# The Function of Discrete Wavelet Transform (DWT)

Signal denoise based on DWT.

## Description

The function of DWT returns the filtered signal. Here are four filter types, and the user can select one of them. "File Upload" is used to load the required data set, and the required parameters should be set in the ''Simple Filter'', ''Kurtosis Filter'', ''Frequency Band Filter'', ''Threshold Filter''.

## Parameter introduction

Parameters of DWT:

* Class of Filter: Four filter types: ''Simple Filter'', ''Kurtosis Filter'', ''Frequency Band Filter'', ''Threshold Filter''.

Simple Filter:

* Wavelet basis: Wavelet basis functions.
* Level: Decomposition level. (data type: int)

Kurtosis Filter:

* Wavelet basis: Wavelet basis functions.
* Level: Decomposition level. (data type: int)
* Nums of kurtosis: Number of kurtosis selected. (data type: int)

Frequency Band Filter:

* Wavelet basis: Wavelet basis functions.
* Sampling Frequency: Sampling frequency of the bearing (data type: int)
* Max: Maximum limit of filtered noise in the frequency band range. (data type: int)
* Min: Minimum limit of filtered noise in the frequency band range. (data type: int)

Threshold Filter:

* Wavelet basis: Wavelet basis functions.
* Level: Decomposition level. (data type: int)
* Method: Threshold selection: ''Soft Threshold'', ''Hard Threshold'', ''Intermediate Threshold''.
* Threshold-coeff: Coefficient for Intermediate Threshold. (Range: [0,1), data type: float)

**Functional description of the main components**

The overall view of the function of DWT is divided into "File Upload", "Class of Filter", "Simple Filter", "Kurtosis Filter", "Frequency Band Filter", "Threshold Filter", and "Result".

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### File Upload

The uploaded data files support ".mat", ".txt", ".csv", ".xls", and ".npy" format files.



### Class of Filter

Here are four filter types: "Simple filter", "Kurtosis filter", "Frequency band filter", and "Threshold filter" and the user can select one of them.

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### Parameter

Here are four parameter fields, corresponding to the four types of filtering. The user only needs to select one filter type and set the parameters in the corresponding parameter field.

### Result

After the user has selected one filter type and the software has been run, then the user needs to click the "Show Result" button to display the signal diagram before and after noise reduction.

图表

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The "Download" button downloads the relevant result images and data.

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**Examples**

The process of using DWT in signal processing to achieve noise reduction.

**Step 1: Configure the procedure**

Select "Data Processing" from the process bar on the left side of the web page.

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**Step 2: Select the function**

Select the procedure that needs to be configured from the process display area.

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The ''DWT'' function is chosen for signal processing.

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**Step 3: Upload the data file**

Select the data file to be applied from the local path.



Click "Upload" after successfully selecting the upload data file.

**Step 4: Set and save the parameters**

Firstly, the user needs to select one filter type in "Class of Filter". Then set parameters in the corresponding parameter field.

1. Simple Filter:

Firstly, the user needs to select one wavelet base in "Wavelet basis". Then set the parameter in "Level".

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1. Kurtosis Filter:

Firstly, the user needs to select one wavelet base in "Wavelet basis". Then set the parameters in "Level" and "Nums of kurtosis".

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1. Frequency Band Filter:

Firstly, the user needs to select one wavelet base in "Wavelet basis". Then set the parameters in "Sampling frequency", "Max" and "Min".

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1. Threshold Filter:

Firstly, the user needs to select one wavelet base in "Wavelet basis". Then set the parameters in "Level". Next user needs to select one threshold in "Method" and set the threshold coefficient in "Threshold-coeff".

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Finally, click "Save" after all parameters are configured.

**Step 5: Execute the configured procedure**

Before executing the configured function, the user also needs to set the selected output image and file format.

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Finally, select "Run".

**Step 6: Show the result**

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When the progress bar reaches the end, the task is completed.

**图片包含 文本

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Select "Show Result" to simply view the graphical results of the function.

图表

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The displayed result graphs are the signal diagrams before and after noise reduction for the four filter types.

**Step 7: Download**

Click "Download" to download the file of data and image.

