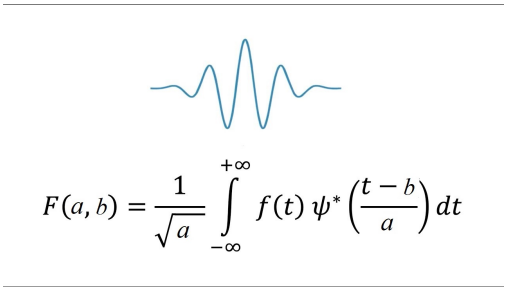

Built-in Wavelet Families and Wavelets

Shouke Wei, Ph.D. Professor

Email: shouke.wei@gmail.com

Objective

- glance over the built-in wavelet families and their wavelet members in PyWavelets library.

1. Display Built-in Wavelet Families

`pywt.families(short=True)` : returns a list of available built-in wavelet families

In [17]:
```
import pywt
```

In [18]:
```
pywt.families()
```

Out[18]:
```
['haar',
 'db',
 'sym',
 'coif',
 'bior',
 'rbio',
 'dmey',
 'gaus',
 'mexh',
 'morl',
 'cgau',
 'shan',
 'fbsp',
 'cmor']
```

In [19]:
```
pywt.families(short=False)
```

Out[19]:
```
['Haar',
 'Daubechies',
 'Symlets',
 'Coiflets',
 'Biorthogonal',
 'Reverse biorthogonal',
 'Discrete Meyer (FIR Approximation)',
 'Gaussian',
 'Mexican hat wavelet',
 'Morlet wavelet',
 'Complex Gaussian wavelets',
 'Shannon wavelets',
 'Frequency B-Spline wavelets',
 'Complex Morlet wavelets']
```

2. Display Built-in Wavelet Members

`pywt.wavelist(family=None, kind='all')` function: returns a list of names of the built-in wavelets.

- family: Short family name.
- kind : {'all', 'continuous', 'discrete'}, optional.

(1) All families and both kinds

In [20]:
```
pywt.wavelist()
```

Out[20]:
```
['bior1.1',
 'bior1.3',
 'bior1.5',
 'bior2.2',
 'bior2.4',
 'bior2.6',
 'bior2.8',
 'bior3.1',
 'bior3.3',
 'bior3.5',
 'bior3.7',
 'bior3.9',
 'bior4.4',
 'bior5.5',
 'bior6.8',
 'cgau1',
 'cgau2',
 'cgau3',
 'cgau4',
```

(2) Display one family

In [21]:
```
pywt.wavelist('db')
```

Out[21]:
```
['db1',
 'db2',
 'db3',
 'db4',
 'db5',
 'db6',
 'db7',
 'db8',
 'db9',
 'db10',
 'db11',
 'db12',
 'db13',
 'db14',
 'db15',
 'db16',
 'db17',
 'db18',
 'db19',
 'db20',
 'db21',
 'db22',
 'db23',
 'db24',
 'db25',
 'db26',
 'db27',
 'db28',
 'db29',
 'db30',
 'db31',
 'db32',
 'db33',
 'db34',
 'db35',
 'db36',
 'db37',
 'db38']
```

(3) Display wavelets of one kind

In [22]:
```
# continuous wavelets
pywt.wavelist(kind='continuous')
```

Out[22]:
```
['cgau1',
 'cgau2',
 'cgau3',
 'cgau4',
 'cgau5',
 'cgau6',
 'cgau7',
 'cgau8',
 'cmor',
 'fbsp',
 'gaus1',
 'gaus2',
 'gaus3',
 'gaus4',
 'gaus5',
 'gaus6',
 'gaus7',
 'gaus8',
 'mexh',
 'morl',
 'shan']
```

In [23]:
```
# discrete wavelets
pywt.wavelist(kind='discrete')
```

Out[23]:
```
['bior1.1',
 'bior1.3',
 'bior1.5',
 'bior2.2',
 'bior2.4',
 'bior2.6',
 'bior2.8',
 'bior3.1',
 'bior3.3',
 'bior3.5',
 'bior3.7',
 'bior3.9',
 'bior4.4',
 'bior5.5',
 'bior6.8',
 'coif1',
 'coif2',
 'coif3',
 'coif4',
```

3. Display all Built-in families and their Members

In [24]:
```
for family in pywt.families():
    print(f'{family} family: {pywt.wavelist(family)}')
```

```
haar family: ['haar']
db family: ['db1', 'db2', 'db3', 'db4', 'db5', 'db6', 'db7', 'db8', 'db9', 'db1
0', 'db11', 'db12', 'db13', 'db14', 'db15', 'db16', 'db17', 'db18', 'db19', 'db
20', 'db21', 'db22', 'db23', 'db24', 'db25', 'db26', 'db27', 'db28', 'db29', 'd
b30', 'db31', 'db32', 'db33', 'db34', 'db35', 'db36', 'db37', 'db38']
sym family: ['sym2', 'sym3', 'sym4', 'sym5', 'sym6', 'sym7', 'sym8', 'sym9', 's
ym10', 'sym11', 'sym12', 'sym13', 'sym14', 'sym15', 'sym16', 'sym17', 'sym18',
'sym19', 'sym20']
coif family: ['coif1', 'coif2', 'coif3', 'coif4', 'coif5', 'coif6', 'coif7', 'c
oif8', 'coif9', 'coif10', 'coif11', 'coif12', 'coif13', 'coif14', 'coif15', 'co
if16', 'coif17']
bior family: ['bior1.1', 'bior1.3', 'bior1.5', 'bior2.2', 'bior2.4', 'bior2.6',
'bior2.8', 'bior3.1', 'bior3.3', 'bior3.5', 'bior3.7', 'bior3.9', 'bior4.4', 'b
ior5.5', 'bior6.8']
rbio family: ['rbio1.1', 'rbio1.3', 'rbio1.5', 'rbio2.2', 'rbio2.4', 'rbio2.6',
'rbio2.8', 'rbio3.1', 'rbio3.3', 'rbio3.5', 'rbio3.7', 'rbio3.9', 'rbio4.4', 'r
bio5.5', 'rbio6.8']
dmey family: ['dmey']
gaus family: ['gaus1', 'gaus2', 'gaus3', 'gaus4', 'gaus5', 'gaus6', 'gaus7', 'g
aus8']
mexh family: ['mexh']
morl family: ['morl']
cgau family: ['cgau1', 'cgau2', 'cgau3', 'cgau4', 'cgau5', 'cgau6', 'cgau7', 'c
gau8']
shan family: ['shan']
fbsp family: ['fbsp']
cmor family: ['cmor']
```

In [ ]: