Short Term Course on
Wavelet *via* Matrices and its Applications in signal and image processing
Discipline of Mathematics, IIT Indore
November 16-20, 2020

ABOUT DEPARTMENT

In view of exchanging mathematical ideas, IIT Indore started the Discipline of Mathematics in July 2009. The Discipline is expanding both in size and variety of expertise, and has already started Ph.D. Programme and M.Sc. programme in Mathematics. As and when sufficient expertise in fields such as statistics, applied computing and informatics become available, the Discipline also envisages another programme with M.Sc. degree in these subjects which will be especially suitable for the needs of industry. Please visit http://math.iiti.ac.in for more details.

IMPORTANT DATES

- Last date of receiving application: November 08, 2020
- Notification about selection: November 10, 2020
- Confirmation from participants: November 11, 2020

COURSE ORGANIZED BY

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REGISTRATION FEES

AICTE Colleges:
No fee* (for faculty members)

* The nominations along with the registration forms must be sent through their coordinator/head to wavelet.iiti@gmail.com.

Non-AICTE Colleges:
Rs. 2,000/-per faculty/researcher**

For industry participants:
Rs. 5,000/-per participant**
**Evidence of payment should be emailed in advance to confirm the participation.

OVERVIEW

On the boundary between mathematics and engineering, wavelet theory shows students and faculty that mathematics research is still thriving, with essential applications in areas such as signal processing, image compression, and the numerical solution of differential equations. The programme will focus on theory and applications of wavelets through matrices and its applications in signals and image processing, etc. Current research topics like Shearlet, curvelet will also be addressed.

Topics will include, but are not limited to, mathematical theory and applications of Haar wavelet & Daubechies wavelet through FFT and its applications of low pass filter, high pass filter, etc. in signal and image processing through MATLAB.

BENEFIT TO TEACHERS?

It is necessary to bring different topics from the undergraduate curriculum and introduce students and faculty to a developing area in mathematics. Basic wavelet theory is a natural topic of this course. The great success of wavelets and shearlet mostly lies in their many desired properties such as multiscale structure, sparse representation, efficient approximation schemes, good time-frequency localization, and fast computational algorithms. In comparison to traditional wavelets, shearlet have the desired properties of redundancy for robustness and flexibility for an adaptive custom design.

This allows the Teachers to become aware what are the current frontiers of wavelet theory and what are the possible further developments and applications of wavelets and framelets. The participants' knowledge about the course content will be raised to the level such that they will be able to use wavelets and shearlets for their own applications and research.

EXPERTS AND TOPICS TO BE COVERED

Experts-to be announced soon...

- Diagonalization of Linear Transformations and Matrices
- Eigen Value, Eigen Vector and Singular Value Decomposition
- Matrix representation of Discrete Fourier transform (DFT) and Fast Fourier transform (FFT)
- Complexity of computing the DFT and FFT
- Time-Frequency Localized Bases & Discrete Wavelet Transforms & Filter Banks
- Matrix representation of Haar & Daubechies scaling functions and Wavelets
- Application of low pass filter, high pass filter, pth-stage-decomposition, etc.
- Complexity of computing the pth-stage wavelet filter bank
- Continuous Fourier and Wavelet transform, Multiresolution Analysis
- Recent development of wavelets & shearlets for detection of singularity.
- Matlab implementation of Pseudo inverse of a matrix, DFT, FFT, Convolution, wavelet, etc.
- **Other special lectures, also**.

ACCOMMODATION AND TRAVEL

- This QIP Course will be on online mode.
- Google Meet link will be provided to the registered participants by email before the course starts.
- For more details, please visit here

  http://www.iiti.ac.in/people/~ nirajshukla/QIP%20wavelet.html