

# Package ‘spectr’

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**Type** Package

**Title** Calculate the Periodogram of a Time-Course

**Version** 1.0.1

**Description** Provides a consistent interface to use various methods to calculate the periodogram and estimate the period of a rhythmic time-course. Methods include Lomb-Scargle, fast Fourier transform, and three versions of the chi-square periodogram. See Tackenberg and Hughey (2021) [doi:10.1371/journal.pcbi.1008567](https://doi.org/10.1371/journal.pcbi.1008567).

**URL** <https://spectr.hugheylib.org>, <https://github.com/hugheylib/spectr>

**License** GPL-2

**Encoding** UTF-8

**RoxygenNote** 7.1.1

**Depends** R (>= 3.6)

**Imports** data.table (>= 1.12.2), foreach (>= 1.5.0), lomb (>= 2.0)

**Suggests** doParallel (>= 1.0.15), knitr, qs (>= 0.24.1), rmarkdown, testthat (>= 3.0.3)

**Config/testthat/edition** 3

**NeedsCompilation** no

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**Repository** CRAN

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`cspgram`*Calculate periodogram*

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### Description

Calculate periodogram for a time-course using Lomb-Scargle, fast Fourier transform, or selected version of chi-square. The `spectr` function is a wrapper for the various methods. `lspgram` is in turn a wrapper for `lomb:lsp()`, and `fftpgram` a wrapper for `stats::spec.pgram()`. Among the versions of chi-square, it is highly recommended to use `greedy`, which has lower bias than `standard` and lower variance than `conservative`.

### Usage

```
cspgram(  
  x,  
  deltat,  
  periodRange = c(18, 32),  
  method = c("greedy", "conservative", "standard"),  
  na.action = stats::na.fail,  
  dopar = FALSE  
)  
  
fftpgram(  
  x,  
  deltat,  
  periodRange = c(18, 32),  
  pad = 50,  
  na.action = stats::na.fail,  
  ...  
)  
  
lspgram(x, deltat, time, periodRange = c(18, 32), ofac = 50)  
  
spectr(  
  x,  
  deltat,  
  time,  
  periodRange = c(18, 32),  
  method = c("greedy_chisq", "conservative_chisq", "standard_chisq", "lombscargle",  
    "fft"),  
  ofac = 50,  
  pad = 50,  
  na.action = stats::na.fail,  
  dopar = FALSE,  
  ...  
)
```

**Arguments**

|                          |                                                                                                                                                                                           |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>x</code>           | Numeric vector of measurements.                                                                                                                                                           |
| <code>deltat</code>      | Numeric value of the interval between time-points.                                                                                                                                        |
| <code>periodRange</code> | Numeric vector of the minimum and maximum values of the period to consider, in the same units as <code>deltat</code> or time.                                                             |
| <code>method</code>      | Character indicating which method to use. Can be an unambiguous substring of the full name.                                                                                               |
| <code>na.action</code>   | Function specifying how to handle NA values in <code>x</code> . Default is <code>stats::na.fail()</code> , which gives an error if any values are missing. Ignored for Lomb-Scargle.      |
| <code>dopar</code>       | Logical indicating whether to run calculations in parallel if a parallel backend is already set up, e.g., using <code>doParallel::registerDoParallel()</code> . Only used for chi-square. |
| <code>pad</code>         | Numeric value of the proportion of the length of <code>x</code> by which to pad <code>x</code> with zeros. Must be $> 0$ . Only used for FFT.                                             |
| <code>...</code>         | Other arguments passed to <code>stats::spec.pgram()</code> for FFT.                                                                                                                       |
| <code>time</code>        | Numeric vector of time-points. Can be specified instead of <code>deltat</code> for Lomb-Scargle.                                                                                          |
| <code>ofac</code>        | Integer value of the oversampling factor. Must be $\geq 1$ . Only used for Lomb-Scargle.                                                                                                  |

**Value**

A `data.table` with various columns depending on the method. For any version of chi-square, columns will be `period`, `chisq`, `df`, and `log_pval`. The log p-value is more reliable than the p-value, since R has finite precision, so p-values less than about  $5e-324$  would be set to 0. For Lomb-Scargle and FFT, columns will be `period` and `power`.

**Examples**

```
library('data.table')

set.seed(1789)
deltat = 0.1
tau = 25
tt = seq(0, 24 * 3, deltat)
x = 3 * sin(tt / tau * 2 * pi) + rnorm(length(tt))

specCsp = spectr(x, deltat, method = 'greedy')
peakCsp = specCsp[which.min(log_pval)]

specLsp = spectr(x, deltat, method = 'lomb')
peakLsp = specLsp[which.max(power)]

specFft = spectr(x, deltat, method = 'fft')
peakFft = specFft[which.max(power)]
```

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