole Polytechnique, Palaiseau, France, November 2009.
- [13] Frank Nielsen. A volume shader for quantum Voronoi diagrams inside the 3D Bloch ball. In Wolfgang Engel, editor, *ShaderX7: Advanced Rendering Techniques*, pages 225–228. Charles River Media, February 2009.
- [14] Richard Nock and Frank Nielsen. Intrinsic geometries in learning. In *Emerging trends in visual computing (ETVC)*, pages 175–215. Ecole Polytechnique, Palaiseau, France, November 2008.
- [15] Frank Nielsen. An interactive tour of Voronoi diagrams on the GPU. In Wolfgang Engel, editor, *ShaderX6: Advanced Rendering Techniques*, pages 539–556. Charles River Media, February 2008. Section 9.1 (Beyond Pixels and Triangles).
- [16] Frank Nielsen. A GPU panorama viewer for generic camera models. In Wolfgang Engel, editor, *ShaderX5: Advanced Rendering Techniques*, pages 543–552. Charles River Media, December 2005.
- [17] Frank Nielsen. Interactive image segmentation based on GPU cellular automata. In Wolfgang Engel, editor, *ShaderX5: Advanced Rendering Techniques*, pages 511–518. Charles River Media, December 2005.

4 Journals

- [18] Marc Arnaudon and Frank Nielsen. On approximating the Riemannian 1-center. *Computational Geometry*, 46(1):93–104, January 2013.
- [19] Frank Nielsen. An information-geometric characterization of Chernoff information. *IEEE Signal Processing Letters*, 2013.
- [20] Richard Nock, Paolo Piro, Frank Nielsen, Wafa Bel Haj Ali, and Michel Barlaud. Boosting k -NN for categorization of natural scenes. *International Journal of Computer Vision*, 99, 2013.
- [21] Paolo Piro, Michel Barlaud, Richard Nock, and Frank Nielsen. Leveraging k -NN for generic classification boosting. *Neurocomputing*, 80:3–9, march 2012. Special Issue on Machine Learning for Signal Processing 2010 (MLSP).
- [22] Marc Arnaudon and Frank Nielsen. Medians and means in Finsler geometry. *LMS Journal of Computation and Mathematics*, 15:23–37, February 2012.
- [23] Meizhu Liu, Baba C. Vemuri, Shun ichi Amari, and Frank Nielsen. Shape retrieval using hierarchical total Bregman soft clustering. *Transactions on Pattern Analysis and Machine Intelligence*, 99, 2012.
- [24] Frank Nielsen and Richard Nock. A closed-form expression for the Sharma-Mittal entropy of exponential families. *Journal of Physics A: Mathematical and Theoretical*, 45(3):032003, 2012.
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- [28] Vincent Garcia, Frank Nielsen, and Richard Nock. Simplification and hierarchical representations of mixtures of exponential families. *Signal Processing (Elsevier)*, 90(12):3197–3212, December 2010.
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- [34] Richard Nock, Pascal Vaillant, Claudia Henry, and Frank Nielsen. Soft memberships for spectral clustering, with application to permeable language distinction. *Pattern Recognition*, 42(1):43–53, January 2009. Extends IJCAI’07.
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- [158] Frank Nielsen. Computational matrix geometry, 2013. Advanced School and Workshop on Matrix Geometries and Applications.

- [159] Frank Nielsen. Computational geometry for statistics, 2012. International Workshop on Anomalous Statistics, Generalized Entropies, and Information Geometry.
- [160] Frank Nielsen. A glance at information-geometric signal processing, 2012. MAHI: Mathematical Analysis of Hyperspectral Imaging.
- [161] Frank Nielsen. Computational information geometry: From euclidean to flat pythagorean geometries, mathematics and image analysis, 2009. Journee de Geometrie Algorithmique.
- [162] Frank Nielsen. Computational photography, 2008. Le modèle et l’algorithme, INRIA Rocquencourt.

7 Diploma thesis

Enrolled in the French education system: License (BSc.), maîtrise (MSc. 1), diplôme d’études approfondies (DEA, MSc. II), thèse (PhD), habilitation (HDR). (licence+maîtrise+DEA = Magistère from ENS Lyon)

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- [179] Thomas Houit and Frank Nielsen. Video stippling. Technical report, 2010.
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Research fields

- **computational information geometry.**
[4, 5, 6, 7, 19, 18, 23, 24, 22, 21, 27, 25, 26, 28, 29, 30, 32, 33, 36, 68, 67, 66, 62, 63, 72, 71, 78, 79, 84, 83, 81, 85, 87, 88, 89, 94, 92, 91, 93, 97, 102, 11, 8, 12, 14, 105, 106, 101, 98, 112, 108, 115, 120, 123]
- **machine learning.**
[10, 20, 31, 34, 40, 38, 41, 46, 65, 64, 74, 80, ?, 75, 82, 86, 107, 100, 99, 111, 116, 117, 128, 131]
- **computational geometry.**
[43, 49, 57, 58, 59, 127, 130, 140, 154, 155, 156, 152, 150]
- **computational economy & finance.**
[9, 70, 73]
- **computer vision (computational photography/GPU).**
[42, 45, 48, 50, 51, 52, 55, 60, 61, 69, 77, 76, 95, 110, 118, 119, 129, 151, 141, ?, 13, 15, 17, 16]
- **computer graphics.**
[37, 39, 44, 47, 103, 104, 109, 114, 113, 126, 134, 132, 133, 137, ?, 148, 147]
- **human computer interaction.**
[96, 122, 125, 121, 124]
- **genomic signal processing.**
[35, 90]
- **geometric combinatorial optimization.**
[54, 53, 56, 153]
- **textbooks (teaching).**
[1, 2, 3]