

PRACTICAL BIOLOGICAL SIGNAL ANALYSIS

GIAN (MHRD, Govt. of India) Supported Advanced Level Course @ NITK Surathkal

Overview

Analysing biological signals such as electrocardiogram and electroencephalogram has become very important with modern healthcare striving to provide cost effective point-of care diagnosis and personalised treatment. Furthermore, fast computing power in recent years has made much of the more complex analysis methodologies possible.

The aim of this course is to provide attendees with a fundamental understanding of signal processing techniques and classification algorithms for analysing biological signals. The course will allow the attendee to demonstrate understanding of basic principles of digital signals; awareness of physiology and characteristics of different biological signals; describe and apply pre- and post-processing techniques, such as conditioning, filtering, feature extraction, classification and statistical validation techniques for biological signals and solve practical biological signal analysis problems using the industry standard software, MATLAB.

Simpler approaches will be followed in the delivery of the course. Mathematics will be used only where necessary and when used (and where possible), numerical examples that are suitable for paper and pencil approach will be given. There will plenty of illustrations('picture speaks thousand words') to aid the attendee in understanding the signal analysis methods and the results of applying the methods. Several examples of recently studied real life biological signal analysis applications will also be discussed.

The main strength of the course is that it will discuss all four related sections to biological signal analysis: signal preprocessing, feature extraction, classification algorithms and statistical validation methods.

Schedule	November 21, 2016 to November 25, 2016
Course Contents	<ol style="list-style-type: none"> 1. Introduction to biological signal analysis 2. Discrete-time signals and systems 3. Introduction to Matlab with exercises 4. Spectral analysis 5. Signal conditioning 6. Digital filtering 7. Matlab exercises: <i>introducing ECG signals, reducing noise from ECG signals, analysing ECG spectral content and filtering</i> 8. Feature extraction 9. Classification 10. Matlab exercises: <i>feature extraction, classification of EEG signals</i> 11. Mini group project: <i>Attendees to work on real world problem solving exercise involving ECG signal</i>
Host Institute	NITK Surathkal, Mangalore (http://nitk.ac.in/)
Max. No.of Participants	Limited to 50
You Should Attend if...	Final year undergraduates and graduates students in any field with interest in biological signal analysis (and related areas like digital signal processing) are the main target audiences. But the course will also be useful for the researchers in both industry and academia, especially those from non-technical background who would be interested in analysing biological signals - the course does not assume any prior signal processing knowledge and MATLAB is used throughout the course to minimise programming time and difficulty and concentrate on the analysis, which is the focus of this course.
Course Registration Fee	<ul style="list-style-type: none"> • Participants from abroad: US \$500 • Industry/ Research Organizations: Rs. 10,000/- • Academic Institutions: Rs. 5,000/- <p>The above fee includes all instructional materials, computer use and internet facility. The participants <u>will not be given</u> any TA/DA and boarding / lodging support. Participant can bring their laptop for effective utilization of course delivery.</p>

Teaching Faculty



Dr Palaniappan Ramaswamy is currently a Reader in the School of Computing, University of Kent, which is a top 20 UK university. His research interests include biological signal processing, brain-computer interfaces,

biometrics, neural-networks, genetic-algorithms, and image processing. To date, he has written three text books in engineering and published over 150 papers (with over 2000 citations) in peer-reviewed journals, book chapters, and conference proceedings. He is a senior member of the Institute of Electrical and Electronics Engineers and member in Institution of Engineering and Technology. He is also the Editor-in-Chief of International Journal of Cognitive Biometrics and editorial board member for several international journals. He also serves in the prestigious Peer Review College for UK Research Councils and many other international grant funding bodies. He has supervised more than half a dozen

postgraduate students to completion and has more than 18 years of multi-disciplinary teaching experience in computer science and engineering (electrical and biomedical) disciplines. His pioneering work on revolutionary new areas of brain-computer interfaces and emerging biometrics has not only received international awards and recognition by the scientific community but also from the media and public. His international research collaborations on signal processing and machine learning include among others institutions from Canada, China, India, Malaysia and Singapore.

Teaching Faculty

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