Fifth International Conference
Modelling and Development of Intelligent Systems
June 23 - 25, 2017
"Lucian Blaga" University
Sibiu - Romania

Plenary Lecture

Stochastic Optimization for Classification Algorithms

Milan Tuba

Faculty of Computer Science
John Naisbitt University
Belgrade, SERBIA
E-mail: tuba@matf.bg.ac.rs

Classification problem is an important research topic in computer science. It is used in data mining or machine learning to detect patterns in the input data and to determine what class each instance belongs to. Applications of classification are numerous and include different areas like medicine for tumor and diseases classification, image processing, economy for stock trend forecasting, ecology for agricultural, forest, plant classification, etc. Classification belongs to supervised machine learning where instances are given with corresponding labels (classes). Some of the most important supervised machine learning techniques are based on artificial intelligence, perception-based techniques and statistics. Some of the supervised learning algorithms used for classifications are decision trees, logistic regression, artificial neural networks, k-nearest neighbors, etc. Support vector machine (SVM) is one of the latest and most efficient supervised machine learning algorithms and it has been successfully used for many different classification problems. SVM determines a hyperplane that separates data from different classes. It first builds a model based on instances from the training set and then uses that model for further classification of unknown instances. Real world data are practically never perfectly separable so a soft margin parameter that affects the trade-off between complexity of the model and proportion of non-separable samples was introduced in the SVM model. Additionally, in order to adjust SVM for classification of non-linearly separable data, projection to higher-dimension space by kernel function was introduced. Gaussian radial basis function is the most common used kernel function and its parameter defines the influence of a single training example to the model. The successfulness of the SVM model depends on the soft-margin coefficient as well as on the parameter of the kernel function hence selecting optimal values for these parameters is a crucial step in SVM construction. One of the most used techniques for SVM parameter tuning is grid search on the log-scale of the parameters, combined with cross validation procedure. This technique may result in huge computational time and far from optimal selection of parameters. Selecting a good pair of values for parameters is a hard optimization problem and for such problems, stochastic population search algorithms, particularly swarm intelligence, were studied and used. In this plenary lecture some recent successful applications of the swarm intelligence algorithms to support vector machine parameters optimization will be presented.

Brief Biography of the Speaker: Milan Tuba is the Dean of Graduate School of Computer Science and Provost for mathematical and technical sciences at John Naisbitt University of Belgrade. He received B. S. in Mathematics, M. S. in Mathematics, M. S. in Computer Science, M. Ph. in Computer Science, Ph. D. in Computer Science from University of Belgrade and New York University. From 1983 to 1994 he was in the U.S.A. first as a graduate student and teaching and research assistant at Vanderbilt University in Nashville and

Courant Institute of Mathematical Sciences, New York University and later as Assistant Professor of Electrical Engineering at Cooper Union School of Engineering, New York. During that time he was the founder and director of Microprocessor Lab and VLSI Lab, leader of scientific projects and theses supervisor. From 1994 he was Assistant Professor of Computer Science and Director of Computer Center at University of Belgrade, from 2001 Associate Professor, Faculty of Mathematics, University of Belgrade, and from 2004 also a Professor of Computer Science and Dean of the College of Computer Science, Megatrend University Belgrade. He was teaching more than 20 graduate and undergraduate courses, from VLSI Design and Computer Architecture to Computer Networks, Operating Systems, Image Processing, Calculus and Queuing Theory. His research interest includes heuristic optimizations applied to computer networks, image processing and combinatorial problems. Prof. Tuba is the author or coauthor of more than 150 scientific papers and coeditor or member of the editorial board or scientific committee of number of scientific journals and conferences. Member of the ACM, IEEE, AMS, SIAM, IFNA.