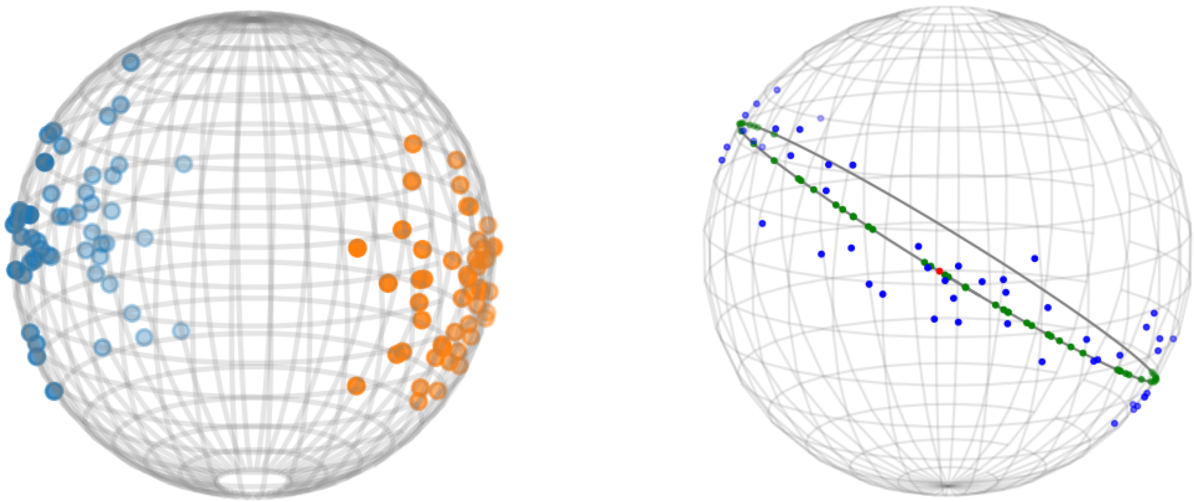

Clustering (left) and geodesic regression (right) on the 2D sphere.
Figures are courtesy of Nicolas Guigui, Nina Miolane and Xavier Pennec.

Titre du cours: Geometric Statistics

Le résumé: statistical concepts like principal component analysis, (empirical) mean or covariance (matrix) are inherent to data and probability distributions living in linear spaces. Geometric statistics aims at providing tools for analysing data that populate (possibly) nonlinear spaces such as manifolds. As the notion of metric is essential for this goal, Riemannian geometry provides a solid ground for the theory. In the course we are going to introduce necessary geometric results, give essentials on probability distributions and then discuss "nonlinear" generalizations of some classical concepts from statistics. The exposition will be accompanied by numerous examples with a view towards applications. Familiarity with calculus on manifolds or basic differential geometry is recommended.

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[2] Principal Geodesic Analysis for the Study of Nonlinear Statistics of Shape, P. T. Fletcher, C. Lu, S. M. Pizer and S. Joshi, IEEE transactions on medical imaging, 23(8), 995–1005, 2004

[3] Riemannian Geometric Statistics in Medical Image Analysis, T. Fletcher, X. Pennec and S. Sommer, Elsevier, https://doi.org/10.1016/C2017-0-01561-6, 2020

[4] Les éléments aléatoires de nature quelconque dans un espace distancié, M. Fréchet, Annales de l'institut Henri Poincaré, 10(4), 215–310, 1948

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