COMPSIG NITT

In This Issue...

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.

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Team members

1. **Dr. E.S.Gopi, Co-ordinator.**
2. **G.JayaBrindha, Ph.D. Scholar.**
3. **Neema. M, Ph.D. Scholar.**
4. **Rajasekharreddy Poreddy, Ph.D Scholar.**
5. **Vineetha Yogesh, M.Tech, Communication systems.**
6. **Shaik Mahammad, M.Tech, Communication systems.**

Distinct sequences that have the identical magnitude responses

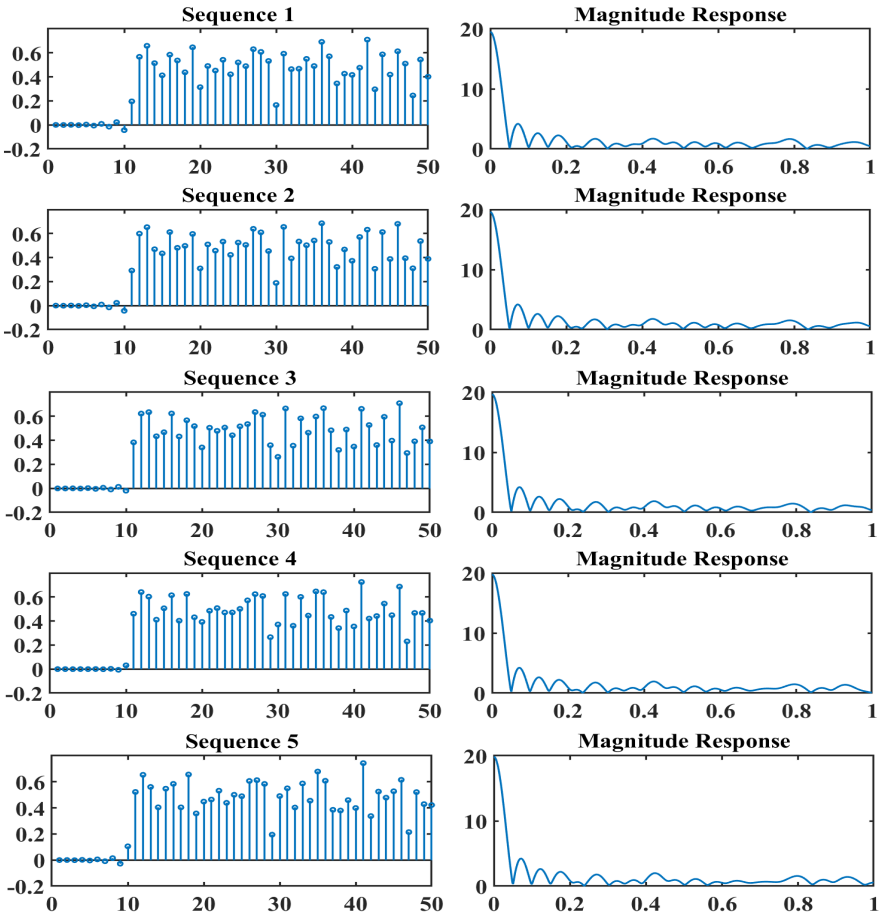

Fig. 1: Sequences having same Magnitude Response

While downsampling a signal by a factor K, there are a total of K-distinct sample index selections to obtain the downsampled sequence. For a signal of length N, the K-distinct downsampled sequences can be obtained by selecting the samples with indexes $(K \times n) + i \; \forall \; n \in \{0, 1, \cdots, \lfloor \frac{N}{K} \rfloor - 1\}$ and $i \in \{0, 1, 2, \cdots, K-1\}$. Downsampled sequences obtained from the above K possible selections have the identical magnitude response, and they differ in phase response alone. Magnitude responses of the K-distinct downsampled sequences of a signal, for N=250 and K=5, are illustrated in Fig.1. A comparison of the magnitude responses of these five downsampled sequences can be seen in Fig 2. It can be observed, from Fig.2, that there is no significant variation in the magnitude responses of downsampled sequences (polyphase filters).

Link to the m-file: polyphase

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Magnitude response of 5 sequences

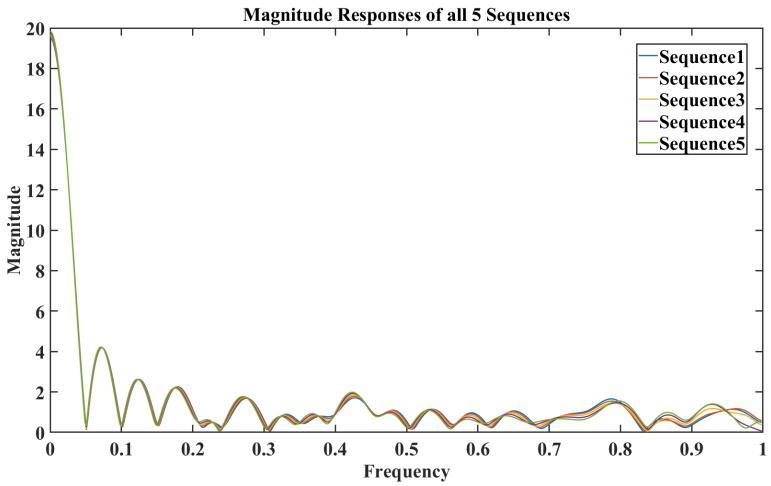

Fig. 2: Comparison of Magnitude Responses of different Sequences

Higher dimensional data visualization

Scatter plot is the most widely used method to visualize the discrimination of the data. But the scatter plots are limited to 2D and 3D visualization. If more than 3 basis functions (eigenvectors) are required for discrimination, then it is not possible to visualize them in scatter plots. So in order to view the discrimination between the high dimensional features of the corresponding classes, euclidean distance measure between the samples are computed to form the block-distance matrix. The image of the obtained matrix may be viewed as the N-D scatter plot (that gives the information about how the vectors are scattered in the higher dimensional space with $N > 3$). The N-D scatter plot corresponding to 10 classes with 35 samples each is shown in the figure. It is noted (refer Fig.3) that the euclidean distance measure is high (light shades) for samples between the classes and insignificant (dark shades) for the samples within a class.

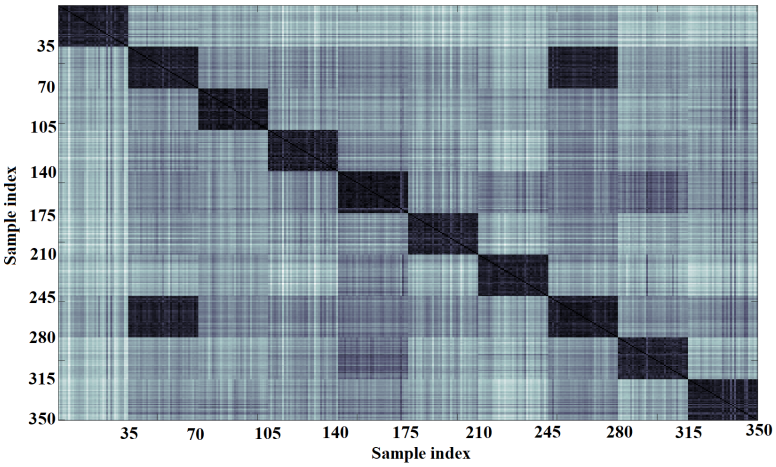

Fig. 3: N-D Scatter Plot

For further details contact: G. JayaBrindha, Research Scholar, PRCI lab.
Link for reference: N-D Scatter plot

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Quotes

> *"I firmly believe that unless one has tasted the bitter pill of failure, one cannot aspire enough for success."* — Dr. A.P.J.Abdul Kalam

On-going Research

- Constructing a Sunflower plant database and perform off-type identification using morphological features
- Application of machine learning techniques in next generation wireless communication
- Classification of Music composition styles using probabilistic generative model
- Computational Intelligence for channel estimation of Massive MIMO
- Investigation of Empirical Match Algorithm for latent sequence estimation in HMM

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Feedback

COMPSIG NITT invites articles and innovative ideas from readers for the Reader's Space column. We expect feedback and comments to monthly newsletter COMPSIG NITT . Readers can share their views in our facebook page, "COMPSIG-NITT". Those who are interested can be a part of the facebook group.

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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