# Wavelets and CNN Workshop

Conducted at VNR-VJIET, Hyderabad at 10/04/2025

***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 | | |
|---|---|---|---|---|---|
| 0 | Explore and DIY Discrete Wavelet Transforms (45 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.*** | | | | | |
| 1 | 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 | | |
| 2 | 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 | | |
| | **Note** | | | | |
| | Module 1 | Multiresolution signal processing | | | |
| | Module 2 | Deep learning unified with multiresolution signal processing | | | |