Package 'StatDeriveR'

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Title Step-by-Step Derivation and Simulation Verification in Mathematical Statistics

Version 0.1.0

Description Provides step-by-step derivations of key results in mathematical statistics, including transformations of random variables, order statistics, and sampling distributions. The package combines analytical derivation with Monte Carlo simulation to compare theoretical and empirical results, facilitating deeper understanding of statistical theory and its computational implementation. The methods are motivated by standard treatments in mathematical statistics (Hogg, McKean, and Craig, 2019, ISBN: 9780134686991).

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Encoding UTF-8

Language en-US

Depends R (>= 4.0.0)

Imports grDevices, graphics, stats

Suggests knitr, rmarkdown, testthat (>= 3.0.0)

RoxygenNote 7.3.3

URL https://github.com/Jokhrof042/StatDeriveR

BugReports https://github.com/Jokhrof042/StatDeriveR/issues

NeedsCompilation no

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Repository CRAN

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Contents

`derive_orderstat` *Derive the distribution of an order statistic*

Description

Derive the distribution of an order statistic

Usage

```
derive_orderstat(dist, params, n, r)
```

Arguments

`dist`	Character: base distribution name
`params`	List: distribution parameters
`n`	Integer: sample size
`r`	Integer: order (1 = min, n = max)

Value

Object of class "statderive" with order statistic derivation

Examples

```
# Minimum of 5 exponential(rate=2) samples
obj <- derive_orderstat(
  dist = "exponential",
  params = list(rate = 2),
  n = 5,
  r = 1
)
```

`derive_transform` *Derive the distribution of a transformed random variable*

Description

Derive the distribution of a transformed random variable

Usage

```
derive_transform(dist, params, transform, support = NULL)
```

Arguments

`dist`	Character: base distribution name
`params`	List: distribution parameters
`transform`	Character: transformation (e.g., "x^2", "sqrt(x)", "1/x")
`support`	Optional vector c(lower, upper) for original support

Value

Object of class "statderive" with derivation steps

Examples

```
# Transform Y = X^2 where X ~ Uniform(0,1)
obj <- derive_transform(
  dist = "uniform",
  params = list(min = 0, max = 1),
  transform = "x^2"
)
```

`imports` *Imported functions*

Description

Internal imports required for package checks.

plot.statderive *Plot method for statderive objects*

Description

Plot method for statderive objects

Usage

```
## S3 method for class 'statderive'
plot(x, y = NULL, ...)
```

Arguments

x	Object of class "statderive"
y	Unused (required for S3 plot method)
...	Additional arguments

Value

Invisibly returns the input object x (of class statderive). This function is called primarily for its side effect of producing plots that compare simulated data with theoretical probability density functions.

print.statderive *Print method for statderive objects*

Description

Print method for statderive objects

Usage

```
## S3 method for class 'statderive'
print(x, ...)
```

Arguments

x	Object of class "statderive"
...	Additional arguments

Value

Invisibly returns the input object x (of class statderive). This function is called primarily for its side effect of printing a formatted summary of the statistical derivation and optional simulation results.

`simulate_check` *Run Monte Carlo simulation and compare with theory*

Description

Run Monte Carlo simulation and compare with theory

Usage

```
simulate_check(object, n_sim = 10000, seed = 123)
```

Arguments

`object`	Object of class "statderive" from derive_transform or derive_orderstat
`n_sim`	Integer: number of simulations (default 10000)
`seed`	Integer: random seed for reproducibility

Value

Updated object with simulation results added

Examples

```
obj <- derive_transform("uniform", list(min = 0, max = 1), "x^2")
obj_sim <- simulate_check(obj, n_sim = 5000)
```

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