Second Generation Wavelets

Settings

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

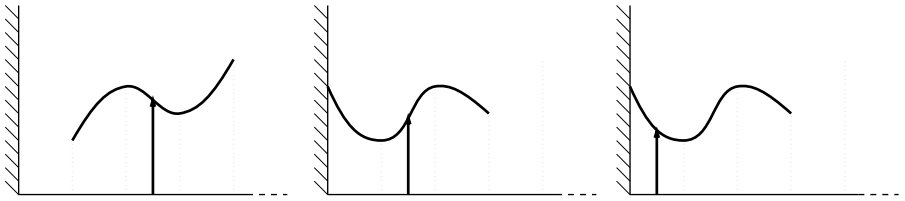
Second generation wavelets

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

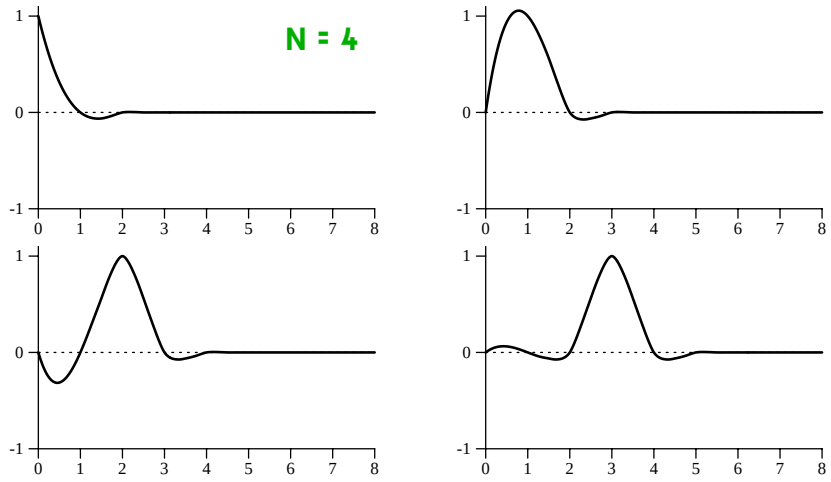
Interpolation

Boundary construction

- maintain polynomial order



Scaling Functions



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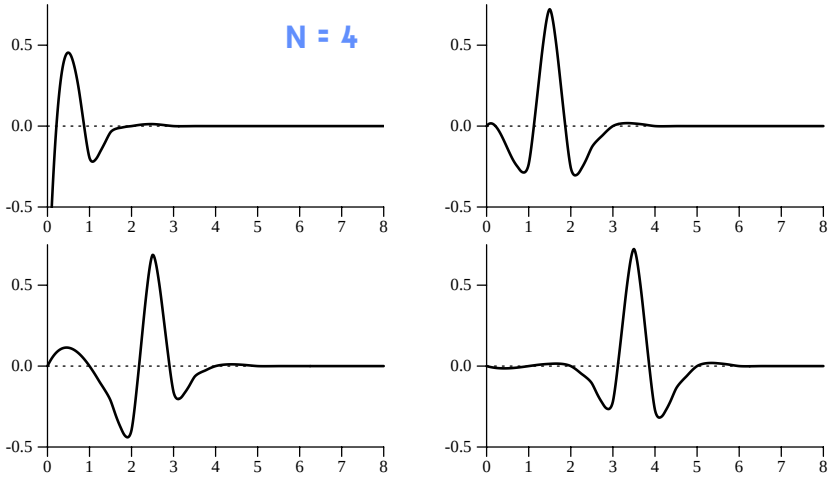
Wavelets



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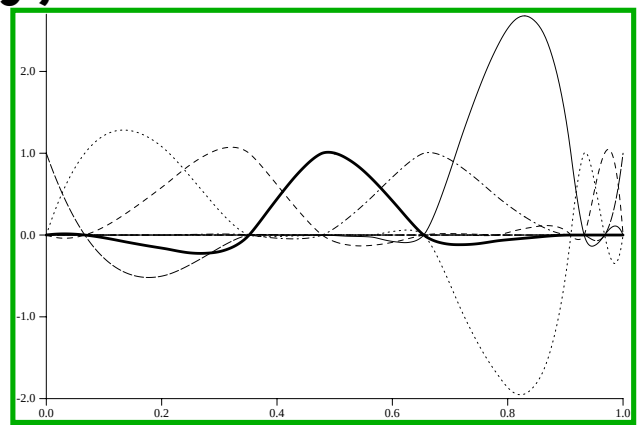
Irregular Samples

Scaling functions



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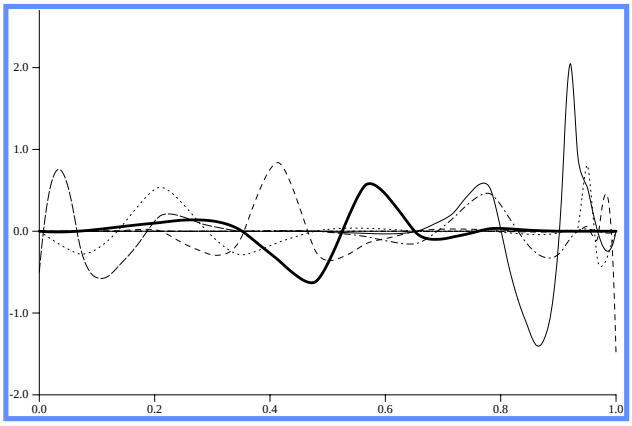
Irregular Samples

Wavelets



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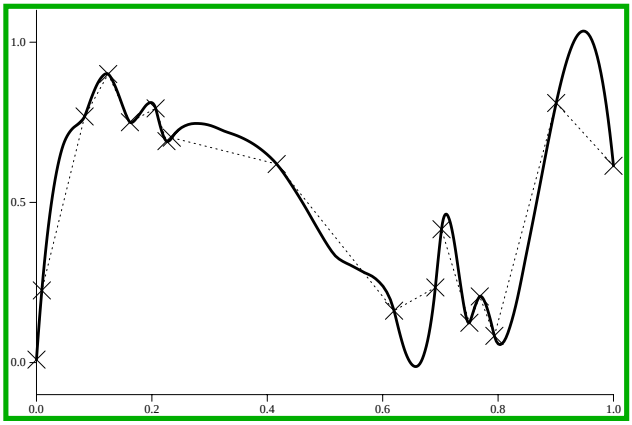
Random Interpolation



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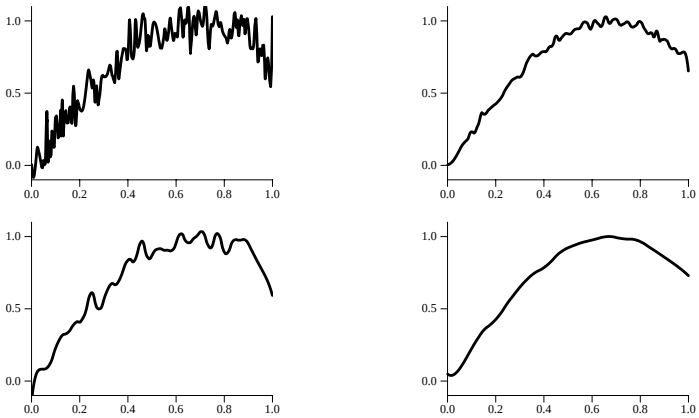
Smoothing

Random samples with noise



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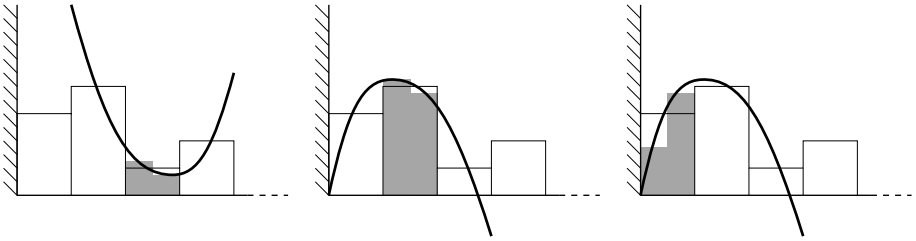
Average Interpolation

Boundary construction

- maintain polynomial order



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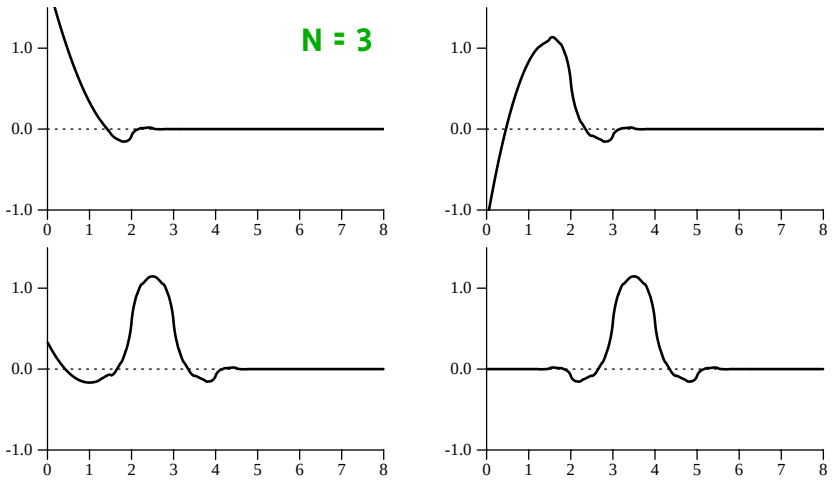
Scaling Functions



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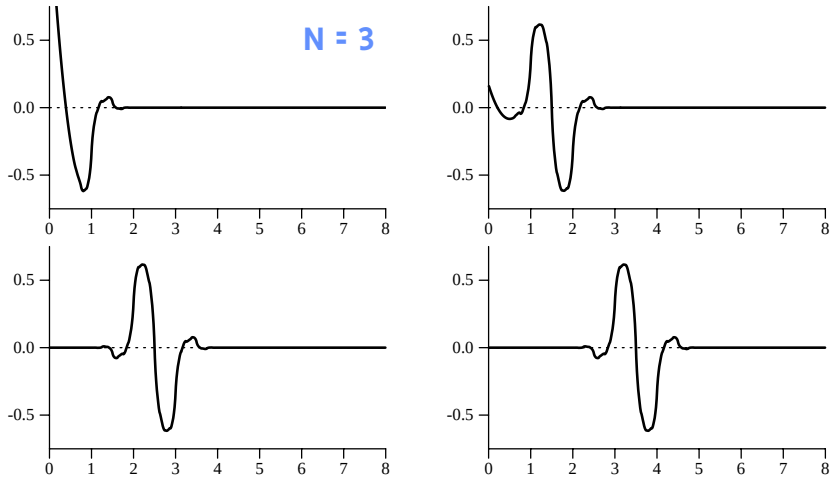
Wavelets



Weighted Inner Products

Length of interval [a,b]

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

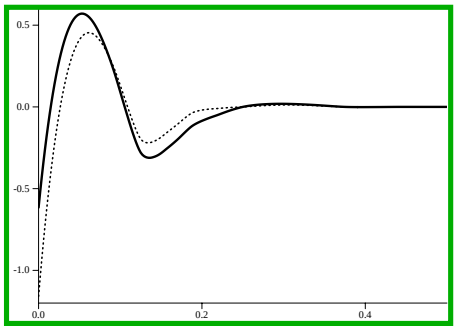
Example: approximate

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

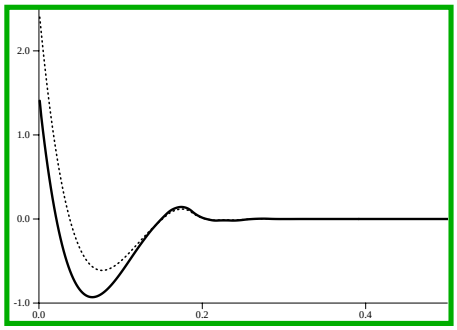
Choose

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

Weighted Wavelets



order 4



order 5

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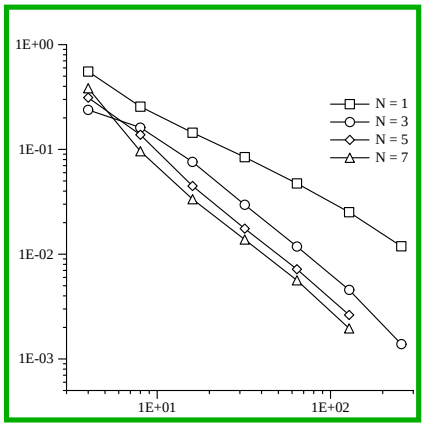
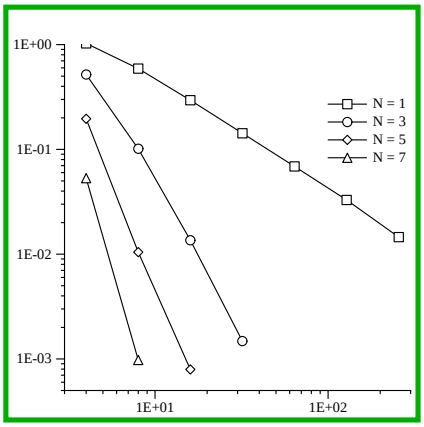
Approximation Error



unweighted



weighted

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