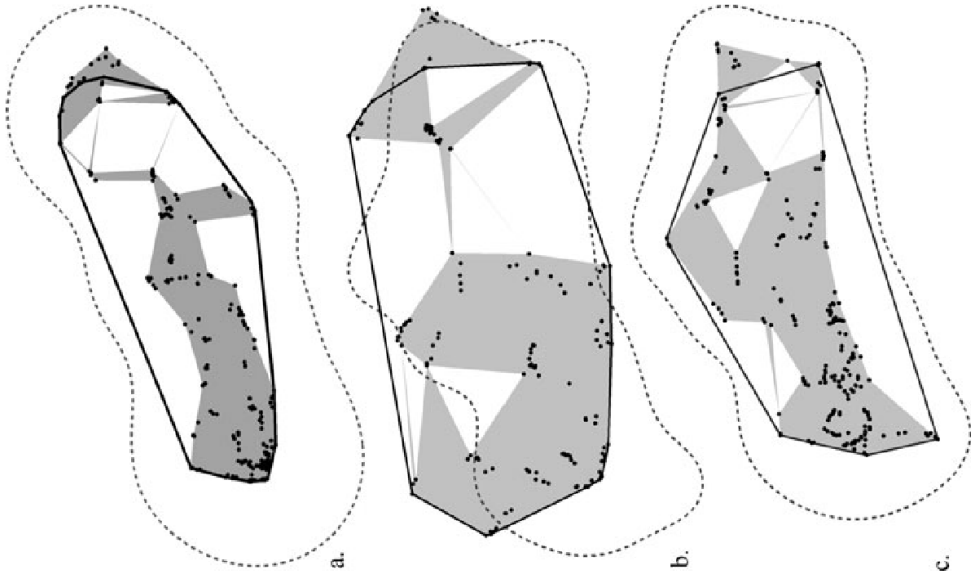
Short Intro to Home Ranges



short lecture by :

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what is a

home range?

What is home range?

“No wild animal roams at random over the country; each has a home region, even if it has not an actual home” (Seton 1909).

“That area traversed by the individual in its normal activities of food gathering, mating and caring for young. Occasional sallies outside the area, perhaps exploratory in nature, should not be considered as in part of the home range” (Burt 1943).

“A cognitive map describing the integration of “food resources, escape cover, travel routes, home ranges of members of the other sex, and so forth” (Powell 2000).

What are the issues posed?

1. ”…few people try to understand what home range means to the animals that have them and often assume that a home-range estimate, quantified using some method *is* the home range.”

    a. “...too much energy is spent discerning and using the“best” method for estimating home ranges while no one understands, really, what a home range is.”

    a. “maps delineating home-range estimates may have little connection with what home ranges are and what they mean to the animals that have them.”

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Four common types of home ranges

1. Minimum Convex Polygon (MCP)
2. Kernel Density Estimates (KDE)
3. Local Convex Hull (locoh)
4. Autocorrelated kernel density estimate (akde)

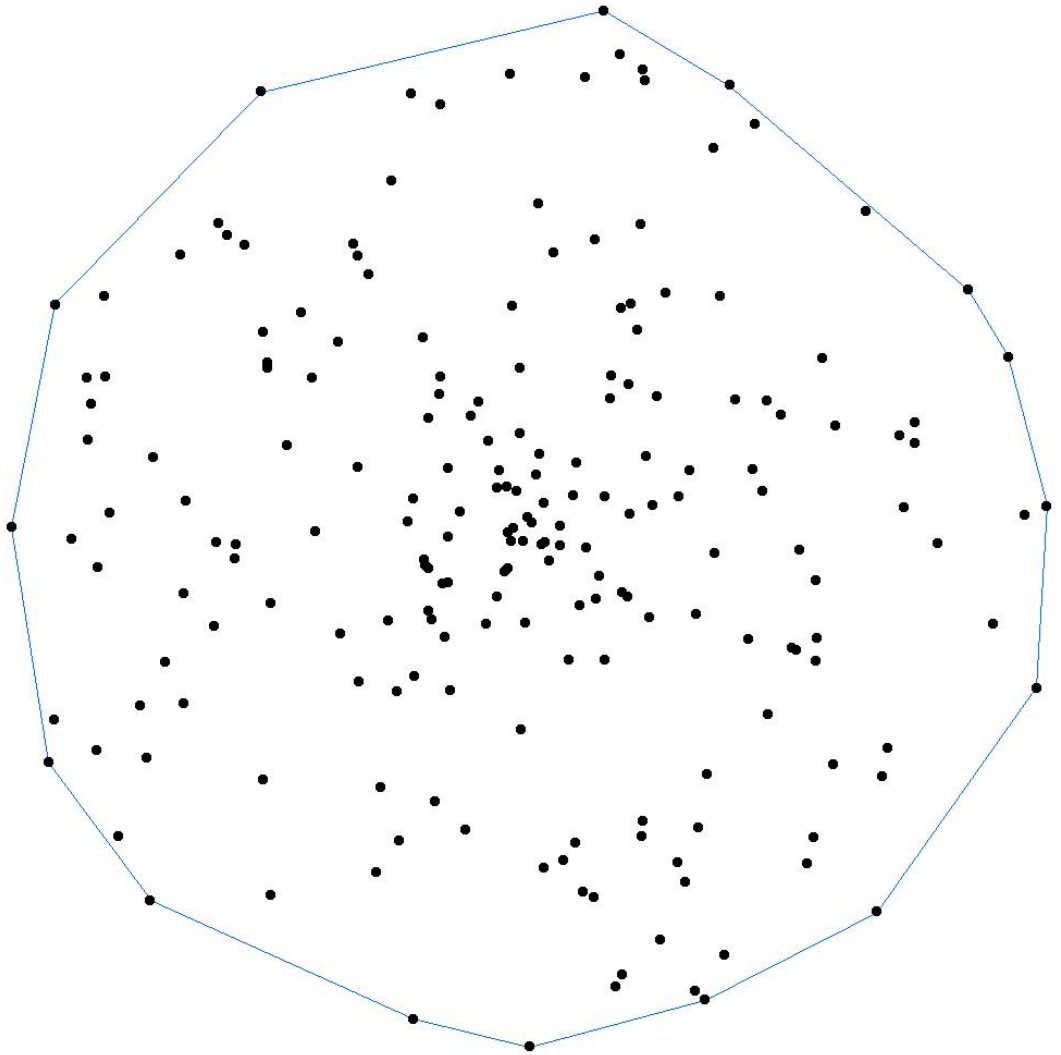
Minimum Convex Polygon (MCP)

Strengths:

- easy to calculate

Weaknesses:

- does not include areas of high or low density
- overestimates the size of the home range
- includes areas that are not likely or possible to use



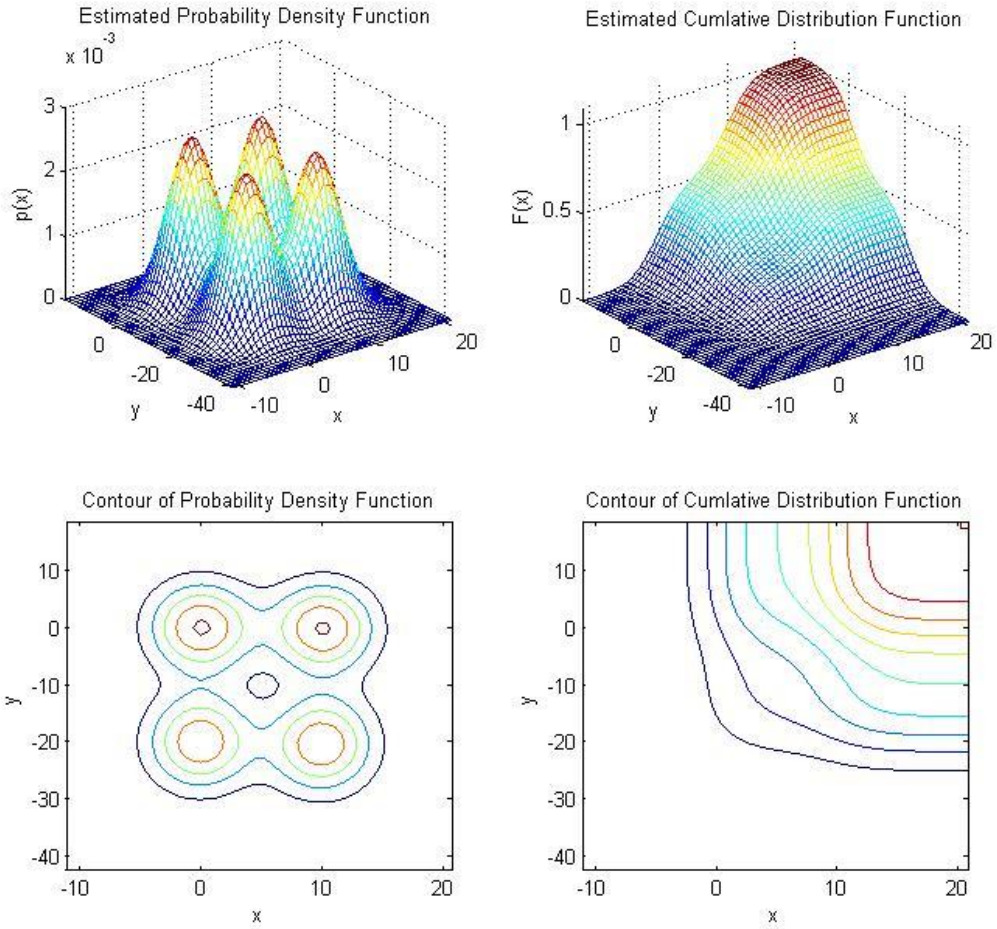
Kernel Density Estimate (KDE)

Strengths:

- utilization distribution (densities)

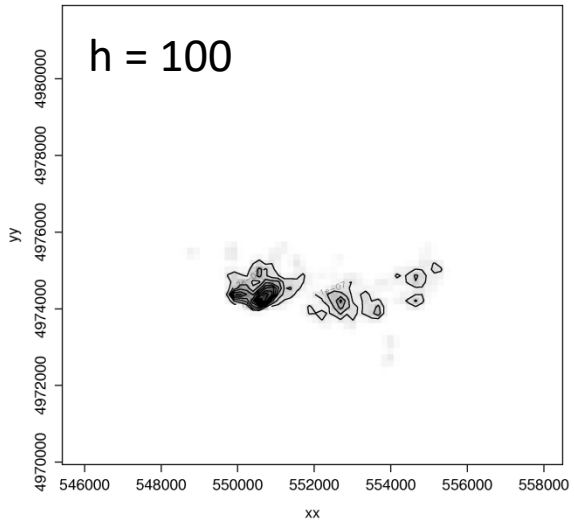
Weaknesses:

- includes areas that are not likely or possible to use
- does not recognize boundaries well
- selecting bandwidth not always straightforward

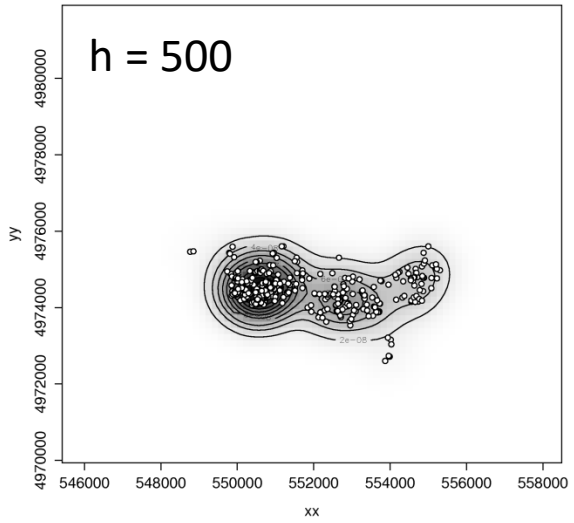


KDE Bandwidth (h)

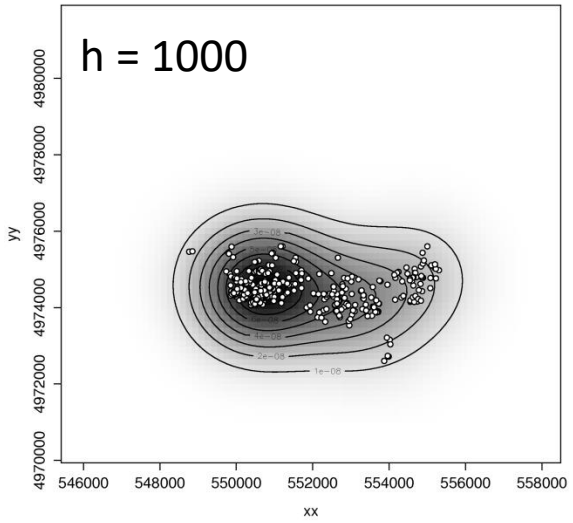
undersmoothed



just right?



oversmoothed



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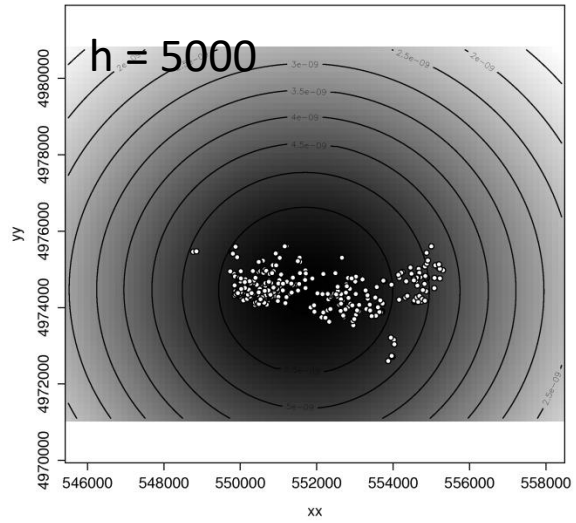
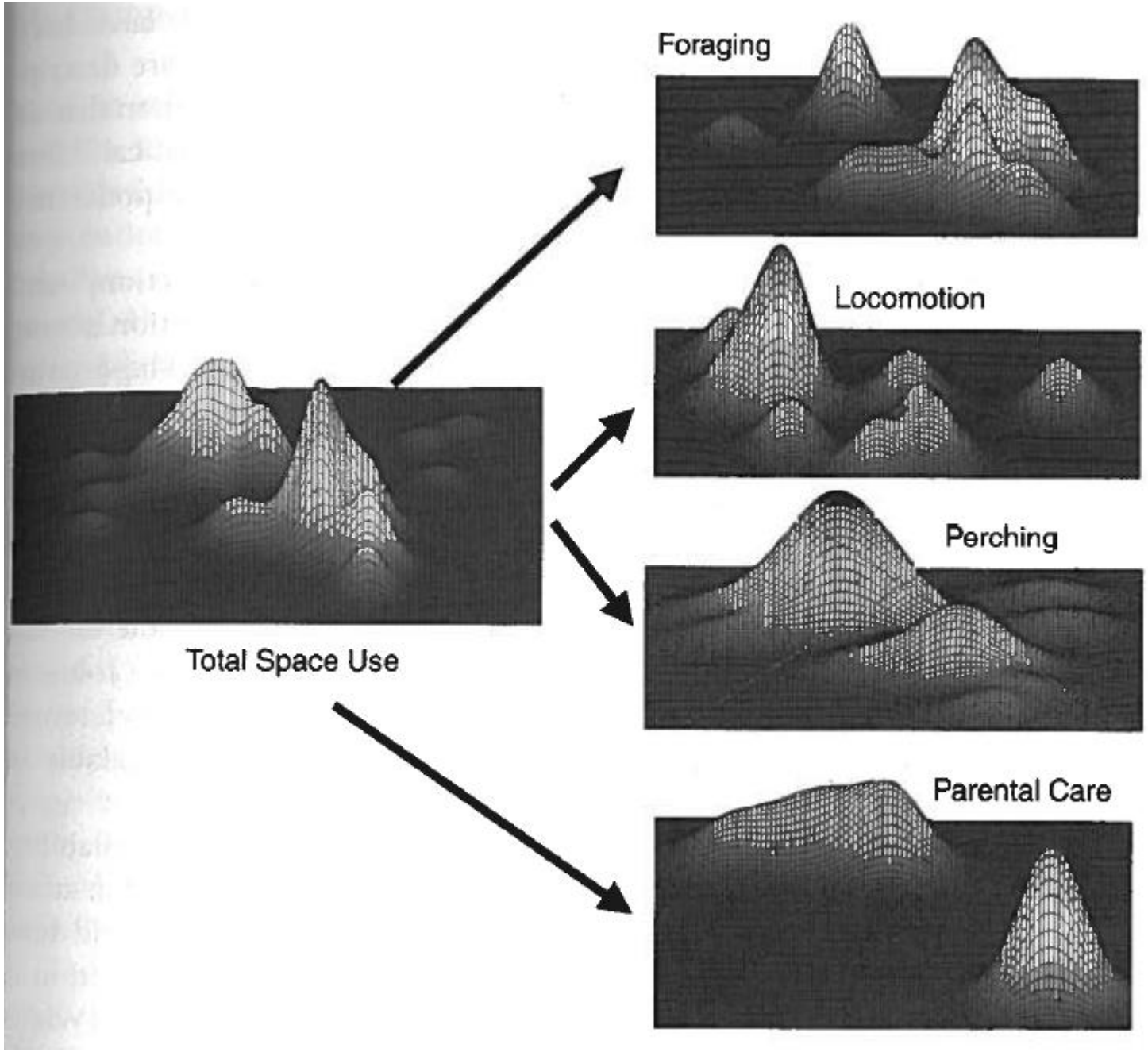


- aka – smoothing parameter
- lots of different ways to estimate bandwidth
- influences densities, and home range size estimates

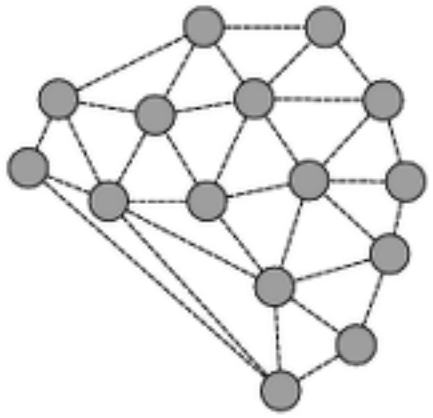
"When the scale at which an animal uses space differs from the critical scales of the home-range estimator (e.g., h), the resulting utilization distribution may assign relatively high probabilities of use to places unlikely to be used, even if animals are located frequently."



Millspaugh, J.J. and J. M. Marzluff (eds). 2001. Radio Tracking and Animal Populations. Academic Press.

Local Convex Hull

a) produce Delaunay triangulations of the data
b) remove all sides that are α-times longer than the median of the original sides
c) you are left with a convex hull home range



(a)

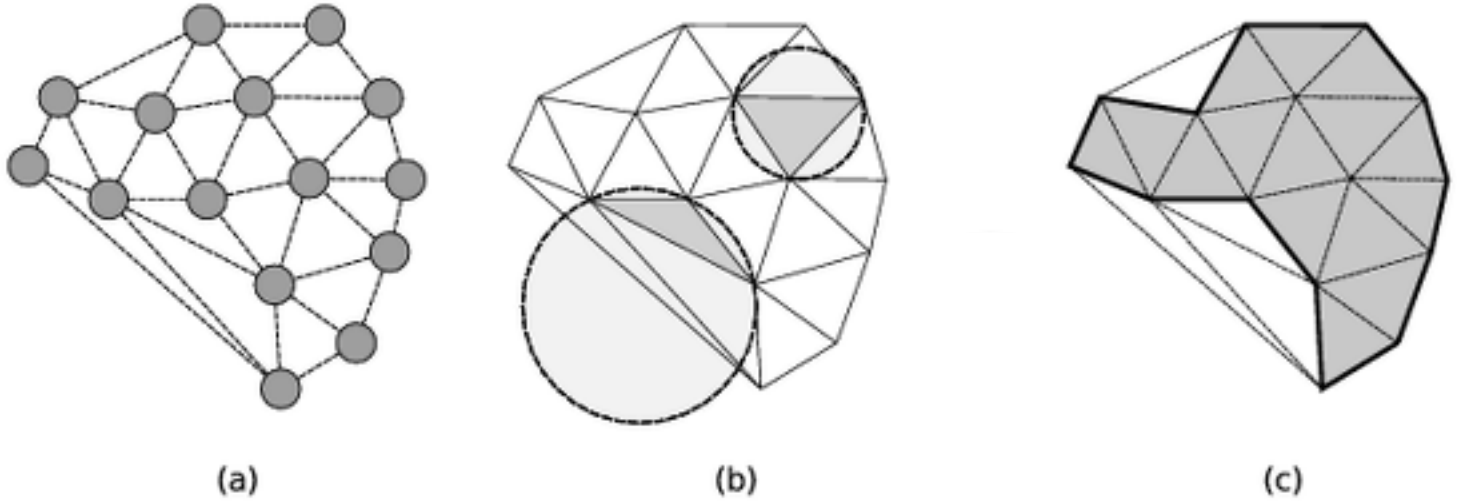
Local Convex Hull

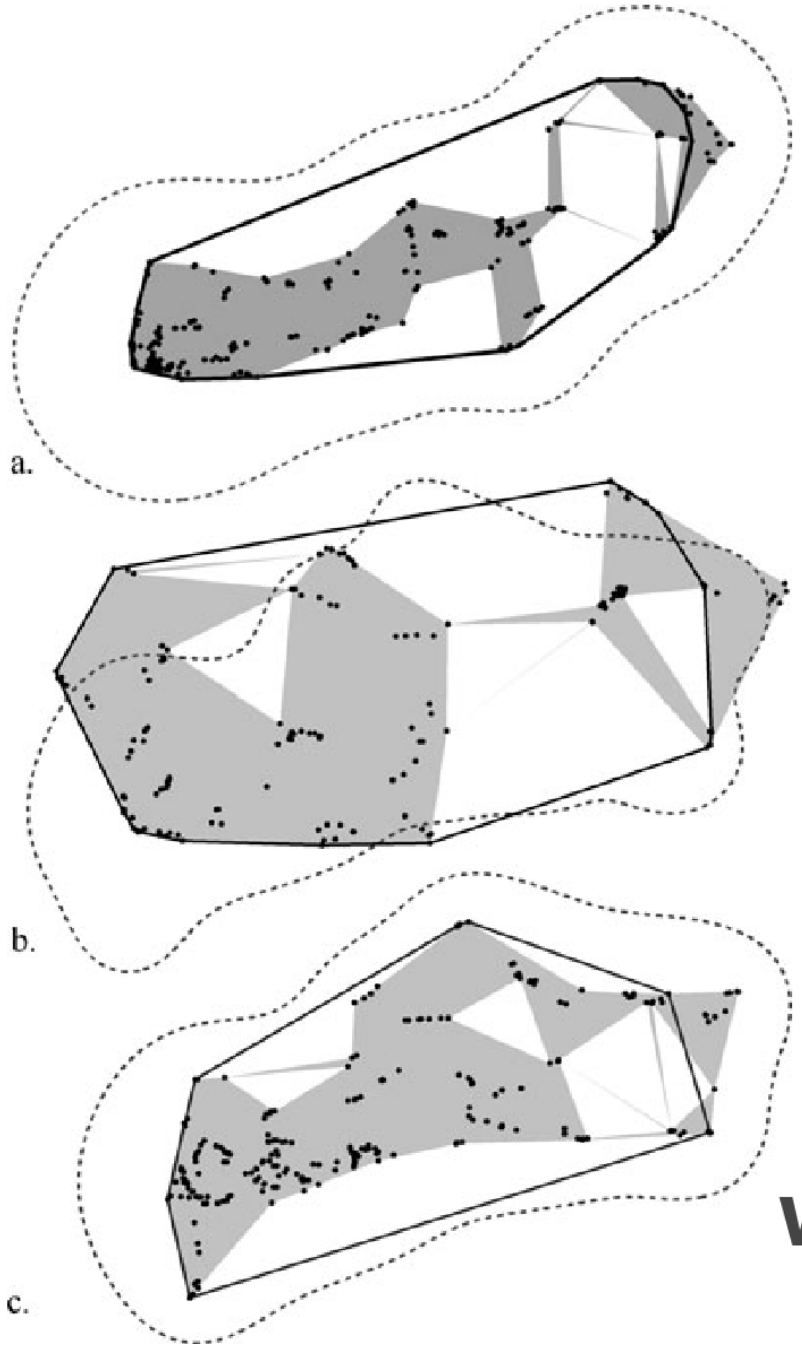
Strengths

- good for home ranges with sharp boundaries
- good for animals that a more “generalist” in their habitat-use behavior
- tend to do a better job than MCP and KDE at estimating what animals are using

Weaknesses

- very difficult to estimate
- considerable limitation for large datasets collected with GPS technology





https://tlocoh.r-forge.r-project.org/

Welcome to T-LoCoH!

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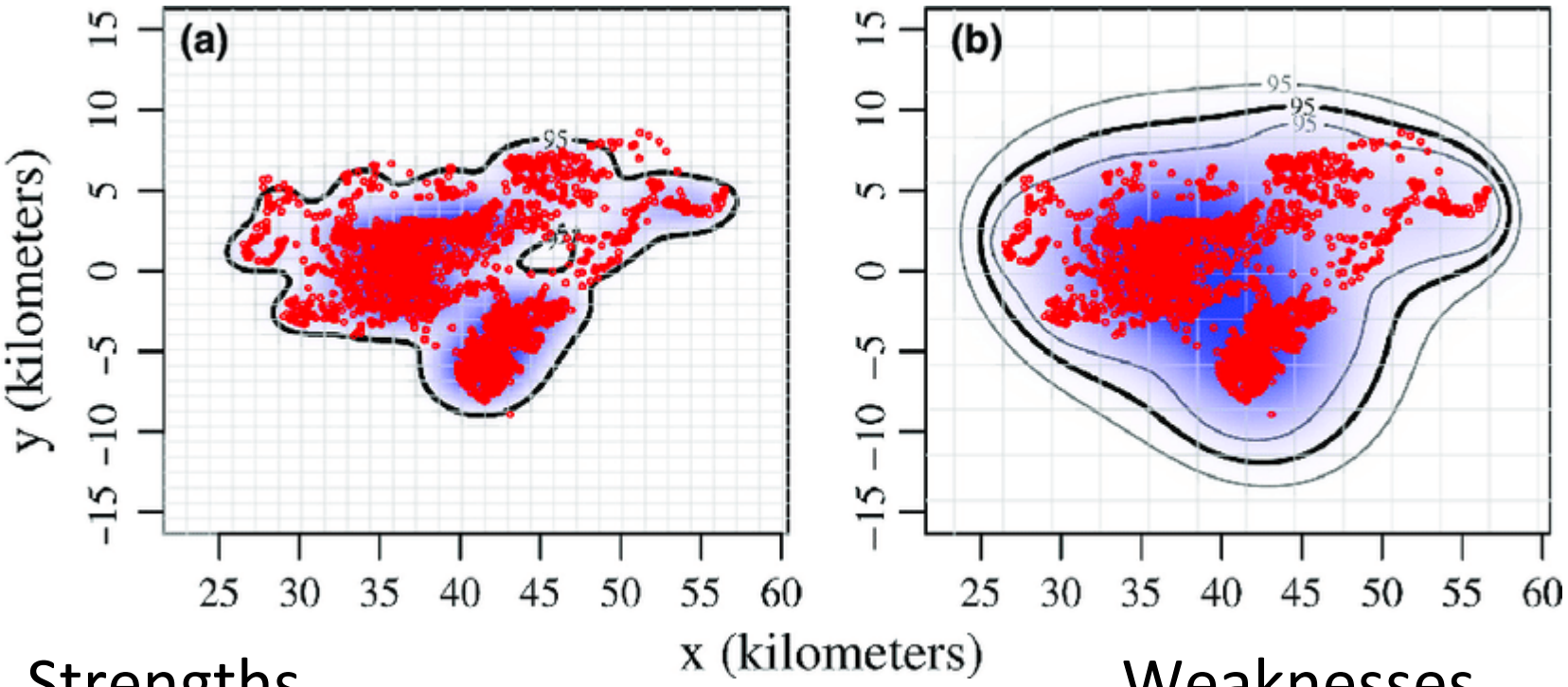
Autocorrelated Kernel Density Estimates (akde)



ctmm package

Strengths

- Accounts for autocorrelation by **adjusting the bandwidth**
- Doesn’t over fit
- Agnostic about data sampling & bandwidths

Weaknesses

- Long time to estimate!
- Need to understand **continuous time movement models**
- Hard to use data structures and outputs.