COMPSIG NITT

In This Issue...

- **Computational intelligence:** Formulating Particle Swarm Optimization based Generalized Kernel Function for Kernel-Linear Discriminant Analysis by .
- **Pattern recognition:** Fast computation of PCA bases of image subspace using its inner-product subspace .
- **Signal processing:** Digital image forgery detection using artificial neural network and independent component analysis

---

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.

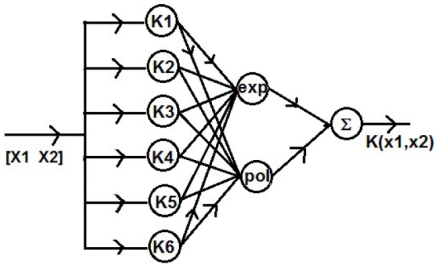
We expect the feedback, comments and articles from you all.

Issue 1-3: December 2015

Team members

1. **G.Jayabrindha, Ph.D. Scholar.**
2. **Samuel Cherukutty Cheruvathur, M.Tech, Communication systems.**
3. **Kshitij H. Rachchh, M.Tech, Communication systems.**

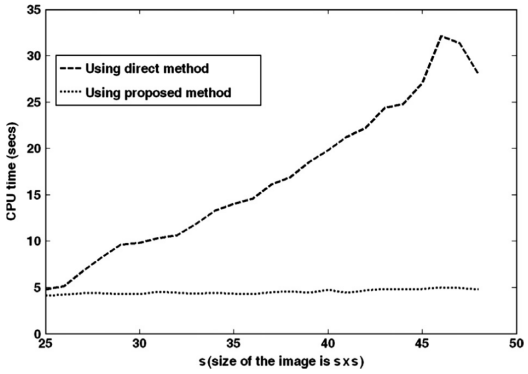
Computational intelligence



Selection of kernel function for solving Kernel-Linear Discriminant Analysis (K-LDA) remains unsolved problem. In this communication, we propose the method to formulate the Generalized Kernel Function (GKF)for K-LDA.The parameters of the GKF are tuned using the Particle Swarm Optimization (PSO) to maximize the discrimination in the higher dimensional space. Experiments are performed on the petal shaped synthetic toy cluster using the proposed GKF and are compared with the results obtained using the standard kernel functions. The experimental results reveals the importance of using the proposed technique.

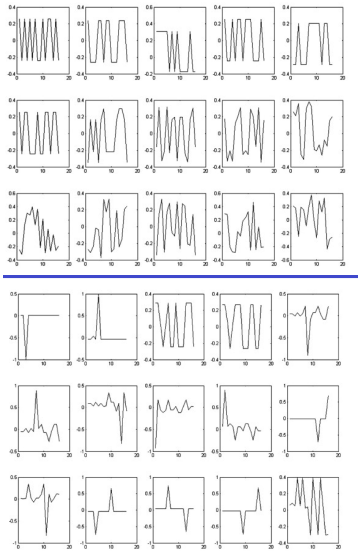
For further details : http://www.sciencedirect.com/science/article/pii/S221201731200607X

Pattern recognition



In image recognition, PCA bases are used to map image vectors which are in the higher dimensional space (image subspace) to the lower dimensional space. Eigenvectors corresponding to the significant eigenvalues of the scatter matrix, that are computed using the image vectors are the PCA bases of the image subspace. The size of the image vectors of the image space is usually large. For instance, the size of the reshaped face image vectors used in ORL face data base and Yale face data base are 2304 and 10000, respectively. Hence the size of the scatter matrix computed for the above mentioned image subspaces are 2304×2304 and 10000×10000respectively. This requires large memory and computation time required to compute the eigenvectors of the above mentioned scatter matrix. In this paper, we explore the relationship between the PCA bases of the image subspace and its inner-product scatter matrix. Hence the procedure to obtain the PCA bases of the image subspace using the inner-product scatter matrix is obtained, which helps in reducing the computation time and the memory requirement. For further details : http://www.sciencedirect.com/science/article/pii/S0096300313000179

Signal processing

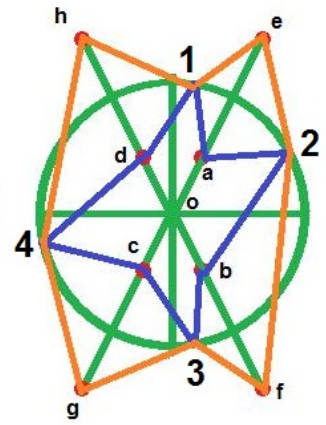


Digital image forgery is the process of manipulating the original photographic images like resizing, rotation, scaling, etc. To produce the photographic images as the evidence to the court, there is the need to identify whether the produced image is original or forgery image. In this paper, an attempt is made to detect forgery portions of the digital image. This is achieved by training the artificial neural network using the ICA coefficients obtained in the AR domain of the image data.

For further details:http://www.sciencedirect.com/science/article/pii/S0096300307005073 Back to Contents

Puzzle 2

The points $1, 2, 3, 4$ lie on the hidden unit circle. $oa = ob = oc = od = r$ and $oe = of = og = oh = \frac{1}{r}$. (refer Figure (not to the scale)). If the linear distance obtained by joining the points $1-a-2-b-3-c-4-d-1$ is 'd', find the distance obtained by joining the points $'1-e-2-f-3-g-4-h-1'$ linearly. The puzzle demonstrates the fact that the digital filter with zero at z_0 and the another digital filter with zero at $\frac{1}{z_0^*}$ will have the identical magnitude response.(why?)



Back to Contents

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 intelligence 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

Back to Contents

Feedback

We expect feedback, comments and the articles to monthly newsletter COMPSIG NITT.

Back to Contents

Contact Information:
Pattern recognition and computational intelligence laboratory,
Department of Electronics and Communication Engineering,
National Institute of Technology
Trichy - 620015
E-mail:esgopi@nitt.edu

Quotes

"All of us do not have equal talent. But , all of us have an equal opportunity to develop our talents." — Dr. A.P.J.Abdul kalam