

# Bugs fixed in `spatstat`

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For `spatstat` version 1.56-1

This vignette lists all *important* bugs detected and fixed in the `spatstat` package since 2010.

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## 1 Bug history

Thousands of bugs have been detected and fixed in `spatstat` during its 25-year history. We started recording the bug history in 2010.

Bugs that may have affected the user are listed in the package `NEWS` file, and can be searched using the R command `news` or the `spatstat` command `bugfixes`.

To see all bugs in the recorded history of `spatstat` that may have affected the user, type

```
> bugfixes
```

which currently produces a list of 720 bugs, of which 252 were detected after publication of the book [1]. To see all bugs in `spatstat` that were fixed after 30 June 2017, type

```
> bugfixes(since="2017-06-30")
```

To see all bugs fixed after the book [1] was written, type

```
> bugfixes(since="1.42-0")
```

## 2 Serious bugs

Following is a list of the **most serious bugs** only, in order of potential impact.

### 2.0.1 Serious Bugs, Always Wrong, Broad Impact

- `nncross.ppp`: Results were completely incorrect if  $k > 1$ .  
(Bug introduced in `spatstat` 1.31-2, april 2013; fixed in `spatstat` 1.35-0, december 2013)
- `nncross.pp3`: Results were completely incorrect in some cases.  
(Bug introduced in `spatstat` 1.32-0, august 2013; fixed in `spatstat` 1.34-0, october 2013)
- `cdf.test.ppm`: Calculation of  $p$ -values was incorrect for Gibbs models:  $1 - p$  was computed instead of  $p$ .  
(Bug introduced in `spatstat` 1.40-0, december 2014; fixed in `spatstat` 1.45-2, may 2016)
- `Smooth.ppp`: Results of `Smooth(X, at="points", leaveoneout=FALSE)` were completely incorrect.  
(Bug introduced in `spatstat` 1.20-5, august 2010; fixed in `spatstat` 1.46-0, july 2016)
- `rmh`:
  - Simulation was completely incorrect in the case of a multitype point process with an interaction that does not depend on the marks, such as `ppm(betacells, ~marks, Strauss(60))` due to a coding error in the C interface.  
(Bug introduced in `spatstat` 1.22-3, march 2010; fixed in `spatstat` 1.22-3, june 2011)
  - Simulation of the Area-Interaction model was completely incorrect.  
(Bug introduced in `spatstat` 1.23-6, october 2011; fixed in `spatstat` 1.31-0, january 2013)
  - Simulation of the Geyer saturation process was completely incorrect.  
(Bug introduced in `spatstat` 1.31-0, january 2013; fixed in `spatstat` 1.31-1, march 2013)
  - Simulation of the Strauss-Hard Core process was partially incorrect, giving point patterns with a slightly lower intensity.  
(Bug introduced in `spatstat` 1.31-0, january 2013; fixed in `spatstat` 1.37-0, may 2014)
  - The result of simulating a model with a hard core did not necessarily respect the hard core constraint, and simulation of a model with strong inhibition did not necessarily converge. This only happened if the first order trend was large, the starting state (`n.start` or `x.start`) was not given, and the number of iterations `nrep` was not very large. It occurred because of a poor choice for the default starting state. (Bug was present since about 2010. Fixed in `spatstat` 1.40-0, december 2014)
  - Simulation was incorrect in the case of an inhomogeneous multitype model with `fixall=TRUE` (i.e. with a fixed number of points of each type) if the model was segregated (i.e. if different types of points had different first order trend). The effect of the error was that all types of points had the same first order trend. (Bug was present since about 2010. Fixed in `spatstat` 1.43-0, september 2015)
  - Simulation of the Geyer saturation process was incorrectly initialised, so that the results of a short run (i.e. small value of `nrep`) were incorrect, while long runs were correct.  
(Bug introduced in `spatstat` 1.17-0, october 2009; fixed in `spatstat` 1.31-1, march 2013)
- `nnmark, as.im.ssf`: If `marks(X)` was a matrix rather than a data frame, the results were completely incorrect.  
(Bug introduced in `spatstat` 1.32-0, august 2013; fixed in `spatstat` 1.55-1, april 2018)
- `rVarGamma`: Simulations were incorrect; they were generated using the wrong value of the parameter `nu.ker`.  
(Bug introduced in `spatstat` 1.25-0, december 2011; fixed in `spatstat` 1.35-0, december 2013)

- **rCauchy**: Simulations were incorrect; they were generated using the wrong value of the parameter `omega`.  
(Bug introduced in `spatstat` 1.25-0, december 2011; fixed in `spatstat` 1.25-2, january 2012)
- **lppm**: For multitype patterns, the fitted model was completely incorrect due to an error in constructing the quadrature scheme.  
(Bug introduced in `spatstat` 1.23-0, july 2011; fixed in `spatstat` 1.30-0, december 2012)
- **[.lpp**: The local coordinate `seg` was completely incorrect, when `i` was a window.  
(Bug introduced in `spatstat` 1.31-2, april 2013; fixed in `spatstat` 1.45-0, march 2016)
- **lohboot**: Implementation was completely incorrect.  
(Bug introduced in `spatstat` 1.26-1, april 2012; fixed in `spatstat` 1.53-2, october 2017)
- **leverage.ppm, influence.ppm, dfbetas.ppm**: Results were incorrect for non-Poisson processes due to a mathematical error.  
(Bug introduced in `spatstat` 1.25-0, december 2011; fixed in `spatstat` 1.51-0, may 2017)

## 2.0.2 Serious Bugs, Often Completely Wrong, Moderate Impact

- **bw.pcf**: Results were totally incorrect due to a typo.  
(Bug introduced in `spatstat` 1.51-0, may 2017; fixed in `spatstat` 1.52-0, august 2017)
- **predict.mppm**: If the model included random effects, and if the library `MASS` was not loaded, the predictions were on the log scale (i.e. they were logarithms of the correct values).  
(Bug introduced in `spatstat` 1.43-0, october 2015; fixed in `spatstat` 1.55-1, april 2018)
- **nnmap, nnmark**: Values were incorrect if the resulting pixel image had unequal numbers of rows and columns.  
(Bug introduced in `spatstat` 1.35-0, december 2013; fixed in `spatstat` 1.55-0, january 2018)
- **vcov.mppm**: Format was incorrect (rows/columns were omitted) in some cases.  
(Bug introduced in `spatstat` 1.45-1, may 2016; fixed in `spatstat` 1.55-0, january 2018)
- **model.matrix.ppm, model.frame.ppm**: Values were sometimes incorrect when applied to the result of `subfits`. To be precise, if `fit` was an `mppm` object fitted to a hyperframe that included “design covariates” (covariates that take a constant value in each row of the hyperframe), and if `futs <- subfits(fit)`, then `model.matrix(futs[[i]])` gave incorrect values in the columns corresponding to the design covariates.  
(Bug introduced in `spatstat` 1.45-1, may 2016; fixed in `spatstat` 1.55-0, january 2018)
- **predict.rho2hat**: Results were incorrect for a `rho2hat` object computed from a point pattern.  
(Bug introduced in `spatstat` 1.42-0, may 2015; fixed in `spatstat` 1.52-0, august 2017)
- **envelope.ppm**: If the model was an inhomogeneous Poisson process, the resulting envelope object was incorrect (the simulations were correct, but the envelopes were calculated assuming the model was CSR).  
(Bug introduced in `spatstat` 1.23-5, september 2011; fixed in `spatstat` 1.23-6, october 2011)
- **linearK, linearpcf, linearKinhom, linearpcfinhom** and multitype versions: These functions were sometimes greatly underestimated when the network had segments shorter than 10 coordinate units.  
(Bug introduced in `spatstat` 1.44-0, december 2015; fixed in `spatstat` 1.46-2, july 2016)

- **nncross, distfun, AreaInter:** Results of **nncross** were possibly incorrect when **X** and **Y** did not have the same window. This bug affected values of **distfun** and may also have affected ppm objects with interaction **AreaInter**.  
(Bug introduced in **spatstat** 1.9-4, june 2006; fixed in **spatstat** 1.25-2, january 2012)
- **update.kppm:**
  - Did not function correctly when several additional arguments were given.  
(Bug introduced in **spatstat** 1.42-2, june 2015; fixed in **spatstat** 1.54-0, november 2017)
  - If the call to **update** did not include a formula argument or a point pattern argument, then all arguments were ignored. Example: **update(fit, improve.type="quasi")** was identical to **fit**.  
(Bug introduced in **spatstat** 1.42-2, june 2015; fixed in **spatstat** 1.45-0, march 2016)
- **markcorrint:** Results were completely incorrect.  
(Bug introduced in **spatstat** 1.39-0, october 2014; fixed in **spatstat** 1.40-0, december 2014)
- **leverage.ppm, influence.ppm, dfbetas.ppm:** Results were slightly incorrect for models with a hard core, due to a mathematical error.  
(Bug introduced in **spatstat** 1.51-0, may 2017; fixed in **spatstat** 1.55-1, april 2018)
- **Ops.msr:** If the input data contained a pixel image of the smoothed density, this image was not updated; it was copied to the output unchanged. Plots of the resulting measure were incorrect.  
(Bug introduced in **spatstat** 1.52-0, august 2017; fixed in **spatstat** 1.55-1, april 2018)
- **[.linnet:** in calculating  $L[W]$  where  $W$  is a window, the code ignored segments of  $L$  that crossed  $W$  without having a vertex in  $W$ .  
(Bug introduced in **spatstat** 1.53-0, september 2017; fixed in **spatstat** 1.55-1, april 2015)

### 2.0.3 Bugs, Substantially Incorrect, Moderate Impact

- **simulate.dppm, simulate.detpointprocfamily:** In dimensions higher than 2, the result was shifted so that it was centred at the origin.  
(Bug introduced in **spatstat** 1.54-0, december 2017; fixed in **spatstat** 1.55-0, january 2018)
- **integral.msr:** If the result was a matrix, it was the transpose of the correct answer.  
(Bug introduced in **spatstat** 1.35-0, december 2012; fixed in **spatstat** 1.55-1, april 2018)
- **density.ppp:** Values of **density(X, at="points")** and **Smooth(X, at="points")** were sometimes incorrect, due to omission of the contribution from the data point with the smallest  $x$  coordinate.  
(Bug introduced in **spatstat** 1.26-0, april 2012; fixed in **spatstat** 1.46-1, july 2016)
- **update.ppm:** If the argument **Q** was given, the results were usually incorrect, or an error was generated.  
(Bug introduced in **spatstat** 1.38-0, august 2014; fixed in **spatstat** 1.38-1, august 2014)
- **subfits:** The interaction coefficients of the submodels were incorrect for Gibbs models with a multitype interaction (**MultiStrauss**, etc).  
(Bug introduced in **spatstat** 1.35-0, december 2013; fixed in **spatstat** 1.45-2, may 2016)
- **F3est:** Estimates of  $F(r)$  for the largest value of  $r$  were wildly incorrect. (Bug was present since about 2010. Fixed in **spatstat** 1.48-0, december 2016)

- `kppm`, `matclust.estpcf`, `pcfmodel`: The pair correlation function of the Matérn Cluster Process was evaluated incorrectly at distances close to 0. This could have affected the fitted parameters in `matclust.estpcf()` or `kppm(clusters="MatClust")`.  
(Bug introduced in `spatstat` 1.20-2, august 2010; fixed in `spatstat` 1.33-0, september 2013)
- `ppm`: Results were incorrect for the Geyer saturation model with a non-integer value of the saturation parameter `sat`.  
(Bug introduced in `spatstat` 1.20-0, july 2010; fixed in `spatstat` 1.31-2, april 2013)
- `clip.infln`: Results were incorrect unless the midpoint of the window was the coordinate origin.  
(Bug introduced in `spatstat` 1.15-1, april 2009; fixed in `spatstat` 1.48-0, december 2016)
- `intensity.ppm`: Result was incorrect for Gibbs models if the model was exactly equivalent to a Poisson process (i.e. if all interaction coefficients were exactly zero).  
(Bug introduced in `spatstat` 1.28-1, june 2012; fixed in `spatstat` 1.47-0, october 2016)
- `funxy`: Did not correctly handle one-line functions. The resulting objects evaluated the wrong function in some cases.  
(Bug introduced in `spatstat` 1.45-0, march 2016; fixed in `spatstat` 1.46-0, july 2016)
- `kernel.moment`: Result was incorrect for `kernel="cosine"` and `kernel="cosine"`.  
(Bug introduced in `spatstat` 1.45-2, may 2016; fixed in `spatstat` 1.56-0, june 2018)
- `[".msr]`: Format was mangled if the subset contained exactly one quadrature point.  
(Bug introduced in `spatstat` 1.21-3, january 2011; fixed in `spatstat` 1.56-0, june 2018)
- `tess`: If a list of tiles was given, and the tiles were pixel images or masks, their pixel resolutions were ignored, and reset to the default  $128 \times 128$ . (Bug fixed in `spatstat` 1.56-0, june 2018)

## 2.0.4 Partially Incorrect

- `model.matrix.ppm`: The attribute `assign` was omitted in some cases.  
(Bug introduced in `spatstat` 1.45-1, may 2016; fixed in `spatstat` 1.55-0, january 2018)
- `density.ppp`: If the smoothing bandwidth `sigma` was very small (e.g. less than the width of a pixel), results were inaccurate if the default resolution was used, and completely incorrect if a user-specified resolution was given.  
(Bug introduced in `spatstat` 1.26-0, april 2012; fixed in `spatstat` 1.52-0, august 2017)
- `selfcrossing.psp`: `y` coordinate values were incorrect.  
(Bug introduced in `spatstat` 1.23-2, august 2011; fixed in `spatstat` 1.25-3, february 2012)
- `Geyer`: For point process models with the `Geyer` interaction, `vcov.ppm` and `suffstat` sometimes gave incorrect answers.  
(Bug introduced in `spatstat` 1.27-0, may 2012; fixed in `spatstat` 1.30-0, december 2012)
- `leverage.ppm`, `influence.ppm`, `dfbetas.ppm`: Calculations were incorrect for a Geyer model fitted using an edge correction other than `"border"` or `"none"`.  
(Bug introduced in `spatstat` 1.25-0, december 2011; fixed in `spatstat` 1.51-0, may 2017)
- `leverage.ppm`, `influence.ppm`, `dfbetas.ppm`: Results were slightly incorrect for models fitted using the border correction.  
(Bug introduced in `spatstat` 1.25-0, december 2011; fixed in `spatstat` 1.54-0, november 2017)

- **leverage.ppm**: The mean leverage value (shown as a contour level in `plot.leverage.ppm`) was slightly incorrect for Gibbs models.  
(Bug introduced in `spatstat` 1.25-0, december 2011; fixed in `spatstat` 1.54-0, november 2017)
- **vcov.ppm**, **suffstat**: These functions sometimes gave incorrect values for marked point process models.  
(Bug introduced in `spatstat` 1.27-0, may 2012; fixed in `spatstat` 1.29-0, october 2012)
- **diagnose.ppm**: When applied to a model obtained from `subfits()`, in the default case (`oldstyle=FALSE`) the variance calculations were incorrect. Consequently the dotted lines representing significance bands were incorrect. An error or warning about negative variances occurred sometimes. However, calculations with `oldstyle=TRUE` were correct. The default has now been changed to `oldstyle=TRUE` for such models.  
(Bug introduced in `spatstat` 1.35-0, december 2013; fixed in `spatstat` 1.45-0, march 2016)
- **Smooth.ppp**: Results for `at="points"` were garbled, for some values of `sigma`, if `X` had more than one column of marks.  
(Bug introduced in `spatstat` 1.38-0, october 2014; fixed in `spatstat` 1.46-0, july 2016)
- **linearK**, **linearKinhom**: If any data points were located exactly at a vertex of the linear network, the weights for Ang's correction were incorrect, due to numerical error. This sometimes produced infinite or NA values of the linear  $K$  function.  
(Bug introduced in `spatstat` 1.23-0, july 2011; fixed in `spatstat` 1.27-0, may 2012)
- **Kinhom**, **Linhom**: the results were not renormalised (even if `renormalise=TRUE`) in some cases.  
(Bug introduced in `spatstat` 1.21-0, december 2010; fixed in `spatstat` 1.37-0, may 2014)
- **Kinhom**, **Linhom**: Ignored argument `reciplambda2` in some cases.  
(Bug introduced in `spatstat` 1.39-0, october 2014; fixed in `spatstat` 1.40-0, december 2014)
- **Kinhom**, **Linhom**: Calculations were incorrect if `lambda` was a fitted point process model.  
(Bug introduced in `spatstat` 1.38-0, august 2014; fixed in `spatstat` 1.38-1, august 2014)
- **integral.linim**, **integral.linfun**:
  - results were inaccurate because of a bias in the distribution of sample points.  
(Bug introduced in `spatstat` 1.41-0, february 2015; fixed in `spatstat` 1.47-0, october 2016)
  - results were inaccurate if many of the segment lengths were shorter than the width of a pixel.  
(Bug introduced in `spatstat` 1.41-0, february 2015; fixed in `spatstat` 1.48-0, december 2016)
  - results were wildly inaccurate in some extreme cases where many segments were very short.  
(Bug introduced in `spatstat` 1.41-0, february 2015; fixed in `spatstat` 1.54-0, november 2017)
- **predict.ppm**: Calculation of the conditional intensity omitted the edge correction if `correction='translate'` or `correction='periodic'`.  
(Bug introduced in `spatstat` 1.17-0, october 2009; fixed in `spatstat` 1.31-3, may 2013)
- **varblock**: Calculations were incorrect if more than one column of edge corrections was computed.  
(Bug introduced in `spatstat` 1.21-1, november 2010; fixed in `spatstat` 1.39-0, october 2014)
- **scan.test** Results were sometimes incorrect due to numerical instability (a 'Gibbs phenomenon').  
(Bug introduced in `spatstat` 1.24-1, october 2011; fixed in `spatstat` 1.26-1, april 2012)

- **relrisk**: When `at="pixels"`, a small fraction of pixel values were sometimes wildly inaccurate, due to numerical errors. This affected the range of values in the result, and therefore the appearance of plots. (Bug fixed in `spatstat 1.40-0`, december 2014)
- **predict.slm**: Results of `predict(object, newdata)` were incorrect if the spatial domain of `newdata` was larger than the original domain. (Bug introduced in `spatstat 1.21-0`, november 2010; fixed in `spatstat 1.25-3`, february 2012)
- **Lest**: The variance approximations (Lotwick-Silverman and Ripley) obtained with `var.approx=TRUE` were incorrect for **Lest** (although they were correct for **Kest**) due to a coding error. (Bug introduced in `spatstat 1.24-1`, october 2011; fixed in `spatstat 1.24-2`, november 2011)
- **bw.diggle**: Bandwidth was too large by a factor of 2. (Bug introduced in `spatstat 1.23-4`, september 2011; fixed in `spatstat 1.23-5`, september 2011)
- pair correlation functions (`pcf.ppp`, `pcfdot`, `pcfcross` etc:) The result had a negative bias at the maximum `r` value, because contributions to the pcf estimate from interpoint distances greater than `max(r)` were mistakenly omitted. (Bugs fixed in `spatstat 1.35-0`, december 2013)
- **Kest**, **Lest**: Gave incorrect values in very large datasets, due to numerical overflow. ‘Very large’ typically means about 1 million points in a random pattern, or 100,000 points in a tightly clustered pattern. [Overflow cannot occur unless there are at least 46,341 points.]
- **bw.relrisk**: Implementation of `method="weightedleastquares"` was incorrect and was equivalent to `method="leastquares"`. (Bug introduced in `spatstat 1.21-0`, november 2010; fixed in `spatstat 1.23-4`, september 2011)
- **triangulate.owin**: Results were incorrect in some special cases. (Bug introduced in `spatstat 1.42-2`, june 2015; fixed in `spatstat 1.44-0`, december 2015)
- **crosspairs**: If `X` and `Y` were identical point patterns, the result was not necessarily symmetric (on some machines) due to numerical artifacts. (Bug introduced in `spatstat 1.35-0`, december 2013; fixed in `spatstat 1.44-0`, december 2015)
- **bdist.tiles**: Values were incorrect in some cases due to numerical error. (Bug fixed in `spatstat 1.29-0`, october 2012)
- **Kest.fft**: Result was incorrectly normalised. (Bug introduced in `spatstat 1.21-2`, january 2011; fixed in `spatstat 1.44-0`, december 2015)
- **crossdist.ppp**: Ignored argument `squared` if `periodic=FALSE`. (Bug fixed in `spatstat 1.38-0`, july 2014)
- polygon geometry: The point-in-polygon test gave the wrong answer in some boundary cases. (Bug fixed in `spatstat 1.23-2`, august 2011)
- **MultiStraussHard**: If a fitted model with **MultiStraussHard** interaction was invalid, `project.ppm` sometimes yielded a model that was still invalid. (Bug fixed in `spatstat 1.42-0`, may 2015)
- **pool.envelope**: Did not always respect the value of `use.theory`. (Bug introduced in `spatstat 1.23-5`, september 2011; fixed in `spatstat 1.43-0`, september 2015)
- **nncross.lpp**, **nnwhich.lpp**, **distfun.lpp**: Sometimes caused a segmentation fault. (Bug introduced in `spatstat 1.44-0`, december 2015; fixed in `spatstat 1.44-1`, december 2015)

- `anova.ppm`: If a single `object` was given, and it was a Gibbs model, then `adjust` was effectively set to `FALSE`.  
(Bug introduced in `spatstat 1.39-0`, october 2014; fixed in `spatstat 1.44-1`, december 2015)
- `[.linim`: the result sometimes had the wrong class.  
(Bug introduced in `spatstat 1.53-0`, september 2017; fixed in `spatstat 1.55-1`, april 2015)

## References

- [1] A. Baddeley, E. Rubak, and R. Turner. *Spatial Point Patterns: Methodology and Applications with R*. Chapman & Hall/CRC Press, 2015.