On point processes, Monte Carlo testing and stochastic reconstruction

Jiří Dvořák[1,2]

[1]Department of Probability and Mathematical Statistics, MFF UK, Prague
[2]Institute of Information Theory and Automation, CAS, Prague

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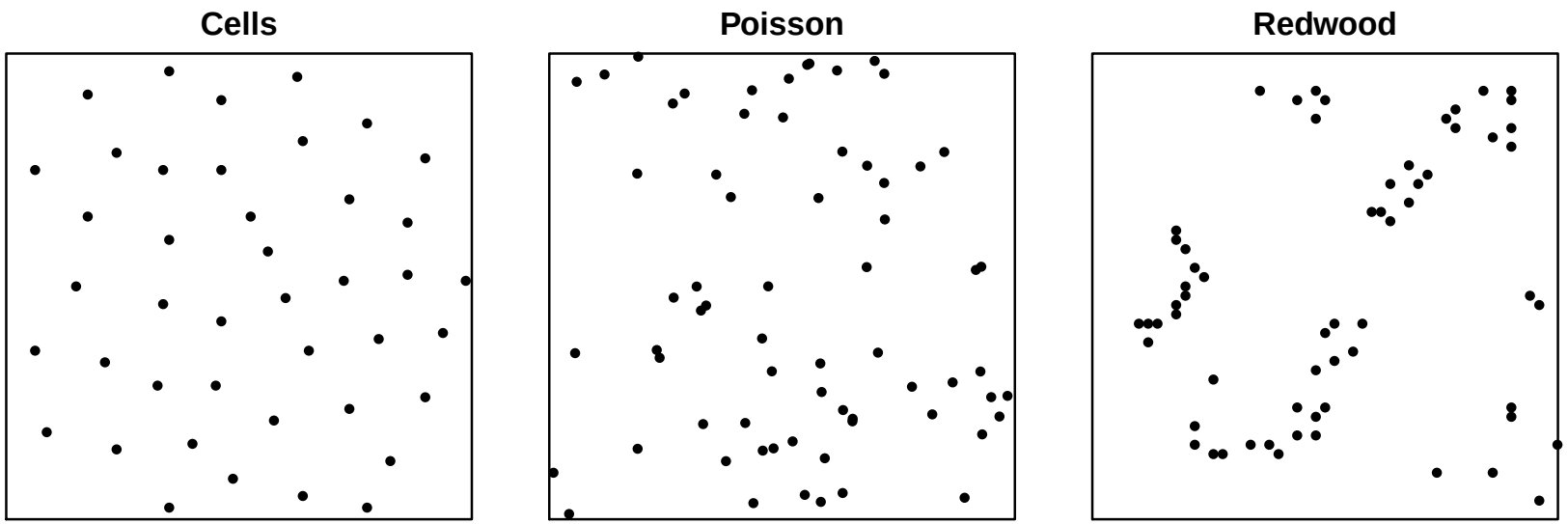
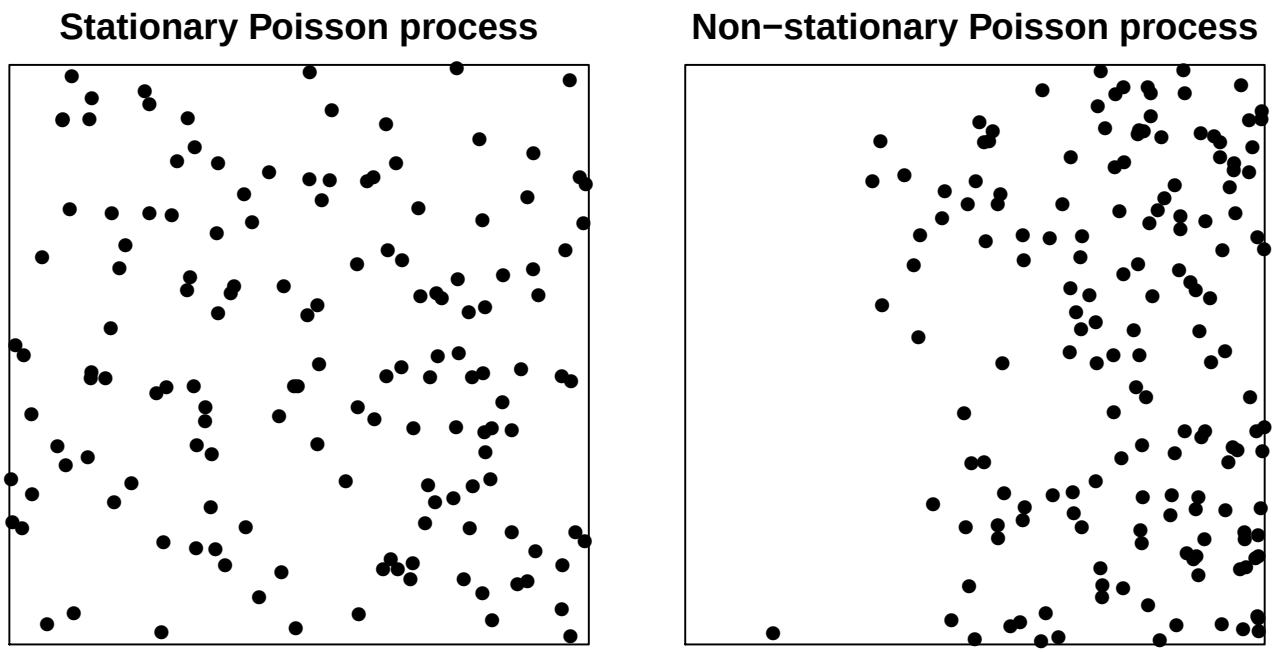
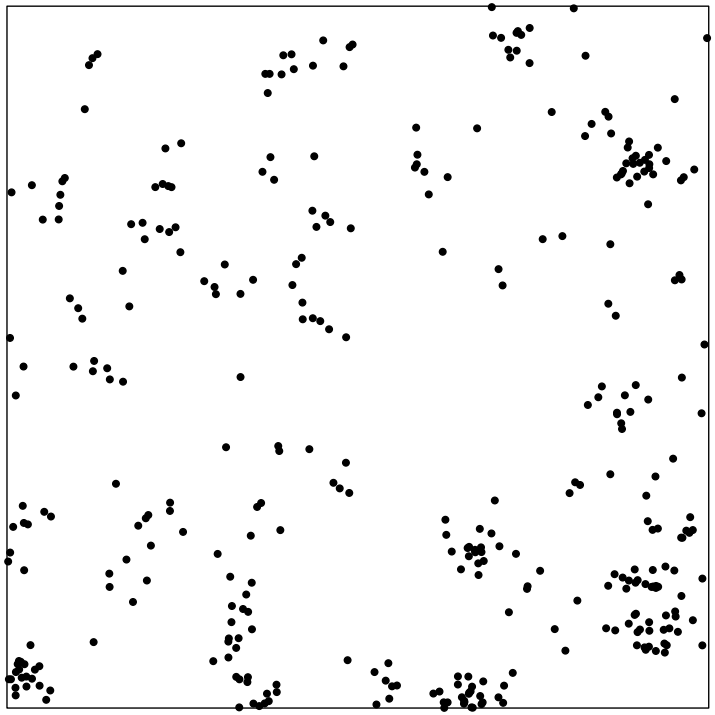
Point patterns – regularity and clustering

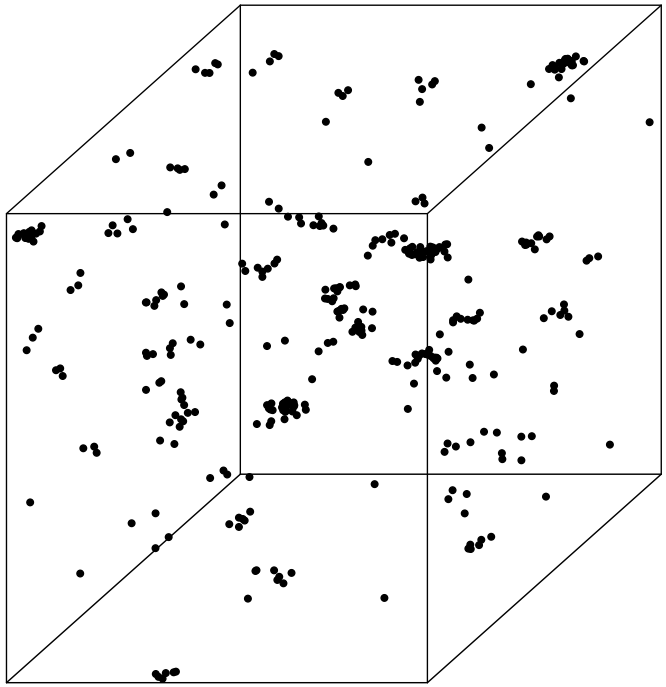


Point patterns – stationary and non-stationary

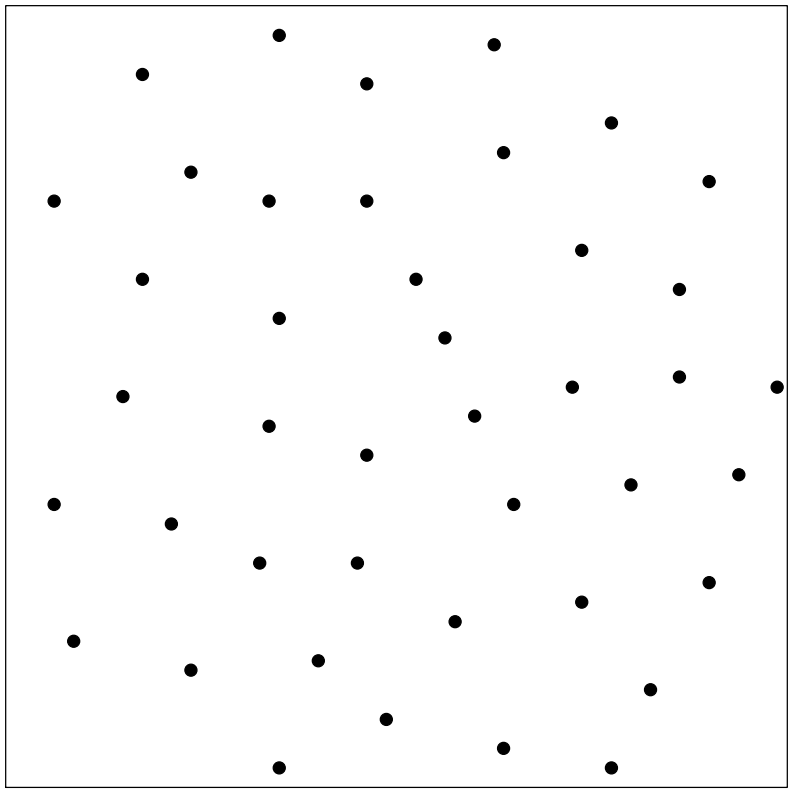


Point patterns – spatial and space-time



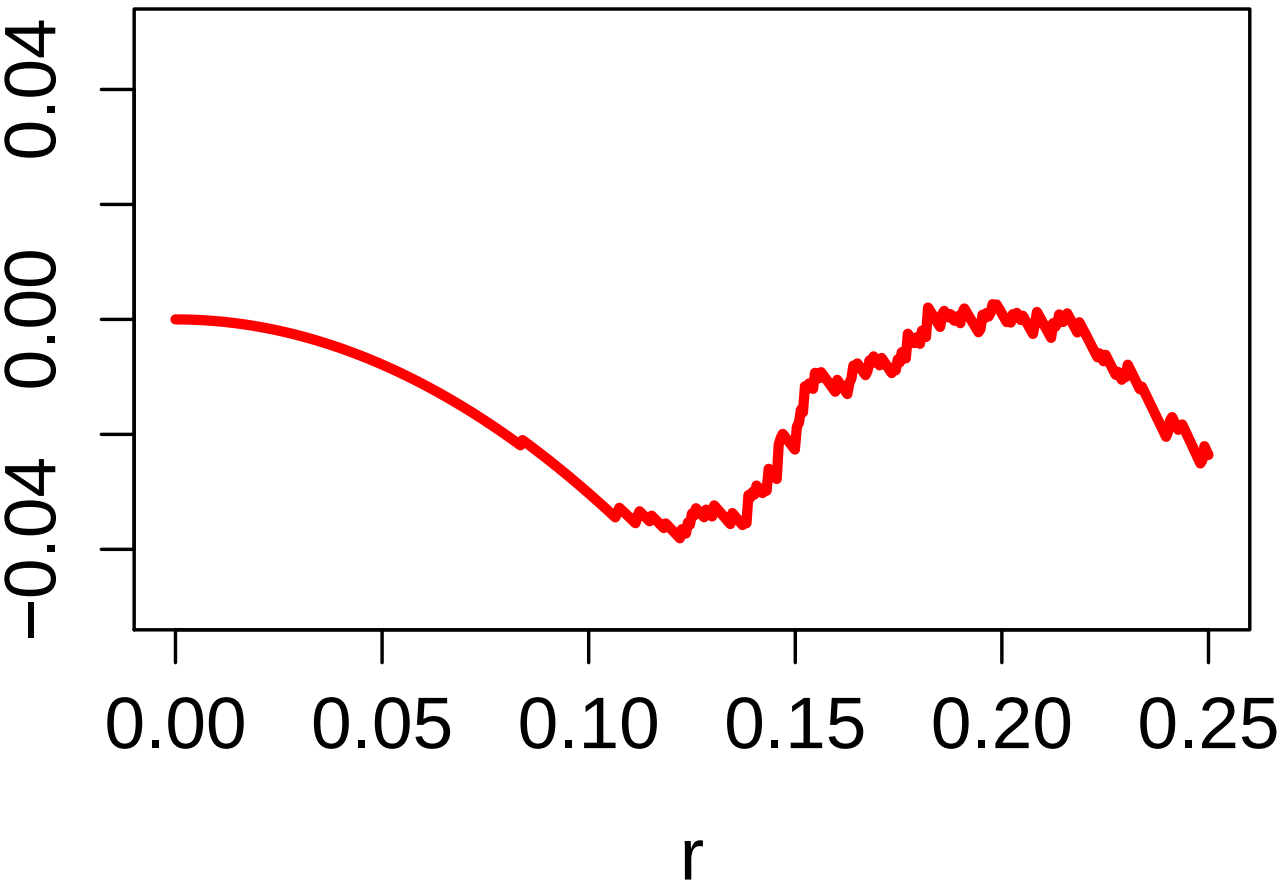


Monte Carlo testing: observed data

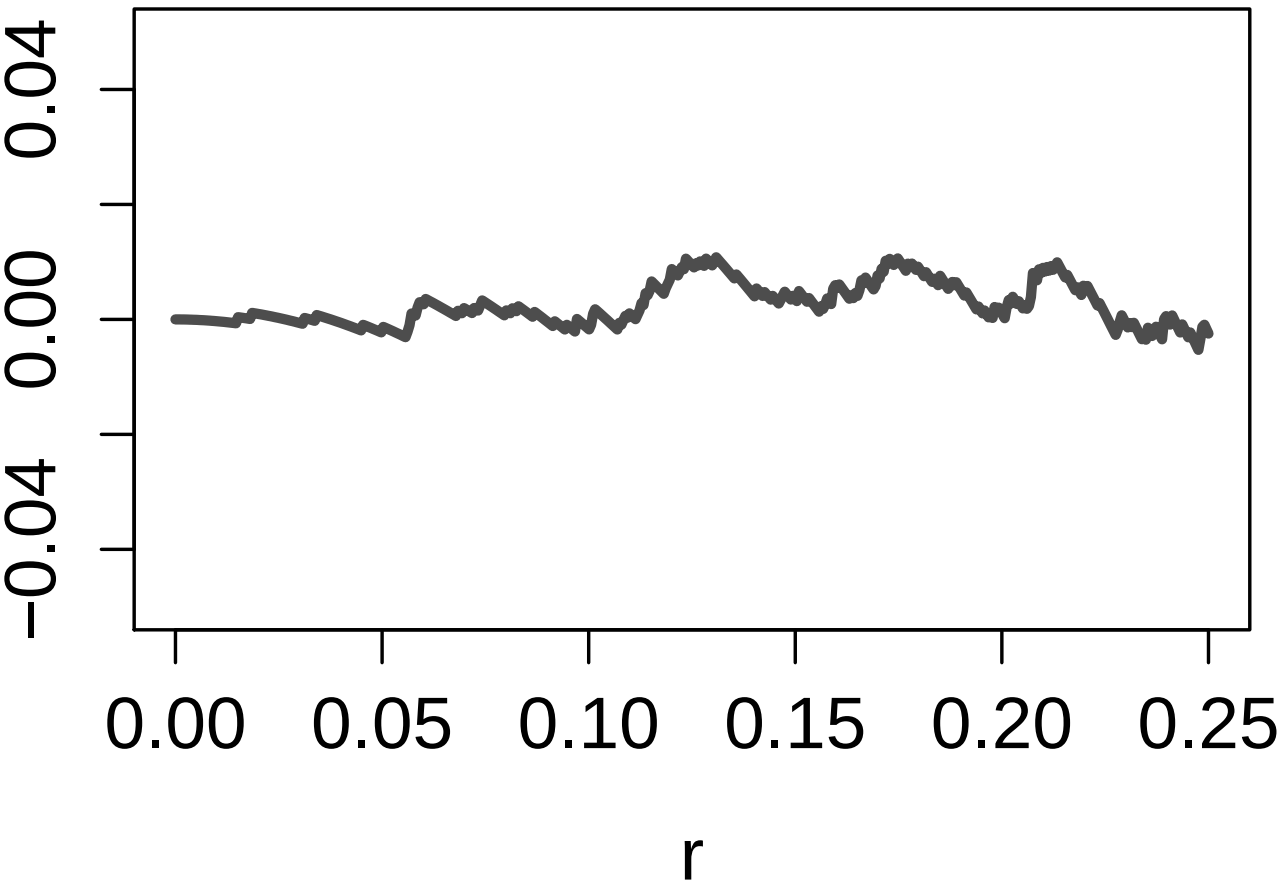


$$T(r) = K(r) - \pi r^2, \; r \in [0; 0.25]$$

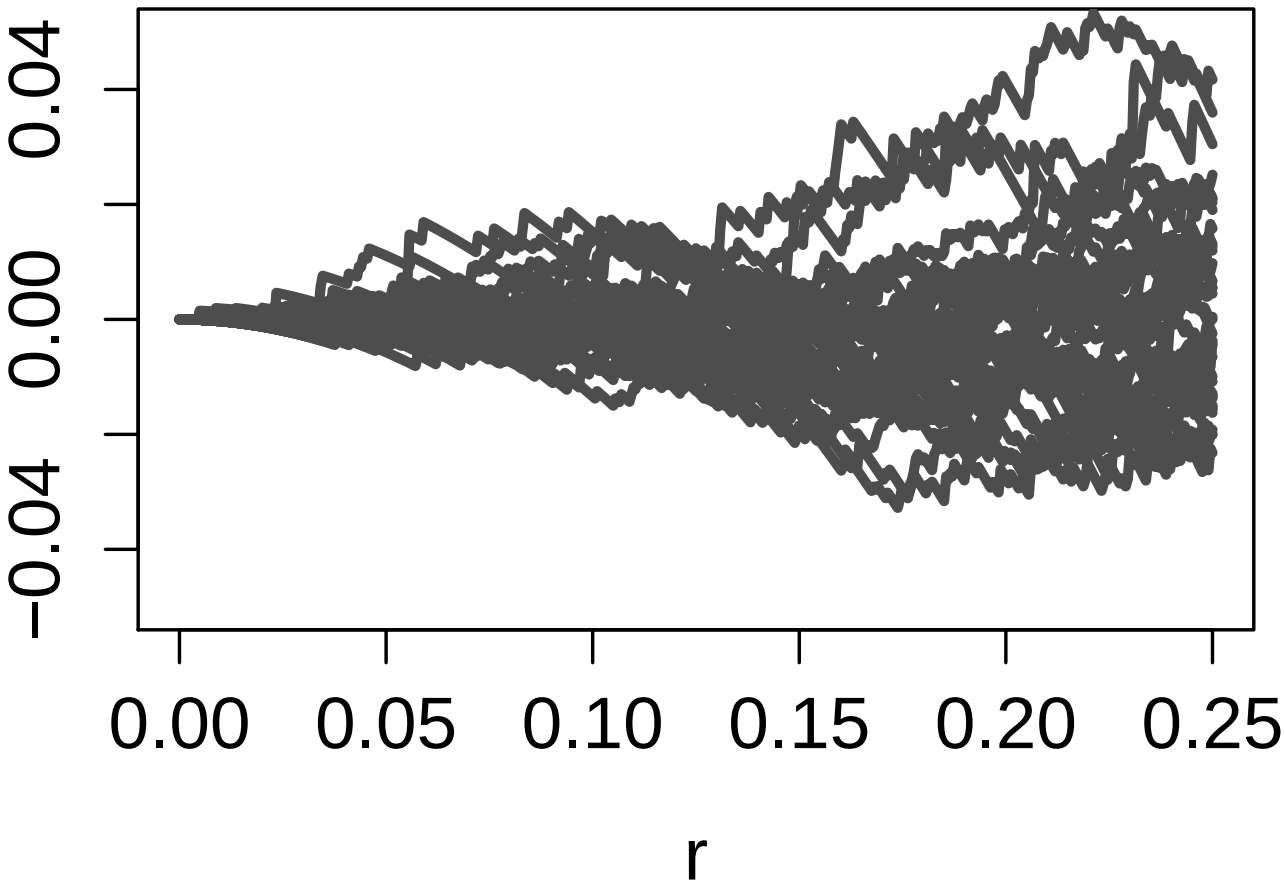
Monte Carlo testing: data curve



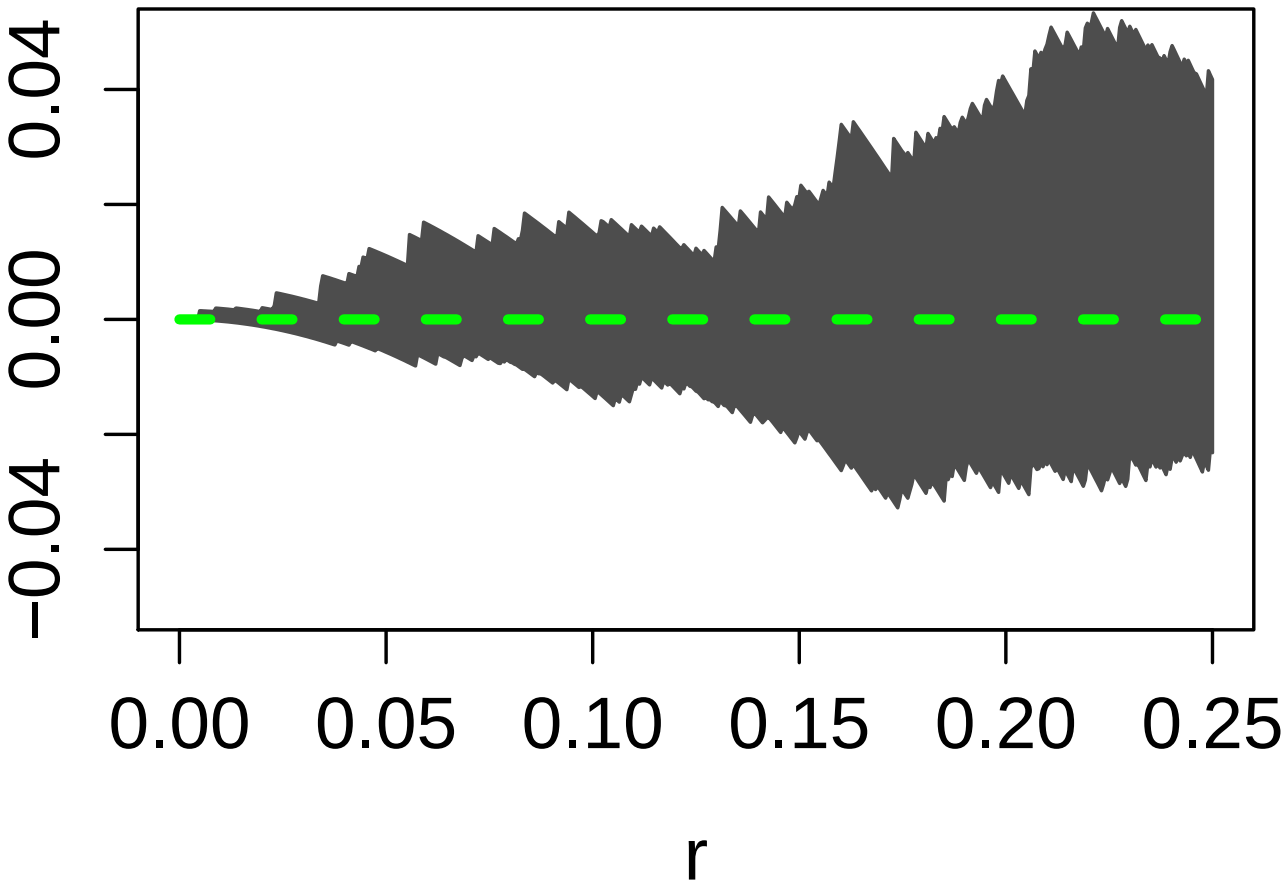
Monte Carlo testing: simulated curve



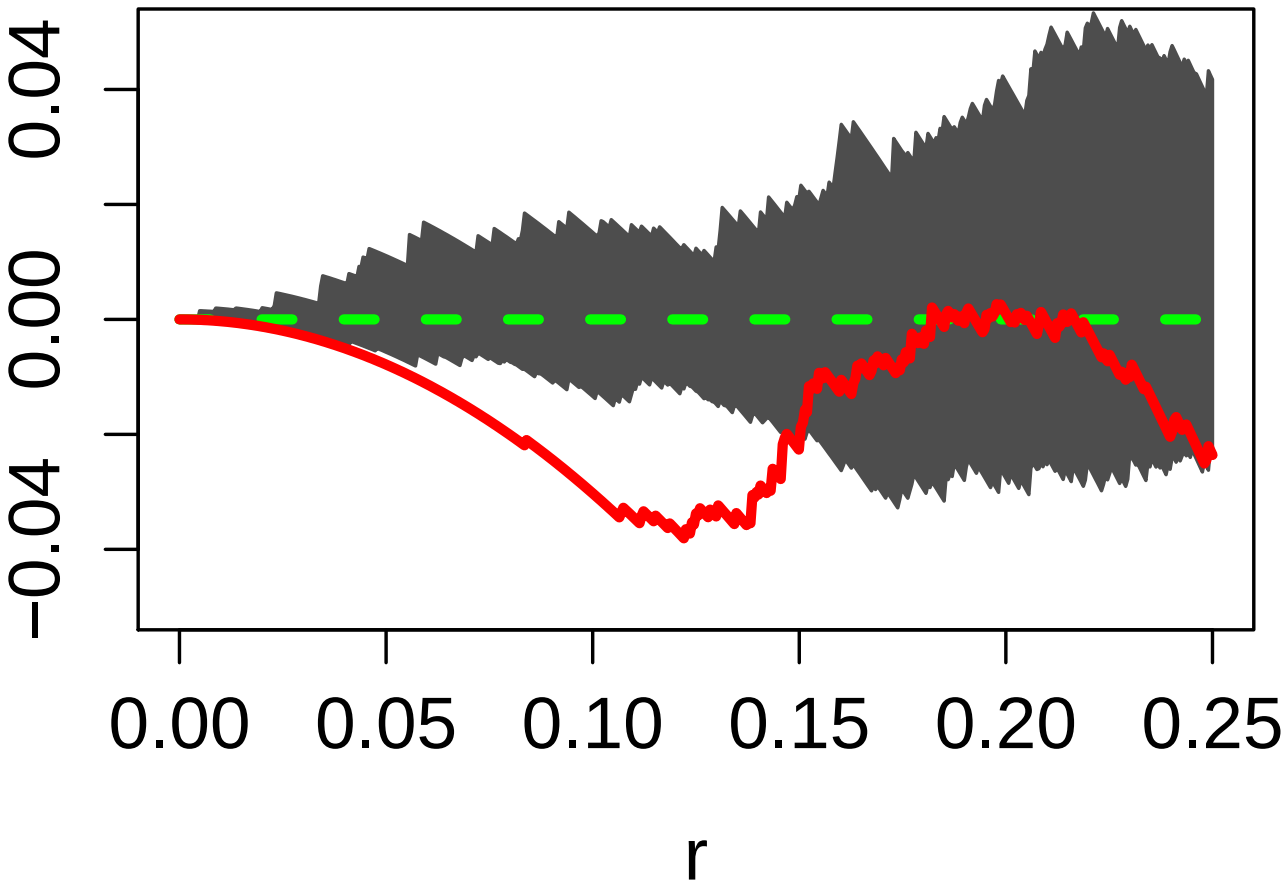
Monte Carlo testing: 39 simulated curves



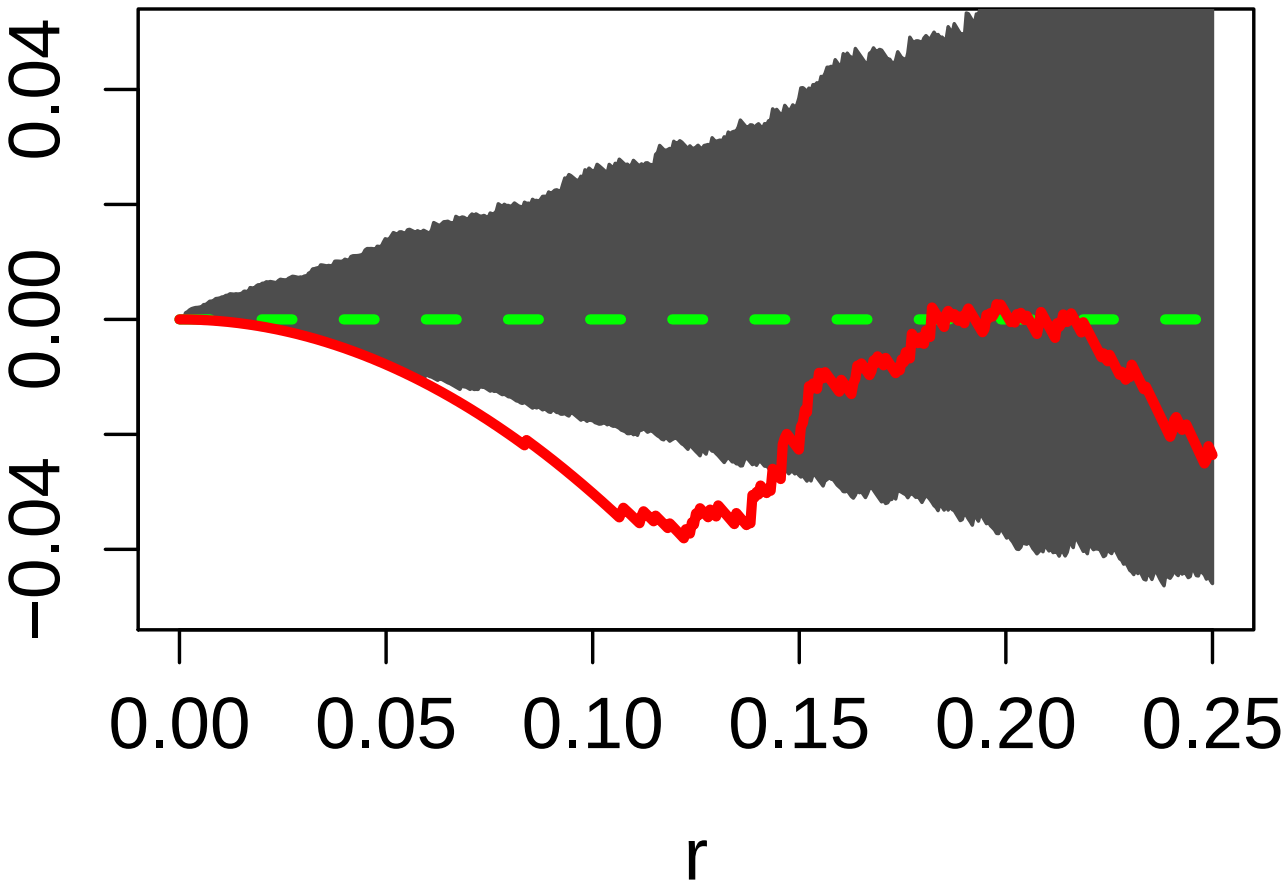
Monte Carlo testing: envelope and T_{H_0}



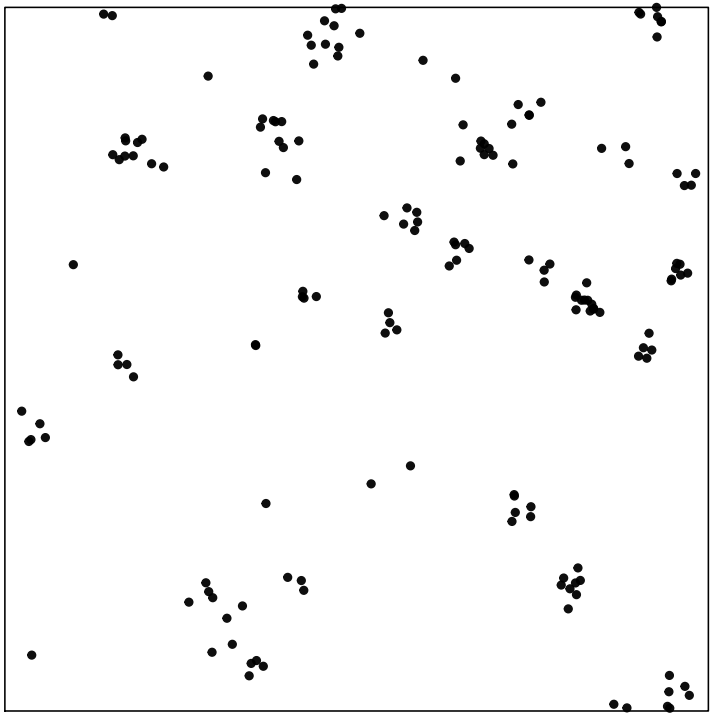
Monte Carlo testing: envelope test

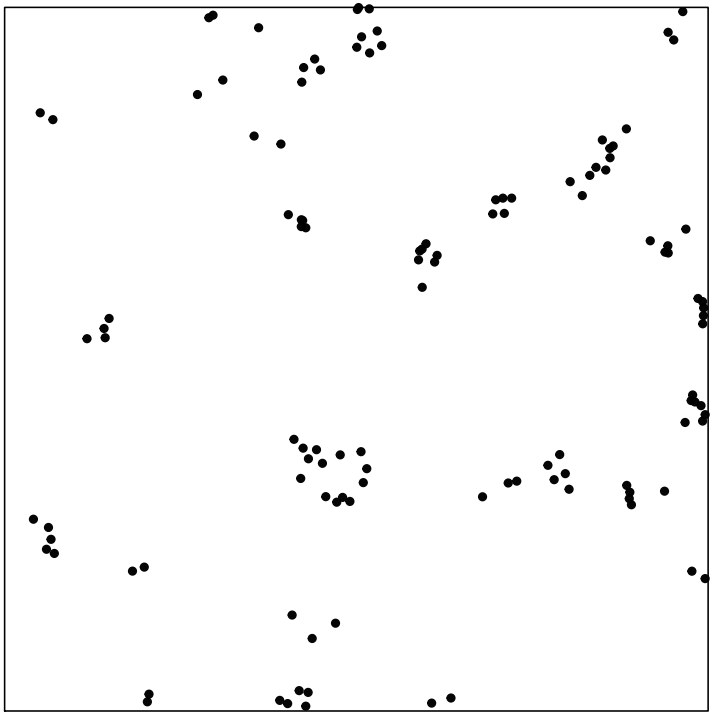


Exact envelope test, n = 4999, α=0.95

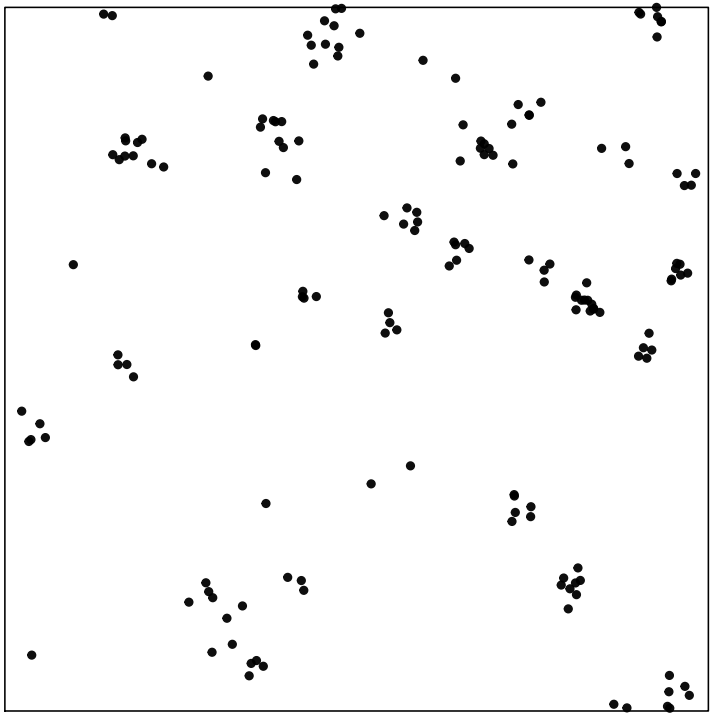


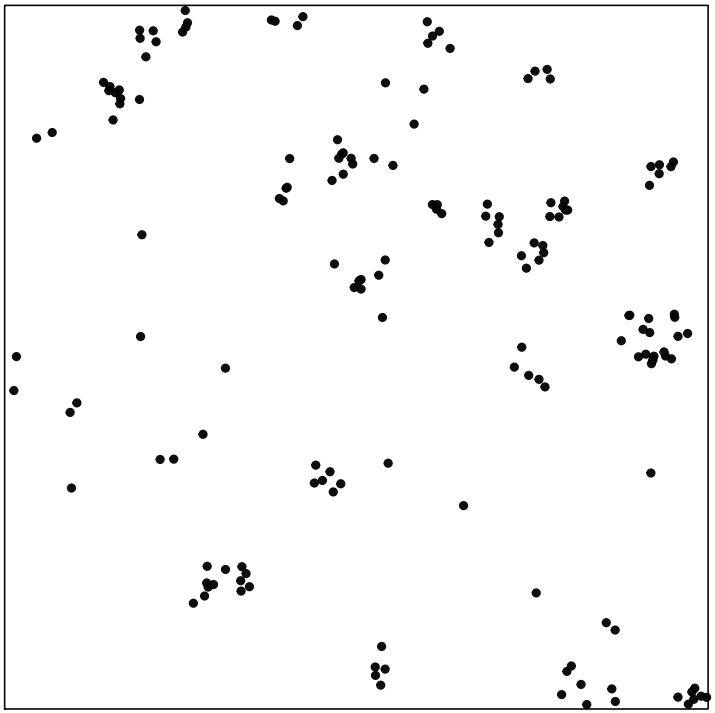
Stochastic reconstruction – similarity of patterns



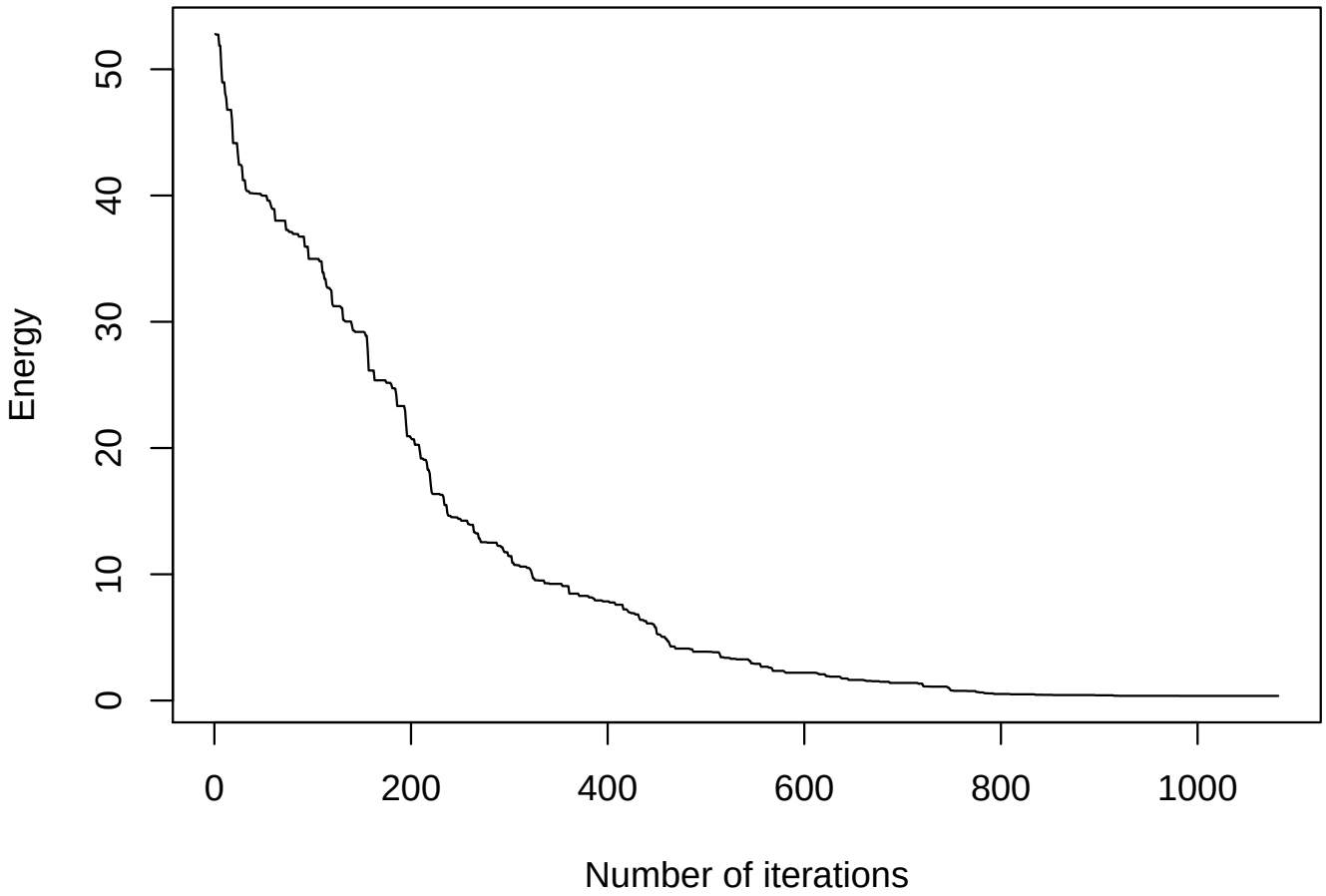


Stochastic reconstruction – similarity of patterns

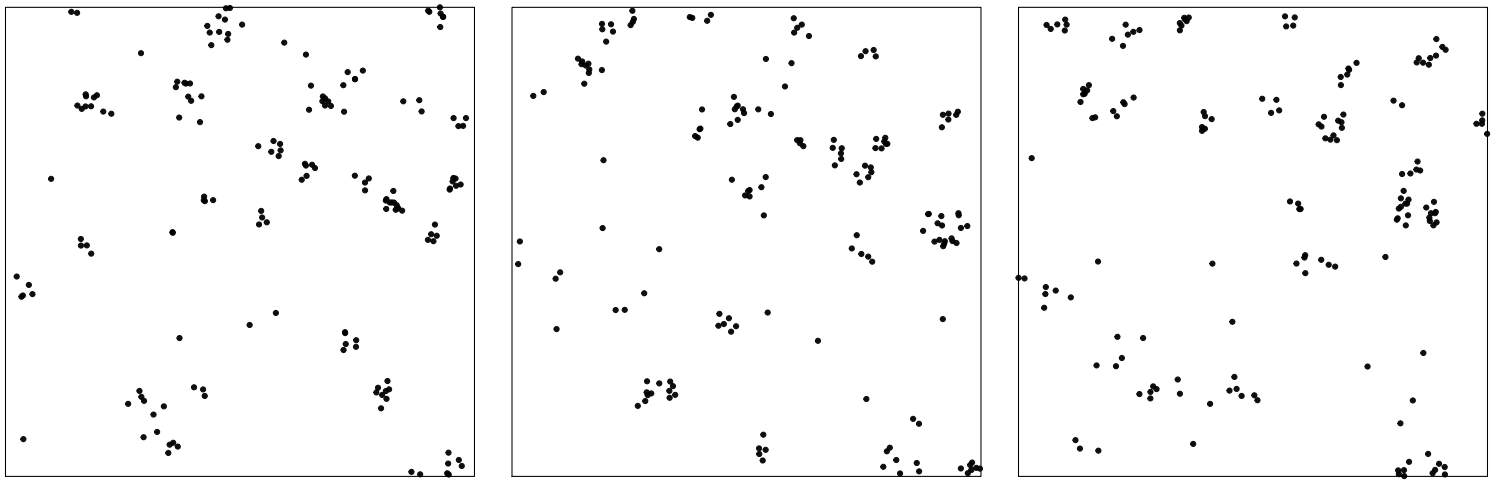




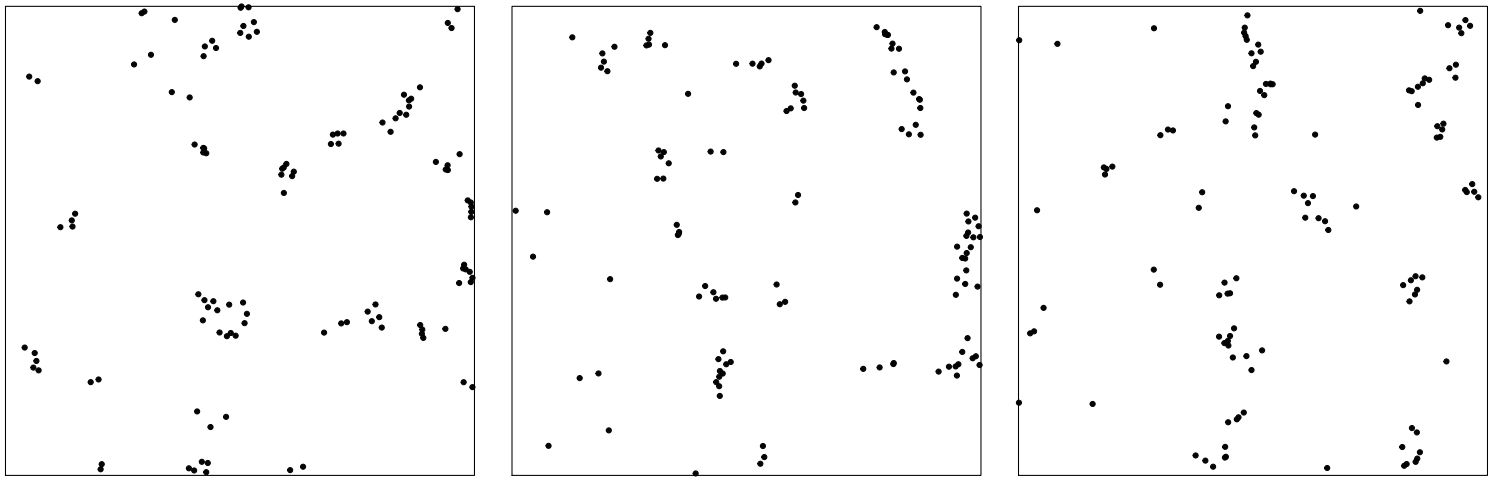
Stochastic reconstruction – energy



Stochastic reconstruction – further examples



Stochastic reconstruction – further examples



Practical problem

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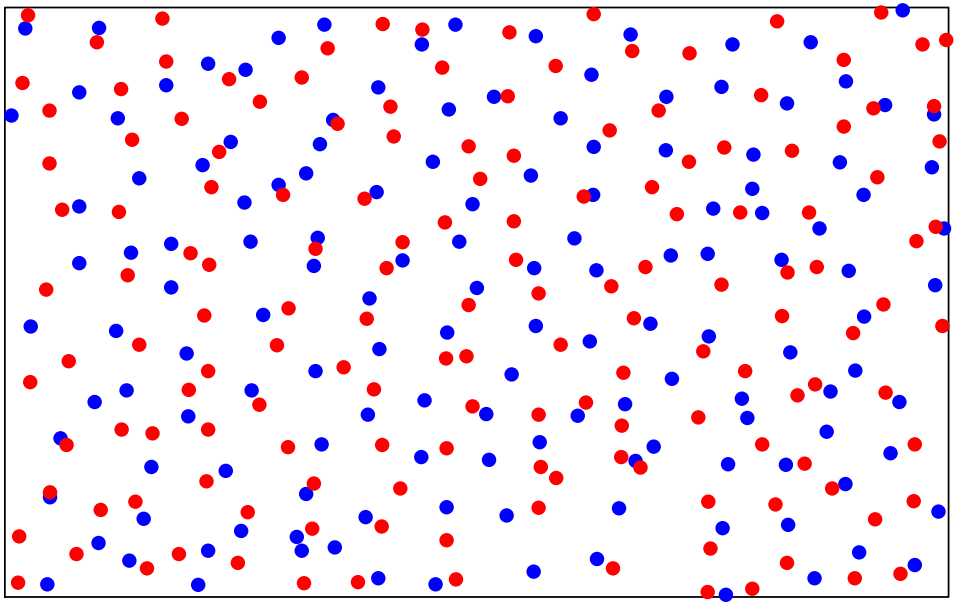
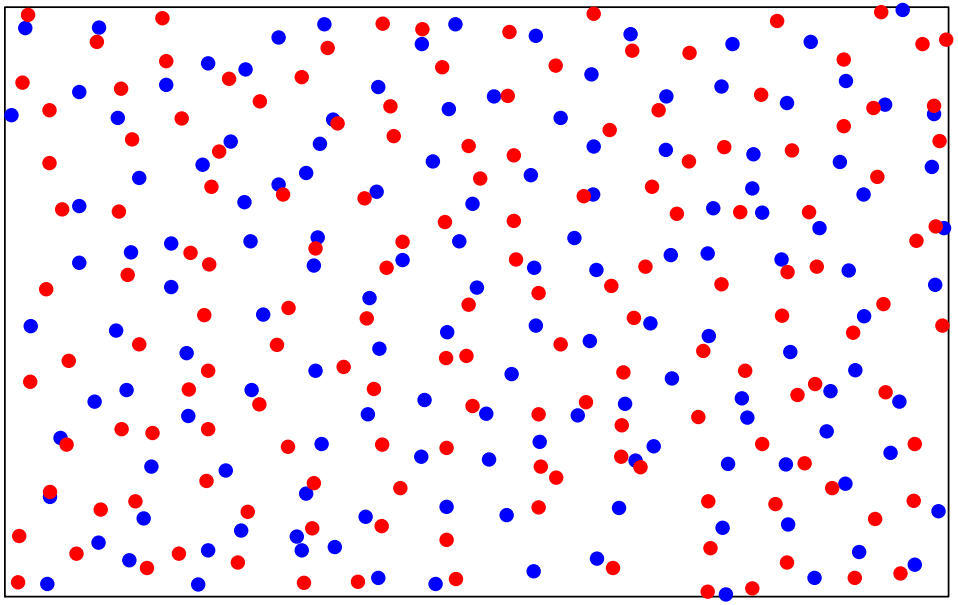
Microscopic image of rabbit retina (neurons, amacrine cells).



red points – neurons in a deeper layer
blue points – neurons in a shallower layer
(they modulate the stream of information from the photoreceptors)

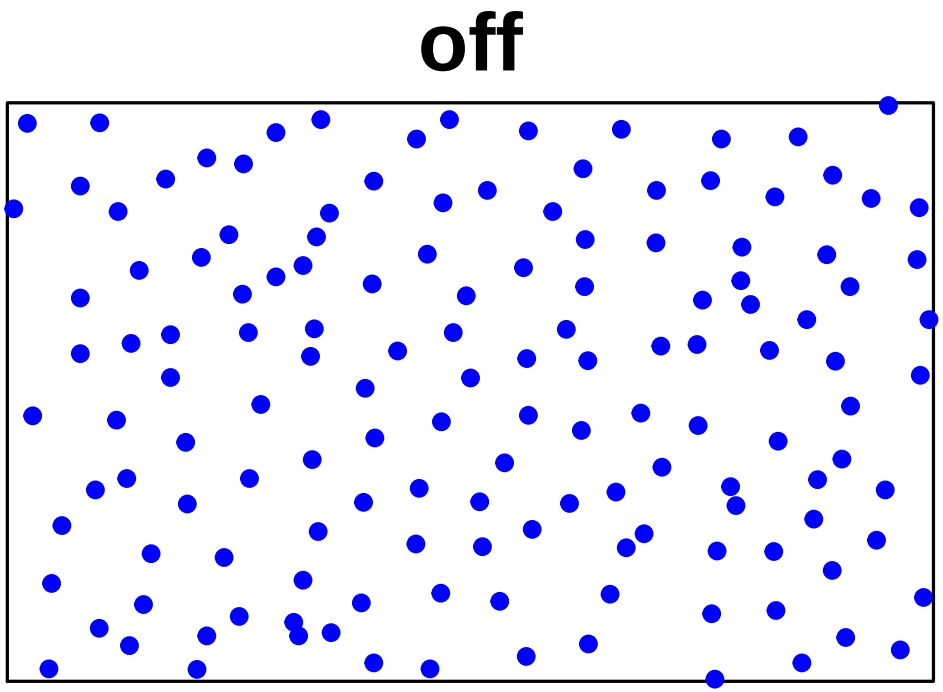
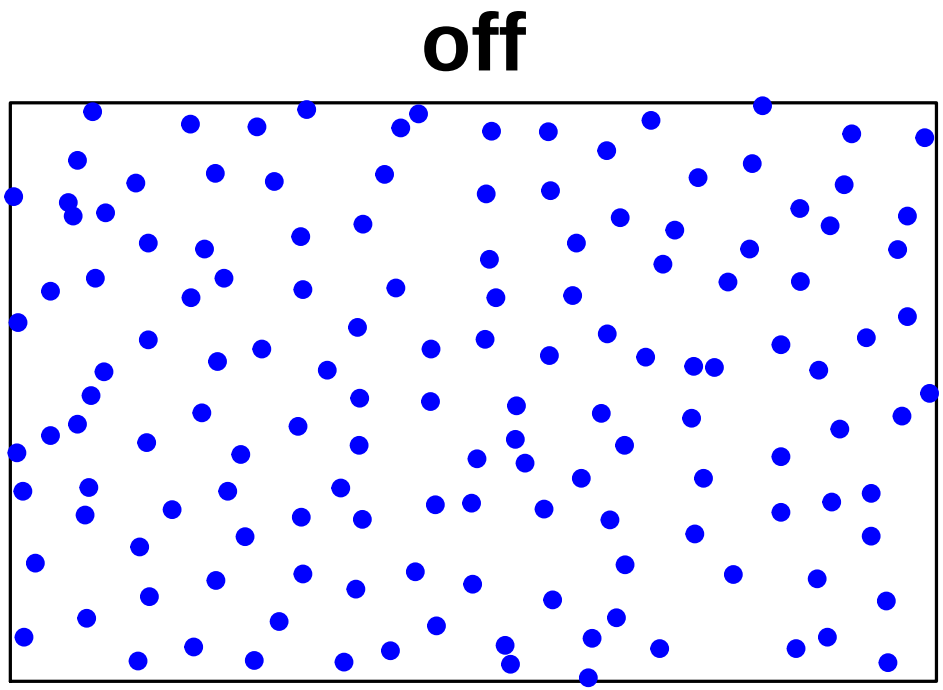
Practical problem



? How did this structure develop:

1. developed in the two layers independently?
2. developed in a single layer which later split into two parts?

Practical problem – testing



Practical problem – testing