

Computational Intelligence Seminar

Data Projection and Visualization Using Self-Organizing Neural Networks

Professor Pablo A. Estévez
IEEE Computational Intelligence Society Distinguished Lecturer
Chairman and Associate Professor
Department of Electrical Engineering
University of Chile

Part of the MU CIS Chapter Celebration

Date and Time: Wednesday, November 29, 2006 at 4:00 PM

Come for Cookies at 3:30!

Place: EBW Auditorium

ABSTRACT

In this talk, an overview of techniques for non-linear projection of high-dimensional data based on self-organizing neural networks will be presented. These methods aim at making projections that preserve the inter-point distances and/or the neighborhood measured in the original space. Most methods have two phases: a) vector quantization and b) projection onto a lower dimensional map. The vector quantization step is usually carried out by using self-organizing maps (SOM), competitive learning or neural gas networks. The projection part is made by methods such as curvilinear component analysis (CCA), curvilinear distance analysis (CDA), Isotop or online visualization neural gas (OVING). Advanced methods for nonlinear projection represent the manifold topology by a graph, and use the geodesic distance as a metric. In addition, nonlinear projections obtained by using particle swarm optimization will be presented. Results from the different methods will be compared using artificial and real data.

References:

P.A. Estévez, C.J. Figueroa, "Online data visualization using the neural gas network", *Neural Networks*, 19 (2006) 923-934.

P.A. Estévez, A.M. Chong, C.M. Held, C.A. Perez, "Nonlinear projection using geodesic distances and the neural gas network", *ICANN 2006, Lecture Notes in Computer Science 4131 (2006) 464-473*.

P.A. Estévez, A.M. Chong, "Geodesic nonlinear projection using the neural gas network", *Proceedings IJCNN 2006, Vancouver, Canada, July 2006*.

P.A. Estévez, C.J. Figueroa, K. Saito "Cross-entropy embedding of high-dimensional data using the neural gas model", *Neural Networks*, 18 (2005) 727-737.

Biosketch

Pablo A. Estévez received the B.S. degree and the P.E. in Electrical Engineering from the University of Chile, in 1978 and 1981, respectively. He received the M. Eng. and Dr. Eng. degrees from the University of Tokyo, Japan, in 1992 and 1995, respectively. Dr. Estévez is currently chairman and associate professor of the Department of Electrical Engineering, University of Chile. Dr. Estévez is a founding member and chairman of the Chilean IEEE CIS Chapter, where he has served as General Chair for three Latin American Summer Schools on Computational Intelligence. He serves as chair of the Distinguished Lecturer Program Committee of IEEE CIS, and he is a distinguished lecturer of this society.

Dr. Estévez research interests include neural networks and evolutionary computation applied to pattern recognition, data visualization, data mining, image processing, classification and prediction tasks, such as fraud detection, automated wood inspection systems, and sleep pattern detection and classification. Dr. Estévez teaches undergraduate-level courses on Circuit Theory and graduate-level courses on Neural Networks and Evolutionary Computation. He has been an invited researcher at the Communication Science Lab., NTT-Kyoto, the ENS-Lyon in France, and visiting professor at the University of Tokyo.