

# Package ‘spikes’

October 14, 2022

**Type** Package

**Title** Detecting Election Fraud from Irregularities in Vote-Share Distributions

**Version** 1.1

**Depends** R (>= 3.2.2), emdbook

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**Description** Applies re-sampled kernel density method to detect vote fraud. It estimates the proportion of coarse vote-shares in the observed data relative to the null hypothesis of no fraud.

**License** GPL (>= 2)

**NeedsCompilation** no

**Repository** CRAN

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## R topics documented:

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|         |                          |
|---------|--------------------------|
| confInt | <i>Credible interval</i> |
|---------|--------------------------|

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**Description**

Estimates credible interval by (1) taking a draw from the posterior density (2) implementing the RKD step. The procedure is repeated boot times.

**Usage**

```
confInt(object, boots = 100)
```

**Arguments**

|        |   |
|--------|---|
| object | object of class out returned by spikes            |
| boots  | number of samples from the posterior; default 100 |

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|      |                     |
|------|---------------------|
| data | <i>Example data</i> |
|------|---------------------|

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**Description**

Synthetic dataset

**Usage**

```
data("data")
```

**Format**

Precinct-level election data from the 2011 Canadian parliamentary elections..

N number of registered voters

t turnout

v votes for the Conservative party

**Examples**

```
data(data)
```

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|        |                      |
|--------|----------------------|
| output | <i>Output object</i> |
|--------|----------------------|

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**Description**

An object of class out returned by spikes or confint.out.

**Usage**

```
data("output")
```

**Examples**

```
data(output)
plot(output)
```

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|          |                               |
|----------|-------------------------------|
| plot.out | <i>Plots output of spikes</i> |
|----------|-------------------------------|

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**Description**

Plots the observed kernel density of data and the upper envelope of the resampled densities.

**Usage**

```
## S3 method for class 'out'
plot(x, main = NULL, ...)
```

**Arguments**

|      |                               |
|------|-------------------------------|
| x    | Object of class out           |
| main | Title, NULL by default        |
| ...  | additional plotting arguments |

**Examples**

```
data(output)
plot(output)
```

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spikes *Fraud-detection from vote-share data*

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### Description

Implements the resampled kernel density method to detect the excess number of election results with coarse vote-shares (a coarse vote-share is a fraction with a low denominator).

### Usage

```
spikes(data, resamples = 1000, bw = 1e-04, grid = 1001, out = NULL)
```

### Arguments

|           |  |
|-----------|--|
| data      | Data frame with three columns with names $N$ (number of votes), $t$ (number who turned out to vote), and $v$ (number who voted for the party the votes of which are being analyzed). Returns error if columns are named incorrectly. |
| resamples | Number of resamples; default 1000  |
| bw        | Bandwidth for kernel density; default 0.0001   |
| grid      | Number of points on which the density is estimated; default 1001   |
| out       | Object containing parameters of beta-mixture model. If spikes has been called earlier, then <code>out = output\$out</code> will skip density estimation and proceed directly to resampling.  |

### Value

spikes returns object of class out.

|       |   |
|-------|---|
| fraud | Estimated percentage of polling stations with fraud.  |
| ymax  | Upper envelope of kernel density samples.   |
| w     | Weights for each bin: the proportion of observations falling into a bin.                    |
| out   | Maximum likelihood estimates of the mixture beta binomial parameters for turnout and votes. |
| data  | Data used in estimation.  |

### See Also

See Also [plot.out](#), [summary.out](#)

### Examples

```
data(data)
## Not run:
out <- spikes(data, resamples = 1000)

## End(Not run)
```

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|                 |                           |
|-----------------|---------------------------|
| spikes-internal | <i>Internal functions</i> |
|-----------------|---------------------------|

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**Description**

Internal functions, should not be called by user

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|             |                  |
|-------------|------------------|
| summary.out | <i>Summarize</i> |
|-------------|------------------|

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**Description**

Extracts estimate of fraud and 95 percent credible interval (if such is estimated) for the object of class out returned by spikes or confint.out.

**Usage**

```
## S3 method for class 'out'  
summary(object, ...)
```

**Arguments**

|        |                      |
|--------|----------------------|
| object | Object of class out  |
| ...    | additional arguments |

**Note**

If the argument is from spikes, then summary returns degenerate credible interval, as it was not estimated. To return a proper credible interval, confint.out must take as its argument object returned by confint.out.

**Examples**

```
data(output)  
summary(output)
```

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