Package 'DEEVD'

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Type Package

Title Density Estimation by Extreme Value Distributions

Version 1.2.1

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Description Provides mean squared error (MSE) and plot the kernel densities related to extreme value distributions with their estimated values.
By using Gumbel and Weibull Kernel. See Salha et al. (2014) <doi:10.4236/ojs.2014.48061> and Khan and Akbar (2020).

URL https://CRAN.R-project.org/package=DEEVD

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R topics documented:

DEEVD-package *DEEVD*

Description

Weibull and Gumbel kernel related functions are presented. `Weibull` and `Gumbel` present estimated values and `plot.Weibull` and `plot.Gumbel` plot the densities. While `mseweibull` and `msegumbel` calculate the Mean Squared Error (MSE).

Details

Density Estimation by Extreme Value Distributions

Author(s)

Javaria Ahmad Khan, Atif Akbar.

References

- Salha, R. B., El Shekh Ahmed, H. I., & Alhoubi, I. M. 2014. Hazard Rate Function Estimation Using Weibull Kernel. *Open Journal of Statistics* **4** (08), 650-661.
- Khan, J. A.; Akbar, A. Density Estimation by Gumbel Kernel. 2020. *Working paper, Department of Statistics, Bahauddin Zakariya University, Multan, Pakistan.*

See Also

Useful links:

- `https://CRAN.R-project.org/package=DEEVD`

Gumbel *Estimated Density Values by Gumbel kernel*

Description

Estimated Kernel density values by using Gumbel Kernel.

Usage

```
Gumbel(y, k, h)
```

Arguments

y	a numeric vector of positive values.
k	gird points.
h	the bandwidth

Details

The Gumbel kernel is developed by Khan and Akbar (2020). They provided evidence that performance of their proposed is better then Weibull kernel especially when data belongs to family of extreme distributions. Gumbel Kernel is

$$K_{Gumbel(x,\sqrt{h})}(j) = \frac{1}{\sqrt{h}} exp - \left(\frac{j-x}{\sqrt{h}} + exp\left(\frac{j-x}{\sqrt{h}} \right) \right)$$

Value

x	grid points
y	estimated values of density

Author(s)

Javaria Ahmad Khan, Atif Akbar.

References

Khan, J. A.; Akbar, A. Density Estimation by Gumbel Kernel. 2020. *Working paper, Department of Statistics, Bahauddin Zakariya University, Multan, Pakistan.*

See Also

For esitimated values by Weibull kernel see `Weibull`. Further, for plot and MSE by Gumbel kernel see `plot.Gumbel` and `msegumbel`, respectively.

Examples

```
y <- rexp(100,1)
h <- 0.79 * IQR(y) * length(y) ^ (-1/5)
Gumbel(y,200,h)
```

`msegumbel` *Calculate Mean Square Error(MSE) when Gumbel kernel is used.*

Description

Calculate MSE by using Gumbel Kernel.

Usage

```
msegumbel(y, k, h, type)
```

Arguments

y	a numeric vector of positive values.
k	gird points.
h	the bandwidth
type	mention distribution of vector.If Gumbel distribution is used scale=1 then use "Gumbel". if use Weibull distribution with scale = 1 then use "Weibull". if use Frechet distribution with scale=1 and shape=1 then use "Frechet".

Value

MSE

Author(s)

Javaria Ahmad Khan, Atif Akbar

References

Khan, J. A.; Akbar, A. Density Estimation by Gumbel Kernel. 2020. *Working paper, Department of Statistics, Bahauddin Zakariya University, Multan, Pakistan.*

See Also

For Weibull estimator MSE see mseweibull. For density estimation by using Gumbel Kernel plot.Gumbel and for estimated values of density Gumbel.

Examples

```
y<-rweibull(350,1)
h<-0.79 * IQR(y) * length(y) ^ (-1/5)
msegumbel(y,200,h,"Weibull")
```

---

mseweibull *Calculate Mean Square Error(MSE) when Weibull kernel is used.*

Description

Calculate MSE by using Weibull Kernel.

Usage

```
mseweibull(y, k, h, type)
```

Arguments

y	a numeric vector of positive values.
k	gird points.
h	the bandwidth
type	mention distribution of vector.If Gumbel distribution is used scale=1 then use "Gumbel". if use Weibull distribution with scale = 1 then use "Weibull". if use Frechet distribution with scale=1 and shape=1 then use "Frechet".

Value

MSE

Author(s)

Javaria Ahmad Khan, Atif Akbar

References

Salha, R. B., El Shekh Ahmed, H. I., & Alhoubi, I. M. 2014. Hazard Rate Function Estimation Using Weibull Kernel. *Open Journal of Statistics* **4** (08), 650-661.

See Also

For Gumbel estimator MSE see `msegumbel`. For density estimation by using Weibull Kernel `plot.Weibull` and for estimated values of density `Weibull`.

Examples

```
y<-rweibull(350,1)
h<-0.79 * IQR(y) * length(y) ^ (-1/5)
mseweibull(y,200,h,"Weibull")
```

---

plot.Gumbel *Density Plot by Gumbel kernel*

Description

Plot density by using Gumbel Kernel.

Usage

```
## S3 method for class 'Gumbel'
plot(x, ...)
```

Arguments

x	an object of class "Gumbel"
...	Not presently used in this implementation

Value

nothing

Author(s)

Javaria Ahmad Khan, Atif Akbar.

References

Khan, J. A.; Akbar, A. Density Estimation by Gumbel Kernel. 2020. *Working paper, Department of Statistics, Bahauddin Zakariya University, Multan, Pakistan.*

See Also

For Weibull kernel see `plot.Weibull`. To calculate Gumbel estimated values see `Gumbel` and for MSE by using Gumbel Kernel `msegumbel`.

Examples

```
y <- rexp(100,1)
h <- 0.79 * IQR(y) * length(y) ^ (-1/5)
den <- Gumbel(y,200,h)
plot(den, type = "s", ylab = "Density Function", lty = 1, xlab = "Time")
```

---

plot.Weibull *Density Plot by Weibull kernel*

Description

Plot density by using Weibull Kernel.

Usage

```
## S3 method for class 'Weibull'
plot(x, ...)
```

Arguments

x	an object of class "Weibull"
...	Not presently used in this implementation

Value

nothing

Author(s)

Javaria Ahmad Khan, Atif Akbar.

References

Salha, R. B., El Shekh Ahmed, H. I., & Alhoubi, I. M. 2014. Hazard Rate Function Estimation Using Weibull Kernel. *Open Journal of Statistics* **4** (08), 650-661.

See Also

For Gumbel kernel see `plot.Gumbel`. To calculate Weibull estimated values see `Weibull` and for MSE by using Gumbel Kernel `mseweibull`.

Examples

```
y <- rexp(100,1)
h <- 0.79 * IQR(y) * length(y) ^ (-1/5)
den <- Weibull(y,200,h)
plot(den, type = "s", ylab = "Density Function", lty = 1, xlab = "Time")
```

Weibull *Estimated Density Values by Weibull kernel*

Description

Estimated Kernel density values by using Weibull Kernel.

Usage

```
Weibull(y, k, h)
```

Arguments

y	a numeric vector of positive values.
k	gird points.
h	the bandwidth

Details

The Weibull kernel is developed by Salha et al. (2014). They used it to nonparametric estimation of the probability density function (pdf) and the hazard rate function for independent and identically distributed (iid) data. Weibull Kernel is

$$K_w\left(x,\frac{1}{h}\right)(t)=\frac{\Gamma(1+h)}{hx}\left[\frac{t\Gamma(1+h)}{x}\right]^{\frac{1}{h}-1}exp\left(-\left(\frac{t\Gamma(1+h)}{x}\right)^{\frac{1}{h}}\right)$$

Value

x	grid points
y	estimated values of density

Author(s)

Javaria Ahmad Khan, Atif Akbar.

References

Salha, R. B., El Shekh Ahmed, H. I., & Alhoubi, I. M. 2014. Hazard Rate Function Estimation Using Weibull Kernel. *Open Journal of Statistics* **4** (08), 650-661.

See Also

For esitimated values by Gumbel kernel see `Gumbel`. Further, for plot and MSE by Weibull kernel see `plot.Weibull` and `mseweibull`, respectively.

Examples

```
y <- rexp(100,1)
h <- 0.79 * IQR(y) * length(y) ^ (-1/5)
Weibull(y,200,h)
```

Index