* Electronic Address: s.m.verduynlunel@uu.nl
[1] Mathematisch Instituut, Utrecht University

Wasserstein distances in the analysis of time series and dynamical systems

Sjoerd Verduyn Lunel[1]*

A new approach based on Wasserstein distances, which are numerical costs of an optimal transportation problem, allows one to analyze nonlinear phenomena in a robust manner. The long-term behavior of a dynamical system represented by time series is reconstructed from time series, resulting in a probability distribution over phase space. Each pair of probability distributions is then assigned a numerical distance that quantifies the differences in their dynamical properties. From the totality of all these distances a low-dimensional representation in a Euclidean space is derived. This representation shows the functional relationships between the dynamical systems under study. It allows to assess synchronization properties and also offers a new method of numerical bifurcation analysis. Several examples are given to illustrate our results. This work is based on joint work with Michael Muskulus, see [1].

References

[1] J. Appl. Physiology 109 (2010), 1582-1591, and Phys. D 240 (2011), 45-58