# Reference

R. J. Povinelli, M. T. Johnson, A. C. Lindgren, and J. Ye, "Time series classification using Gaussian mixture models of reconstructed phase spaces," *IEEE Transactions on Knowledge and Data Engineering*, vol. 16, pp. 779-783, 2004.

# Abstract

A new signal classification approach is presented that is based upon modeling the dynamics of a system as they are captured in a reconstructed phase space. The modeling is done using full covariance Gaussian Mixture Models of time domain signatures, in contrast with current and previous work in signal classification that is typically focused on either linear systems analysis using frequency content or simple nonlinear machine learning models such as artificial neural networks. The proposed approach has strong theoretical foundations based on dynamical systems and topological theorems, resulting in a signal reconstruction, which is asymptotically guaranteed to be a complete representation of the underlying system, given properly chosen parameters. The algorithm automatically calculates these parameters to form appropriate reconstructed phase spaces, requiring only the number of mixtures, the signals, and their class labels as input. Three separate data sets are used for validation, including motor current simulations, electrocardiogram recordings, and speech waveforms. The results show that the proposed method is robust across these diverse domains, significantly outperforming the time delay neural network used as a baseline.

# Summary

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# Critique

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