Detecting Fake Paintings

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Joint work with Morten Nielsen

Outline

Problem Statement: Which is Authentic?

Relevance

The Art Newspaper:

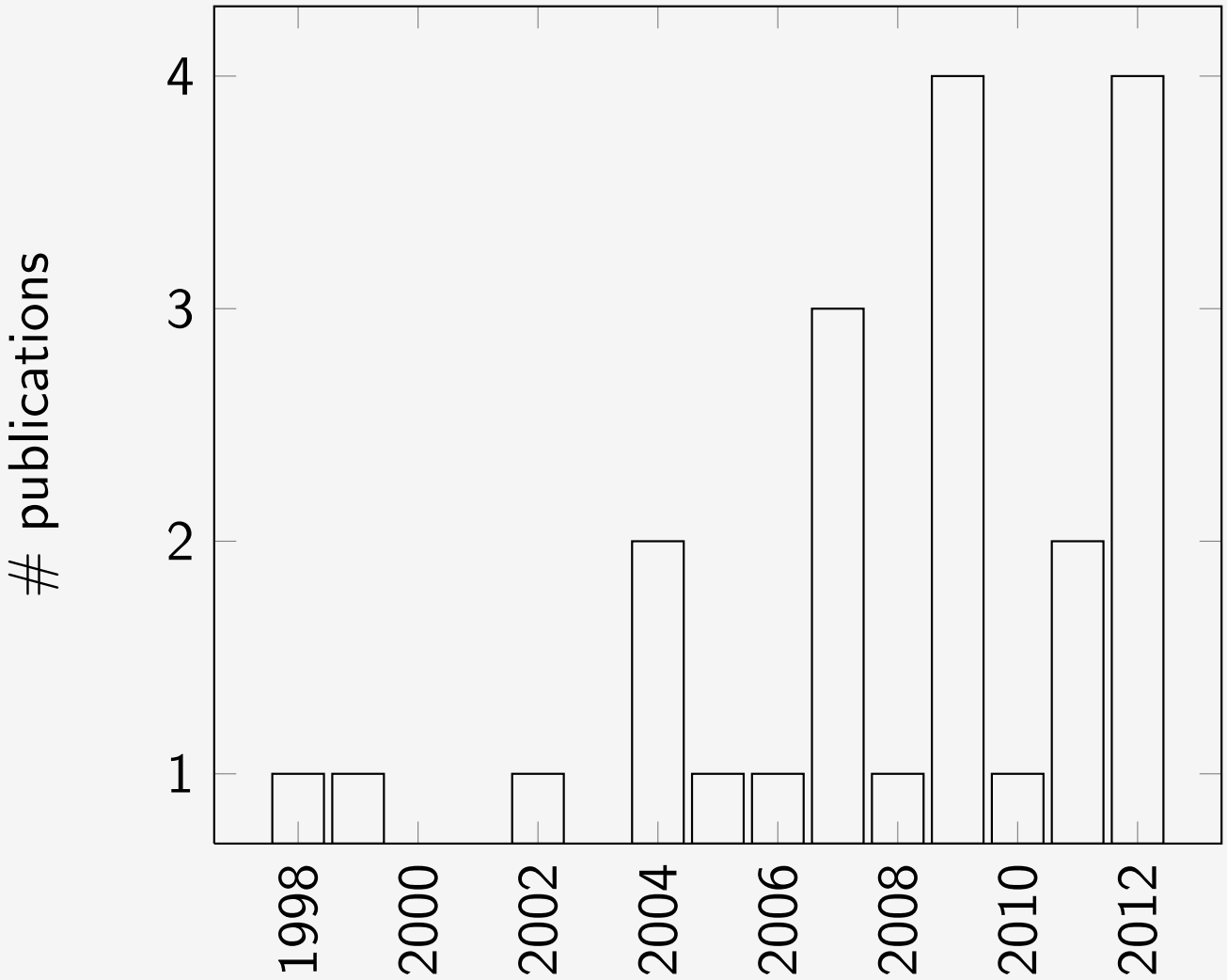
Break the silence over fakes

Enforced silence encourages fakes. It gives forgers the space in which they can manoeuvre

By Jack Flam. Opinion, Issue 234, April 2012
Published online: 12 April 2012

The press has recently been full of reports about forgeries. In Europe, fakes by Wolfgang Beltracchi have embarrassed a number of experts and collectors. In the US, a painting purportedly by Jackson Pollock that was sold for $17m is the subject of a lawsuit against the now-closed Knoedler gallery and its former president Ann Freedman. This "Pollock", moreover, seems to be only the tip of the iceberg, since it appears to belong to a surprisingly large collection of pictures supposedly painted by leading abstract expressionist artists. This collection was allegedly

Interest in this Subject



Brushstrokes

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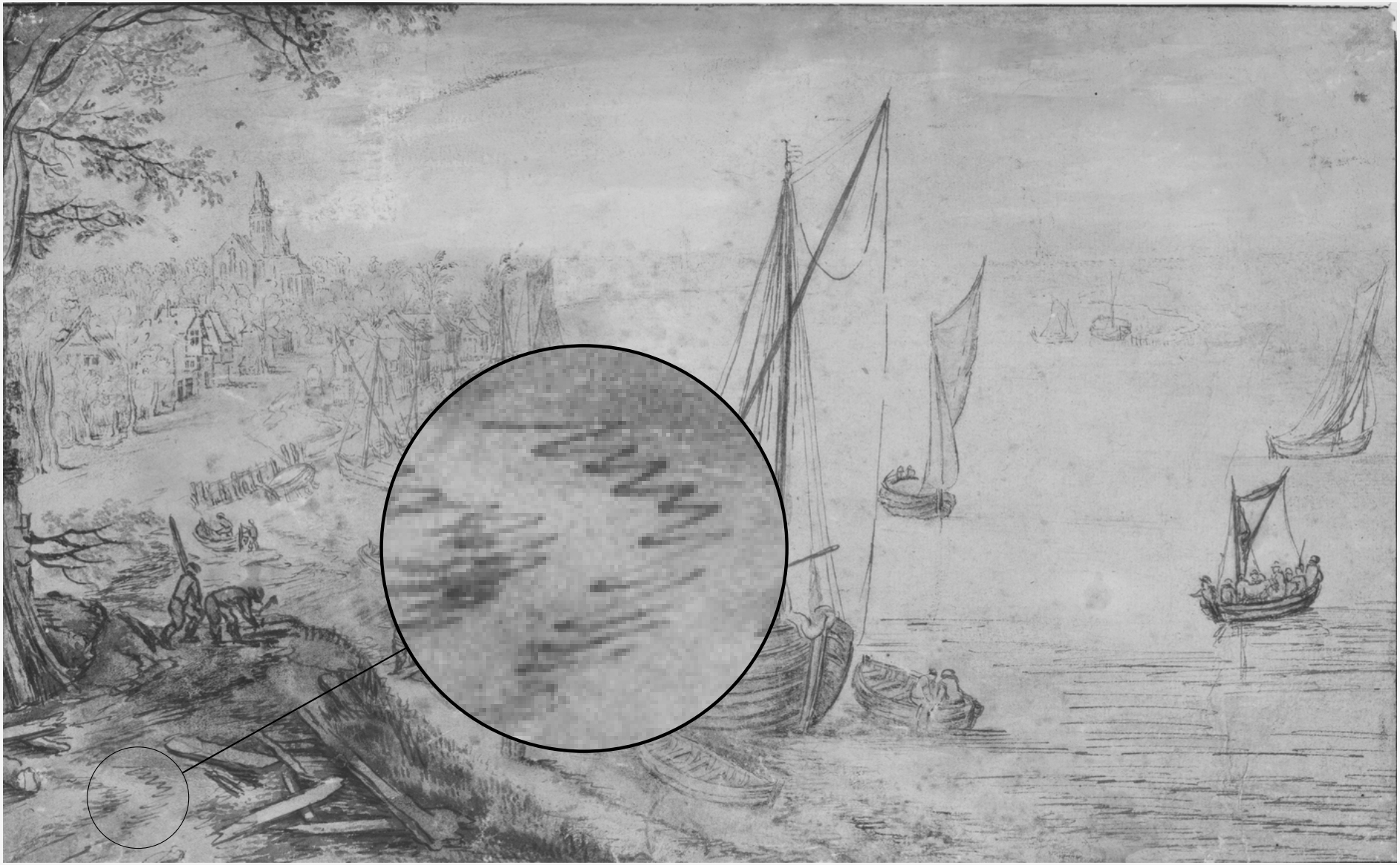

Divide and Conquer

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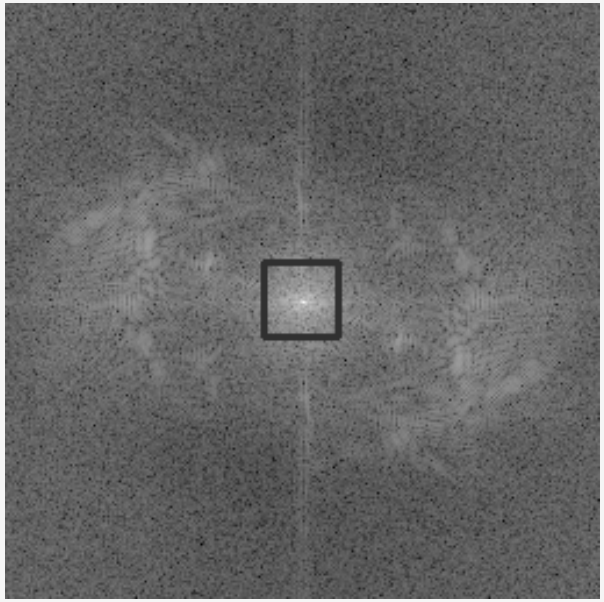
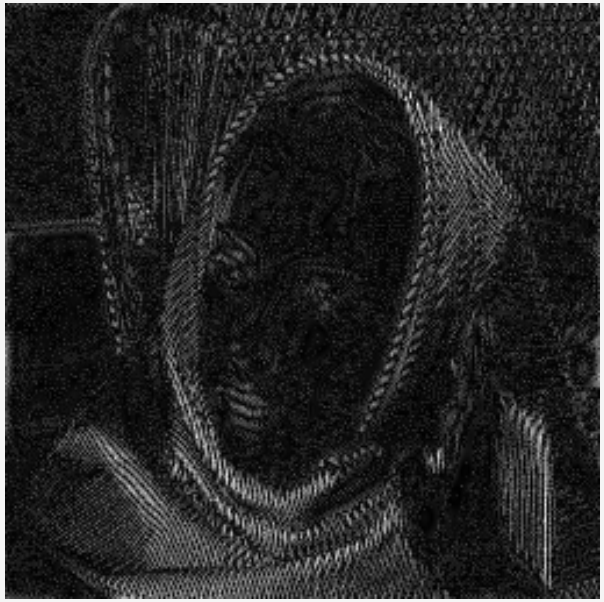
Details = High Frequencies





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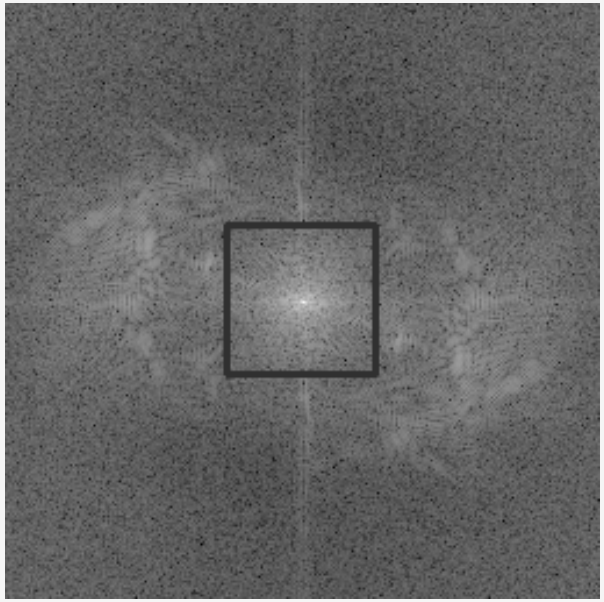
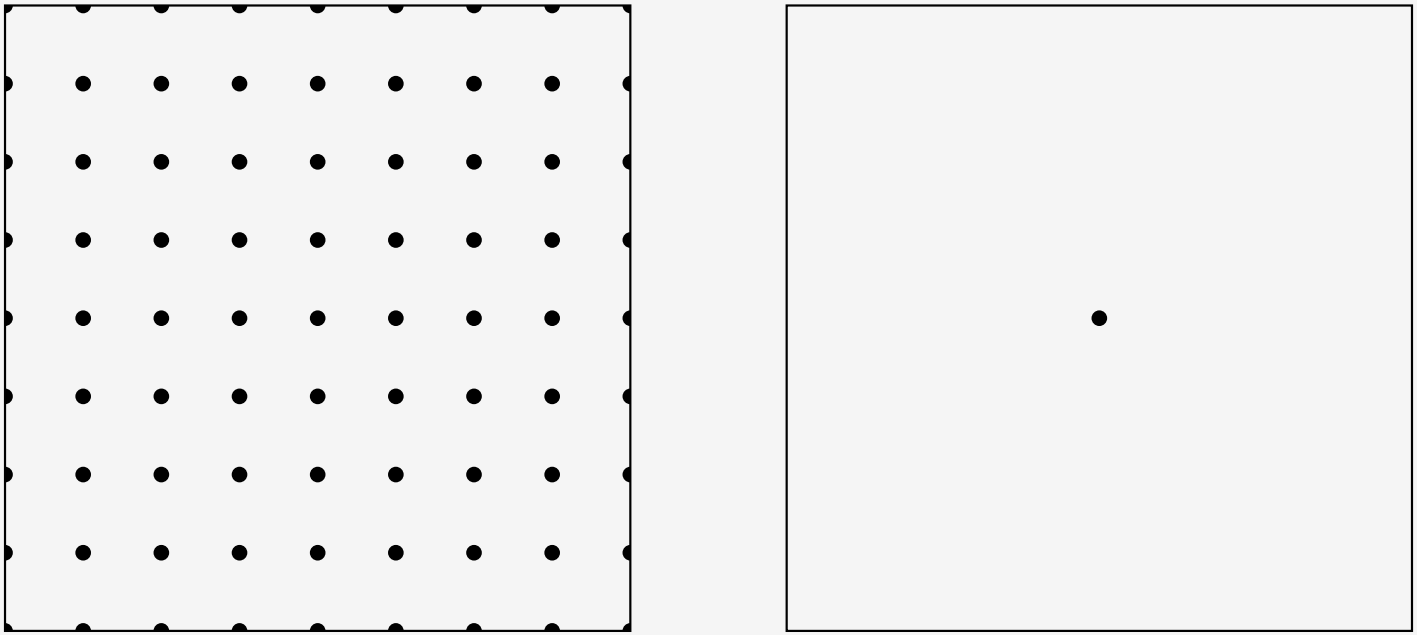


Fourier Fails

- Fourier: One frequency, lots of pixels
- Heisenberg: One frequency, one pixel is impossible
- Realistic: Few frequencies, few pixels.



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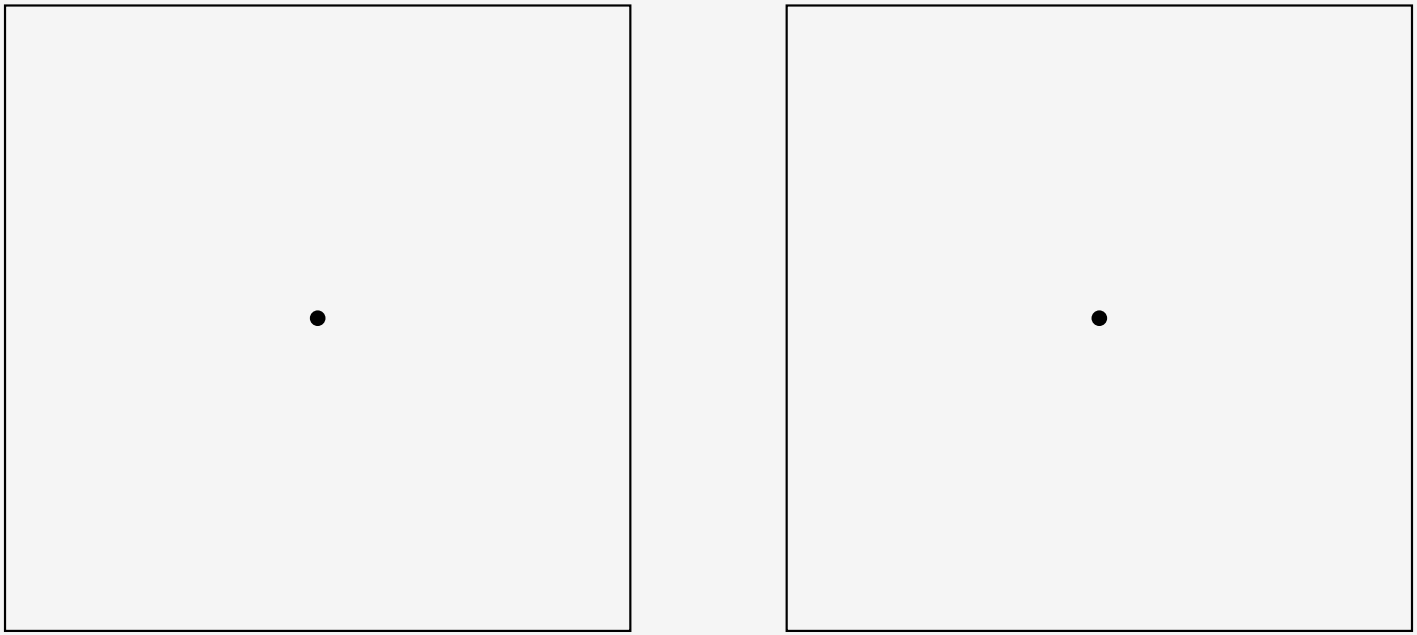

spatial frequency

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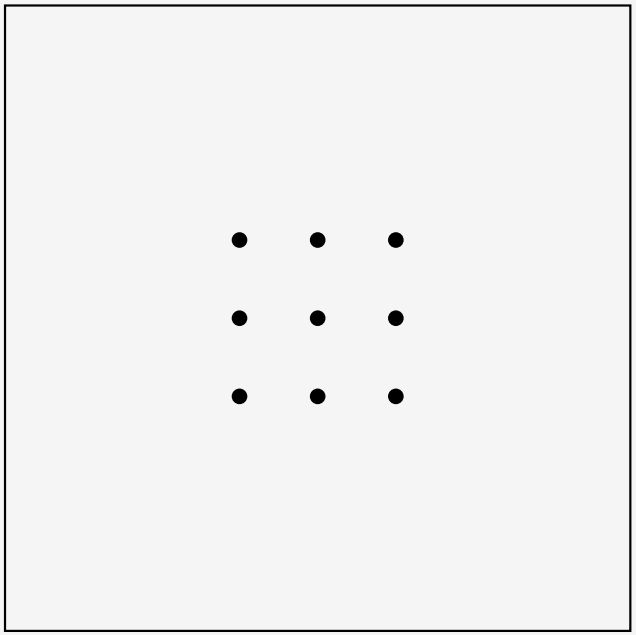
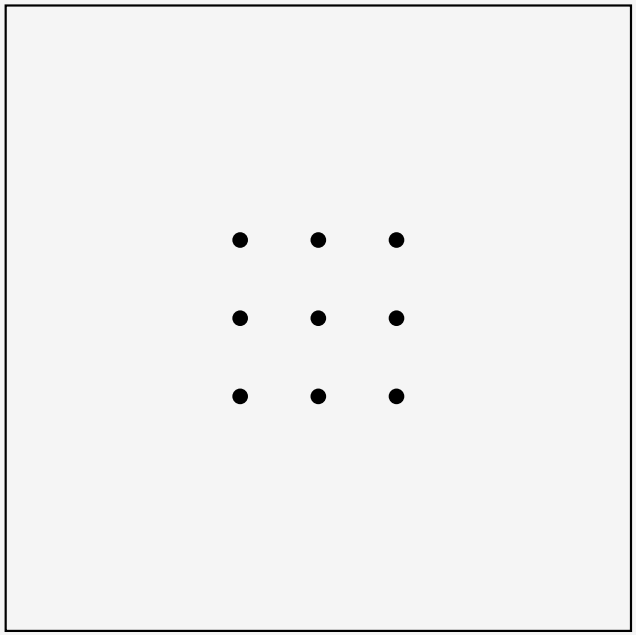


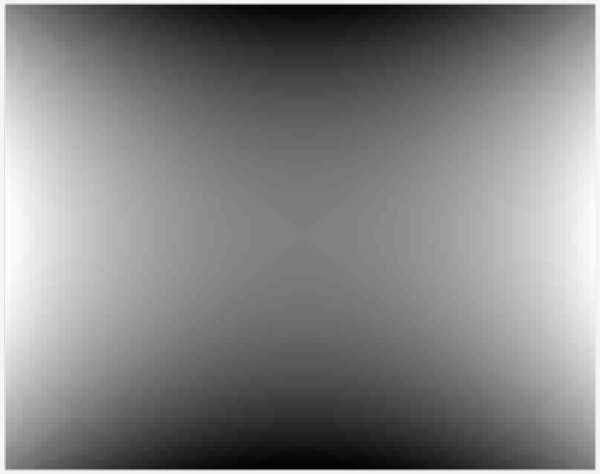
spatial

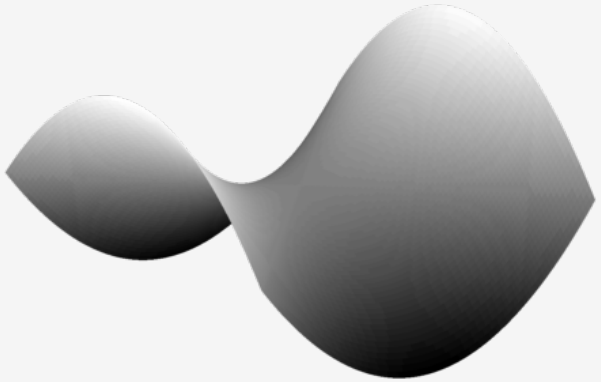


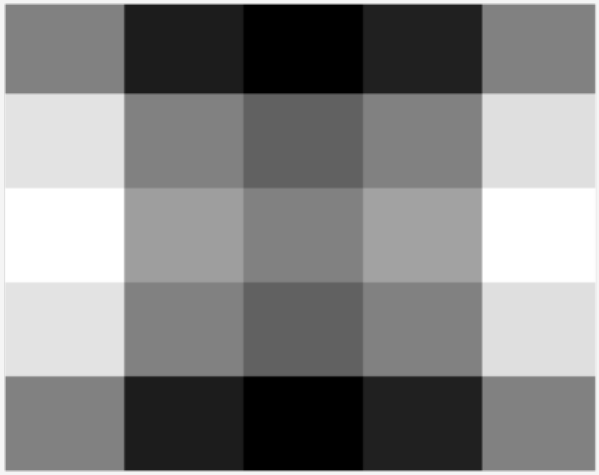
frequency

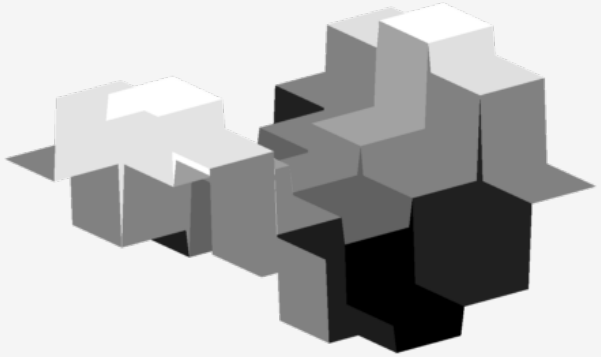
Multiresolution Analysis: Digital image

$$\text{digital image} = \sum_{k \in \mathbb{Z}^2} a_k \phi(x - k), \quad \phi(x) = \mathbb{1}_{[0,1)^2}(x).$$









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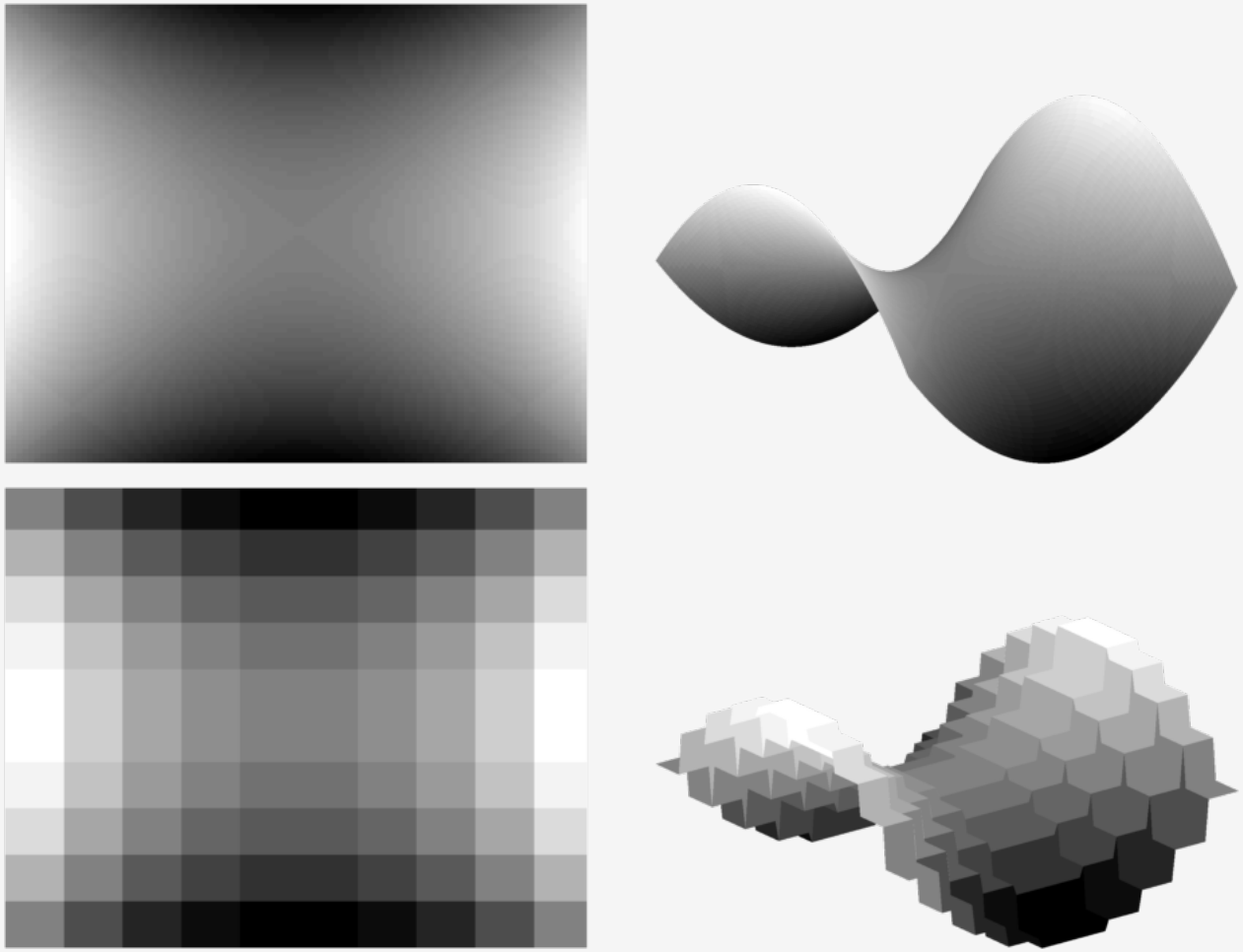

Multiresolution Analysis: Contourlets

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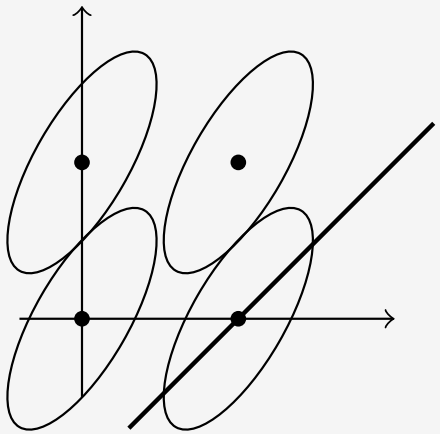

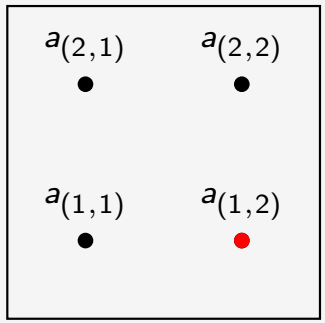

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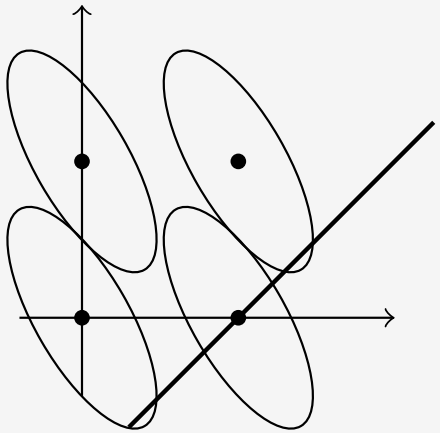

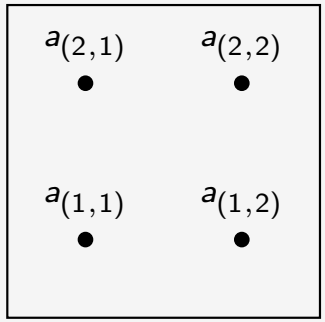

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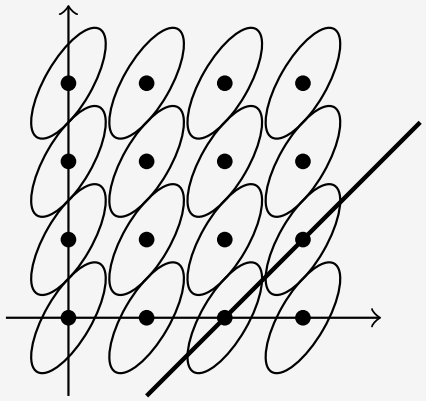
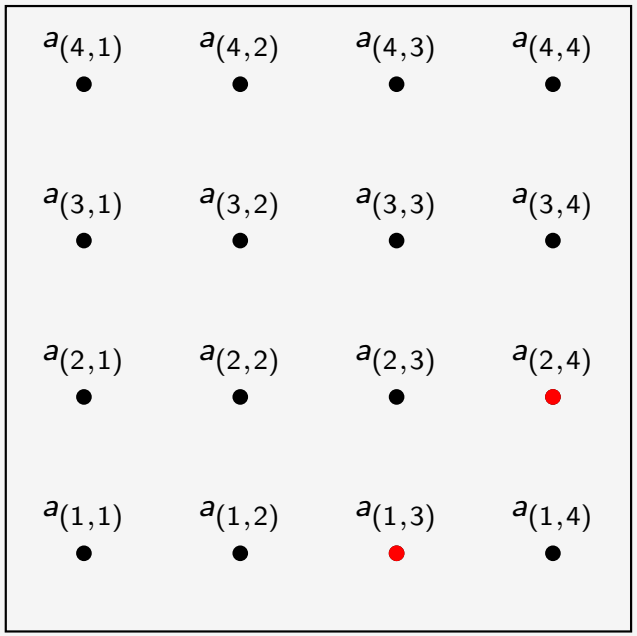
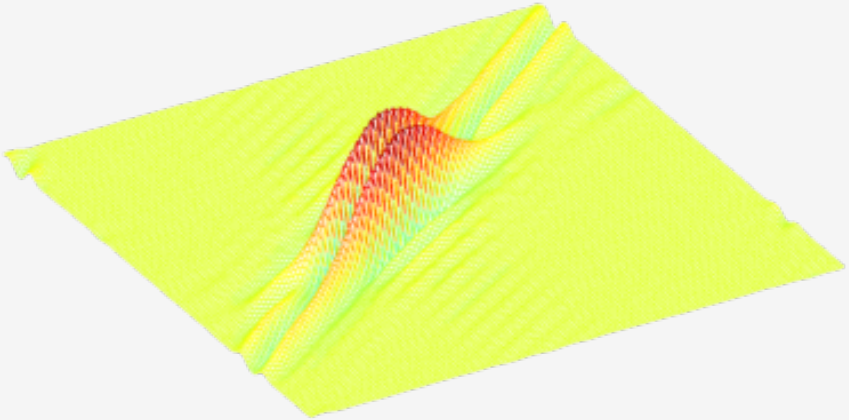


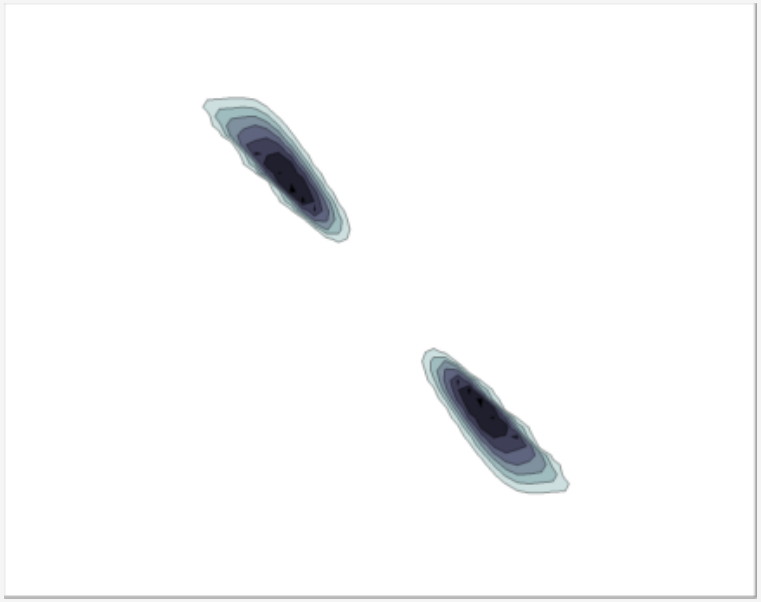


Contourlet properties

- Directionality



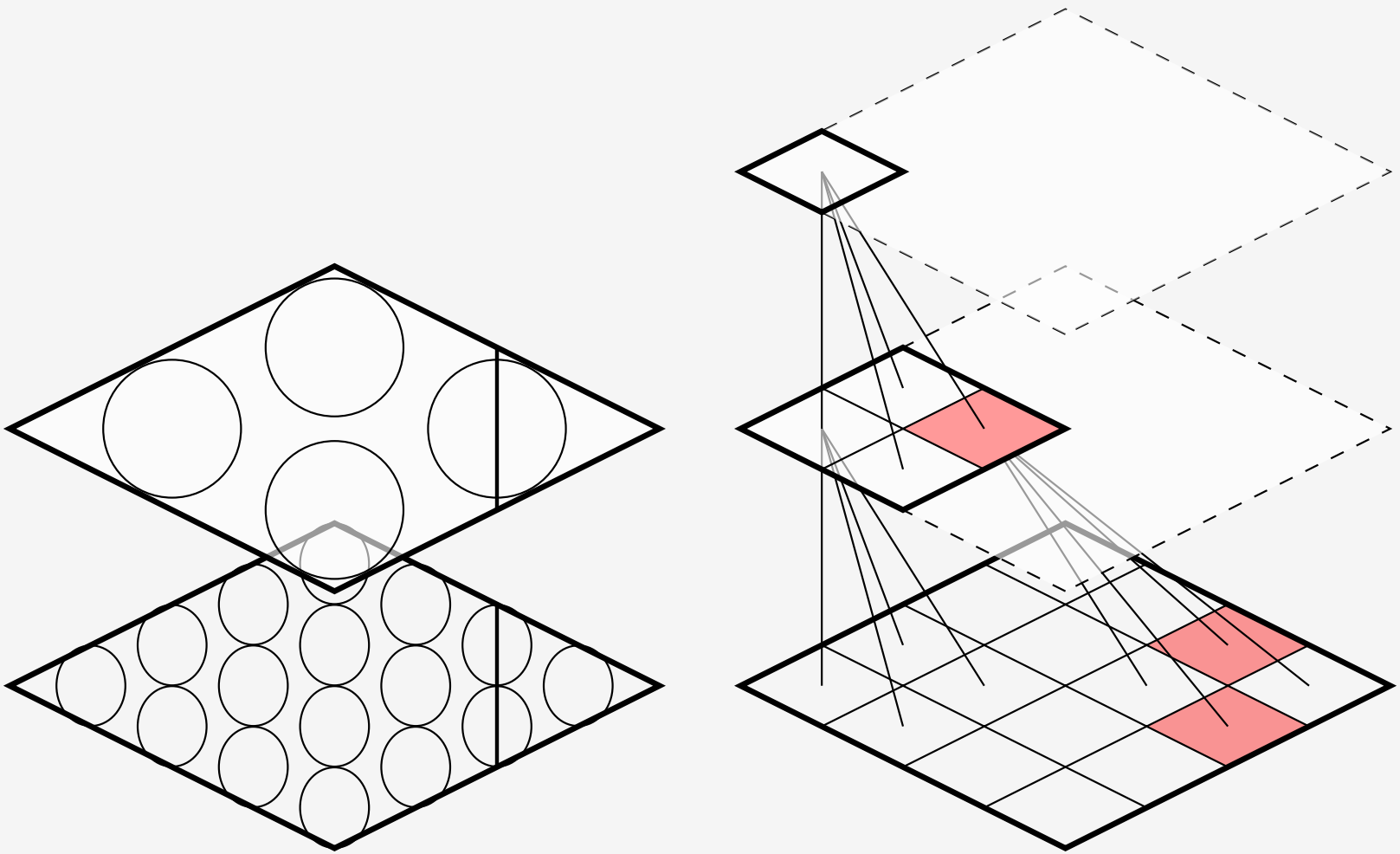
- Frequency selection
- Made for digital images



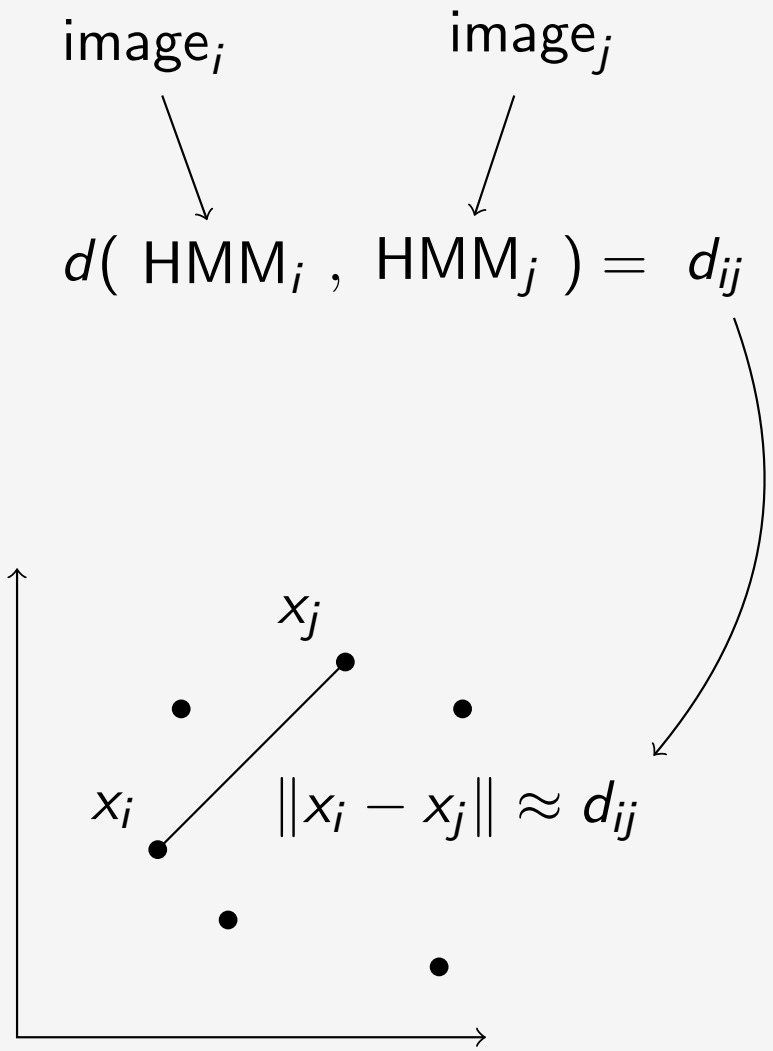
Contourlet Transform

Contourlet Transform

Hidden Markov Model



Distances: Multidimensional Scaling



Results: Pieter Bruegel the Elder

3

4

5

6

7

9

11

13

20

120

121

125

Results: Pieter Bruegel the Elder