

Second Generation Wavelets

Settings

- interval
- non-uniform samples
- curves, surfaces, volumes

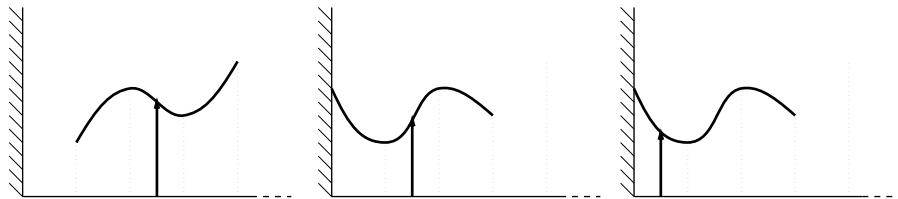
Second generation wavelets

- keep powerful properties
 - no translation and dilation
 - filters different everywhere
-

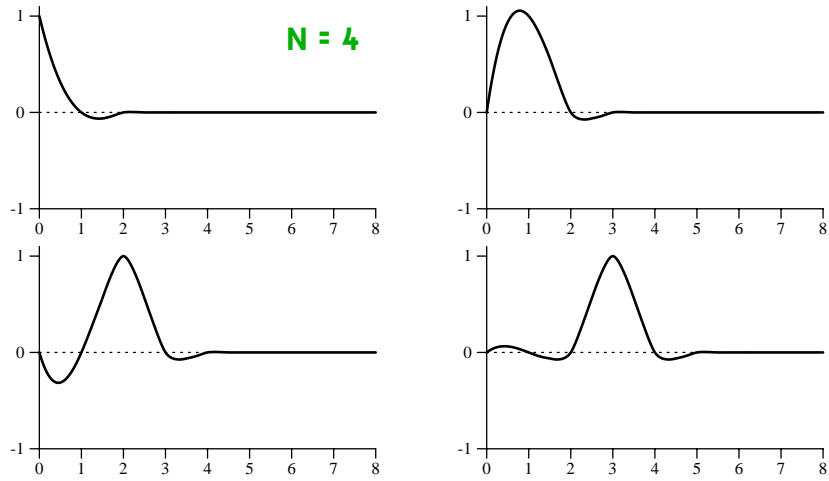
Interpolation

Boundary construction

- maintain polynomial order

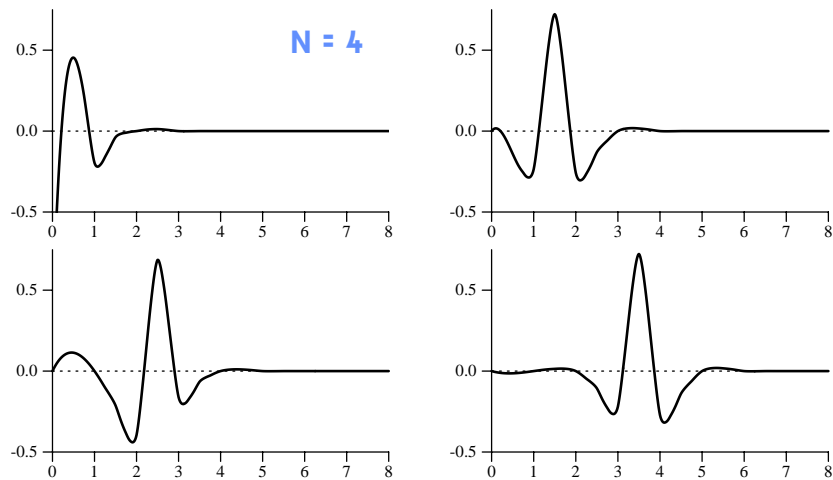


Scaling Functions



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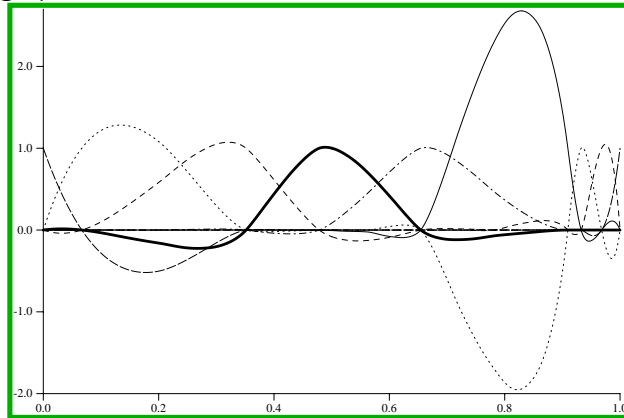
Wavelets



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Irregular Samples

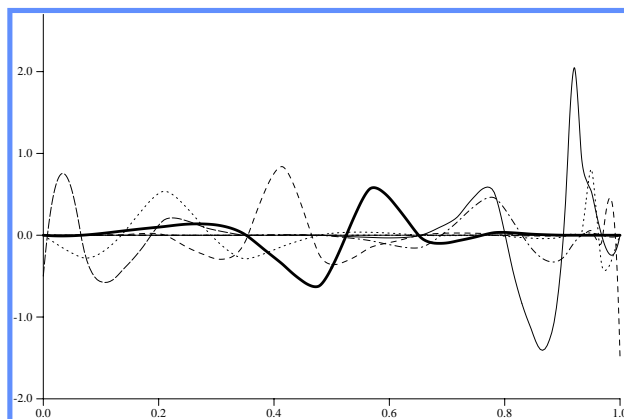
Scaling functions



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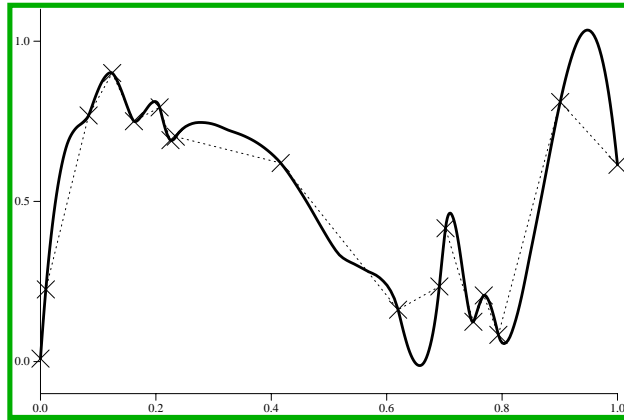
Irregular Samples

Wavelets



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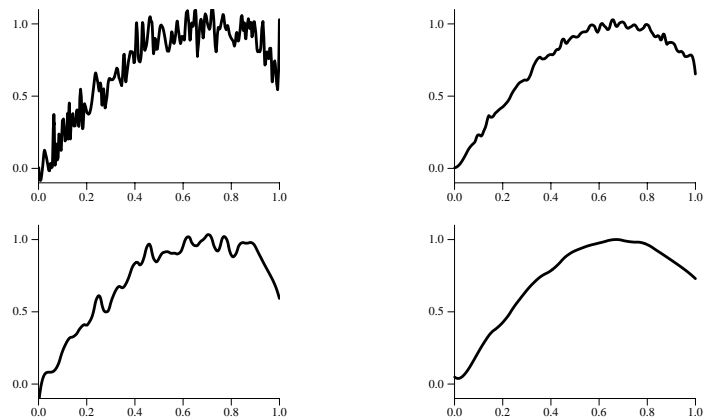
Random Interpolation



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Smoothing

Random samples with noise

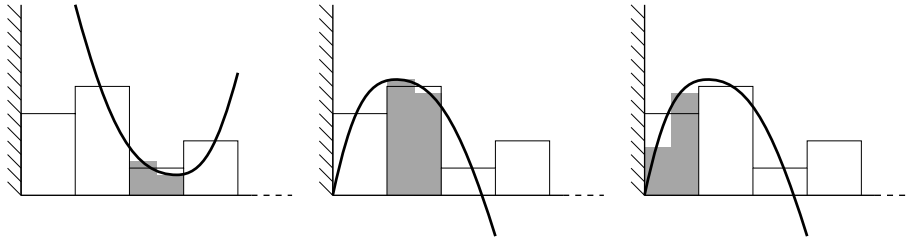


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Average Interpolation

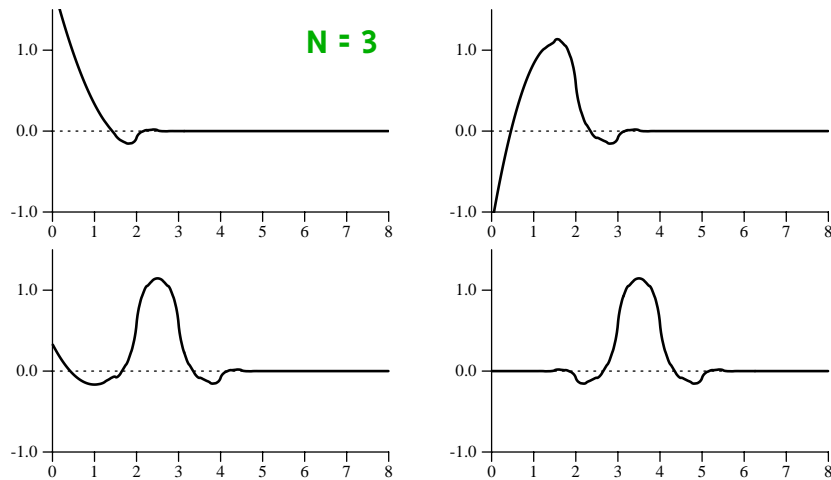
Boundary construction

- maintain polynomial order



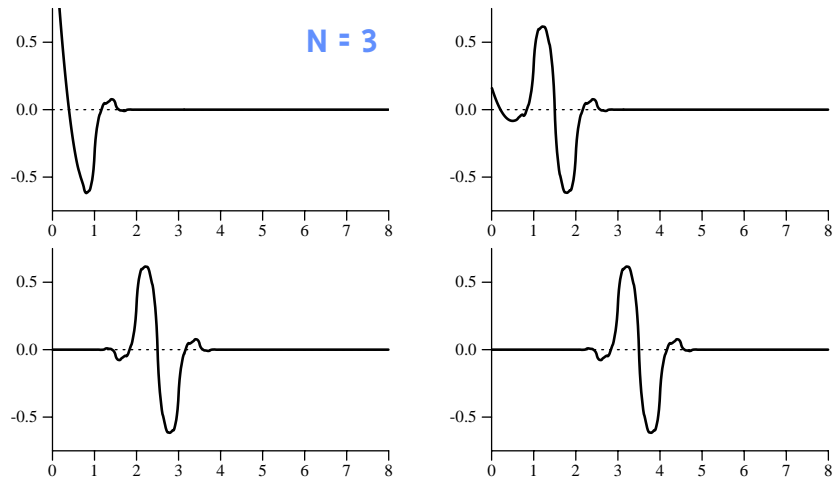
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Scaling Functions



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Wavelets



Weighted Inner Products

Length of interval $[a, b]$

$$\int_a^b w(x) dx$$

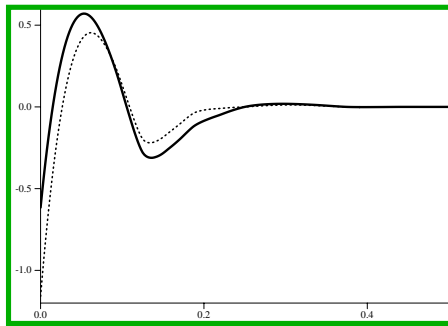
Example: approximate

$$f(x) = \sin(4\pi\sqrt{x})$$

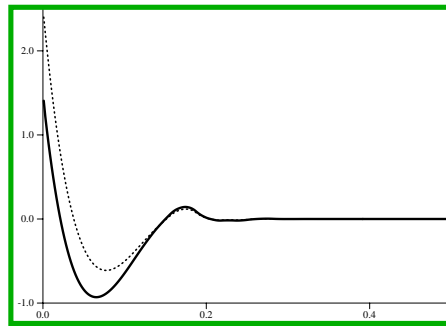
Choose

$$w(x) = \frac{1}{\sqrt{x}}$$

Weighted Wavelets



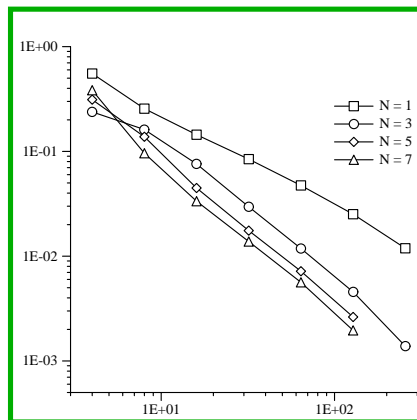
order 4



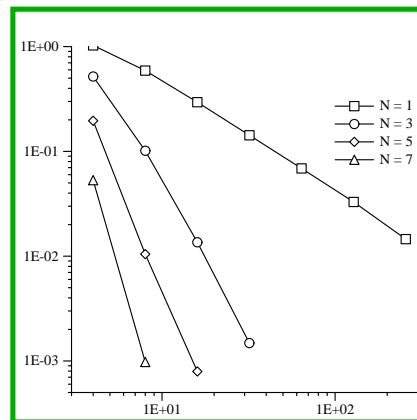
order 5

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Approximation Error



unweighted



weighted

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