



Faithful Representations and Topographic Maps: From Distortion- to Information-Based Self- Organization

Marc M. Van Hulle

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A new perspective on topographic map formation and the advantages of information-based learning. The study of topographic map formation provides us with important tools for both biological modeling and statistical data modeling. Faithful Representations and Topographic Maps offers a unified, systematic survey of this rapidly evolving field, focusing on current knowledge and available techniques for topographic map formation. The author presents a cutting-edge, information-based learning strategy for developing equiprobabilistic topographic maps--that is, maps in which all neurons have an equal probability to be active--clearly demonstrating how this approach yields faithful representations and how it can be successfully applied in such areas as density estimation, regression, clustering, and feature extraction. The book begins with the standard approach of distortion-based learning, discussing the commonly used Self-Organizing Map (SOM) algorithm and other algorithms, and pointing out their inadequacy for developing equiprobabilistic maps. It then examines the advantages of information-based learning techniques, and finally introduces a new algorithm for equiprobabilistic topographic map formation using neurons with kernel-based response characteristics. The complete learning algorithms and simulation details are given throughout, along with comparative performance analysis tables and extensive references. Faithful Representations and Topographic Maps is an excellent, eye-opening guide for neural network researchers, industrial scientists involved in data mining, and anyone interested in self-organization and topographic maps.

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