Wavelets and CNN Workshop

NOTE: The highlighted contents will be available to only those participants who have filled the feedback form (4). The form is still open for those who have not yet filled it.

The curated dataset will be removed to free up my disk space in next 3 days. Please save it in your drives before that.

For any futher information please contact me in my email: kkt.ai@iitb.ac.in, kishorektarafdar@gmail.com

#	Module	Topics	URL		
1	Theory of Wavelets and Filter banks	Lecture by Prof. Vikram Gadre	Full cousre at https://archive.nptel.ac.in/courses/117/101/117101123/		
	Explore and DIY Discrete Wavelet Transforms (50 mins)	Explore DWT 1D, 2D and perfect reconstruction using available libraries. Identify challenges for building transforms for use in backpropagation CNNs. Suggest possible solutions.	https://forms.gle/bfiyBgrfuPUGWT6P6	Python DWT & IDWT (1D & 2D)	https://pywavelets.readthedocs.io/en/latest/index.html
				MATLAB DWT1D	https://www.mathworks.com/help/wavelet/ref/dwt.html
				MATLAB IDWT1D	https://www.mathworks.com/help/wavelet/ref/idwt.html
				MATLAB DWT2D	https://www.mathworks.com/help/wavelet/ref/dwt2.html
				MATLAB IDWT2D	https://www.mathworks.com/help/wavelet/ref/idwt2.html
Though the following content is implemeted in TensorFlow, however understanding the mathematics in the content below will allow us to realize separable D-dimensional DWT and IDWT independent of any software platform.					
2	DWT basics (50 mins)	TFDWT arxiv paper	https://arxiv.org/abs/2504.04168		
		TFDWT PyPI package	https://pypi.org/project/TFDWT/		
		DWT 1D and perfect reconstruction	DWTIDWTTutorial1.ipynb		
		DWT 2D and perfect reconstruction	https://colab.research.google.com/drive/12sReAqzjDAOg4tZEuYxTO9riF1g2Yqpw?usp=sharing		
		Sample brain image	https://drive.google.com/file/d/1pWLcCZLFL07EfCwFdfmfTq1g0JgWnMFJ/view?usp=sharing		
		DWT layers for CNN	https://github.com/kkt-ee/TFDWT/blob/main/Tutorials/DWT_IDWT_Layers_Demo.ipynb		
			https://github.com/kkt-ee/TFDWT/blob/main/Tutorials/DWT_Level1_Perfect_Reconstruction_1D_2D_3D_Filterbanks.ipynb		
3	MEDCNN for binary segmentation (50 mins)	ICASSP'25 paper	https://doi.org/10.1109/ICASSP49660.2025.10890832		
		PyPI package	https://pypi.org/project/MEDCNN/		
		Notebook - binary segmentation with CNN (U-Net)	https://github.com/kkt-ee/MEDCNN/blob/main/DemoTrainingPipelines/ControlUnet2D_ColabPipelinePIP.ipynb		
		Notebook - Binary segmentation with MEDCNN	https://github.com/kkt-ee/MEDCNN/blob/main/DemoTrainingPipelines/G2D_ColabPipelinePIP.ipynb		
		~~Curated data for segmentation~~	~~https://drive.google.com/drive/folders/14osnrfB9ms_NNYITKVv-JuCN_8Y2r_Tn?usp=drive_link~~		
4	Feedback form	Please fill the feedback form	https://forms.gle/mhxpFdWthJvHCAoYA		

Workshop conducted at VNRVJIET,Hyderabad at 10/04/2025

Lab module 2	*Multiresolution signal processing*
Lab module 3	*Deep learning unified with multiresolution signal processing*
Theory instructor :	Prof. Vikram Gadre, EE, Indian Institute of Technology Bombay
Lab instructor :	Kishore Tarafdar, PhD student, EE, Indian Institute of Technology Bombay