ÁREA TEMÁTICA	
Título:	Machine learning and nonlinear dimensionality reduction for information retrieval
Vagas:	Mestrado: 2 Doutorado: 0
Descrição:	High-dimensional data are everywhere. If we want to extract meaningful information from these data and use them in making decisions, we first need to explore and analyse them using data visualization techniques. In order to retrieve valuable information, the data are often mapped onto a low-dimensional space by using dimensionality reduction techniques. Although characterised by endemic interpretability problems, however, dimensionality techniques are popular among data scientists and visualization researchers and they are routinely used during the exploratory analysis of challenging datasets. In this research topic, we first focus on state-of-the-art techniques for nonlinear dimensionality reduction (reference [1], manifold learning and neighbour embedding) and then we shall analyse some recent algorithmic developments that aim at recovering intelligible sets of low-dimensional coordinates from them (references [2] and [3]). We are looking for students with an interest in the analysis and visualisation of spatio-temporal data. We aim at studying geometric dimensionality reduction methods that preserves probability distributions according to a class of information-theoretic divergences. The mathematical focus of the work is on statistical machine learning methods for dimensionality reduction and latent-variable modelling. Applications to modelling of multiple and possibly short time-series from life sciences will set the playground.
Palavras-Chaves:	Machine Learning, Manifold Approximation, Neighbour Embedding, Unsupervised Learning, Supervised Learning
Referências	[1] J. A. Lee and M. Verleysen, *Nonlinear Dimensionality Reduction*, Springer, 2007 [2] G. Kindlmann and C. Scheidegger, "An algebraic process for visualization design," in *IEEE Transactions on Visualization and Computer Graphics*, vol. 20, no. 12, pp. 2181-2190, 2014. doi: 10.1109/TVCG.2014.2346325. https://bit.ly/2AYw3dy [3] R. Faust, D. Glickenstein and C. Scheidegger, “DimReader: Axis lines that explain non-linear projections” in *IEEE Transactions on Visualization and Computer Graphics*, in press. doi: 10.1109/TVCG.2018.2865194. https://arxiv.org/abs/1710.00992