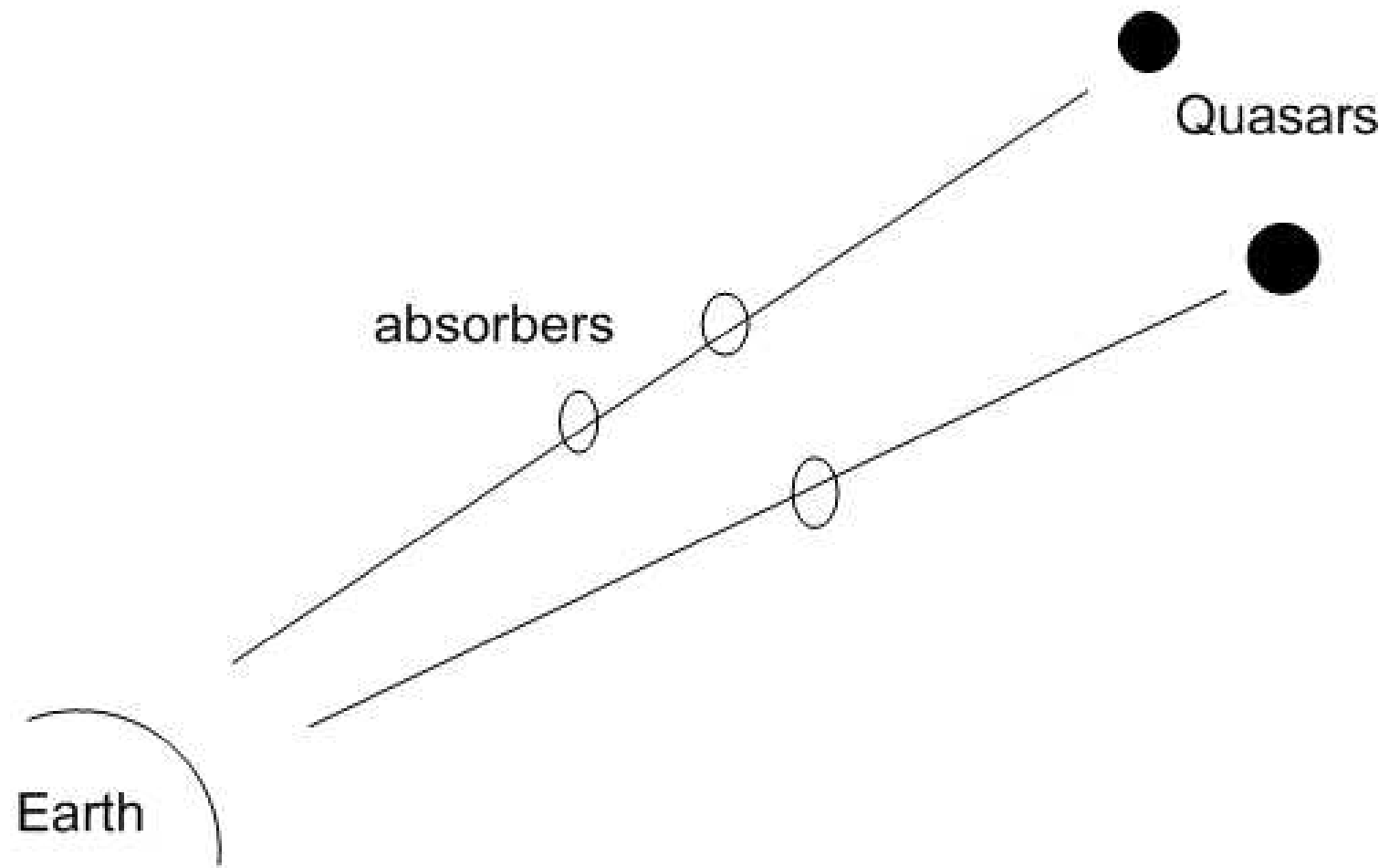
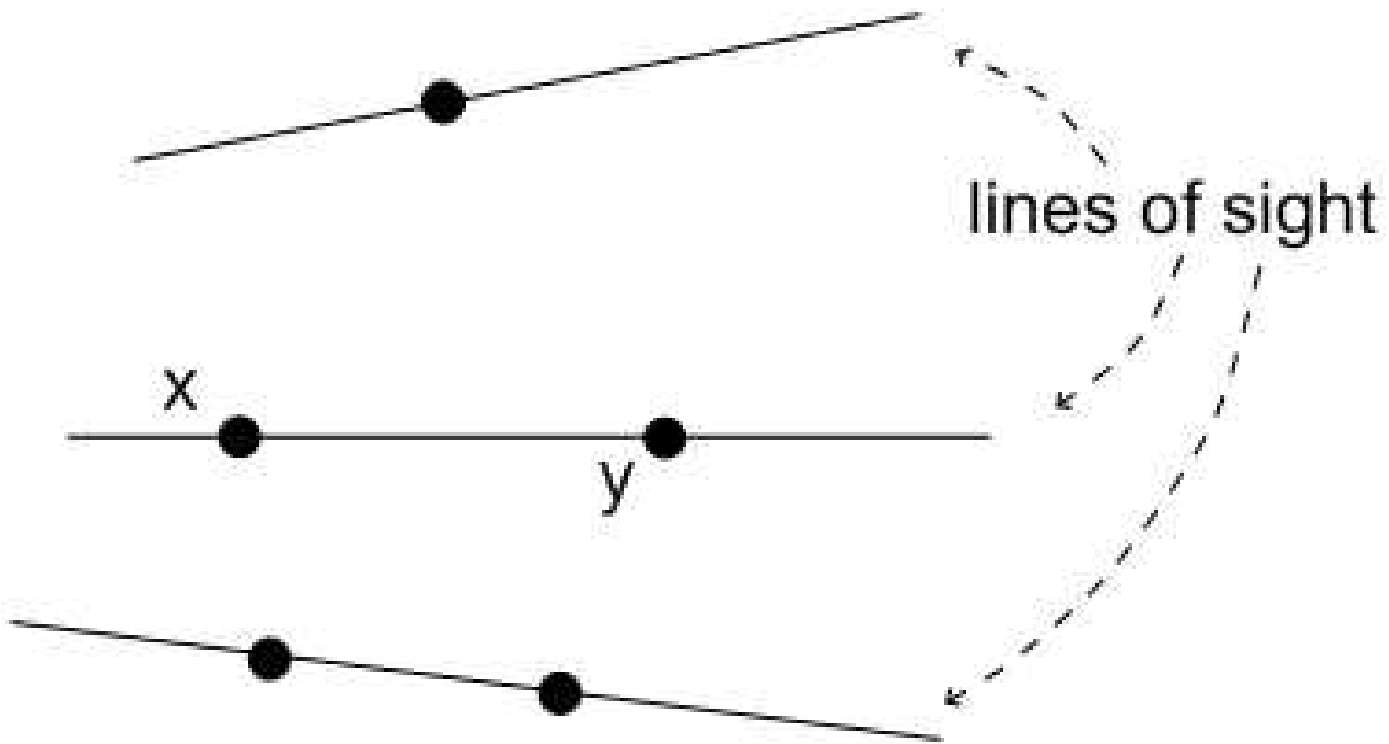


# Measuring clustering of absorbers

Ji Meng Loh  
Department of Statistics  
Columbia University

Samsi Astrostatistics Workshop  
Jan 24, 2006





Ripley's K-function:

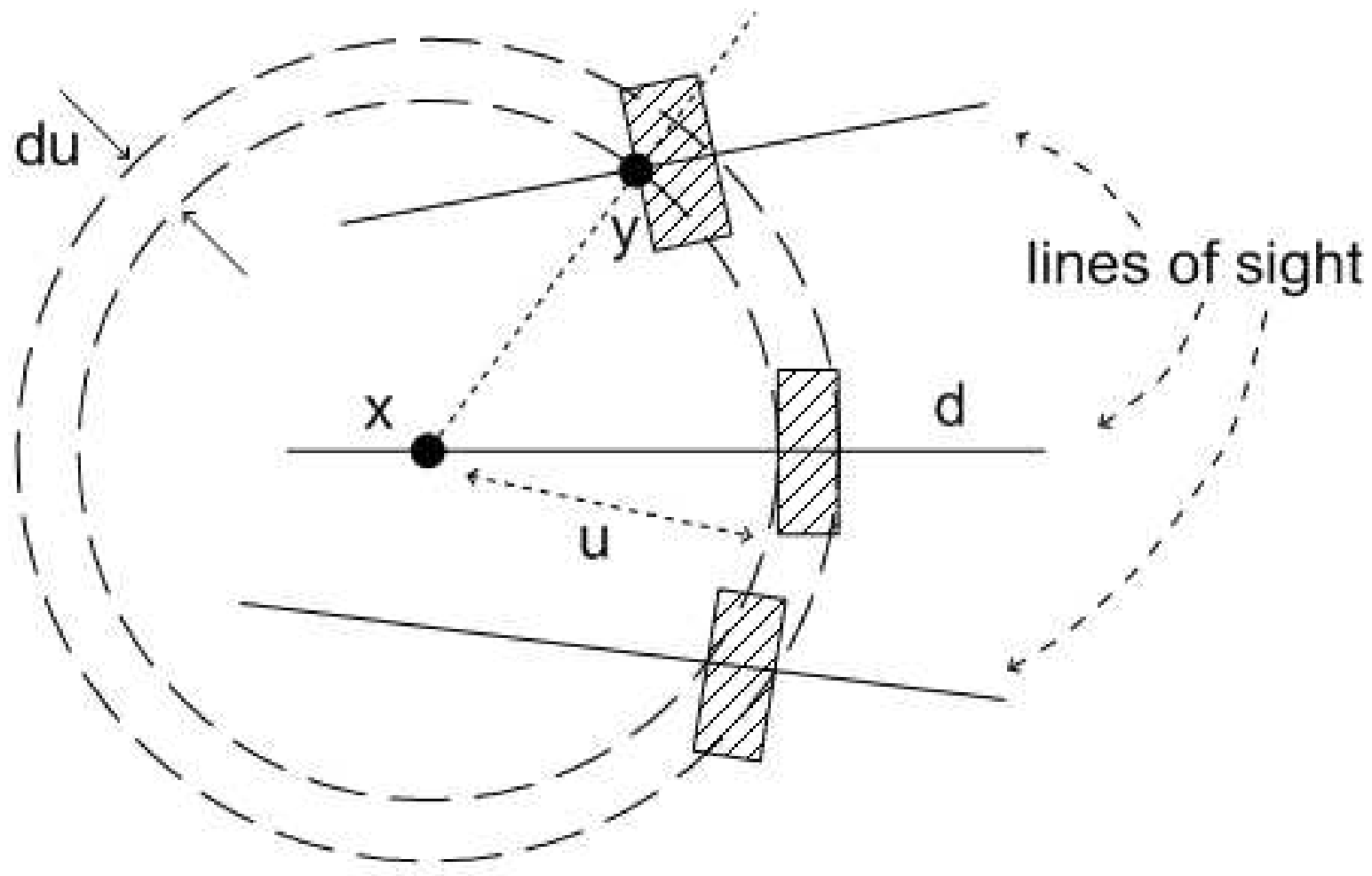
$$\lambda K(r) = E(\# \text{ points within distance } r \text{ of } x | \text{point at } x)$$

$\lambda$  : intensity

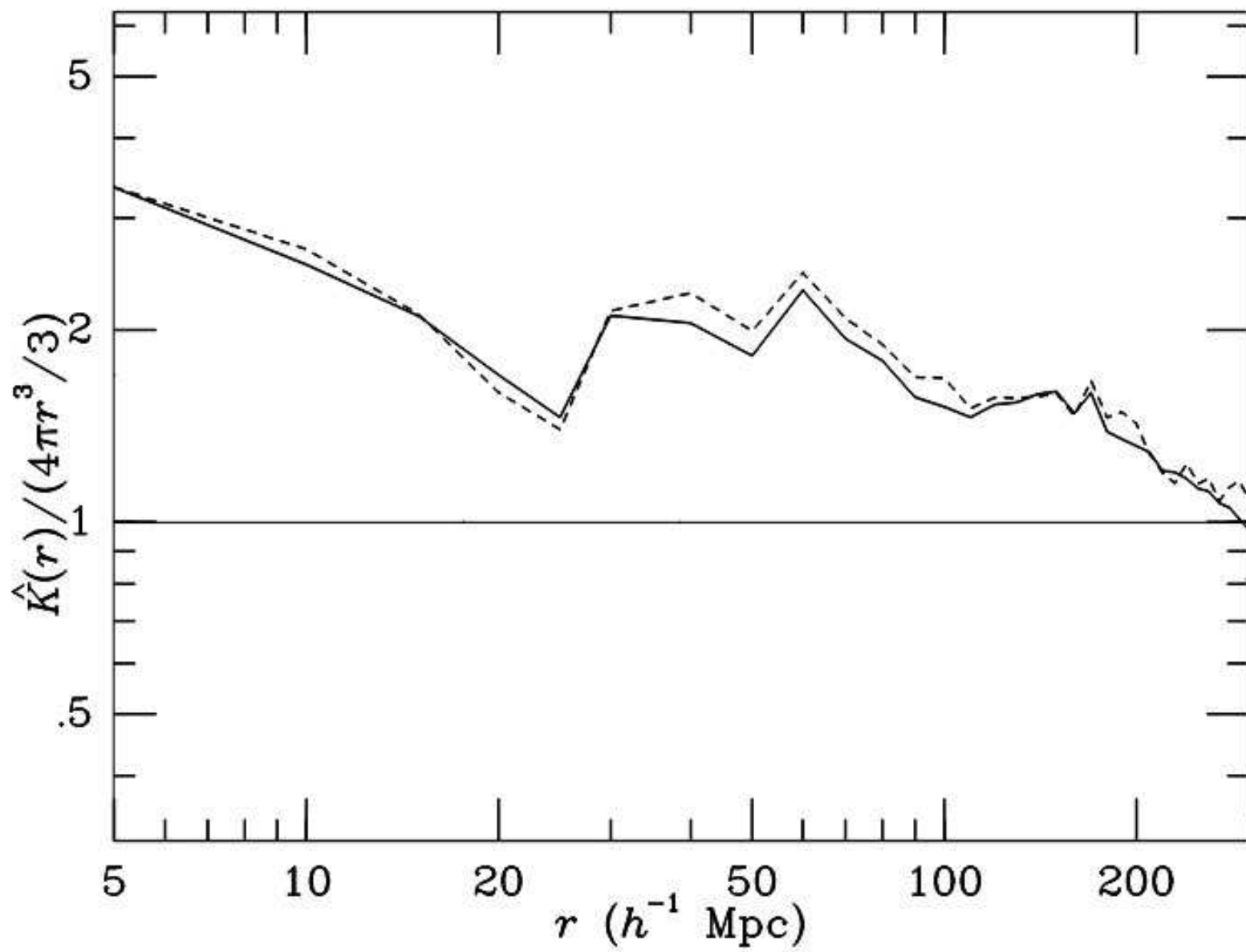
$$\hat{K}(r) = \frac{A}{N(N-1)} \sum_{x \neq y} 1\{|x - y| \leq r\} w(x, y)$$

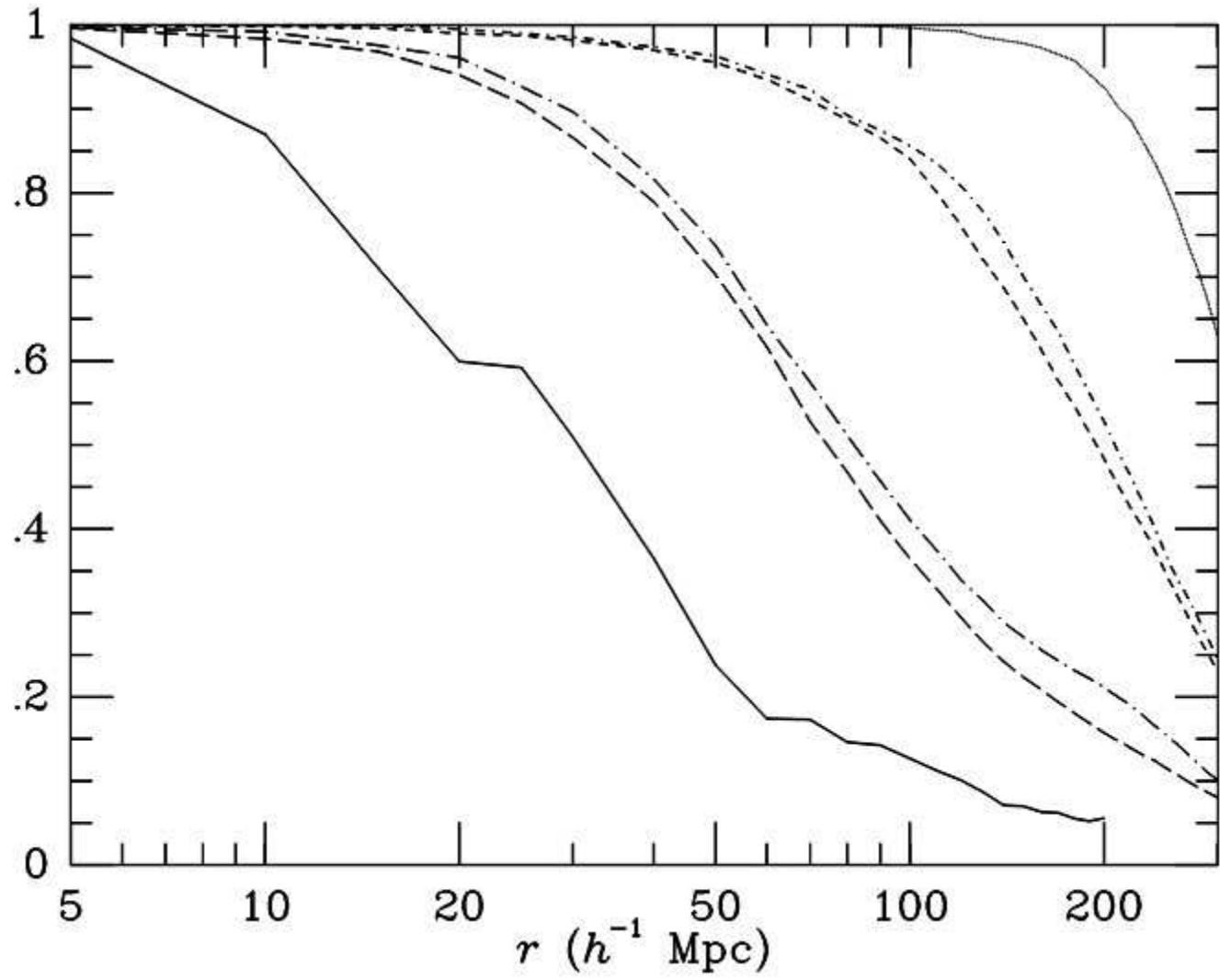
N: number of points;      A: volume;

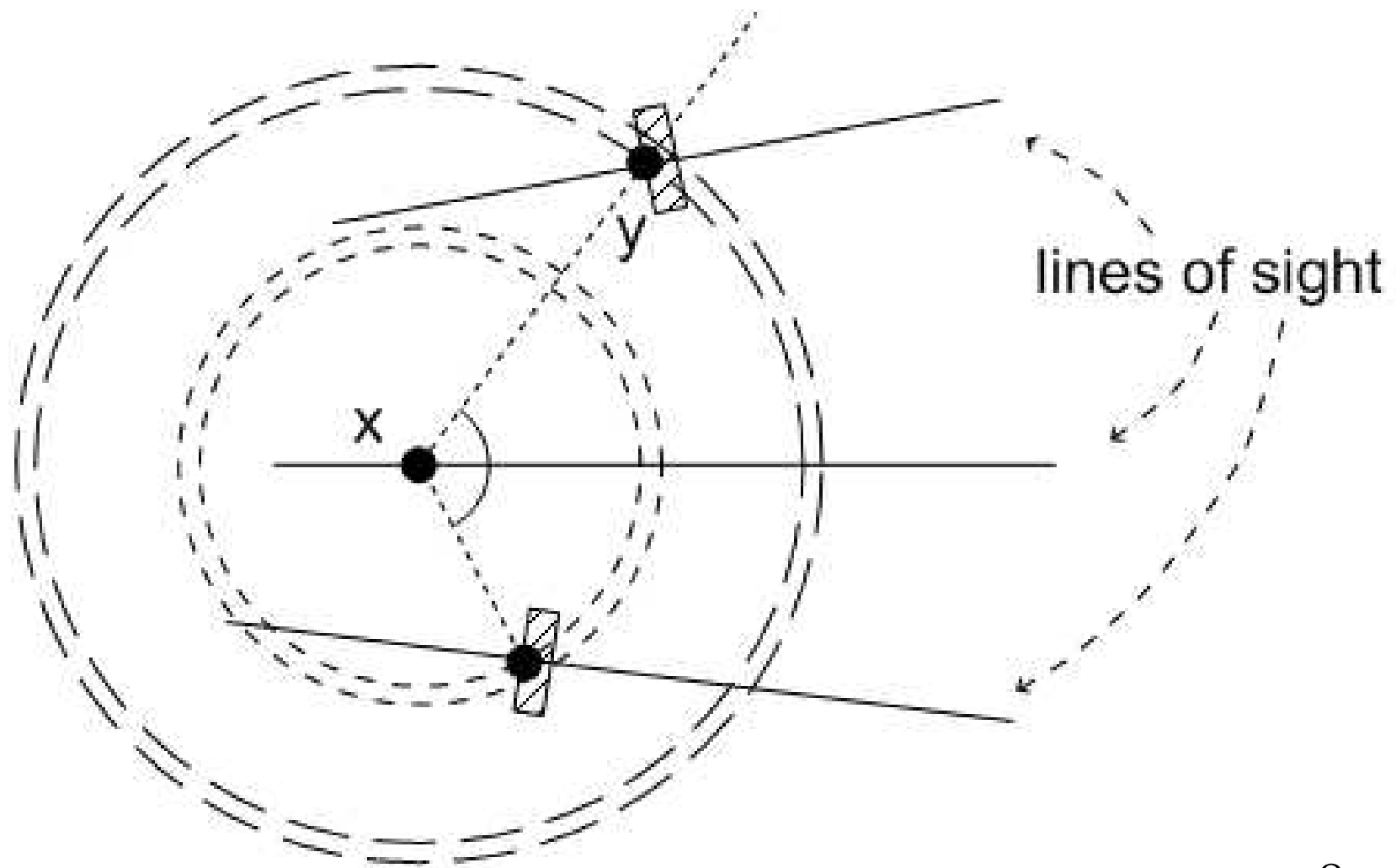
w(x,y): weight



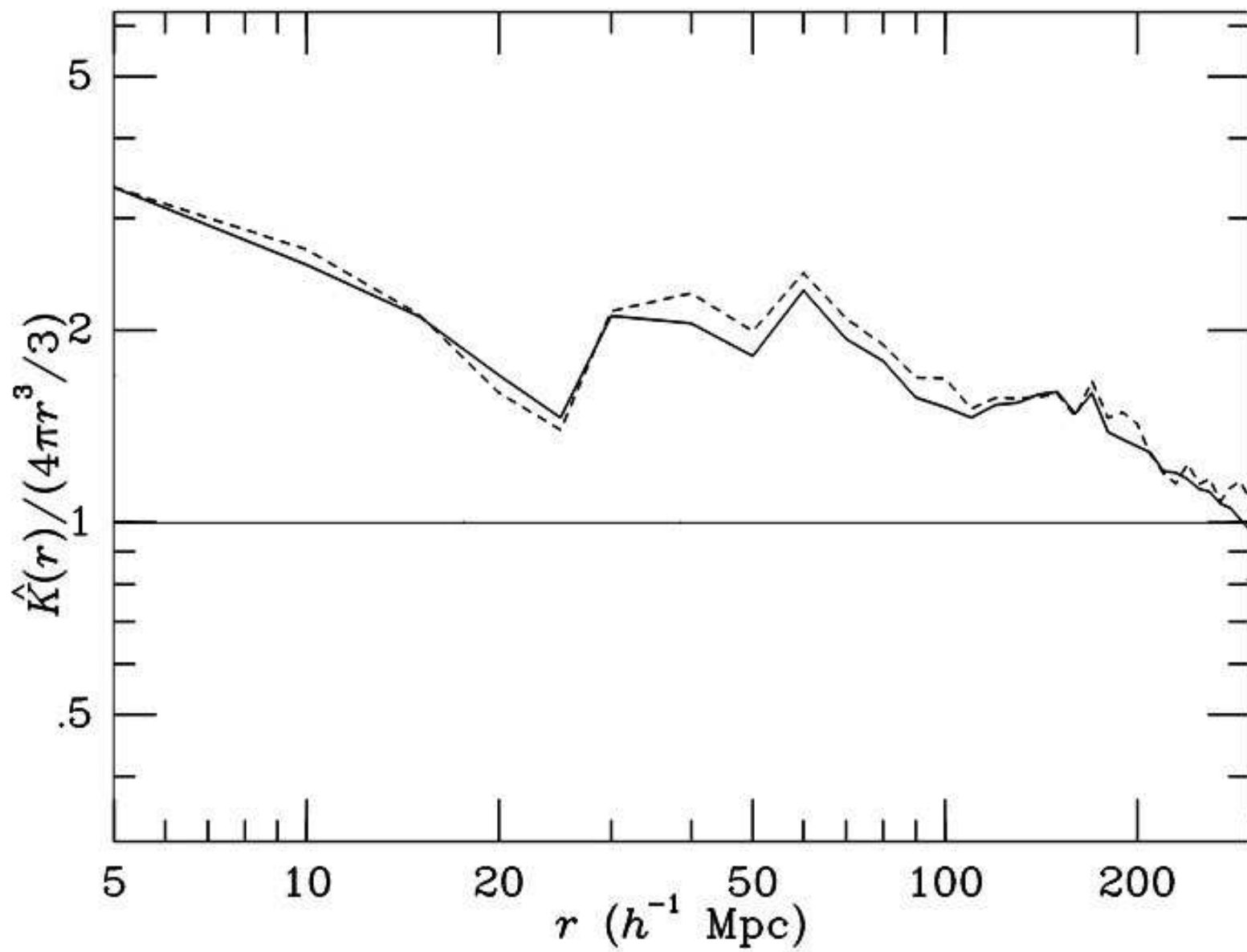
$$\hat{K}(r) = \sum_{x \neq y} \mathbf{1}_{(0,r]}(|x - y|) C(x, y) \quad 5$$



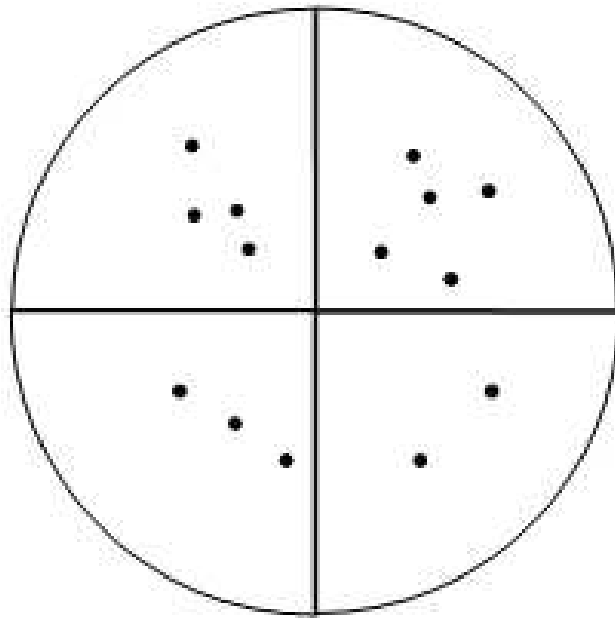


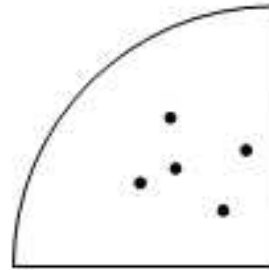
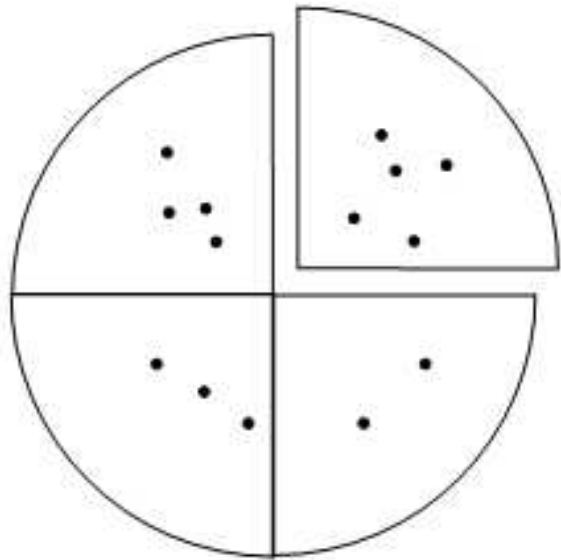




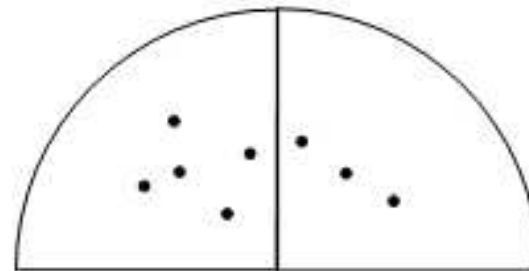
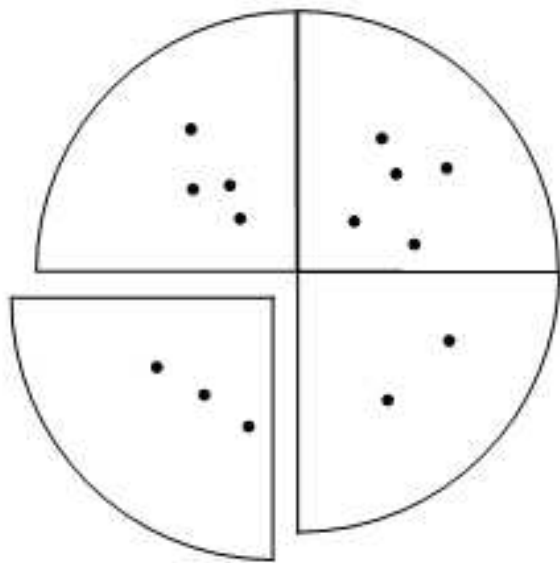


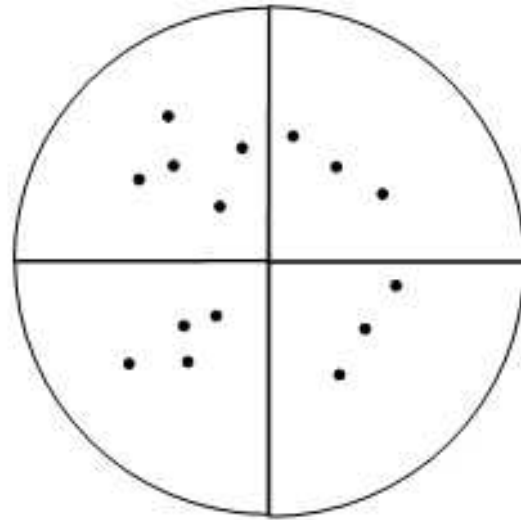
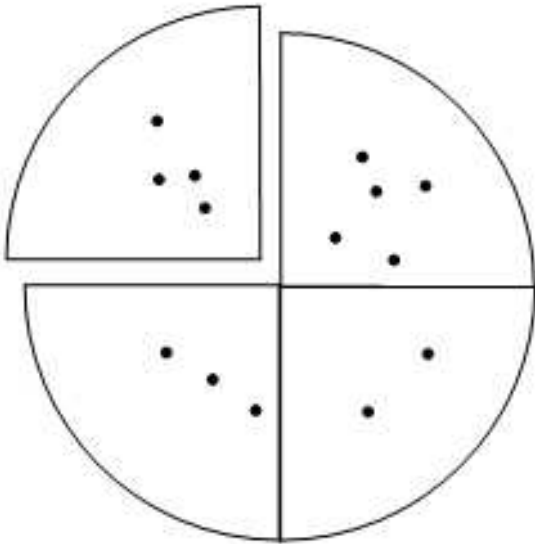
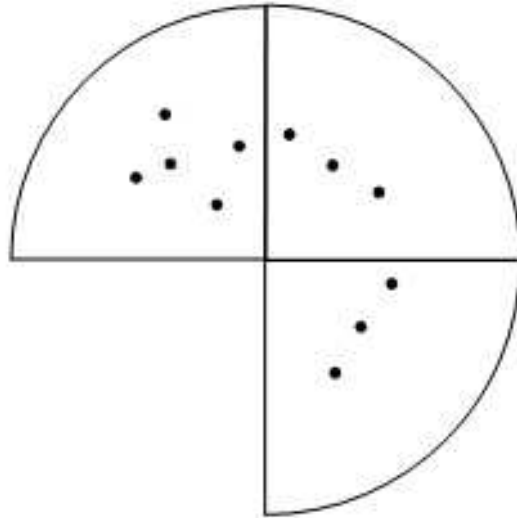
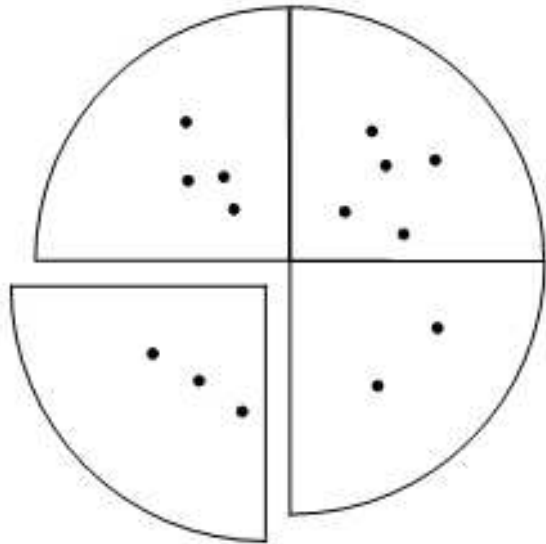
# Bootstrapping to get std errors



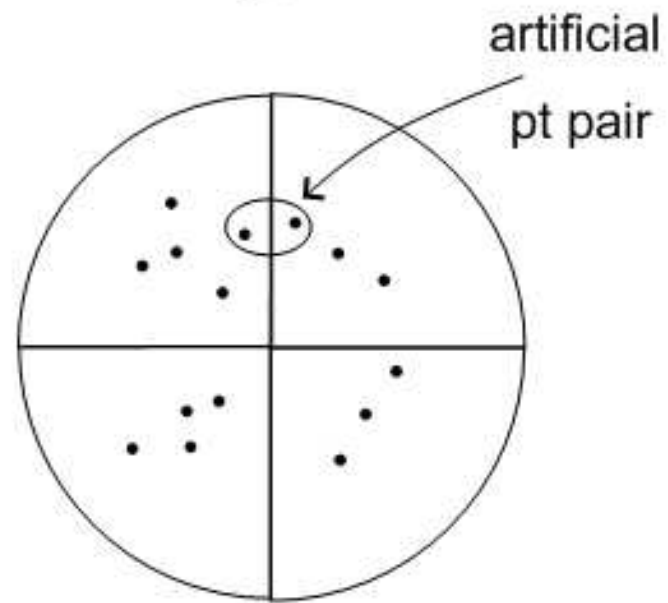
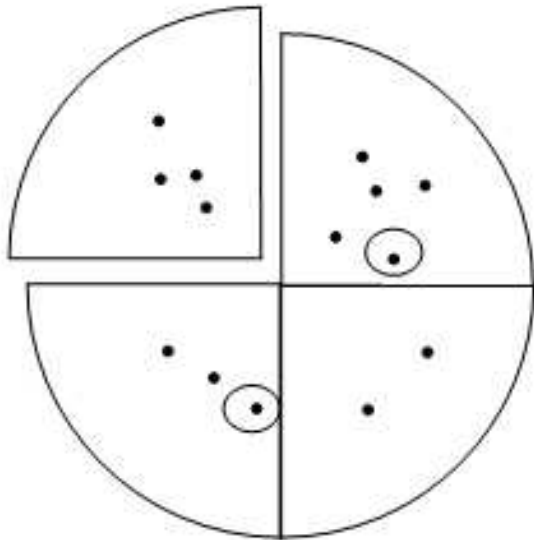
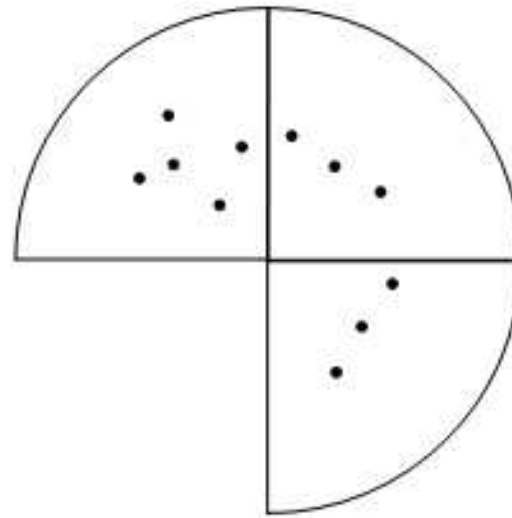
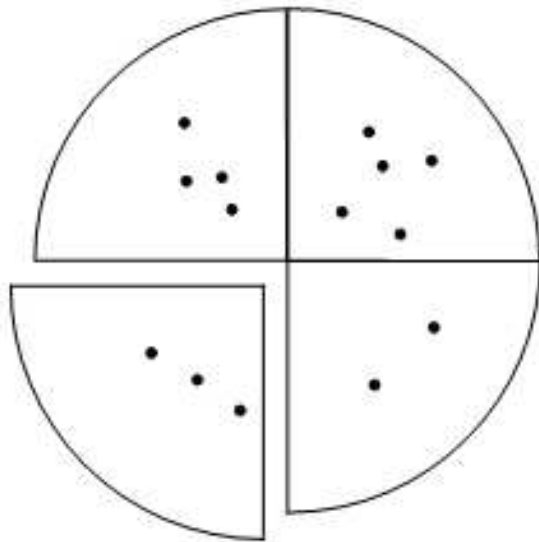


Block resampling



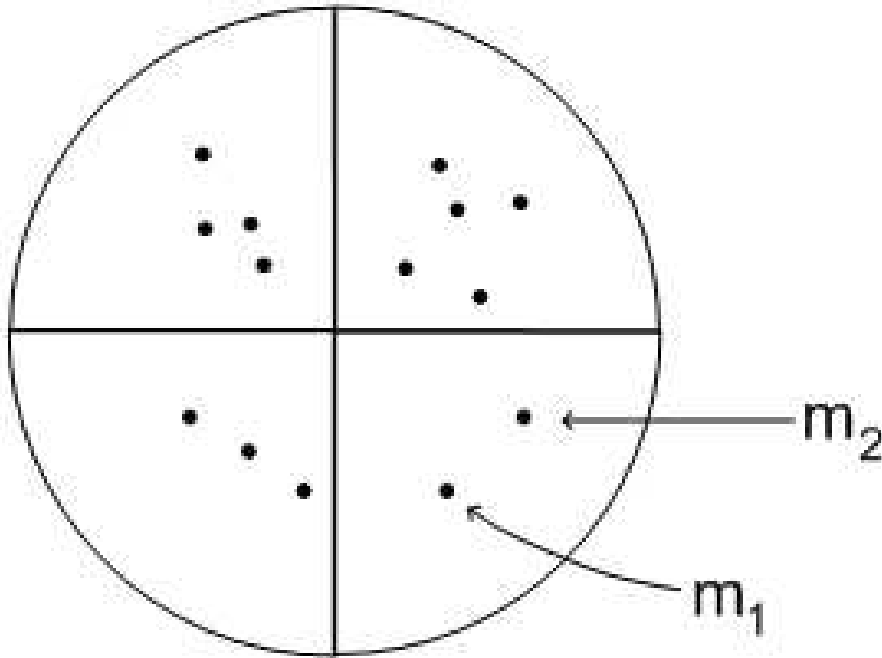


Block  
resampling  
(cont)



$$\hat{K}(r) = \sum_x \sum_{y:y \neq x} 1_{(0,r]}(|x - y|) C(x, y)$$

$$= \sum_x M_x$$



Assign mark  $M_x$  to each point  $x$ .

Estimate is simply sum of the marks.

For each new bootstrap sample, simply add up the marks

## Approximate 94% confidence bands

