

In This Issue...

- **Computational intelligence:** Neural network based class-conditional probability density function using kernel trick for supervised classifier by .
- **Pattern recognition:** Maximizing Gaussianity using kurtosis measurement in the kernel space for kernel linear discriminant analysis by .
- **Signal processing:** Signal processing approach for music synthesis using bird's Sound by Hemant sharma, M.Tech (alumni).

Dear friends! COMPSIG NITT is a monthly newsletter to share the research work done in the Pattern recognition and computational intelligence laboratory, Department of Electronics and Communication Engineering, National Institute of Technology Trichy.

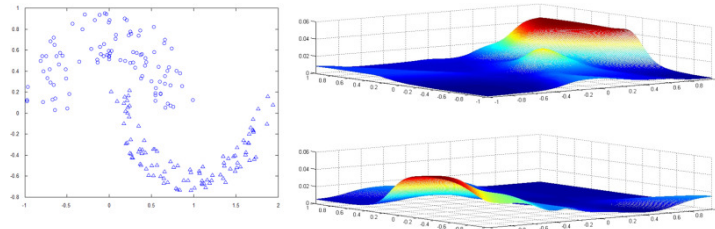
Concepts, Ideas pertaining to Computational intelligence, Pattern recognition and Signal processing are also included in this newsletter.

We expect the feedback, comments and articles from you all.
Issue 1-2: November 2015

Team members

1. G.Jayabrindha, Ph.D. Scholar.
2. Samuel Cherukutty Cheruvathur, M.Tech, Communication systems.
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Computational intelligence

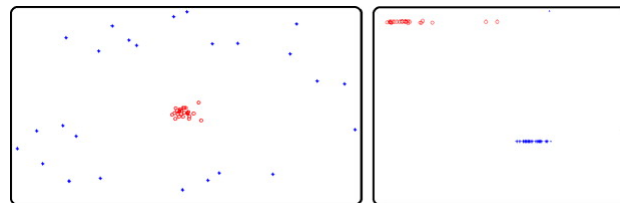


The practical limitation of the Bayes classifier used in pattern recognition is computing the class-conditional

probability density function (pdf) of the vectors belonging to the corresponding classes. In this paper, a neural network based approach is proposed to model the class-conditional pdf, which can be further used in supervised classifier (e.g. Bayes classifier). It is also suggested to use kernel version (using kernel trick) of the proposed approach to obtain the class-conditional pdf of the corresponding training vectors in the higher dimensional space. This is used for better class separation and hence better classification rate is achieved. The performance of the proposed technique is validated by using the synthetic data and the real data. The simulation results show that the proposed technique on synthetic data and the real data performs well (in terms of classification accuracy) when compared with the classical Fisher's Linear Discriminant Analysis (LDA) and Gaussian based Kernel-LDA.

For further details : <http://www.sciencedirect.com/science/article/pii/S0925231214016646>

Pattern recognition



Kernel-linear discriminant analysis (K-LDA) is the notable breakthrough among the dimensionality reduction techniques for supervised classification. The parameter used in the kernel function is usually

tuned using k-fold cross-validation. Recently, a technique is proposed to optimize the bandwidth parameter of the Gaussian kernel by simultaneously maximizing the homoscedasticity (identical co-variance matrices) and the separation of various classes in the higher dimensional space (HDS). In this technique, it is assumed that the individual classes are Gaussian distributed in the HDS, which are not usually true in practical applications. In this paper, we propose a technique that maximizes the Gaussianity of the individual classes and the separation of various classes in the HDS using "kernel-trick". This is determined by the tuning parameters used in the kernel function. The steepest-descent algorithm is used to obtain the optimal value of the tuning parameters. The experiments are performed with the synthetic datasets and real datasets to demonstrate the improved results obtained using the proposed technique. The proposed technique can also be adopted for other kernel functions used in K-LDA.

For further details : <http://www.sciencedirect.com/science/article/pii/S092523121400633X>

Signal processing

Music is generated by a sequence of musical notes which are arranged in a particular manner. Indian classical music contains 12 notes in an octave. Similarly bird's sound also contains such notes which are responsible for the sensible voice of birds. So we can generate musical tone using bird's sounds. For generating music using bird's sounds we have to extract these 12 notes. For extracting these notes from bird's sounds and arranging these notes in a particular Raga give us a musical tone. These notes would be sound of different birds. Selection of notes from bird's sounds is done using different signal processing approaches. Using Ant Colony Optimization we can select best 12 sounds as notes whose dominant normalized frequencies give minimum mean square error with already existing normalized frequencies (reference normalized frequency) of Indian classical music. In this paper these notes in form of bird's sounds have been determined using different signal processing approaches and tried to implement with some Raga. Benefit of this selection is to generate musical tones with actual bird's voice to feel different taste in music composition with already available musical instruments and bird sounds. The experiments are performed using the original sound of different perching birds.

For further details : <http://www.sciencedirect.com/science/article/pii/S221201731300522>

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Release of the first issue of the Newsletter



The first issue of the newsletter **COMP-SIG NITT** was released by Prof. Dr. K. K. Biswas, IIT Delhi. On the occasion, he delivered a special guest lecture on "Automated Human Activity Recognition from video clips". The lecture dealt with action recognition from RGB video clips followed by a short introduction to machine learning to justify use of Support Vector Machine based

approach for training the system. The objective was to show how a depth based camera can be effectively used for collecting 3D data and improve the recognition rates using depth and body joints data and just by few features various activities can be learned effectively. The next day interested research scholars and PG students had a brief discussion about their projects with Prof. Dr. K.K Biswas.

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Quotes

"Thinking should become your capital asset, no matter whatever ups and downs you come across in your life" — Dr. A.P.J.Abdul kalam

Coming up Global elective: PATTERN RECOGNITION (EC 009)

- Summarize the various techniques involved in pattern recognition.
- Identify the suitable pattern recognition techniques for the particular applications.
- Categorize the various pattern recognition techniques into supervised and unsupervised.
- Summarize the mixture models based pattern recognition techniques.
- Summarize the artificial neural network based pattern recognition techniques.

Tentative evaluation scheme(weightage)-Under flexible curriculum structure.

- Cycle test 1 - 15%
- Cycle test 2 - 15%
- Matlab simulation experiment - 40%
- End semester exam - 30%

Expression of interest through esgopi@nitt.edu

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Feedback

We expect feedback, comments and the articles to monthly newsletter **COMP-SIG NITT**.

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