# 4th International Workshop on Enterprise Information Systems – PRIS 2004

## April 13-14, 2004 – Porto, Portugal

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## Final Program

Sessions:

| | April 13 | | April 14 |
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| | | | |
| 8:00 | Welcome Desk | | |
| 8:45 | Opening | | |
| 9:00 | **Invited Talk - Joachim Buhmann - Clustering in Computer Vision and Data Analysis** | 9:00 | **Invited Talk - John Oommen - Recent Results on Learning from Stochastic Teachers and Compulsive Liars/Con-Men** |
| | **Computer Vision** | | **Learning** |
| 10:00 | 1203 - Introduction of Homeostatic Regulation in Face Detection | 10:00 | 864 - Unsupervised Learning of a Finite Discrete Mixture Model Based on the Multinomial Dirichlet Distribution: Application to Texture Modeling |
| 10:25 | 1110 - Camera Control for a Distant Lecture Based on Estimation of a Teacher's Behavior | 10:25 | 1168 - Learning Text Extraction Rules without Ignoring Stop Words |
| 10:50 | Coffee-Break | 10:50 | Coffee – Break |
| | **Classification and Combination of Classifiers** | | **Decision Trees and Pattern Analysis** |
| 11:10 | 1016 - A Meta-Learning Approach to Improve Progressive Sampling | 11:10 | 954 - Behavior of Consolidated Trees when using Resampling Techniques |
| 11:35 | 1181 - A fusion Methodology for Recognition of off-line Signatures | 11:35 | 1048 - Learning in Dynamic Environments: Decision Trees for Data Streams |
| 12:00 | 1146 - AHP-Based Classifier Combination | 12:00 | 1041 - An Online Ensemble of Classifiers |
| 12:25 | 784 - On Designing Pattern Classifiers Using Artificially Created Bootstrap Samples | 12:25 | 1083 - Similarity Range Queries in Streaming Time Series |
| 12:50 | Lunch | 12:50 | Lunch |
| 14:30 | **Invited Talk - Jake Aggarwal - Content-based Image Retrieval in Digital Image Databases using Structure, Color and Texture** | | **Feature Generation and Selection** |
| | **Pattern Recognition** | 14:30 | 848 - A Pitfall in Determining the Optimal Feature Subset Size |

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| 15:30 | 1195 - Character Rotation Absorption Using a Dynamic Neural Network Topology: Comparison With Invariant Features | 14:55 | 1097 - Features Generation and Stochastic Geometry |
| 15:55 | 1161 - Pattern recognition algorithms for polyphonic music transcription | 15:20 | Posters |
| 16:20 | Coffee-Break | 16:30 | Closing |
| | **Document Analysis** | | |
| 16:40 | 1226 - Ancient Document Recognition using Fuzzy Methods | | |
| 17:05 | 1175 - Effect of Feature Smoothing Methods in Text Classification Tasks | | |
| 19:00 | Visit to a Wine Cellar (Caves Taylor) followed by workshop's dinner | | |

Detailed Program:

# April, 13 2004

| Time | Event |
|---|---|
| 8:00 | Welcome Desk opens |
| 8:45 | Opening Session |
| 9:00 | Keynote Speech by **Joachim Buhmann**<br><br>Clustering in Computer Vision and Data Analysis |
| 10:00-10:50 | Paper Session I – Computer Vision<br><br>10:00 Introduction of Homeostatic Regulation in Face Detection<br>*J. Lorenzo, M. Castrillón, M. Hernández and O. Déniz*<br>10:25 Camera Control for a Distant Lecture Based on Estimation of a Teacher's Behavior<br>*A. Shimada, A. Suganuma, and R. Taniguchi* |
| 10:50-11:10 | Coffee-Break |

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| 11:10-12:50 | Paper Session II – Classification and Combination of Classifiers<br><br>11:10  A Meta-Learning Approach to Improve Progressive Sampling<br>*Rui Leite and Pavel Brazdil*<br>11:35  A fusion Methodology for Recognition of off-line Signatures<br>*Muhammad Arif, Thierry Brouard and Nicole Vincent*<br>12:00  AHP-Based Classifier Combination<br>*László Felföldi and András Kocsor*<br>12:25  On Designing Pattern Classifiers Using Artificially Created Bootstrap Samples<br>*Qun Wang and B. John Oommen* |
| 12:50-14:30 | Lunch |
| 14:30-15:30 | Keynote Speech by **Jake Aggarwal**<br><br>Content-based Image Retrieval in Digital Image Databases using Structure, Color and Texture |
| 15:30-16:20 | Paper Session III – Pattern Recognition<br><br>15:30  Character Rotation Absorption Using a Dynamic Neural Network Topology: Comparison With Invariant Features<br>*Christophe Choisy, Hubert Cecotti and Abdel Bela*<br>15:55  Pattern recognition algorithms for polyphonic music transcription<br>*Antonio Pertusa and José M. Iñesta* |
| 16:20-16:40 | Coffee-Break |
| 16:40-17:55 | Paper Session IV – Document Analysis<br><br>16:40  Ancient Document Recognition using Fuzzy Methods<br>*Cláudia Ribeiro, João Gil, J. Caldas Pinto and João Sousa*<br>17:05  Effect of Feature Smoothing Methods in Text Classification Tasks<br>*David Vilar, Hermann Ney, Alfons Juan and Enrique Vidal* |
| 19:00 | Visit to a Wine Cellar (Caves Taylor) followed by workshop's dinner |

## April, 14 2004

| Time | Event |
|---|---|
| 9:00 | **Keynote Speech by John Oommen**<br><br>Recent Results on Learning from Stochastic Teachers and Compulsive Liars/Con-Men |
| 10:00-10:50 | Paper Session V – Learning<br><br>10:00   Unsupervised Learning of a Finite Discrete Mixture Model Based on the Multinomial Dirichlet Distribution: Application to Texture Modeling<br>*Nizar Bouguila and Djemel Ziou*<br>10:25   Learning Text Extraction Rules without Ignoring Stop Words<br>*João Cordeiro and Pavel Brazdil* |
| 10:50-11:10 | Coffee-Break |
| 11:10-12:50 | Paper Session VI – Decision Trees and Pattern Analysis<br><br>11:10   Behavior of Consolidated Trees when using Resampling Techniques<br>*J. Pérez, J. Muguerza, O. Arbelaitz, I. Gurrutxaga and J. Martin*<br>11:35   Learning in Dynamic Environments: Decision Trees for Data Streams<br>*João Gama and Pedro Medas*<br>12:00   An Online Ensemble of Classifiers<br>*S. B. Kotsiantis, P. E. Pintelas*<br>12:25   Similarity Range Queries in Streaming Time Series<br>*Maria Kontaki, Apostolos N. Papadopoulos, Yannis Manolopoulos* |
| 12:50-14:30 | Lunch |
| 14:30-15:20 | Paper Session VII – Feature Generation and Selection<br><br>14:30   A Pitfall in Determining the Optimal Feature Subset Size<br>*Juha Reunanen*<br>14:55   Features Generation and Stochastic Geometry<br>*Nikolay G. Fedotov, Luydmila A. Shul'ga and Alexander V. Moiseev* |
| 15:20-16:30 | Poster Session<br><br>Neural Network Learning: Testing Bounds on Sample Complexity<br>*Joaquim Marques de Sá, Fernando Sereno and Luís Alexandre* |

| | Application of Fractal Codes in Recognition of Isolated Handwritten Farsi/Arabic Characters and Numerals<br>*Saeed Mozaffari, Karim Faez and Hamidreza R. Kanan*<br><br>Ancient Word Indexing Using Fuzzy Methods<br>*Cláudia Ribeiro, João Gil, J. Caldas Pinto and João Sousa*<br><br>A New Approach for Geological Faults Detection<br>*A. Cepero Díaz, V.Di Gèsu and C. Valenti*<br><br>Comparison of Combination Methods using Spectral Clustering Ensembles<br>*André Lourenço and Ana Fred*<br><br>Dynamic Feature Space Selection in Relevance Feedback Using Support Vector Machines<br>*Fang Qian, Mingjing Li, Lei Zhang, Hongjiang Zhang, and Bo Zhang* |
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| 16:30 | Closing |

## Abstracts of Invited Talks:

## Clustering in Computer Vision and Data Analysis
### *Joachim Buhmann*

Image segmentation is often defined as a partition of pixels or image blocks into homogeneous groups. These groups are characterized by a prototypical vector in feature space, e.g., the space of Gabor filter responses, by a prototypical histograms of features or by pairwise dissimilarities between image blocks. For all three data formats cost functions have been proposed to measure distortion and, thereby, to encode the quality of a partition.

Robust algorithms for image processing are designed according to the following three steps: First, structure in images has to be defined as a statistical model. Second, an efficient optimization procedure to find good structures has to be determined. I advocate stochastic optimization methods like simulated annealing or deterministic variants of it which maximize the entropy while maintaining the approximation accuracy of the structure measure. Other optimization algorithms like interior point methods or continuation methods are

equally suitable. Third, a validation procedure has to test the noise sensitivity of the discovered image structures. This strategy is demonstrated in the context of image analysis based on color and texture features as well as for grouping gene expression data.

I will discuss a parametric distributional clustering model which represents the distribution of color and texture features as a mixture model. This model is closely related to rate distortion theory with side information also known as the information bottleneck method. A two part coding scheme allows us to design agglomerative clustering methods for remote sensing with smooth boundaries.

## Content-based Image Retrieval in Digital Image Databases using Structure, Color and Texture
*Jake Aggarwal*

The field of computing has changed significantly in the last decade. A major factor for this change is the evolution of the computing technology itself. Advances in signal processing hardware, powerful image rendering mechanisms, and high bandwidth communication facilities, have spurred an increased interest in various kinds of database management systems for non-textual information. These include multimedia, spatial and object oriented databases, and the inter-linkage of database management and artificial intelligence techniques.

Interest in digital images, in particular, has increased enormously over the last few years, motivated at least in part by the rapid growth of imaging on the World-Wide Web (Eakins and Graham, 1999). A picture is worth a 1,000 words, says the old adage. Modern data systems, in areas ranging from surveillance, space exploration and medical imaging, accrue and store massive numbers of images for future use. The accumulated images, however significant, are of little value if they cannot be quickly retrieved. Digital image databases typically have been organized with human-assigned textual labels, a time-consuming and labor intensive process. Content-based image retrieval (CBIR), a technique for retrieving images on the basis of automatically-derived features such as color, texture and shape, is becoming increasingly important in visual information management systems (VIMS). Content-based retrieval analyzes image features to automatically identify image content, and hence can provide a more accurate and efficient basis for image query systems.

Management of images within a large database is an important and emerging area of research. The computer vision community has focused on the design of image database management systems (IDMS). Efficient use of VIMS requires techniques that are quite different from conventional textual database management systems (Jain and Gupta, 1996). Work in this direction is still in development, and general solutions to key problems relating to regions of interest, segmentation, and retrieval are still being sought.

Color and texture are two of the features that have traditionally been used to approach this challenging problem. At The University of Texas at Austin, we have found that image structure, derived by perceptual grouping, is a valuable tool in our quest for more efficient content-based image retrieval (Iqbal and Aggarwal, 2002c; Iqbal and Aggarwal, 2002b). This presentation highlights the use of structure, derived via perceptual grouping, for image classification and retrieval. Our use of structure does not require image segmentation.

A hands-on comparison of results using color, texture and structure to retrieve images containing both natural and manmade objects will demonstrate that collectively structure, color and texture form an excellent feature set for image retrieval (Iqbal and Aggarwal, 2002a). Our system CIRES: Content-based Image Retrieval System, available on the web (CIRES), retrieves images ranging from scenes of purely natural objects such as vegetation, water and sky, to images containing conspicuous manmade structures like towers, buildings and bridges. In addition, it incorporates the use of multiple query images, and relevance feedback from the user to further refine the search (Iqbal and Aggarwal, 2003).

Future work includes developing methodologies for efficient indexing structures that will provide optimal resolution of similarity queries. Image and video searches typically involve high-dimensional feature spaces. For rapid retrieval it is not feasible to perform a linear search on a very large image collection. For this purpose we are developing methodologies to accelerate indexing and retrieval by using database management techniques, including analyzing hierarchical access methods using tree-type structures for feature representation. This will help in constructing an effective data structure for multimedia data repositories that facilitates efficient queries on complex objects. Future uses of our system in surveillance and video summarization will also be discussed.

## Recent Results on Learning from Stochastic Teachers and Compulsive Liars/Con-Men
### *John Oommen*

In this talk we will present some recent results on how learning can be achieved from systems whose stochastic identities are unknown.

Typically, all of the research that has been done in learning, has involved learning from a Teacher who is either deterministic or stochastic. In this talk, we shall present new results of how a learning mechanism can learn while interacting with either a stochastic teacher or a stochastic compulsive liar/con-man. In the first instance, the teacher intends to teach the learning mechanism. In the second, the compulsive liar/con-man intends to consciously mislead the learning mechanism. We shall present some new results in this vein, including a formal strategy for the mechanism to perform e-optimal learning

without it knowing the identity of the "person" it is interacting with. The talk will give an overview of some recent results including the results with Raghunath and  Kuipers.

Believe It Or Not - IT WORKS !