

Editorial

Complexity reduction in efficient prototype-based classification

This special issue was born in the framework of the Spanish Pattern Recognition Network (TIC2001-5057-E). The network was intended to provide a forum for study and discussion of the different aspects of Pattern Recognition. During 2 years (2002–2003), it hosted periodic meetings to present work on specific topics of pattern recognition. Besides, relevant experts were also invited to talk about their recent research.

The topic of this special issue focuses on classifiers which rely on local representatives in the classification space. The last developments in kernel-based methods, lazy learning schemes, RBF neural networks and LVQ-based adaptive classifiers, among many others, have put forward the close relationship among these techniques. These methods share the fact that they explicitly employ some local information about the particular problem in the form of examples or extended and generalized versions of them. Efficient and approximated algorithms for the rules involving search and looking for reduced representation spaces through feature selection and/or extraction methods constitute other examples of complexity reduction techniques for prototype-based classification.

Although it is difficult to entirely cover all the topics related to complexity reduction in a special issue, we think that the papers here included can high-light some examples of its relevance in the pattern classification domain. We hope that this issue provides useful information for further research and that it will be followed by other researchers reporting new results in the framework of this interesting field.

The contributions to this issue have been carefully selected from the total number of submissions which were strictly peer reviewed through a double blind reviewing process by reputed international referees. The collection of papers in this special issue covers some of the methods aforementioned and constitutes a representative sample of the latest research in the area of complexity reduction in prototype-based classification.

In the first paper, “Boosted Discriminant Projections for Nearest Neighbor Classification”, D. Masip and J. Vitrià introduce a new embedding technique to find the linear projection that best projects labelled data into a new space where the performance of a nearest neighbor classifier is maximized. The authors consider a large set of one-dimensional projections and combine them into a projection matrix (not restricted to be orthogonal). The embedding is defined as a classifier selection task that makes use of the Adaboost algorithm to find an optimal set of discriminant projections. The main advantage of the algorithm is that the final projection matrix does not make any global assumption on the data distribution, and the projection matrix is created by minimizing the classification error on the training data set.

The next paper by E. Gómez-Ballester, L. Micó and J. Oncina, “Some Approaches to Improve Tree-based Nearest Neighbour Search Algorithms”, focuses on fast search algorithms for nearest neighbor classification. A number of procedures are based upon the construction of a tree structure to organize the training data. In this work, two new decomposition methods to build such a tree and three new pruning rules are explored.

In the third work, “Learning Prototypes and Distances: A Prototype Reduction Technique Based on Nearest Neighbor Error Minimization”, R. Paredes and E. Vidal propose a new prototype reduction algorithm which simultaneously trains both a reduced set of prototypes and a suitable local metric for these prototypes. Starting with an initial selection of a small number of prototypes, it iteratively adjusts both the position (features) of these prototypes and the corresponding local-metric weights. The resulting prototypes/metric combination minimizes a suitable estimation of the classification error probability. Performance of this algorithm has been evaluated through experiments on several benchmark data sets and also in a real task to verify images of human faces.

In the last contribution to this issue, “Prototype Selection for Dissimilarity-based Classifiers”, E. Pekalska,

R.P.W. Duin and P. Paclik address the problem of designing a proper representative set (that is, a small set of prototypes selected from the original training set) for dissimilarity-based classifiers. In this paper, some experiments have been conducted on several metric and non-metric dissimilarity representations and prototype selection methods, comparing them with the well-known random selection.

We would like to thank all the Authors who submitted their high-quality papers to this special issue, for without their effort, interest and valuable collaboration, the publication of this issue would not have been possible. We are also very grateful to the Reviewers for their advice and expertise: Francisco Herrera, Alfons Juan, Mineichi Kudo, Ludmila I. Kuncheva, Ramón López de Mantaras, Gábor Lugosi, Andrés Marzal, José C. Riquelme, Petr Somol, and Godfried T. Toussaint.

As guest editors of this special issue, we would especially like to express our sincere gratitude to Prof. Robert S. Ledley, the Editor-in-Chief of the Pattern Recognition journal, for giving the Authors the opportunity to present their research work to the appreciated readership of this journal. We would also like to extend our thanks to Mrs. Blaire V. Mossman, the Managing Editor of this journal, for her outstanding support throughout the preparation of the present special issue. Moreover, we have to acknowledge the support from Spanish projects TIC2001-5057-E, TIC2002-12744-E and TIC2003-08496-C04.

Finally, we would like to make a very special mention and dedicate this issue to our dear colleague and friend Dr. Ricardo Barandela (1938–2004), an active and enthusiast researcher in this field who passed away on 26th December 2004 during the preparation of this special issue.

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