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### SUBJEK : MACHINE (12 Judul)

Ozgur Kisi, Mesut Cimen, A wavelet-support vector machine conjunction model for monthly streamflow forecasting,

*Journal of Hydrology*, In Press, Corrected Proof, Available online 4 January 2011, ISSN 0022-1694, DOI: 10.1016/j.jhydrol.2010.12.041.

(<http://www.sciencedirect.com/science/article/B6V6C-51W05CK-1/2/3d64f08b9ec9b5109b429d4419baa8cd>)

#### **Abstract: Summary**

The study investigates the accuracy of wavelet and support vector machine conjunction model in monthly streamflow forecasting. The conjunction method is obtained by combining two methods, discrete wavelet transform and support vector machine, and compared with the single support vector machine. Monthly flow data from two stations, Gerdelli Station on Canakdere River and Isakoy Station on Goksudere River, in Eastern Black Sea region of Turkey are used in the study. The root mean square error (RMSE), mean absolute error (MAE) and correlation coefficient (R) statistics are used for the comparing criteria. The comparison of results reveals that the conjunction model could increase the forecast accuracy of the support vector machine model in monthly streamflow forecasting. For the Gerdelli and Isakoy stations, it is found that the conjunction models with RMSE = 13.9 m<sup>3</sup>/s, MAE = 8.14 m<sup>3</sup>/s, R = 0.700 and RMSE = 8.43 m<sup>3</sup>/s, MAE = 5.62 m<sup>3</sup>/s, R = 0.768 in test period is superior in forecasting monthly streamflows than the most accurate support vector regression models with RMSE = 15.7 m<sup>3</sup>/s, MAE = 10 m<sup>3</sup>/s, R = 0.590 and RMSE = 11.6 m<sup>3</sup>/s, MAE = 7.74 m<sup>3</sup>/s, R = 0.525, respectively.

Keywords: Monthly streamflows; Discrete wavelet transform; Support vector machine; Forecast

S. Nashat, A. Abdullah, S. Aramvith, M.Z. Abdullah, Support vector machine approach to real-time inspection of biscuits on moving conveyor belt,

*Computers and Electronics in Agriculture*, Volume 75, Issue 1, January 2011, Pages 147-158, ISSN 0168-1699, DOI: 10.1016/j.compag.2010.10.010.

(<http://www.sciencedirect.com/science/article/B6T5M-51FWRDM-2/2/9cf1ab334b1dfc0db92fd9c20125a17d>)

#### **Abstract:**

An intelligent system for colour inspection of biscuit products is proposed. In this system, the state-of-the-art classification techniques based on Support Vector Machines (SVM) and Wilk's [ $\lambda$ ] analysis were used to classify biscuits into one of four distinct groups: under-baked, moderately baked, over-baked, and substantially over-baked. The accuracy of the system was compared with standard discriminant analysis using both direct and multi-step classifications. It was discovered that the radial basis SVM after Wilk's [ $\lambda$ ] was more precise in classification compared to other classifiers. Real-time implementation was achieved by means of multi-core processor

with advanced multiple-buffering and multithreading algorithms. The system resulted in correct classification rate of more than 96% for stationary and moving biscuits at 9 m/min. It was discovered that touching and non-touching biscuits did not significantly interfere with accurate assessment of baking. However, image processing of touching biscuits was considerably slower compared to non-touching biscuits, averaging at 36.3 ms and 9.0 ms, respectively. The decrease in speed was due to the complexity of the watershed-based algorithm used to segment touching biscuits. This image computing platform can potentially support the requirements of the high-volume biscuit production. Keywords: Biscuit; Discriminant analysis; Machine vision; Multi-core processor; Image segmentation; Support vector machine

Hongfei Lu, Hong Zheng, Ya Hu, Heqiang Lou, Xuecheng Kong, Bruise detection on red bayberry (*Myrica rubra* Sieb. & Zucc.) using fractal analysis and support vector machine,

*Journal of Food Engineering*, Volume 104, Issue 1, May 2011, Pages 149-153, ISSN 0260-8774, DOI: 10.1016/j.jfoodeng.2010.12.007.

(<http://www.sciencedirect.com/science/article/B6T8J-51NG4B0-6/2/9e8171b704b4f4038e58203d3f149d0a>)

**Abstract:**

A new method to sort red bayberries based on the presence of bruises was proposed. Principal component-support vector machine (PC-SVM) and support vector machine (SVM) models combined with fractal analysis were developed and compared with classification models based on RGB intensity values. The results of this study show the classification models based on fractal parameters achieved 100% total accuracy rate, but the models based on RGB values was only 85.29%. In addition, the performance of the SVM model in terms of iteration time and the number of support vectors was better than the PC-SVM model. Therefore, the SVM model based on fractal analysis is recommended for detecting bruises on red bayberries.

Keywords: Bayberry; Bruises; Classification; Fractal analysis; PCA; Support vector machine

Alfonso F. Torres, Wynn R. Walker, Mac McKee, Forecasting daily potential evapotranspiration using machine learning and limited climatic data,

*Agricultural Water Management*, Volume 98, Issue 4, February 2011, Pages 553-562, ISSN 0378-3774, DOI: 10.1016/j.agwat.2010.10.012.

(<http://www.sciencedirect.com/science/article/B6T3X-51PRHJ1-1/2/9c1ca3839c9bc077c1e026c7b2005287>)

**Abstract:**

Anticipating, or forecasting near-term irrigation demands is a requirement for improved management of conveyance and delivery systems. The most important component of a forecasting regime for irrigation is a simple, yet reliable, approach for forecasting crop water demands, which in this paper is represented by the reference or potential evapotranspiration (ET<sub>o</sub>). In most cases, weather data in the area is limited to a reduced number of variables measured, therefore current or future ET<sub>o</sub> estimation is restricted. This paper summarizes the results of testing of two proposed forecasting ET<sub>o</sub> schemes under the mentioned conditions. The first or 'direct' approach involved

forecasting ETo using historically computed ETo values. The second or 'indirect' approach involved forecasting the required weather parameters for the ETo calculation based on historical data and then computing ETo. An statistical machine learning algorithm, the Multivariate Relevance Vector Machine (MVRVM) is applied to both of the forecastings schemes. The general ETo model used is the 1985 Hargreaves Equation which requires only minimum and maximum daily air temperatures and is thus well suited to regions lacking more comprehensive climatic data. The utility and practicality of the forecasting methodology is demonstrated with an application to an irrigation project in Central Utah. To determine the advantage and suitability of the applied algorithm, another learning machine, the Multilayer Perceptron (MLP), is used for comparison purposes. The robustness and stability of the proposed schemes are tested by the application of the bootstrap analysis.

Keywords: Evapotranspiration; Forecasting; Hargreaves ETo equation; Irrigation; Canal systems; Water management; Machine learning

Heesung Yoon, Seong-Chun Jun, Yunjung Hyun, Gwang-Ok Bae, Kang-Kun Lee, A comparative study of artificial neural networks and support vector machines for predicting groundwater levels in a coastal aquifer, *Journal of Hydrology*, Volume 396, Issues 1-2, 5 January 2011, Pages 128-138, ISSN 0022-1694, DOI: 10.1016/j.jhydrol.2010.11.002.

(<http://www.sciencedirect.com/science/article/B6V6C-51FGT88-1/2/270ee74bc6873a93c5edc438df304ab2>)

**Abstract: Summary**

We have developed two nonlinear time-series models for predicting groundwater level (GWL) fluctuations using artificial neural networks (ANNs) and support vector machines (SVMs). The models were applied to GWL prediction of two wells at a coastal aquifer in Korea. Among the possible variables (past GWL, precipitation, and tide level) for an input structure, the past GWL was the most effective input variable for this study site. Tide level was more frequently selected as an input variable than precipitation. The results of the model performance show that root mean squared error (RMSE) values of ANN models are lower than those of SVM in model training and testing stages. However, the overall model performance criteria of the SVM are similar to or even better than those of the ANN in model prediction stage. The generalization ability of a SVM model is superior to an ANN model for input structures and lead times. The uncertainty analysis for model parameters detects an equifinality of model parameter sets and higher uncertainty for ANN model than SVM in this case. These results imply that the model-building process should be carefully conducted, especially when using ANN models for GWL forecasting in a coastal aquifer.

Keywords: Groundwater level; Coastal aquifer; Artificial neural network; Support vector machine

Katrien De Bruyne, Bram Slabbinck, Willem Waegeman, Paul Vauterin, Bernard De Baets, Peter Vandamme, Bacterial species identification from MALDI-TOF mass spectra through data analysis and machine learning,

*Systematic and Applied Microbiology*, In Press, Corrected Proof, Available online 4 February 2011, ISSN 0723-2020, DOI: 10.1016/j.syapm.2010.11.003.

(<http://www.sciencedirect.com/science/article/B7GVX-523KH76-1/2/dbfd7f8f183c17c471045fbb959bccf6>)

**Abstract:**

At present, there is much variability between MALDI-TOF MS methodology for the characterization of bacteria through differences in e.g., sample preparation methods, matrix solutions, organic solvents, acquisition methods and data analysis methods. After evaluation of the existing methods, a standard protocol was developed to generate MALDI-TOF mass spectra obtained from a collection of reference strains belonging to the genera *Leuconostoc*, *Fructobacillus* and *Lactococcus*. Bacterial cells were harvested after 24 h of growth at 28 [degree sign]C on the media MRS or TSA. Mass spectra were generated, using the CHCA matrix combined with a 50:48:2 acetonitrile:water:trifluoroacetic acid matrix solution, and analyzed by the cell smear method and the cell extract method. After a data preprocessing step, the resulting high quality data set was used for PCA, distance calculation and multi-dimensional scaling. Using these analyses, species-specific information in the MALDI-TOF mass spectra could be demonstrated. As a next step, the spectra, as well as the binary character set derived from these spectra, were successfully used for species identification within the genera *Leuconostoc*, *Fructobacillus*, and *Lactococcus*. Using MALDI-TOF MS identification libraries for *Leuconostoc* and *Fructobacillus* strains, 84% of the MALDI-TOF mass spectra were correctly identified at the species level. Similarly, the same analysis strategy within the genus *Lactococcus* resulted in 94% correct identifications, taking species and subspecies levels into consideration. Finally, two machine learning techniques were evaluated as alternative species identification tools. The two techniques, support vector machines and random forests, resulted in accuracies between 94% and 98% for the identification of *Leuconostoc* and *Fructobacillus* species, respectively.

Keywords: MALDI-TOF MS; Bacteria; Species; Identification; Data processing; Machine learning techniques; *Leuconostoc*; *Fructobacillus*; *Lactococcus*

Xiaoqing Yu, Taigang Liu, Xiaoqi Zheng, Zhongnan Yang, Jun Wang, Prediction of regulatory interactions in *Arabidopsis* using gene-expression data and support vector machines,

*Plant Physiology and Biochemistry*, In Press, Corrected Proof, Available online 12 January 2011, ISSN 0981-9428, DOI: 10.1016/j.plaphy.2011.01.002.

(<http://www.sciencedirect.com/science/article/B6VRD-51XR3GB-2/2/d4c11f60befb9fc2e688a21f26e524ad>)

**Abstract:**

Identification of regulatory relationships between transcription factors (TFs) and their targets is a central problem in post-genomic biology. In this paper, we apply an approach based on the support vector machine (SVM) and gene-expression data to predict the regulatory interactions in *Arabidopsis*. A set of 125 experimentally validated

TF-target interactions and 750 negative regulatory gene pairs are collected as the training data. Their expression profiles data at 79 experimental conditions are fed to the SVM to perform the prediction. Through the jackknife cross-validation test, we find that the overall prediction accuracy of our approach achieves 88.68%. Our approach could help to widen the understanding of Arabidopsis gene regulatory scheme and may offer a cost-effective alternative to construct the gene regulatory network.

Keywords: Arabidopsis; Regulatory relationships; Transcription factor; Gene-expression profile; SVM

Devrim Unay, Bernard Gosselin, Olivier Kleynen, Vincent Leemans, Marie-France Destain, Olivier Debeir, Automatic grading of Bi-colored apples by multispectral machine vision,

*Computers and Electronics in Agriculture*, Volume 75, Issue 1, January 2011, Pages 204-212, ISSN 0168-1699, DOI: 10.1016/j.compag.2010.11.006.

(<http://www.sciencedirect.com/science/article/B6T5M-51MHP0Y-1/2/483ee8277861340ee1400c0df15d5afe>)

**Abstract:**

In this paper we present a novel application work for grading of apple fruits by machine vision. Following precise segmentation of defects by minimal confusion with stem/calyx areas on multispectral images, statistical, textural and geometric features are extracted from the segmented area. Using these features, statistical and syntactical classifiers are trained for two- and multi-category grading of the fruits. Results showed that feature selection provided improved performance by retaining only the important features, and statistical classifiers outperformed their syntactical counterparts. Compared to the state-of-the-art, our two-category grading solution achieved better recognition rates (93.5% overall accuracy). In this work we further provided a more realistic multi-category grading solution, where different classification architectures are evaluated. Our observations showed that the single-classifier architecture is computationally less demanding, while the cascaded one is more accurate.

Keywords: Fruit grading; Defect detection; Multispectral images; Feature extraction; Feature selection; Classification

Raffaele Spinelli, Natascia Magagnotti, Carla Nati, Claudio Cantini, Graziano Sani, Gianni Picchi, Marcello Biocca, Integrating olive grove maintenance and energy biomass recovery with a single-pass pruning and harvesting machine,

*Biomass and Bioenergy*, Volume 35, Issue 2, February 2011, Pages 808-813, ISSN 0961-9534, DOI: 10.1016/j.biombioe.2010.11.015.

(<http://www.sciencedirect.com/science/article/B6V22-51K1Y8P-1/2/110d883a93a5b193cce80f7e4ba8c089>)

**Abstract:**

In Italy, olive tree groves may offer up to a million tonnes of dry biomass per year as pruning residue. Searching for a cost-effective way to tap this potential, the authors tested a new machine, capable of recovering pruning residue at the same time as pruning. The pre-commercial prototype was tested on four different plots and compared to a simpler tractor-base mechanical pruning unit. The authors conducted detailed time-studies in order to determine machine productivity and residue recovery cost. The

integrated machine can treat between 0.2 and 0.6 ha h<sup>-1</sup>, producing between 0.33 and 1.03 tonnes of fresh residue hour<sup>-1</sup>. Its integrated residue recovery function does not slow the pruning, which actually proceeds faster than with the tractor-base unit, due to the more efficient multiple-disc cutting bar. The marginal cost of residue recovery hovers around 40-45 [euro] fresh tonne<sup>-1</sup>. However, the new machine must not be considered just as a biomass harvester, but rather as a mechanical pruning unit with an integrated biomass recovery function. Its main benefit derives from the capacity of performing a very effective mechanical pruning, and the residue recovery function is a secondary benefit yet unavailable on standard pruning machines. Its deployment must be seen in the context of a general effort to modernize olive grove management and to develop an integrated biomass production system, rather than as a further attempt to build a specialised biomass supply chain.

Keywords: Olive; Pruning; Mechanization; Harvesting; Supply

A.J. Sjolander, J.A. Thomasson, R. Sui, Y. Ge, Wireless tracking of cotton modules. Part 2: Automatic machine identification and system testing, *Computers and Electronics in Agriculture*, Volume 75, Issue 1, January 2011, Pages 34-43, ISSN 0168-1699, DOI: 10.1016/j.compag.2010.09.015.

(<http://www.sciencedirect.com/science/article/B6T5M-51CHM54-1/2/80a9d54796c55a82028d335090c78bf5>)

**Abstract:**

The ability to map profit across a cotton field would enable producers to determine where money is being made or lost on their farms and to implement precise field management practices to facilitate the highest return possible on each portion of a field. Mapping profit requires knowledge of site-specific costs and revenues, including yield and price. Price varies site-specifically because fiber quality varies, so mapping fiber quality is an important component of profit mapping. To map fiber quality, the harvest location of individual cotton bales must be known, and thus a system to track the harvest location of cotton modules must be available. To this end, a wireless module-tracking system was recently developed, but automation of the system is required before it will find practical use on the farm. In Part 1 of this report, research to develop automatic triggering of wireless messages is described. In Part 2, research to enable the system to function with multiple harvesting machines of the same type in the same field - a common situation in commercial cotton farming - is described along with testing of the entire automated wireless module-tracking system (WMTS). An RFID system was incorporated, and it enabled the WMTS to correctly and consistently differentiate among various harvesting vehicles. The improved WMTS subsequently sent wireless messages to the correct machines when cotton transfers were made in the presence of multiple harvest machines. Overall testing proved that the automated WMTS worked largely as designed. When both complete and partial cotton basket dumps were simulated, the correct wireless-messaging decision was made 100% of the time.

Keywords: Cotton; Fiber quality; Fiber quality mapping; Precision agriculture; GPS; Wireless; Yield mapping; Profit mapping

V.O. Petrenko, O.S. Volovyk, Theoretical study and design of a low-grade heat-driven pilot ejector refrigeration machine operating with butane and isobutane and intended for cooling of gas transported in a gas-main pipeline, *International Journal of Refrigeration*, In Press, Accepted Manuscript, Available online 27 January 2011, ISSN 0140-7007, DOI: 10.1016/j.ijrefrig.2011.01.016.  
(<http://www.sciencedirect.com/science/article/B6V4R-521WB2K-1/2/922e8c673bee9ba92d290e28cb0fe512>)

**Abstract:**

This paper describes the construction and performance of a novel combined system intended for natural gas transportation and power production, and for cooling of gas transported in a gas-main pipeline. The proposed system includes a gas turbine compressor, a combined electrogenerating plant and an ejector refrigeration unit operating with a hydrocarbon refrigerant. The combined electrogenerating plant consists of a high-temperature steam-power cycle and a low-temperature hydrocarbon vapor power cycle, which together comprise a binary vapor system. The combined system is designed for the highest possible effectiveness of power generation and could find wide application in gas-transmission systems of gas-main pipelines. Application of the proposed system would enable year-round power generation and provide cooling of natural gas during periods of high ambient temperature operation. This paper presents the main results of a theoretical study and design performance specifications of a low-grade heat-driven pilot ejector refrigeration machine operating with butane and isobutane.

Keywords: Ejector; Ejector system; Butane; Isobutane; Gas turbine; Gas pipeline

Sherry Turkle, Don't be seduced by sociable machines,  
*The New Scientist*, Volume 209, Issue 2795, 15 January 2011, Pages 28-29, ISSN 0262-4079, DOI: 10.1016/S0262-4079(11)60101-2.  
(<http://www.sciencedirect.com/science/article/B83WY-51Y5FR9-1M/2/1dc583b334f77ca9e656555cd60a94d5>)

**Abstract:**

Robots minding the elderly, technologies denying us privacy, and simulations masquerading as real places to live: we deserve better says Sherry Turkle