Список литературы

[his02:Aguilar] J.L. Aguilar and N. Perozo. Sparse distributed memory with adaptive threshold. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 426–432. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Sparse Distributed Memory is a content addressable, associative memory technique which relies on close memory items tending to be clustered together, with some abstraction and blurring of details. This paper discusses the limitations of the original model. Then, we propose a method which improve Sparse Distributed Memory efficiency through an adaptive threshold. The results obtained are good and promising.

[his02:Ait] N. Ait Oufroukh and E. Colle. Pattern recognition with ultrasonic sensor using classification methods. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 673–680. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This paper describes a binaural ultrasonic sensor for mobile robot recognition of simple objects with non-parametric methods (K nearest neighbours and a neural network). These methods identify and then exploit echo features defined as characteristics of the simple objects. The features selection is also studied and the reduction of parameters is obtained with several methods: Sequential Backward, Forward Selection and Branch and bound. The parameters correlation is verified by correlation circle given by the principals component analysis. The result of feature selection and classification are presented.

[his02:Amali] R. Amali, J. Vinney, S. Noroozi, and V. Patel. The use of a back propagation neural network to determine the load distribution on a component. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 15–20. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: A method that combines a Back Propagation Neural Network (BPNN) with the data obtained using Finite Element Analysis (FEA) is introduced in this paper as an approach to solve inverse problems. This paper presents the feasibility of this approach. It demonstrates that the method approach works under laboratory or controlled conditions. FEA results are used to train the BPNN. The component used is a simple cantilever plate resembling an aircraft wing. Once trained, the approximate load distribution solution to any problem, bound by the training envelope, can be obtained quickly and accurately.

[his02:Angkawattanawit] N. Angkawattanawit and A. Rungsawang. Learnable topic-specific web crawler. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 573–582. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Topic-specific web crawler collects relevant web pages of interested topics from the Internet. There are many previous researches focusing on algorithms of web page crawling. The main purpose of those algorithms is to gather as many relevant web pages as possible, and most of them only show the approaches of the first crawling. However, no one has ever mentioned some

important questions, such as how the crawler does during the next crawlings, does the crawling process can be done in an incremental way, how to track the change of web pages, etc. In this paper, we present an algorithm that covers the detail of both the first and the consecutive crawlings. For efficient result of the next crawling, we keep the log of previous crawling to build some knowledge bases: starting URLs, topic keywords and URL prediction. These knowledge bases are used to build the experience of the topic-specific web crawler to produce better result for the next crawling.

[his02:Asseraf] M. Asseraf. An efficient algorithm in optimal partition problem for trees induction. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 212–220. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Addressing the inherent computational complexity of the construction of optimal trees, we will present in this paper an efficient procedure to find the optimal partition for categorical variables. The attribute selection metric will be presented for this optimisation. It's the Kolmogorov-Smirnov criterion adapted to discrete variables. The algorithm converges to the globally optimal solution in polynomial time with three degrees. We will compare the complexity time with other classical algorithms and show that there is a significant difference in time required to find the optimal partition.

[his02:Astrain] J.J. Astrain, J.R. Garitagoitia, J. Villadangos, F. Fariña, and A. Córdoba. An imperfect string matching experience using deformed fuzzy automata. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 115–123. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This paper presents a string matching experience using deformed fuzzy automata for the recognition of imperfect strings. We propose an algorithm based on a deformed fuzzy automaton that calculates a similarity value between strings having a non-limited number of edition errors. Different selections of the fuzzy operators for computing the deformed fuzzy automaton transitions allows to obtain different string similarity definitions. The selection of the parameters determining the deformed fuzzy automaton behavior is obtained via genetic algorithms.

[his02:Baeza] R. Baeza-Yates and C. Castillo. Balancing volume, quality and freshness in web crawling. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 565–572. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: We describe a crawling software designed for high-performance, large-scale information discovery and gathering on theWeb. This crawler allows the administrator to seek for a balance between the volume of a Web collection and its freshness; and also provides flexibility for defining a quality metric to prioritize certain pages.

[his02:Batista] Gustavo E. A. P. A. Batista and M.C. Monard. A study of k-nearest neighbour as an imputation method. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 251–260. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Most contemporary computing systems situate humans only as the end users. Alternatively, human-in-the-loop computing systems employ humans to buttress the system when faced with hard tasks, which enables human reasoning to be used as part of the computational process. This paper discusses how human reasoning can be embedded as part of a Soft Computing environment and examines its implications. It exemplifies the arguments using a prototype help recommender system and highlights how pedagogical recommendations are made with the integration of human reasoning with system reasoning mechanisms. It also highlights a number of research fronts that result from embedding human reasoning to complement other reasoning mechanisms that are present in Soft Computing.

[his02:Beker] T. Beker and L. Hadany. Noise and elitism in evolutionary computation. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 193–203. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Evolutionary Computation applications often involve a high degree of noise in the evaluation of solution performance. In the Genetic Algorithms literature, this has usually been considered a limitation, and attempts to reduce this noise seem to be the common practice. After introducing a proper measure for the performance of evolutionary techniques, we show that for complex fitness landscapes, noise reduction is not necessarily helpful, and sometimes is in fact harmful. Based on insights gained from biology, we suggest a simple form of Elitist selection, termed *Group Elitism*, which has a strong and robust positive effect on the performance of noisy algorithms. We discuss the notion of Elitism as an extreme form of *Fitness-Associated Variation*, and show that Group Elitism efficiently deals with the harmful effects of evaluation noise without compromising its benefits in evading local adaptive maxima.

[his02:Bologna] G. Bologna. Rule extraction from bagged neural networks. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 42–53. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This work presents a technique to extract rules from ensembles of "Discretized Interpretable Multi Layer Perceptrons" (DIMLPs) based on the characterization of discriminant hyper-planes. Experiments were achieved on 25 classification problems using single DIMLP networks and bagged ensembles. It turned out that extracted rule sets from bagged DIMLPs were on average significantly more accurate than single networks (78.0% versus 76.4%), and slightly less complex. Finally, rules were slightly more accurate than those generated from ensembles of C4.5 decision trees (78.0% versus 77.8%), while exhibiting significantly smaller complexity in almost all classification problems.

[his02:Brouwer] R.K. Brouwer. Using a helper ffn to represent the cost function for training drnn's by gradient descent. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 707–714. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Abstract. This research is concerned with a gradient descent training algorithm for a target network that makes use of a helper feed-forward network (FFN) to represent the performance function used in training the target network. A helper FFN (HFFN) is trained because the mathematical form of the performance function for the target network in terms of the

trainable parameters, P, is not known yet data for the relationship can be generated. The transfer function of the HFFN provides a differentiable function for the performance function of the parameter vector, P, for the target network allowing gradient search methods for finding the optimum P. The method is applied to the training of discrete recurrent networks (DRNNs) that are used as a tool for classification of temporal sequences of characters.

[his02:Castilho] V.C. Castilho, M.C. Nicoletti, and M.K. El Debs. Using genetic algorithms for minimizing the production costs of hollow core slabs. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 796–805. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Genetic algorithms (GAs) are adaptive methods based on the genetic process of biological organisms that have been successfully applied to a variety of tasks, in areas such as function optimization, parameter tuning, learning, etc. The main goal of this work is to investigate a set of selection strategies which are used by a typical GA for minimizing the cost function of prefabricated hollow core slabs and to demonstrate GA's robustness over a conventional method with respect to the complexity of the problem and quality of the solution

[his02:Cavalcante] R.B. Cavalcante Prudêncio and T.B. Ludermir. Selection of models for time series prediction via meta-learning. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 74–83. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: In this work, we propose the use of meta-learning techniques in the task of selecting models for time series prediction. In our approach, a machine learning algorithm generates symbolic knowledge used for choosing a better model to predict a time series, according to the features of the series. In the implemented prototype, a decision tree is used for selecting between the Simple Exponential Smoothing model and the Time-Delay Neural Network, for predicting stationary time series. Our experiments revealed encouraging results.

[his02:Cheng] S.S. Cheng, Y.H. Chen, C.L. Tseng, H.C. Fu, and H.T. Pao. A self-growing probabilistic decision-based neural network with applications to anchor/speaker identification. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 818–829. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: In this paper, we propose a new learning algorithm for a mixture Gaussian based neural network, called Self-growing Probabilistic decision-based neural networks (SPDNN) for better density function estimation, and pattern classification. We also developed a new Self-growing Mixture Gaussian learning (SMGL) algorithm, that is able to find the natural number of components based on a self-growing validity measure, Bayesian Information Criterion (BIC). It starts with a single component randomly initialized in the feature space and grows adaptively during the learning process until most appropriate number of components are found. In our experiments on anchor/speaker identification, we have observed noticeable improvement among various model-based or vector quantization-based classification schemes. Key Words: Self-growing Probabilistic Decision-based Neural Networks (SPDNN), Supervised learning, Competitive learning, Unsupervised learning, Validity measure.

[his02:Chervonenkis] Alexey Jakovlevich Chervonenkis. Reconstruction of conditional distribution field based on empirical data. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 462–469. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: In the paper the problem of conditional distribution estimation at a current point on tha basis of measured values of a random field at a set of sampling points is considered. An estimator is searched in the form similar to Parsen estimation of a distribution function, but with coefficients depending on the distance between the current point and the sampling points. Theoretical foundation is given for optimal choice of these coefficients. Application of the theory are considered in the learning theory and practical problems.

[his02:Cios] W. Jackson K. Cios and L. Springhetti W. Swiercz. Spiking neurons in clustering of diabetic retinopathy data. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 84–94. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: In simple models of biological neurons the output does not depend on time. In contrast, the spiking neuron model, in response to external stimulation, generates a series of action potentials (spikes). In the paper we use MacGregorIs spiking neuron model, and the Temporal Correlation Learning (TCL) rule to update synaptic connections between spiking neurons. The network of such neurons, with the TCL rule, was shown to be capable of clustering, without the need of specifying the number of clusters. In this paper the network of spiking neurons is used for finding clusters in eye images of diabetic retinopathy patients. Diabetic retinopathy is a disease caused by diabetes that if not treated can lead to major loss of vision.

[his02:Cock] M. De Cock. Linguistic hedges: a quantifier based approach. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 142–152. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: We present an entirely new approach for the representation of intensifying and weakening linguistic hedges in fuzzy set theory, which is primarily based on a crisp ordering relation associated with the term that is modified, as well as on a fuzzy quantifier. With this technique we can generate membership functions for both atomic and modified linguistic terms. We prove that our model respects semantic entailment and we show that it surpasses traditional approaches, such as powering and shifting modifiers, on the intuitive level and on the level of applicability.

[his02:Cuppens] F. Cuppens, F. Autrel, A. Miège, and S. Benferhat. Recognizing malicious intention in an intrusion detection process. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 806–817. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Generally, the intruder must perform several actions, organized in an *intrusion scenario*, to achieve his or her malicious objective. We argue that intrusion scenarios can be modelled as a planning process and we suggest modelling a malicious objective as an attempt to violate a given security requirement. Our proposal is then to extend the definition of attack correlation presented in [**?**] to correlate attacks with intrusion objectives This notion is

useful to decide if a sequence of correlated actions can lead to a security requirement violation. This approach provides the security administrator with a global view of what happens in the system. In particular, it controls unobserved actions through hypothesis generation, clusters repeated actions in a single scenario, recognizes intruders that are changing their intrusion objectives and is efficient to detect variations of an intrusion scenario. This approach can also be used to eliminate a category of false positives that correspond to false attacks, that is actions that are not further correlated to an intrusion objective.

[his02:Dixon] P.W. Dixon, D.W. Corne, and M.J. Oates. Enhancing real-world applicability by providing confidence-in-prediction in the xcs classifier system. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 290–299. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Classifier systems are machine learning ruleset-discovery systems; the XCS classifier system has been found in recent years to compete well with rival machine learning systems on difficult benchmarks, and is now being intensively researched for real world applications. A problem common to all such systems is their accuracy on unseen data, and hence their real-world performance. This is not surprising, and standard methods such as cross-validation and early-stopping are commonly used in training to assess likely performance on unseen data. However, an additional and related issue is the confidence we can have in a prediction as a function of our confidence in the inputs. Predictions which lay on the boundary between two differing outcomes (e.g. the system may say ImalignantI in response to an input pattern, but a slight difference in that pattern might cause it to respond IbenignI) must somehow be identified and questioned on their validity. We describe a technique which takes a ruleset learned by XCS (or another system), and provides highly useful confidence information when predictions are made with that ruleset. Further, we describe a measure which enables confidence-in-prediction behaviour to be assessed for different rulesets. Using this measure, called zero tolerance performance, we find that small, succinct and general rulesets produce better confidence-in-prediction performance. This mitigates against direct use of classifier system learned rulesets, since these tend to be very large, but it validates recent research which is successfully applying post-processing techniques which quickly reduce such a ruleset to a much smaller but equally accurate one. Development and testing is done on the standard Wisconsin Breast Cancer database.

[his02:Ferreira] C. Ferreira. Analyzing the founder effect in simulated evolutionary processes using gene expression programming. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 153–162. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Gene expression programming is a genotype/phenotype system that evolves computer programs encoded in linear chromosomes of fixed length. The interplay between genotype (chromosomes) and phenotype (expression trees) is made possible by the structural and functional organization of the linear chromosomes. This organization allows the unconstrained operation of important genetic operators such as mutation, transposition, and recombination. Although simple, the genotype/phenotype system of gene expression programming can provide some insights into natural evolutionary processes. In this work the question of the initial

diversity in evolving populations of computer programs is addressed by analyzing populations undergoing either mutation or recombination. The results presented here show that populations undergoing mutation recover practically undisturbed from evolutionary bottlenecks whereas populations undergoing recombination alone depend considerably on the size of the founder population and are unable to evolve efficiently if subjected to really tight bottlenecks.

[his02:Gokcen] I. Gokcen, J. Peng, and B.P. Buckles. Active learning using one-class classification. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 280–289. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Active learning aims at minimizing the number of labeled examples and at the same time reaching the optimum as fast as possible. In this paper, we propose a new parameterization for active learning, which is described based on the idea of one-class classification. We demonstrate the use of this parameterization by proposing a simple heuristic and a volume reduction metric for active learning. Empirical results on a variety of data sets show that our metrics outperform and are comparable with other proposed active learning metrics.

[his02:Gouarderes] S. Gouarderes, G. Gouarderes, and P. Delpy. Maybe - multi-agent yield-based engineering : Improve training in the emergency room chain. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 529–539. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This paper describes a method of multi-agent analysis and design for reactive, real-time information systems, relating to complex and risks applications in medicine. According to specific needs in emergency healthcare units : spatio-temporal deployment of heterogeneous tasks, non-determinism of actors and self-organization in an unpredictable and/or disrupted environment, we propose MAYBE - Multi-Agent Yield-Based Engineering. MAYBE is a solution that makes possible for the agents to evolve and adapt by instantiation in different contexts. This paper details the various stages of the methodology applied to an emergency case, in parallel with the computerization of the process. It also compares the issues with other current work.

[his02:Haindl] M. Haindl and S. äimberová. Model-based restoration of short-exposure solar images. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 697–706. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This paper presents a derivation of a fast recursive filter for image restoration if degradation obeys a linear degradation model with the unknown possibly non-homogeneous point-spread function. It is assumed that for every ideal undegraded image several degraded observed images are available. Pixels in the vicinity of steep discontinuities are left unrestored to minimize restoration blurring effect. The degraded image is assumed to follow a causal simultaneous multidimensional regressive model and the point-spread function is estimated using the local least-square estimate.

[his02:Heinen] F.J. Heinen and F.S. Osório. Hycar - a robust hybrid control architecture for autonomous robots. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 830–842. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This work presents a new hybrid architecture applied to autonomous mobile robot control - HyCAR (Hybrid Control for Autonomous Robots). This architecture provides a robust control for robots as they become able to operate and adapt themselves to different environments and conditions. We designed this new hybrid control architecture, integrating the two main techniques used in robotic control (de-liberative and reactive control) and the most important environment representation techniques (grids, geometric and topological maps), through a three-layer architec-ture approach (vital, functional and deliberative layers). To guarantee the robustness of our control system, we also integrated a localization module based on Monte Carlo localization method. This localization module possesses an important role in our control system, and supplies a solid base for the control and navigation of autonomous mobile robots. In order to validate our control architecture, a realistic simulator of mobile robots was implemented (SimRob3D) allowing the practical use of the proposed system. We implemented several three-dimensional environment models, as well as diverse sensorial and kinematics models found in actual robots. Our simulation results had demonstrated that the control system is perfectly able to determine the mobile robot position into a partially known environment, considering local or global localization, and also to determine if the robot needs to re-localize it-self given an incorrect localization. In navigation tasks the robot was able to plan and follow self-generated trajectories in a dynamic environment, which can include several unexpected static and mobile obstacles. We also demonstrated that with the integration of topological and grid information we improved planning algorithm execution.

[his02:Hirche] S. Hirche, I. Santibanez-Koref, and I. Boblan. Design of strong causal fitness functions. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 183–192. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: A new kind of fitness functions for controller optimization is presented. This new fitness functions are postulated to be strong causal. Thus a better behaviour during the o ptimization process can be achieved.

[his02:Hruschka] E.R. Hruschka Jr., E.R. Hruschka, and N.F.F. Ebecken. A data preparation bayesian approach for a clustering genetic algorithm. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 453–461. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: The substitution of missing values is an important task in data mining applications and it can be performed by means of many methods. This work describes the use of the bayesian algorithm K2 as a data preparation tool for a clustering genetic algorithm. We illustrate the proposed method by means of simulations in three datasets: Ruspini, 200 Randomly Generated and Wisconsin Breast Cancer. The obtained results show that the substitution Bayesian method is adequate in the Clustering Genetic Algorithm context.

[his02:Iba] H. Iba, N. Tokui, and H. Wakaki. 3d-cg avatar motion design by means of interactive evolutionary computation. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen,

editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 540–549. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: The motion of a 3D-CG avatar is recently used in many games and movies. But it is not easy to generate human motion. Also along with the increasing spread of the Internet, the users want to use various expressions on the web. However the users who don't have special techniques cannot create human motion. In the light of foregoing, the system by which the users can create human motion in an available environment is requierd. This paper describes a new approach to generating human motion, more easily and semi-automatically by means of Interactive Evolutionary Computation (IEC). In our system the profile of the avatar is based on the Humanoid Animation standard in order to popularize easily.

[his02:Ishibuchi] H. Ishibuchi and T. Yamamoto. Comparison of fuzzy rule selection criteria for classification problems. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 132–141. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This paper compares heuristic rule selection criteria in fuzzy rule extraction for classification problems. Using several heuristic criteria, we examine the performance of extracted fuzzy rules through computer simulations on four data sets (glass, Wisconsin breast cancer, wine, and sonar). Simulation results show that better results are obtained from composite criteria of the confidence and support measures than the individual use of those measures. It is also suggested that genetic algorithm-based rule selection can improve the classification ability of extracted fuzzy rules by searching for good rule combinations. This result shows the importance of taking into account the combinatorial effect (i.e., interaction) of extracted fuzzy rules when we design fuzzy rule-based systems.

[his02:Ishibuchi2] H. Ishibuchi and T. Yoshida. Hybrid evolutionary multi-objective optimization algorithms. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 163–172. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This paper examines how the search ability of evolutionary multi-objective optimization (EMO) algorithms can be improved by the hybridization with local search through computational experiments on multi-objective permutation flowshop scheduling problems. The task of EMO algorithms is to find a variety of non-dominated solutions of multi-objective optimization problems. First we describe our multi-objective genetic local search (MOGLS) algorithm, which is the hybridization of a simple EMO algorithm with local search. Next we discuss some implementation issues of local search in our MOGLS algorithm such as the choice of initial (i.e., starting) solutions for local search and a termination condition of local search. Then we implement hybrid EMO algorithms using well-known EMO algorithms: SPEA and NSGA-II. Finally we compare those EMO algorithms with their hybrid versions through computational experiments. Experimental results show that the hybridization with local search can improve the search ability of the EMO algorithms when local search is appropriately implemented in their hybrid versions.

[his02:Jakovlevich] C.A. Jakovlevich. Reconstruction of conditional distribution field based on empirical data. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors,

Soft Computing Systems - Design, Management and Applications, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 462–469. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: In the paper the problem of conditional distribution estimation at a current point on tha basis of measured values of a random field at a set of sampling points is considered. An estimator is searched in the form similar to Parsen estimation of a distribution function, but with coefficients depending on the distance between the current point and the sampling points. Theoretical foundation is given for optimal choice of these coefficients. Application of the theory are considered in the learning theory and practical problems.

[his02:Jarur] M.C. Jarur and M.A. Rodríguez. A non-deterministic versus deterministic algorithm for searching spatial configurations. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 602–611. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: A deterministic approach to searching spatial configurations can be a computationally demanding task, since it implies to permute combinations of possible objects stored in a database in order to satisfy particular spatial constraints. In addition, while deterministic approaches may find the best solution, they can also miss possible solutions due to local optimum effects. In this paper, we present an approach to searching spatial configurations that explores the characteristics of genetic algorithms to find solutions within a time framing. The novelty of our approach lies in the combination of genetic algorithms with a heuristic operator and an indexing schema for handling binary spatial constraints. Experimental results compare a genetic versus a deterministic algorithm and show the convenience of using a genetic algorithm depending on the type and complexity of a user query.

[his02:Jedrzejowicz] J. Jedrzejowicz and P. Jedrzejowicz. Experimental evaluation of the pla-based permutation-scheduling. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 241–250. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: The paper proposes implementations of the population learning algorithm (PLA) for solving three well-known NP-hard permutation-scheduling problems. PLA is a recently developed method belonging to the class of population-based algorithms and used for solving difficult optimization problems. The first of the discussed problems involves scheduling tasks on a single machine against common due date with earliness and tardiness penalties. The second is known as the permutation flow shop problem. The third one involves scheduling tasks on a single machine with total weighted tardiness as a criterion. To evaluate the proposed implementations computational experiments have been carried. Experiments involved solving available sets of benchmark problems and comparing the results with the optimum or best-known solutions. PLA has found better upper bounds on several benchmark instances.

[his02:Kacprzyk] J. Kacprzyk and S. Zadrozny. Protoforms of linguistic data summaries: Towards more general natural-language-based data mining tools. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 417–425. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

[his02:Kawamae] N. Kawamae. Latent semantic indexing based on factor analysis. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 300–308. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: The main purpose of this paper is to propose a novel latent semantic indexing (LSI), statistical approach to simultaneously mapping documents and terms into a latent semantic space. This approach can index documents more effectively than the vector space model (VSM). Latent semantic indexing (LSI), which is based on singular value decomposition (SVD), and probabilistic latent semantic indexing (PLSI) have already been proposed to overcome problems in document indexing, but critical problems remain. In contrast to LSI and PLSI, our proposed method uses a more meaningful, robust statistical model based on factor analysis and information theory. As a result, this model can solve the remaining critical problems in LSI and PLSI. Experimental results with a test collection showed that our method is superior to LSI and PLSI from the viewpoints of information retrieval and classification. We also propose a new term weighting method based on entropy.

[his02:Knowles] J.D. Knowles and D.W. Corne. Towards landscape analyses to inform the design of hybrid local search for the multiobjective quadratic assignment problem. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 271–279. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: The quadratic assignment problem (QAP) is a very difficult and practically relevant combinatorial optimization problem which has attracted much research effort. Local search (LS) moves can be quickly evaluated on the QAP, and hence favoured methods tend to be hybrids of global optimization schemes and LS. Here we introduce the *multiobjective* QAP (mQAP) where $m \geq 2$ distinct QAPs must be minimized simultaneuously over the same permutation space, and hence we require a set of solutions approximating the Pareto front (PF). We argue that the best way to organise a hybrid LS for the mQAP will depend on details of the multiobjective fitness landscape. By using various techniques and measures to probe the landscapes of mQAPs, we attempt to find evidence for the relative ease with which the following can be done by LS: approach the PF from a random initial solution, or search along or close to the PF itself. On the basis of such explorations, we hope to design an appropriate hybrid LS for this problem. The paper contributes a number of landscape measurement methods that we believe are generally appropriate for multiobjective combinatorial optimization.

[his02:Koppen] M. Köppen, R. Vicente Garcia, X. Liu, and B. Nickolay. 2d-histogram lookup for low-contrast fault processing. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 765–774. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This paper presents a framework for low-contrast texture fault processing based on 2D-Histogram lookup. 2D-Histogram lookup is a variant of 2D-Lookup operation. For 2D-Lookup, in two differently processed versions of the same image, grayvalue pairs from the same location in both images are replaced by the corresponding entry in a given two-dimensional matrix. The two operations and the matrix have to be provided for full algorithm

specification. For 2D-Histogram lookup, the matrix is derived from the 2D-Histogram of both processed images. The main advantage of using the 2D-Histogram is the darkening of rarely occurring structures in the image, while highly probable image structures becomes bright. The so-processed images are then given to a 2D-Lookup procedure for automatic filter generation. For low-contrast texture faults, i.e. faults which are hard to separate from the background texture, the approach shows better performance in fault region detection than the approach of 2DLookup adaptation without 2D-Histogram lookup. For handwriting separation from textured background, no achievement was obtained.

[his02:Kramer] K.D. Kramer, S. Patzwahl, and T. Nacke. Complete algorithm to realize ci model-based control and monitoring strategies on microcontroller systems. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 785–795. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This paper describes a complete algorithm for the realization of model-based control and monitoring strategies adopting computational intelligence (CI) strategies to microcontroller systems. Process interfaces, data mining and realization of process models and controller structures are subjected to detailed discussion. A further key issue is exporting the complete algorithm to target hardware systems with microcontrollers and/or digital signal processors. The paper outlines a software tool for user-friendly implementation of the complete algorithm. The application presented is a fuzzy control (FC) system to control substrate supply to biogas pilot plants.

[his02:Kumar] V.S. Kumar. Human reasoning in soft computing. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 625–633. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

[his02:Lee] S.W. Lee, D. Palmer-Brown, J. Tepper, and C. Roadknight. Performance-guided neural network for rapidly self-organising active network management. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 21–31. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: A neural network architecture is introduced for the real-time learning of input sequences using external performance feedback. The target problem domain suggests the use of Adaptive Resonance Theory (ART) networks [1] that are able to function in a robust and fast real-time adaptive active network environment, where user requests and new proxylets (services) are constantly being introduced over time [2,3]. The architecture learns, self-organises and self-stabilises in response to the user requests and maps the requests according to the types of proxylets available. However, the ART1 architecture and the original algorithm are modified to incorporate an external feedback mechanism whereby the performance of the system is fed into the network periodically. This modification, namely the Isnap-driftI algorithm, uses fast convergent, minimalist learning (snap) when the overall network performance has been poor and slow learning (drift towards user request input patterns) when the performance has been good. A key concern of the research is to devise a mechanism that effectively searches for alternative solutions to the ones that have already been tried, guided simultaneously by the input data (bottom-up information) and the performance feedback (top-down information). Preliminary simulations evaluate the two-tiered architecture

using a simple operating environment consisting of simulated training and test data.

[his02:Lenic] M. Lenic and P. Kokol. Combining classifiers with multimethod approach. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 374–383. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: The automatic induction of classifiers from examples is an important technique used in data mining. One of the problems encountered is how to induce a good classifier without overfitting. Although there is a lot of research going on in this field, the research is mainly focused on a specific machine learning method or on a specific combination of those methods. In this paper a multimethod approach to combine classifiers is presented that combines advantages of single methods and avoids theirs disadvantages at the same time by applying different methods on the same knowledge model, each of which may contain inherent limitations, with the expectation that the combined multiple methods may produce better results.

[his02:Letelier] J.C. Letelier, G. Marín, J. Mpodozis, and J. Soto-Andrade. Anticipatory computing with autopoietic and (m,r) systems. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 205–211. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

[his02:Liu] Z. Liu and Y. Xu. Adaptive support vector classifications. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 331–340. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Support vector machines (SVM) was originally designed for regression and binary classification. It promises to give good generalization and has been applied to various tasks. The basic idea behind SVM is to do the classification through solving a nonlinear(quadratic) programming. In this paper, we concentrate on adaptive support vector classification problems. Since there are many parameters in the kernel functions of SVM, tuning the smooth parameters can certainly improve the performance of classification. The general literature of SVM has not discussed in detail the subject of tuning the various user defined parameters. In this paper, we explore the trade-off between maximum margin and classification errors and estimate the best kernel parameters. Toy and real life data are used in the experiments

[his02:Macedo] S. Macedo and E. Mamdani. Bi-directional flow of information in the softboard architecture. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 470–479. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This paper addresses the issue of integrating top-down and bottom-up processing of information in modular hybrid systems. Backed by computational and neurological evidence, we show that there are important advantages to be gained from supporting bi-directional flow of information, especially in the context of intelligent information processing in real-world applications. We consider modular hybrid systems from a granular computing perspective and propose an approach based on evidential reasoning to integrate both top-down and bottom-up processes. The implementation of

the model in the Softboard framework, an experimental distributed hybrid architecture, is presented and its application to intelligent filtering and retrieval of multimedia is illustrated.

[his02:Marik] V. Marik and V. Mashkov. Alliance formation with several coordinators. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 550–564. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Practical issue of alliance formation is considered as a subproblem of a more general coalition formation problem in the context of multi-agent systems. The paper describes the process of creating alliances with specific restrictions applied. The intended alliance is formed by several independent coordinators which exchange information during the alliance formation process. The main goal of the research consists in highliting the problems occurring when alliance is formed by several coordinators and sketching the ways of their solution. The approach proposed integrates the current results in both the fields of the multi-agent research and the complex discrete system diagnostics.

[his02:Marin] M. Marin. Parallel text query processing using composite inverted lists. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 612–624. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: The inverted lists strategy is frequently used as an index data structure for very large textual databases. Its implementation and comparative performance has been studied in sequential and parallel applications. In the latter, with relatively few studies, there has been a sort of "which-is-better"discussion about two alternative parallel realizations of the basic data structure and algorithms. We suggest that a mix between the two is actually a better alternative. Depending on the workload generated by the users, the composite inverted lists algorithm we propose in this paper can operate either as a local or global inverted list, or both at the same time.

[his02:Martins] I.M. Garaffa M. C. Martins. Identifying patterns of corporate tax payment. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 490–499. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

[his02:Mastropasqua] D. Mastropasqua, N. Mosca, and F. Zambetta. An xml-based specification of fuzzy logic controllers. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 124–131. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Since their introduction, Fuzzy Systems have proven their usefulness in various fields, including linear and non linear control, pattern recognition, financial systems and data analysis. Current fuzzy systems, however, vary in supported capabilities, rules representation and storage. These differences, strictly interconnected, cause a lot of problems when there is a necessity to port a whole set of fuzzy rules from one system to another. To solve this portability issue, the International Electrotechnical Commission (IEC) formed a specific committee to propose a standard format to represent fuzzy systems, named Fuzzy Control Language (FCL).

Subsequently, in another context, another research group have proposed a standardized system to represent Evolutionary Computation Systems using an XML-based grammar. Based on this idea, strengthened by growing Internet fame, we propose a mapping of the FCL grammar and capabilities in a standardized XML format, showing at the same time, a bunch of extensions that can further enhance FCL language expressive power.

[his02:Maturana] C. Maturana and R. Weber. Feature extraction by distance neural network in classification tasks. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 384–393. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Feature extraction is an important task for data mining applications, in particular for classification. On one hand it leads to a better understanding of the relations between features and classification results. On the other hand it helps to perform fast classifications with a reduced number of features. Principal component analysis (PCA) is one of the mostly used techniques for linear feature extraction. Recently neural networks have been proposed for non-linear feature extraction out-performing PCA in many cases like non-linear principal component analysis (NLPCA). The mentioned approaches have in common an error reduction when reproducing the initial feature space from the reduced space. We present a new approach which tries instead conserving the patterns distribution from the original space to the reduced space. This model called dNN (Distance Neural Network) pro-vides very good results for several cases outperforming PCA and shows to be competitive with the best non-linear techniques for feature extraction.

[his02:Minami] T. Minami and T. Inui. A neural network model of rule-guided behavior. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 64–73. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: The flexibility of our behavior is mainly caused by our ability to abstract rules from a circumstance and apply them to other situations. To examine the system for such rule-guided behavior, we proposed a neural network model of rule-guided behavior and simulated the physiological experiments of a rule-guided delayed matching-to-sample task (Wallis et al., 2001). Our model was constructed through neural system identification (Zipser, 1993) and a fully recurrent neural network model was optimized to perform a rule-guided delayed task. In the model's hidden layer, rule-selective units as in Wallis et al.(2001) were found, and an examination of connection weights substantiated that rule-selective neurons maintain encoded rule information and indirectly contributed to rule-guided responses. The simulation results predict functional interactions among neurons exhibiting various task-related activities.

[his02:Montiel] O. Montiel, O. Castillo, P. Melin, and R. Sepulveda. The evolutionary learning rule for system identification in adaptive finite impulse filters. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 755–764. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: In this paper, we are proposing an approach for integrating evolutionary computation applied to the problem of system identification in the well-known statistical signal processing theory. Here, some mathematical expressions are developed in order to justify the learning rule in the adaptive

process when a Breeder Genetic Algorithm is used as the optimization technique. In this work, we are including an analysis of errors, energy measures, and stability

[his02:Mora] I. Mora-Jiménez, A. Lyhyaoui, J. Arenas-García, A. Navia-Vázquez, and A.R. Figueiras-Vidal. A trainable classifier via k nearest neighbors. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 365–373. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This paper introduces a new classifier derived from a variant of the k-Nearest Neighbor (kNN) rule. This classification scheme, which we call kNN Learning Vector Classifier (kNN-LVC), has a similar architecture to that of Learning Vector Quantizers (LVQs). In fact, both methods place in the observation space a set of centroids or prototypes with a limited area of influence; however, our approach finds optimal prototypes by optimizing a new discriminant function that considers the k nearest prototypes to a sample. Among kNN-LVC characteristics are its localized nature, easy training and interpretation, small storage requirements, and a very competitive performance. The proposed technique is benchmarked against other classifiers as kNN and LVQ. Experiments show good generalization capabilities and efficacy of our approach on datasets with enough number of data in relation to dimensionality.

[his02:Morales] E.K. Morales and C. Gutiérrez. Building yearbooks with rdf. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 593–601. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: We present a simple application of semantic integration using the RDF model of metadata, namely, the construction and maintenance of a yearbook. It can be built and used by organizations which already have their information on the Web and require to keep yearbooks to service advanced searching facilities. Unlike traditional approaches, ours ensures wide interoperability, extensibility and historical recording by using RDF and a decentralized approach.

[his02:Mukkamala] S. Mukkamala and A.H. Sung. Performance based feature identification for intrusion detection using support vector machines. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 351–364. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Intrusion detection is a critical component of secure information systems. This paper addresses the issue of identifying important input features in building an intrusion detection system (IDS). Since elimination of the insignificant and/or useless inputs leads to a simplification of the problem, faster and more accurate detection may result. Feature ranking and selection, therefore, is an important issue in intrusion detection. Since support vector machines (SVMs) tend to scale better and run faster than neural networks with higher accuracy for intrusion detection, we apply the technique of deleting one feature at a time to perform experiments on SVMs to rank the importance of input features for the DARPA collected intrusion data. Important features for each of the 5 classes of intrusion patterns in the DARPA data are identified. It is shown that SVM-based IDS using a reduced number of features can deliver enhanced or comparable performance. An IDS for class-specific detection based on five SVMs is proposed.

[his02:Murakami] M. Murakami, M. Yoneyama, and K. Shirai. Accurate human face extraction using genetic algorithm and subspace method. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 745–754. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Subspace method that can express facial images efficiently by linear translation into lower dimensional subspace has wide application for face recognition e.g. identification, facial pose detection etc. In the preprocess of this method the accurate extraction of human face area is required, but it is influenced by the light condition, various background, individual variation and so on, so it has not put into practical use yet. In this paper we examine the subspace method by comparison of the search space, and apply Genetic Algorithm to face extraction and show that the effective results was obtained.

[his02:Nakamatsu] K. Nakamatsu, J.M. Abe, and A. Suzuki. A railway interlocking safety verification system based on abductive paraconsistent logic programming. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 775–784. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: We introduce a safety verification system for railway interlocking based on a paraconsistent logic program called an Extended Vector Annotated Logic Program(EVALP for short) and its abductive procedure called SLDNFAà, which is an extended version of SLDNFA by Denecker and De Schreye.

[his02:Nascimento] H.A.D. do Nascimento and P. Eades. A focus and constraint-based genetic algorithm for interactive directed graph drawing. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 634–643. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This paper presents a user-driven genetic algorithm for directed graph drawing. An interactive framework is considered where users can focus the algorithm on regions of the drawing that need major improvement, or include domain knowledge as layout constraints. The paper describes how focus and user constraints are managed by the genetic algorithm. The combination of userIs skills with automatic tools allows a more flexible and efficient optimization method, when compared to traditional non-interactive genetic algorithms. Issues regarding memory usage, processing time, solution representation and convergence are discussed here.

[his02:Navarrete] P. Navarrete and J. Ruiz del solar. Eigenspace-based face recognition: A comparative study of different hybrid approaches. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 663–672. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Different eigenspace-based approaches have been proposed for the recognition of faces. They differ mostly in the kind of projection method been used, in the projection algorithm been employed, in the use of simple or differential images before/after projection, and in the similarity matching criterion or classification method employed. Statistical, neural, fuzzy and evolutionary algorithms are used in the implementation of those systems. The aim of this paper is to present an independent, comparative study between some of these hybrid eigenspace-based approaches. This study considers

theoretical aspects as well as simulations performed using a small face database (Yale Face Database) and a large face database (FERET).

[his02:Nolan] J.J. Nolan, A.K. Sood, and R. Simon. Sadisco: A scalable agent discovery and composition mechanism. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 519–528. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Peer-to-peer systems have recently gained popularity as a way to share files amongst distributed users. Such an approach can be applied to the discovery of distributed software agents. In this paper, we introduce a scalable agent discovery mechanism that utilizes a semantic layer on top of traditional middleware, and forms a hierarchy representing the types of agents on the network. The approach is used to support the composition of meta-agents, or "an agent of agents to build distributed applications. Our results show that the SADISCO approach scales well and allows users to discover agents with little or no *a priori* information.

[his02:Partridge] S. Cang D. Partridge. Revealing feature interactions in classification tasks. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 394–403. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This paper presents a contribution to the theory of optimal feature-subset selection associated with pattern recognition or classification tasks. It extends the theory of Mutual Information (MI) to deal with the difficulties introduced by feature interaction. The essential contribution is to permit MI calculations between sets of features and the target class such that all interactions between the features in the chosen set are taken into account in the MI value produced. In order to accomplish this extension from traditionally pairwise (i.e., feature-feature or feature-class) MI computation we have developed algorithms to transform any continuous-valued feature into a discrete-valued one, and to transform any set of discrete-valued features into a 'composite' feature suitable for the necessary MI calculations. We have built these algorithms into classical forwards and backwards sequential search procedures, and these provide an initial survey of the interactions present among features within a given set of feature vectors. If no significant feature interaction is present then the features have effectively been ranked, and the optimal subset selection problem has been solved. When feature interactions are present, the initial survey will indicate where and what interactions are present and will suggest, if necessary, further probes with the extended MI algorithm to reveal their full nature. We demonstrate the effectiveness of the extended MI algorithm on a number of examples that have been presented as problematic in the literature, especially in the feature-selection literature that has employed MI theory .

[his02:Rakus] E. Rakus-Andersson and L. Zakrzewski. Factor analysis with qualitative factors as fuzzy numbers. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 105–114. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: The classical version of Factor Analysis is seldom used in the case of qualitative factors. We now propose a fuzzy interpretation of the method, which gives the possibility to investigate the strength of the factor influence on a tested variable. By assuming that fuzzy numbers in the L-R form represent

the variable and the factors, which are the qualitative parameters, we are able to perform all the operations when following the Factor Analysis algorithm. The conception of a new fuzzy space with particularly defined op

[his02:Ramos] V. Ramos, F. Muge, and P. Pina. Self-organized data and image retrieval as a consequence of inter-dynamic synergistic relationships in artificial ant colonies. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 500–512. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

> **Abstract:** Social insects provide us with a powerful metaphor to create decentralized systems of simple interacting, and often mobile, agents. The emergent collective intelligence of social insects ñ swarm intelligence ñ resides not in complex individual abilities but rather in networks of interactions that exist among individuals and between individuals and their environment. The study of ant colonies behavior and of their self-organizing capabilities is of interest to knowledge retrieval/ management and decision support systems sciences, because it provides models of distributed adaptive organization which are useful to solve difficult optimization, classification, and distributed control problems, among others. In the present work we overview some models derived from the observation of real ants, emphasizing the role played by stigmergy as distributed communication paradigm, and we present a novel strategy (ACLUSTER) to tackle unsupervised data exploratory analysis as well as data retrieval problems. Moreover and according to our knowledge, this is also the first application of ant systems into digital image retrieval problems. Nevertheless, the present algorithm could be applied to any type of numeric data.

[his02:Ribeiro] B. Ribeiro and P. Carvalho. Mercer's kernel based learning for fault detection. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 341–350. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

> **Abstract:** This paper proposes a Mercer's kernel based learning for classification problems using Minkovsky's norm. A comprehensively comparative study of the main characteristics of the support vector algorithm using various values of α parameter in norm's definition is presented. Special emphasis is laid on kernel machine accuracy evaluation and model complexity using Gaussian kernels. Experimental results are given concerning a real application dealing with classification of part defects in an injection molding machine for plastics industry. Also, future research directions are outlined. Keywords: Kernel learning, Support Vector Machines, Fault Detection.

[his02:Riverola] F. Fdez-Riverola and J.M. Corchado. An automated hybrid reasoning system for forecasting. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 31–41. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

> **Abstract:** A hybrid neuro-symbolic problem solving model is presented in which the aim is to forecast parameters of a complex and dynamic environment in an unsupervised way. In situations in which the rules that determine a system are unknown, the prediction of the parameter values that determine the characteristic behaviour of the system can be a problematic task. The proposed system employs a case-based reasoning model to wrap a growing cell structures network, a radial basis function network and a set of Sugeno fuzzy

models to provide an accurate prediction. Each of these techniques is used in a different stage of the reasoning cycle of the case-based reasoning system to retrieve, to adapt and to review the proposed solution to the problem. This system has been used to predict the red tides that appear in the coastal waters of the north west of the Iberian Peninsula. The results obtained from those experiments are presented.

[his02:Rodriguez] M.A. Rodríguez. A spatial dimension for searching the world wide web. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 583–592. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Few studies have explored spatial relations as they constrain the searching of documents in the World Wide Web (WWW). This paper presents the theoretical basis for a spatial searching of Web documents. It reviews spatial reasoning concepts associated with spatial relations and describes a model for organizing and deriving spatial relations based on a hierarchical structure of the space, that is, a conceptual model of the space in terms of connected regions. Using a study case, this work presents guidelines for how this model can be used for extending current searching techniques of Web documents to answer queries that are constrained by spatial relations.

[his02:Rumantir] G.W. Rumantir. Frequent flyer points calculator: More than just a table lookup. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 871–880. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Frequent flyer program is a popular promotional tool used by most major airlines in the world. The trend of airlines forming alliances with other airlines to expand their service-base means that the potential routes that one can take to get from one city to another have increased exponentially. Airline customers however are typically provided with a table which only shows the list of direct flights or flights with a transit point that can be booked using frequent flyer points. The online frequent flyer calculators available on the internet seem to basically work based on this incomplete table. To optimise the use of available frequent flyer points and to provide satisfactory automated customer service, a better frequent flyer points calculator which accesses the complete map of the available routes and the distance of each sector of a route needs to be built. This paper shows the use of standard graph algorithms to build such a frequent flyer points calculator.

[his02:Saegusa] R. Saegusa and S. Hashimoto. Nonlinear principal component analysis to preserve the order of principal components. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 54–63. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Principal component analysis (PCA) is an effective method of linear dimensional reduction. Because of its simplicity in theory and implementation, it is often used for analysis in various disciplines. However, because of its linearity, PCA is not always suitable, and has redundancy in expressing data. To overcome this problem, some methods of nonlinear PCA have been proposed. However, most of the methods have drawbacks, such that the number of principal components must be predetermined, and also the order of the generated principal components is not explicitly given. In this paper, we propose a hierarchical neural network model composed of a number

of multi-layered perceptrons to perform nonlinear PCA that preserves the order of the principal components. Moreover, our method does not need to know the number of the principal components in advance. The effectiveness of the proposed model will be shown through experiments.

[his02:Sanchis] E. Sanchis and M.J. Castro. Dialogue act connectionist detection in a spoken dialogue system. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 644–651. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: We present an approach to dialogue act detection within the framework of a domain-specific dialogue system. The task consists of answering telephone queries about train timetables, prices and services for long distance trains in Spanish. In this system, the representation of the meaning of the user utterances is made by means of "dialogue acts which determine the type of communication of the user turn, and by their associated "case-frames which supply the data of the utterance. We focus on the classification of a user turn given the utterance in a specific class of dialogue act by using multilayer perceptrons. This classification can help in the posterior processes of understanding and dialogue management. Results of experiments with the correct transcriptions of the user utterances (text data) and with the sequences of words obtained from the recognition process (speech data) are presented.

[his02:Sharma] D. Sharma. Unilr: An automated fuzzy legal reasoner. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 433–441. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Automating legal reasoning is an interesting problem in artificial intelligence. In this paper, the problem of deciding on student disciplinary cases is studied, the various characteristics of the problem are identified and a prototype rule-based expert system that uses fuzzy reasoning is developed for the problem. The main motivation for the work is to study the difficulties in automating legal reasoning so that a sound verdict is reached for a small but an intricate domain. Some results are presented and the experience gained from the project is discussed. Future work is discussed on strengthening the prototype to include a formal case specification and an interaction language, and its drawing (through automated clustering) and use of relevant information from a base of previous cases. The UniLR prototype has been successfully tested for sample data.

[his02:Shawkat] A.B.M. Shawkat Ali and A. Abraham. An empirical comparison of kernel selection for support vector machines. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 321–330. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Abstract. Support Vector Machine (SVM) has gained much attention as an efficient pattern recognition tool primarily between two classes problems by finding a decision surface determined by certain points of the learning set, termed Support Vector (SV). In this paper, we examine how to discriminate SVM for two class classification problems with different kernel settings. We also compare SVM with other three popular learning algorithms, namely Navie Bayes, C4.5 and neural network in terms of accuracy and computational complexity. Our studies reveal that SVM is the best choice for classification and SVM polynomial kernel is the best choice when compared to others.

[his02:Shekar] B. Shekar and R. Natarajan. A fuzzy relatedness measure for determining interestingness of association rules. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 95–104. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: In Knowledge Discovery in Databases (KDD)/ Data Mining literature, IinterestingnessI measures are used to rank rules according to the IinterestI a particular rule is expected to evoke in a user. In this paper, we introduce an aspect of interestingness called Iitem-relatednessI to determine interestingness of item-pairs occurring in association rules. In actuality, association rules that contain weakly-related item-pairs are the ones that are interesting. We elucidate and quantify three different types of item-relatedness. Relationships corresponding to item-relatedness proposed by us are shown to be captured by paths in a Ifuzzy taxonomyI (an extension of the concept hierarchy tree). We then combine these measures of item-relatedness to arrive at a total-relatedness measure. This total relatedness measure appropriately combines each aspect of relatedness-relationships among items. We finally demonstrate the efficacy of this total measure on a sample taxonomy. We analyse the results and explain intuitive correspondences between numerical results and reality.

[his02:Sinka] M.P. Sinka and D.W. Corne. Web and multimedia applications. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 881–890. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

[his02:Sugimoto] F. Sugimoto and M. Yoneyama. A trial method to create a natural interaction in interactive genetic algorithm. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 652–662. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: We have been developing a hybrid fitness assignment strategy to realize a natural interaction in IGA. The strategy allows a user to select some individuals and evaluate a grade that shows how the selected individual resembles a target image. In this paper, we will show a method to compose fitness when a user selects two individuals in the hybrid fitness assignment strategy. It is known that better performance is obtained when two individuals are selected in the generations limited with a condition. The condition is equivalent to the actual situation in which it is difficult for a user to select only one individual. The hybrid strategy is useful to realize a more natural interaction in the actual situation.

[his02:Sunayama] W. Sunayama and M. Yachida. Panoramic view system for extracting key sentences based on viewpoints and an application to a search engine. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 863–870. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Since there are many resources on the WWW, it has become natural for us to extract available information from them. We would like to see many documents in order to get useful information. Though summaries are useful pieces of documents, a document has various viewpoints to be summarized. Therefore, if a viewpoint of a summary is different from user's, a user cannot grasp the contents of the document correctly, and the user

has to see through the documents until the end. In this paper, we present a system which makes a summary based on a user's viewpoint by user's search keywords.

[his02:Torres] S. Torres and J. Pezoa. Scene-based nonuniformity correction method using the inverse covariance form of the kalman filter. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 715–724. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: A scene-based algorithm for nonuniformity correction (NUC) in focal-plane arrays (FPA) detectors has been developed. The NUC technique is based in the inverse covariance form (ICF) of the Kalman filter. The gain and the offset of each detector of the FPA are modeled by discrete-time Gauss-Markov processes. These parameters are taken as constant within a given sequence of frames, corresponding to a certain time and operational conditions, but they randomly drift from one sequence to another in response to new operational conditions. For each detector and each sequence of frames, the ICF filter input is an observation vector consisting of detector's read-out values. The output of ICF filter for any sequence of infrared frames is the detectors' gain and offset. The efficacy of the ICF of the Kalman filter to compensate for nonuniformity noise in infrared imagery is demonstrated using sequences of infrared imagery with both artificial nonuniformity and artificial drift in the detectors' parameters. It is shown that the ICF filter and the Kalman filter generate similar reductions of nonuniformity. However, the ICF filter compensates the noisy images with less number of operations per pixel and per frame than the Kalman filter.

[his02:Veenhuis] C. Veenhuis and M. Köppen. Document oriented modeling of cellular automata. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 309–320. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This paper proposes a document-oriented modeling concept for cellular> automata (CA), which supports the simple and rapid design of a huge variety of cellular automata. This modeling concept is realized as a domain-specific modeling language derived from XML (e**X**tensible **M**arkup **L**anguage). XML is in general considered as the future for internet documents and data exchange. The main concept behind XML is to separate the content of a document from its layout (its appearance). The presented modeling concept uses a document for describing a whole cellular automaton. Like the content of a document is separated from its layout, the abstract cellular automaton is separated from a concrete implementation and programming language. Everyone can create and use XSL(T) stylesheets for translating cellular-automaton-documents into ready to use source-code (covering the adequate cellular-automaton-functionality) as well as for documentation and exchange of the realised CA.

[his02:Velasquez] J.D. Velásquez, H. Yasuda, T. Aoki, and R. Weber. Voice codification using self organizing maps as data mining tool. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 480–489. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Voice transmission plays a crucial role in many applications such as e.g. telecommunications. An alternative to increase the efficiency of voice transmission is using a codification that permits compressing the signal to be

transmitted. Such a compression assumes data sets with basic forms, whose combination produce the voice signal. Generally this data set is organized around an array of data, known as codebook. The codebook is constructed by a vectorial quantization process, which consists of looking for what vectors are most representatives, within a set. Next a structure of data is created that stores the vectors, also known as centers. Then, given a codebook with the most representative basic forms, the problem is translated to take a piece of voice, look for its position and transmit it. Since the receiver will have the same structure of data the voice will be able to be synthesized. The problem consists in the search in the codebook, which can be expensive in terms of computation and other resources, which perform operation in real time, characteristic that in some services is fundamental, for example in telecommunication. In this work we present a new algorithm to construct and to cross codebooks by using a data mining tool such as self organizing maps over a database of humans voices. This algorithm produces a codebook structure within a relation of proximity between its elements, reducing the problem to a local search, which allows to decrease compression time and to reduce the rate of transmitted bits.

[his02:Vera] E. Vera, R. Reeves, and S. Torres. Adaptive bias compensation for non-uniformity correction on infrared focal plane array detectors. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 725–734. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: The non-uniform response in infrared focal plane array (IRFPA) detectors produces corrupted images with a fixed-pattern noise. In this paper we present a new adaptive scene-based non-uniformity correction (NUC) technique. The method simultaneously estimates detector's parameters and performs the non-uniformity compensation using a neural approach and a Kalman estimator in a frame by frame recursive basis. Each detector's output is connected to its own inverse model: a single 1-input linear neuron. The neuron bias is directly related to the detector's offset, and have the property of being softly adapted using simple learning rules, choosing a suitable error measure to fit the NUC objective. The proposed method has been tested with sequences of real infrared data taken with a InSb IRFPA, reaching high correction levels, reducing the fixed pattern noise, and obtaining an effective frame by frame adaptive estimation of each detector's offset.

[his02:Vishwanthan] S.V.N. Vishwanthan and M.N. Murty. Jigsawing : A method to create virtual examples in ocr data. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 690–696. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: In this theoretical note we propose the use of a suffix tree on square matrices for compact representation of a set of training patterns. We show how a test pattern can be generated by *jigsawing* various regions from different training patterns. This in turn leads us naturally to a compact data dependent representation of a test pattern which we call the *description tree*. We envisage the use of the description tree in a variety of applications including nearest neighbor classifiers, data dependent distance norms, kernel methods and syntactic pattern recognition. We provide statistical learning theory based arguments to show that our method generates valid virtual examples and hence will lead to better classification accuracy.

[his02:Walker] R.L. Walker. Simulating an information ecosystem within the www. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design,*

Management and Applications, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 891–900. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: The design focus of the Tocorime Apicu integrated search engine builds upon new approaches and techniques associated with evolutionary computation to improve the precision and recall mechanisms of existing information retrieval systems within popular search engines. The interactions of the four major components of engines are facilitated through the use of a hierarchical communication topology which partitions the nodes of a distributed computing system into subclusters. The hierarchical communication topology is based on an information ecosystem modeled upon and incorporating the social structure of honeybees—this providing mechanisms for the efficient sharing of information.

[his02:Wang] X. Wang and K.A. Smith. Clustering web user interests using self organising maps. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 843–852. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This paper presents an approach to clustering a Web userIs interests represented as text term maps using the unsupervised Neural Networks algorithm (Self Organising Map) from the records in the particular userIs history file. Self Organising Map is a good tool for clustering the text data set into a low-dimensional regular grid that can be visualised as maps labeled with text terms. In this research, an experiment was carried out to find the User Interests Term Map in which all associated terms could be grouped in the same cluster. The text terms based on the Web userIs interests could be applied to the intelligent Web query search in future work.

[his02:Wang2] X. Wang, A. Abraham, and K.A. Smith. Web traffic mining using a concurrent neuro-fuzzy approach. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 853–862. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Web servers play a crucial role to convey knowledge and information to the end users. With the popularity of the WWW, discovering the hidden information about the users and usage pattern is critical to determine effective marketing strategies and to optimise the server usage and accommodate future growth. Many of the currently available server analysis tools could provide only statistical data without much useful information. Mining useful information becomes a challenging task when the user traffic volume is enormous and keeps on growing. In this paper, we propose a concurrent neuro-fuzzy model to analyse useful information from the available statistical/text data from the Web log analyser. We made use of the cluster information generated by Self Organising Map (SOM) for data analysis and a Fuzzy Inference System (FIS) to forecast the daily and hourly traffic volume. Empirical results clearly demonstrate that the proposed hybrid technique is efficient and could be extended to other Web environments.

[his02:Weidl] G. Weidl, A. Madsen, and E. Dahlquist. Condition monitoring, root cause analysis and decision support on urgency of actions. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 221–230. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: We discuss the use of a hybrid system utilizing Object Oriented Bayesian networks and influence diagrams for probabilistic reasoning under uncertainties in industrial process operations. The Bayesian networks are used for condition monitoring and root cause analysis of process operation. The recommended decision sequence of corrective actions and observations is obtained following the ImyopicO approach. The BN inference on most probable root cause is used in an influence diagram for taking decisions on urgency of corrective actions vs. delivery deadline. The build-in chain of causality from root cause to process faults can provide the user with explanation facility and a simulation tool of the effect of intended actions.

[his02:Wiese] K.C. Wiese and E. Glen. A permutation based genetic algorithm for rna secondary structure prediction. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 173–182. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This paper presents a permutation based genetic algorithm (GA) to predict the secondary structure of RNA molecules. More specifically the proposed algorithm predicts which specific canonical base pairs will form hydrogen bonds and build helices, also known as stem loops. Since RNA is involved in both transcription and translation and also has catalytic and structural roles in the cell, knowing its structure is of fundamental importance since it will determine the function of the RNA molecule. We introduce a GA where a permutation is used to encode the secondary structure of RNA molecules. We discuss initial results on RNA sequences of lengths 76 and 785 nucleotides and present several improvements to the algorithm. We show that with a higher selection intensity through the Keep-Best Reproduction operator and 1-elitism the best results (i.e. the structures with the lowest free energy) are achieved.

[his02:Youssif] R.S. Youssif and C.N. Purdy. Combining genetic algorithms and neural networks to build a signal pattern classifier. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 735–744. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: In this paper we show how genetic algorithms and neural networks are combined to build a high performance Signal Pattern Classifier (GNSPC). Signal patterns are intrinsic to many sensor-based systems. The goal of GNSPC is to differentiate among large numbers of signal pattern classes with low classification cost and high classification performance. Classification performance is measured by the correct classification of noisy signal patterns despite using pure signal patterns for building the classifier. GNSPC is basically a decision tree classifier with similarity classification rules. The rules are used to test the similarity of signal patterns. A combination of a genetic algorithm and a neural network is used to find the best rules for the decision tree. This combination provides powerful classification capabilities with great tuning flexibility for either performance or cost-efficiency. Learning techniques are employed to set the genetic algorithm global parameters and to obtain training data for the neural network.

[his02:Zambetta] F. Zambetta and G. Catucci. Designing not-so-dull virtual dolls. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 513–518. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Intelligent virtual agents exhibiting autonomous behavior rather than mere reactions to users actions are going to become a major requirement for modern web sites. In this paper we present SAMIR, a system conceived to design intelligent agents with a 3D animated look as a front-end, to enhance the user interaction with the web applications itIs embedded into.

[his02:Zanni] C.H. Zanni, M. Le Goc, and C.S. Frydman. Towards a unique framework to describe and compare diagnosis approaches. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 231–240. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This paper introduces a unique framework to describe the different approaches to intelligent monitoring and diagnosis present in the literature. In first place, the state of the art in diagnosis is reviewed and then we propose a framework for analyzing the approaches presented so far, based on the KADS standard for development of knowledge based systems. In the end, we present our conclusions on the conceptual level of description of these systems, which lead us to state a general structure for them.

[his02:Zegers] P. Zegers and M.K. Sundareshan. Determining the degree of generalization using an incremental learning algorithm. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 261–270. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Any Learning Machine (LM) trained with examples poses the same problem: how to determine whether the LM has achieved an acceptable level of generalization or not. This work presents a training method that uses the data set in an incremental manner such that it is possible to determine when the behavior displayed by the LM during the learning stage truthfully represents its future behavior when confronted by unseen data samples. The method uses the set of samples in an efficient way, which allows discarding all those samples not really needed for the training process. The new training procedure, which will be called "Incremental Training Algorithm", is based on a theoretical result that is proven using recent developments in statistical learning theory. A key aspect of this analysis involves identification of three distinct stages through which the learning process normally proceeds, which in turn can be translated into a systematic procedure for determining the generalization level achieved during training. It must be emphasized that the presented algorithm is general and independent of the architecture of the LM and the specific training algorithm used. Hence it is applicable to a broad class of supervised learning problems and not restricted to the example presented in this work.

[his02:Zemke] S. Zemke. Ensembles in practice: Predication, estimation, multi-feature and noisy data. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 404–416. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: This paper addresses 4 practical ensemble applications: time series prediction, estimating accuracy, dealing with multiple feature and noisy data. The intent is to refer a practitioner to ensemble solutions exploiting the specificity of the application area.

[his02:Ziarko] W. Ziarko. Set approximation quality measures in the variable precision rough set model. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and

Applications Vol. 87, pages 442–452. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: The article introduces the basic notions of the variable precision rough set model (VPRS) including the parametric definitions of lower approximation, boundary and negative regions of a set. The main focus of the article is on the evaluation of the resulting set approximations and probabilistic decision tables using a number of proposed probabilistic measures. The application of the measures to evaluation of probabilistic decision tables is illustrated with a comprehensive example.

[his02:book] Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors. *Soft Computing Systems - Design, Management and Applications*, volume 87 of *Frontiers in Artificial Intelligence and Applications*. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Hybridization of intelligent systems is a promising research field of modern artificial/computational intelligence concerned with the development of the next generation of intelligent systems. A fundamental stimulus to the investigations of Hybrid Intelligent Systems (HIS) is the awareness in the academic communities that combined approaches will be necessary if the remaining tough problems in artificial/computational intelligence are to be solved. Recently, hybrid intelligent systems are getting popular due to their capabilities in handling several real world complexities involving imprecision, uncertainty and vagueness. Current research interests in this field focus on integration of the different soft computing paradigms like fuzzy logic, neurocomputation, evolutionary computation, probabilistic computing and their interactions with hard computing techniques, intelligent agents, machine learning, other intelligent computing frameworks and so on. The phenomenal growth of hybrid intelligent systems and related topics has created the need for this International conference as a venue to present the latest research. HIS'02 builds on the success of last year's.

[his02Plenary:Baets] Bernard de Baets. Fuzzy set theory - a playground for mathematicians. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, page 4. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: When Zadeh first introduced the notion of a fuzzy set, it was laughed away by the ruling caste of 'serious' mathematicians and logicians. Driven by ignorance, the main reason for it was probably strategic: as fuzzy set theory touches upon the very building block of mathematics, it might be better to deny it than to risk being taken out of business. Even the ample practical realizations had no effect on them. Unfortunately, the fuzzy mathematics community has offered plenty of stones to be thrown at them. One by one, the core mathematical theories were subjected to fuzzification: topology, algebra, analysis, etc. The literature has witnessed various waves of these activities, not in the least the 'replace min by a triangular norm' wave. The majority of these works are sheer mathematical exercises and have no reason to appeal to the established mathematical community. Indeed, instead of trying to generalize things on a micro-level, the potential interest of fuzzy set theory lies on the macro-level, offering a global view and additional insight into existing mathematical theories. Fortunately, more and more works of this kind are appearing, and are, finally, attracting the interest of non-fuzzy mathematicians. A nice work of the latter kind is the far-reaching monograph "Metamathematics of fuzzy logic"by Hajek on fuzzy logic

in "narrow sense making its way into the established community of many-valued logicians. Another example is the book "Triangular norms"of Klement, Mesiar and Pap, dealing with the omnipresent concept of a triangular norm, originating from the theory of probabilistic metric spaces, but elegantly further explored by this trio of fine 'fuzzy' mathematicians. The purpose of this lecture is not to bore the listeners with a historic account of the contributions that fuzzy set theorists did make to the development of mathematics, but to offer the audience a digestible selection of mathematical appetizers illustrating what fuzzy set theory has to offer. One thing is clear: it takes a multi-skilled mathematician to succeed. Without the purpose of being pretentious, the author will discuss a number of developments he was privileged to be involved in. Possible topics include uninorms (ranging from semi-group aspects to applications in expert systems), fuzzy preference structures (ranging from functional equations to applications in decision support systems) and similarity measures (ranging from inequalities in quantum-mechanics to applications in numerical taxonomy).

[his02Plenary:Dote] Yasuhiko Dote. Neuro-fuzzy control. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, pages 9–10. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: In 1987, fuzzy control was successfully applied in industrial plants in Japan. In the late eighties, neuro-control was used for robot arms including the robot arm of the space shuttle, chemical processes, continuous production of high- quality parts, and aerospace applications) in the U.S.A.. In 1991, the BISC (Berkley Initiative in Soft Computing) was established as an ILP (industrial liaison program), with Dr. Zadeh, as its director. Since the establishment of BISC, researchers through the world have been studying soft computing, i.e., the fusion of fuzzy logic (FL), neural networks (NN), and evolutionary computation (EC). The term computational intelligence as defined by Dr. L. A. Zadeh, is the combination of soft computing and numerical processing. First this term was used in 1990 by the IEEE Neural Networks Council. Three IEEE International Workshop on Soft Computing in Industry has been held in Muroran, Japan in 1993, 1996, and 1999, with Dr. Zadeh as plenary speaker each time . The first workshop put emphasis on the fusion of neural networks and fuzzy logic. In the second workshop, evolutionary computation ,chaotic computing, and immune networks were discussed. The third workshop focused on cognitive distributed artificial intelligence (human-like information processing and reactive distributed artificial intelligence (bioinformatic information processing) . The IEEE international workshops on applications of industries were held in Finland and the U.S.A. in 1999 and 2001, respectively. The 1st trough 5th On-line World Conference on Soft Computing in Industrial Applications were held every year. State-of ?the-art industrial applications were presented at those conferences. There were a large number of application papers of soft computing in the related IEEE Transactions and other related journals for the past ten years. Soft Computing (SC) is an evolving collection of methodologies, which aims to exploit tolerance for imprecision, uncertainty, and partial truth to achieve robustness, tractability, and low total cost. Therefore, soft computing provides an attractive opportunity to represent the ambiguity in human thinking with real life uncertainty. Fuzzy Logic (FL), Neural Networks (NN), and Evolutionary Computation (EC) are the core methodologies of soft computing. However, FL, NN, and EC should not be viewed as competing with each other, but synergistic and complementary instead. Soft computing (SC) has been theoretically developed for the past decade, since Dr. L. A. Zadeh proposed the concept in the early 1990s. Later, chaos computing and immune networks were

added to explain so-called complex systems, cognitive distributed artificial intelligence, and reactive distributed artificial intelligence. . Evolutionary computation has been developed and modified for application to optimization for large-scale and complex systems. Data mining technology, which has been developed since the late 80s using heterogeneous technologies, including soft computing methods based on pattern recognition techniques, has been recently used for interpreting and understanding important associations for large-scale and complex systems hidden in large database The term intelligence has been frequently used by Dr. Zadeh's human like information processing(cognitive artificial intelligence) and by Dr. Fogel's bioinformatic information processing(reactive artificial intelligence): i.e. intelligent behavior is able to result from an ability to predict the environment coupled with the selection of an algorithm that permits the translation of each prediction into a suitable response. Intelligent information processing is considered to be emergent, self-organizing (adaptive) and interactive among human beings, environment and artificial objects with an advanced learning method using a combination of perception and motion. Soft computing plays an important role in intelligent information processing. Soft computing is causing a paradigm shift (breakthrough) in engineering and science fields since soft computing can solve problems that have not been able to be solved by traditional analytic methods(tractability). In addition , SC yields rich knowledge representation (symbol and pattern), flexible knowledge acquisition (by machine learning from data and by interviewing experts), and flexible knowledge processing (inference by interfacing between symbolic and pattern knowledge), which enable intelligent systems to be constructed at low cost(high machine IQ and low cost). Tractability, high machine IQ and low cost enable industrial systems to be innovative. Soft computing is considered to create new computational capabilities combining or fusing each soft computing methodology (hybrid system). This talk starts with the history of neuro-fuzzy control. Then, I will present the features of neuro-fuzzy hybrid systems. Lastly, I will introduce our developed novel fast and accurate fuzzy neural network for control and diagnosis of nonlinear dynamic systems using general parameter learning and adaptation.

[his02Plenary:Kacprzyk] Janusz Kacprzyk and Sawomir Zadrony. Protoforms of linguistic data summaries : Towards more general natural-language-based data minig tools. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, page 7. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: We advocate the use of linguistic data summaries, exemplified by ¨most employees are young and well paid¨, for a personnel database, as an intuitive and human consistent tool for data mining. We present an interactive approach, based on fuzzy logic and fuzzy database queries, which makes it possible to implement such summaries. We show how fuzzy queries are related to linguistic summaries, and show that one can introduce a hierarchy of prototype forms (proto forms), or abstract summaries in the sense of latest Zadeh's ideas meant mainly for increasing deduction capabilities of search engines. For illustration we show an implementation for a sales database in a computer retailer, employing some type of a proto form of a linguistic summary. (see also paper in this book)

[his02Plenary:Khatib] Oussama Khatib. Robots for the human and haptic interaction. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, page 5. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: A new field of robotics is emerging. Robots are today moving towards applications beyond the structured environment of a manufacturing plant. They are making their way into the everyday world that people inhabit. The successful introduction of robotics into human environments will rely on the development of competent and practical systems that are dependable, safe, and easy to use. The discussion focuses on models, strategies, and algorithms associated with the autonomous behaviours needed for robots to work, assist, and cooperate with humans. In addition to the new capabilities they bring to the physical robot, these models and algorithms and more generally the body of developments in robotics is having a significant impact on the virtual world. Haptic interaction with an accurate dynamic simulation provides unique insights into the real-world behaviors of physical systems. The potential applications of this emerging technology include virtual prototyping, animation, surgery, robotics, cooperative design, and education among many others. Haptics is one area where the computational requirement associated with the resolution in real-time of the dynamics and contact forces of the virtual environment is particularly challenging. The presentation describes various methodologies and algorithms that address the computational challenges associated with interactive simulations involving multiple contacts and impacts with complex human-like structures.

[his02Plenary:Langdon] William B. Langdon. A hybrid genetic programming neural network classifier for use in drug discovery. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, page 6. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: We have shown genetic programming (GP) can automatically fuse given classifiers of diverse types to produce a hybrid classifier. Combinations of neural networks, decision trees and Bayes classifier shave been formed. On a range of benchmarks the evolved multiple classifier system is better than all of its components. Indeed its Receiver Operating Characteristics (ROC) are better than [Scott et al., 1998]s "Maximum Realisable Receiver Operating Characteristics"MRROC (convex hull) An important component in the drug discovery is testing potential drugs for activity with P450 cell membrane molecules. Our technique has been used in a blind trial where artificial neural networks are trained by Clementine on P450 pharmaceutical data. Using just the trained networks, GP automatically evolves a composite classifier. Recent experiments with boosting the networks will be compared with genetic programming.

[his02Plenary:Letelier] Juan Carlos Letelier, Gonzalo Martin, Jorge Mpodozis, and Jorge Soto Andrade. Anticipatory computing with autopoietic and (m r)systems. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, page 11. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: From the many attempts to produce a conceptual framework for the organization of living systems, the notions of (M R) systems and Autopoiesis stand out for their rigor, their presupposition of the circularity of metabolism, and the new epistemologies that they imply. From their inceptions, these two notions have been essentially disconnected because each has defined its own language and tools. Here we demonstrate the existence of a deep conceptual link between (M R) systems and Autopoietic systems. This relationship permits us to posit that Autopoietic systems, which have been advanced as capturing the central aspects of living systems,

are a subset of (M,R) systems. This result, in conjunction with previous theorems proved by Rosen, can be used to outline a demonstration that the operation of Autopoietic systems cannot be simulated by Turing machines. This demonstration is rather delicate as it involves four different aspects: a) ẗhe central theorem of Rosen̈involving the stability of metabolic networks with circular organization, b) the use of the theory of Categories to model systems with circular organization, c) a preliminary proof that such systems can not be computable ä la Turingänd d) an identification between Autopoietic and (M R) systems. This work will analyze with detail the mathematics behind Rosen central theorem as well as the implications for computing of the intrinsic anticipatory behavior of Autopoietic systems. The unfamiliar computing aspects of Autopoietic system arise from the internal reference frame of the controller. The control is done by the logic of the maintenance of circular organization in the presence of structural coupling. (see also paper in this book)

[his02Plenary:Oja] Erkki Oja. Independent component analisys. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, page 3. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Independent Component Analysis (ICA) is a computational technique for revealing hidden factors that underlie sets of measurements or signals. ICA assumes a statistical model whereby the observed multivariate data, typically given as a large database of samples, are assumed to be linear or nonlinear mixtures of some unknown latent variables. The mixing coefficients are also unknown. The latent variables are non gaussian and mutually independent, and they are called the independent components of the observed data. By ICA, these independent components, also called sources or factors, can be found. Thus ICA can be seen as an extension to Principal Component Analysis and Factor Analysis. ICA is a much richer technique, however, capable of finding the sources when these classical methods fail completely. In many cases, the measurements are given as a set of parallel signals or time series. Typical examples are mixtures of simultaneous sounds or human voices that have been picked up by several microphones, brain signal measurements from multiple EEG sensors, several radio signals arriving at a portable phone, or multiple parallel time series obtained from some industrial process. The term blind source separation is used to characterize this problem. The lecture will first cover the basic idea of demixing in the case of a linear mixing model and then take a look at the recent nonlinear demixing approaches. Although ICA was originally developed for digital signal processing applications, it has recently been found that it may be a powerful tool for analyzing text document data as well, if the documents are presented in a suitable numerical form. A case study on analyzing dynamically evolving text is covered in the talk.

[his02Plenary:Sung] Andrew H. Sung. Role of soft computing in internet security. In Ajith Abraham, Javier Ruiz-del-Solar, and Mario Köppen, editors, *Soft Computing Systems - Design, Management and Applications*, Frontiers in Artificial Intelligence and Applications Vol. 87, page 8. IOS Press Amsterdam, Berlin, Oxford, Tokyo, Washington D.C., 2002.

Abstract: Information security (INFOSEC) is an issue of global concern. As the Internet is bringing great convenience and benefits to the modern society, the rapidly increasing connectivity and accessibility to the Internet is also posing a serious threat to security and privacy, to individuals, organizations, and nations alike. Finding effective ways to detect, prevent, and respond to intrusions and hacker attacks of networked computers

and information systems, therefore, has become a timely research topic. In this talk, I will present the application of soft computing methods in information security. Since intrusions and malicious attacks are commonly detected by inspecting the system audit data, soft computing methods can be utilized in various ways for analyzing, organizing, and mining the tremendous amount of audit data generated by computer systems. I will also describe several of our ongoing INFOSEC research projects that use soft computing methods: intrusion detection using Support Vector Machines(SVMs); feature ranking and selection for intrusion detection; and steganalysis (stegonagraphy detection). Our research demonstrates the soft computing paradigms tremendous potential for problem solving in information security, e.g., SVMs are ideal learning machines for intrusion detection, and neural networks and fuzzy systems have various applications in INFOSEC problems as well.