Package: statisR (via r-universe)

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Type Package

Title STATIS and STATIS DUAL Multivariate Methods

Version 1.0.1

Description Provides tools for the integration and exploration of data tables measured on the same set of observational units. The package includes methods to assess similarities among tables, extract common patterns across variable blocks, and create visual summaries that highlight shared structures in multiblock data.

License GPL (>= 2)

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Contents

`expert1` *Sensory Evaluation Data from Expert 1*

Description

This dataset contains the ratings provided by Expert 1 for six wine samples. Each wine is evaluated according to three sensory attributes commonly used in descriptive analysis: *fruity*, *woody*, and *coffee*. The dataset is typically used in STATIS and multitable analyses to illustrate how different experts evaluate the same set of products.

Usage

```
data(expert1)
```

Format

A data frame with 6 rows (Wine1–Wine6) and 3 sensory attributes:

fruity Intensity of fruity aromas.

woody Intensity of woody/aged aromas.

coffee Perceived coffee-like notes.

References

Abdi, H., & Valentin, D. (2007). The STATIS method. Encyclopedia of measurement and statistics, 955-962.

Examples

```
data(expert1)
expert1
```

`expert2` *Sensory Evaluation Data from Expert 2*

Description

This dataset contains the evaluations provided by Expert 2 for the same six wine samples. Unlike Expert 1, this expert uses four sensory descriptors: *red_fruit*, *roasted*, *vanillin*, and *woody*. The dataset demonstrates how experts may differ in terminology and profiling, and it is commonly used in STATIS, MFA, and other multitable comparison techniques.

Usage

```
data(expert2)
```

Format

A data frame with 6 rows (Wine1–Wine6) and 4 sensory attributes:

red_fruit Intensity of red fruit aromas.

roasted Intensity of roasted or toasted notes.

vanillin Perceived vanilla-related notes.

woody Intensity of woody/aged aromas.

References

Abdi, H., & Valentin, D. (2007). The STATIS method. Encyclopedia of measurement and statistics, 955-962.

Examples

```
data(expert2)
expert2
```

expert3 *Sensory Evaluation Data from Expert 3*

Description

This dataset contains the ratings given by Expert 3 for the same set of six wine samples. This expert evaluates wines using three sensory attributes: *fruity*, *butter*, and *woody*. The dataset is often used in multivariate and STATIS examples to highlight both agreement and divergence across panels of experts.

Usage

```
data(expert3)
```

Format

A data frame with 6 rows (Wine1–Wine6) and 3 sensory attributes:

fruity Intensity of fruity aromas.

butter Presence of buttery or lactic notes.

woody Intensity of woody/aged aromas.

References

Abdi, H., & Valentin, D. (2007). The STATIS method. Encyclopedia of measurement and statistics, 955-962.

Examples

```
data(expert3)
expert3
```

plot.statis.circle *Plot a Correlation Circle (Unit Circle)*

Description

This function generates a correlation circle plot from two-dimensional coordinates, commonly used in principal component analysis (PCA) or other multivariate methods.

Usage

```
## S3 method for class 'statis.circle'
plot(points, inertia = 100, labels = NULL, title = "")
```

Arguments

points	A matrix or data frame with two numeric columns (x, y) representing the coordinates of the vectors.
inertia	A number between 0 and 100 representing the percentage of explained inertia. It is displayed in the title.
labels	A character vector with labels for the points (optional). If not specified, labels are left blank.
title	Optional text used as the main title of the plot.

Details

Arrows are drawn from the origin to each point specified in `points`. A reference circle with radius 1 is displayed. You can also show the percentage of explained inertia and point labels.

The `inertia` argument is flexible and can be passed as the second or third parameter if argument names are omitted.

Value

A `ggplot` object with the generated plot.

See Also

`statis`

Examples

```
data(expert1, expert2, expert3)

labels <- c("Expert 1", "Expert 2", "Expert 3")

# If you want to select an specific table or row just set the parameters in the statis function.

res <- statis(list(expert1, expert2, expert3), table.labels = labels)

# Circle of correlations of all the tables
inter <- res$circle.inter
plot.statis.circle(inter$points, inter$inertia, inter$labels, inter$title)

# Circle of correlations of all variables evolution
intra <- res$circle.intra
plot.statis.circle(intra$points, intra$inertia, intra$labels, intra$title)
```

`plot.statis.dual.circle` *Bivariate PCA-style Scatter Plot*

Description

This function generates a 2D scatter plot with support for multiple groups, labels, arrows from the origin, reference circles, cross axes, and full style customization using `ggplot2`.

Usage

```
## S3 method for class 'statis.dual.circle'
plot(
  points.list,
  style.points = list(list(size = 3)),
  style.circle = list(),
  radius.circle = 1,
  labels = "auto",
  labels.style = NULL,
  draw.labels = TRUE,
  vars.direction = NULL,
  style.vars = list(),
  radius.vars = c(0.5, 1),
  join.dots = FALSE,
  style.join = list(),
  base.colors = .base.colors,
  axes = TRUE,
  frame = TRUE,
  hide.ticks = TRUE,
  proportion = 1,
  xlim = NULL,
  ylim = NULL,
  axes.xy = TRUE,
  style.axes.xy = list(linewidth = 0.35, linetype = "dashed", color = "gray40"),
  arrows.points = TRUE,
  factor.arrow = 0.95,
  style.arrows = list(color = "red", linewidth = 0.6, arrow = grid::arrow(length =
    grid::unit(0.2, "cm")))
)
```

Arguments

`points.list`	List of numeric objects (matrices, data.frames, or lists of vectors), each representing a group of 2D points.
`style.points`	List of `ggplot2` styles applied per group. If `NULL`, `geom_point()` is used by default.

style.circle	List of styles for the reference circle (passed to ggforce::geom_circle).
radius.circle	Radius (or vector of radii) to draw circles centered at the origin. Default value 1, if 0, no circles are drawn.
labels	"auto" generates numeric labels by group, or it can be a vector/list of custom labels.
labels.style	List of styles for the labels, passed to ggrepel::geom_text_repel.
draw.labels	Logical. If TRUE, labels are drawn on the points.
vars.direction	Directions of projected variables.
style.vars	Style for projected variables.
radius.vars	Radii used to scale variable arrows.
join.dots	Logical or list. If TRUE, connects points by group. If a list, connects points as manually defined.
style.join	List of styles for connecting points (passed to geom_path()).
base.colors	Vector of base colors used for the groups.
axes	Logical. If FALSE, all axis elements are removed.
frame	Logical. Not directly used; may be reserved for future use.
hide.ticks	Logical. If TRUE, hides axis ticks and text.
proportion	Fixed aspect ratio of the plot (to avoid distortion).
xlim	X-axis limits.
ylim	Y-axis limits.
axes.xy	Logical. If TRUE, draws cross axes (X = 0, Y = 0) with defined style.
style.axes.xy	List of styles for the XY cross axes (e.g., linetype, color, etc.).
arrows.points	Logical. If TRUE, draws arrows from the origin to each point.
factor.arrow	Factor to shorten the arrows.
style.arrows	List of styles for the arrows.

Value

A ggplot object with the generated plot.

See Also

statis.dual

Examples

```
data(Tuis5_95, Tuis5_96, Tuis5_97, Tuis5_98)
labels <- c("95","96","97","98")

res <- statis.dual(list(Tuis5_95, Tuis5_96, Tuis5_97, Tuis5_98), labels.tables = labels)

# Interstructure
t <- ggplot2::ggtitle("Interstructure")
```

```
plot.statis.dual.circle(points.list = list(res$interstructure), labels = res$labels.tables) + t

# Circle of correlations (all variables)
t <- ggplot2::ggtitle("Correlation (all variables)")
plot.statis.dual.circle(list(res$supervariables), labels = row.names(res$supervariables)) + t

# Circle of correlations (variables selected)
selected.variables <- c("Ph", "Temp", "DBO", "ST", "PO4", "NO3", "POD", "Cal")
superv.sel.df <- select.super.variables(res$supervariables, res$vars.names, selected.variables)

t <- ggplot2::ggtitle("Correlation (selected variables)")
plot.statis.dual.circle(list(superv.sel.df), labels = row.names(superv.sel.df)) + t
```

`plot.statis.dual.trajectories`

Plot Variable Trajectories in STATIS DUAL

Description

Visualizes the evolution of one or more variables across the different tables in a STATIS DUAL analysis. Each trajectory represents the sequence of positions of a variable in the compromise space.

Usage

```
## S3 method for class 'statis.dual.trajectories'
plot(
  vars,
  trajectories,
  labels.tables,
  .range = NULL,
  style.line = list(linetype = 2, linewidth = 0.5, color = "orange"),
  point.size = 3,
 base.colors = c("red", "blue", "brown", "darkgreen", "purple", "orange", "cyan4",
    "gold3", "black")
)
```

Arguments

`vars`	Vector of variable names to plot (must match the names in `trajectories`).
`trajectories`	List generated by `statis.dual()$trajectories`, where each element is a K x 2 matrix.
`labels.tables`	Vector of length K with the names or labels of the tables.
`.range`	List with axis limits: `list(x = c(xmin, xmax), y = c(ymin, ymax))`. If `NULL`, limits are computed automatically.
`style.line`	List with line style for the trajectories.

point.size	Size of the points at each position along the trajectory.
base.colors	Vector of base colors to distinguish the variables.

Value

A ggplot object showing the trajectories of the selected variables.

See Also

plot.statis.dual.circle, statis.dual

Examples

```
data(Tuis5_95, Tuis5_96, Tuis5_97, Tuis5_98)
labels = c("95","96","97","98")

res <- statis.dual(list(Tuis5_95, Tuis5_96, Tuis5_97, Tuis5_98), labels.tables = labels)

# If you want to select some variables
vars.A <- c("Ph","ST","NO3")
t <- ggplot2::ggtitle(sprintf("Trayectorias (%s)", paste(vars.A, collapse = ", ")))

plot.statis.dual.trajectories(vars.A, res$trajectories, res$labels.tables) + t

# If you want to select an specific variable
vars.1 <- "Temp"
t <- ggplot2::ggtitle(sprintf("Trajectory (%s)", vars.1))

plot.statis.dual.trajectories(vars.1, res$trajectories, res$labels.tables) + t

# All variables
t <- ggplot2::ggtitle("Trajectories (all variables)")
plot.statis.dual.trajectories(res$vars.names, res$trajectories, res$labels.tables) + t
```

---

plot.statis.plane *Plot a Plane of Observations or 2D Projections*

Description

This function generates a two-dimensional scatter plot with centered axes, useful for representing the results of multivariate analyses.

Usage

```
## S3 method for class 'statis.plane'
plot(points, inertia = 100, labels = NULL, title = "")
```

Arguments

points	A matrix, data frame, or a length-2 vector with coordinates (x, y). Must have exactly two columns.
inertia	A number between 0 and 100 indicating the percentage of explained inertia (optional, defaults to 100).
labels	A character vector with labels for the points (optional). Must match the number of rows in points.
title	A text string to be used as the main title of the plot (optional).

Details

The plot includes points, optional labels, Cartesian axes (centered at 0), and a title indicating the percentage of explained inertia.

Value

A ggplot object with the generated plot.

See Also

statis

Examples

```
data(expert1, expert2, expert3)

labels <- c("Expert 1", "Expert 2", "Expert 3")

# If you want to select an specific table or row just set the parameters in the statis function.

res <- statis(list(expert1, expert2, expert3), table.labels = labels)

# Main Plane of Average Individuals
individuals <- res$plane.individuals
plot.statis.plane(individuals$points, individuals$inertia, individuals$labels, individuals$title)

# Main Plane of the Evolution of individuals
evolution <- res$plane.evolution
plot.statis.plane(evolution$points, evolution$inertia, evolution$labels, evolution$title)
```

---

select.super.variables

Select and prepare a subset of variables from a supervision matrix

---

Description

This function selects a predefined subset of variables (ETCal) from a supervision matrix (superv), checks dimension consistency, verifies missing variables, and constructs a clean data frame containing the first two coordinates typically used for PCA or STATIS correlation plots.

Usage

```
select.super.variables(superv, ET, ETCal)
```

Arguments

superv	A numeric matrix or data frame where each row corresponds to a variable and columns represent coordinates (res$supervariables).
ET	A character vector containing the full list of expected variable names (res$vars.names).
ETCal	A character vector containing the subset of variables to be selected.

Details

The function performs the following steps:

1. Checks that the number of rows in superv matches the length of ET.
2. Assigns the row names of superv using ET.
3. Identifies whether any variables in ETCal are missing in superv; missing variables trigger a warning.
4. Creates an ordered list of valid variables (ETCal_ok) based on their presence in superv.
5. Extracts the corresponding rows from superv and constructs a data frame with columns x and y.

Value

A data frame with two columns:

- x: first coordinate (e.g., PC1)
- y: second coordinate (e.g., PC2)

Row names correspond to the selected variables defined in ETCal.

Examples

```
data(Tuis5_95, Tuis5_96, Tuis5_97, Tuis5_98)
labels <- c("95","96","97","98")

res <- statis.dual(list(Tuis5_95, Tuis5_96, Tuis5_97, Tuis5_98), labels.tables = labels)

ETCal <- c("Ph","Temp","DBO","ST","PO4","NO3","POD","Cal")

df_selected <- select.super.variables(res$supervariables, res$vars.names, ETCal)
```

statis *STATIS Method*

Description

Applies the STATIS method to a set of matrices (data tables) with the same rows. Is a multivariate analysis technique that allows studying the common structure and the evolution of individuals and variables across multiple tables.

Usage

```
statis(
  matrices,
  selected.tables = NULL,
  selected.rows = NULL,
  table.labels = NULL
)
```

Arguments

matrices	List of numeric matrices (at least 2), all with the same number of rows (individuals).
selected.tables	Select a subset of tables. If NULL, all tables are included.
selected.rows	Select a subset of rows. If NULL, all rows are included.
table.labels	Optional vector with names for the tables. It must have the same length as the number of tables.

Value

A list with the following elements:

n	Number of rows (individuals).
r	Number of tables.
p	Vector with the number of columns per table.
S	List of centered matrices.
W	List of proximity matrices.
X	Matrix of interstructure (vectorization of W).
acp.inter	PCA results of the interstructure: eigenvalues, eigenvectors, components, correlations.
XT	Weighted average of the matrices.
acp.intra	PCA results of the average: eigenvalues, eigenvectors, components, correlations.
IND	Concatenated matrix with all W stacked (individual evolution).

Omega	Projection of individual evolution onto the principal components.
circle.inter	Data to plot the correlation circle between tables.
circle.intra	Data to plot the variable evolution circle.
plane.individuals	Data to plot the average individuals plane.
plane.evolution	Data to plot the evolution of the individuals.

See Also

plot.statis.circle, plot.statis.plane

Examples

```
data(expert1, expert2, expert3)

labels <- c("Expert 1", "Expert 2", "Expert 3")

# If you want to select an specific table or tables
res <- statis(list(expert1, expert2, expert3), selected.tables = c(1, 3), table.labels = labels)

# If you want to select an specific row or rows
res <- statis(list(expert1, expert2, expert3), selected.rows = c(1, 5), table.labels = labels)

# If you want to select some tables and rows at the same time
res <- statis(list(expert1,expert2,expert3), selected.tables=c(1, 3), selected.rows=c(1, 4), labels)

# All tables and rows selected
res <- statis(list(expert1, expert2, expert3), table.labels = labels)

# How to use res
inter <- res$circle.inter
plot.statis.circle(inter$points, inter$inertia, inter$labels, inter$title)

evolution <- res$plane.evolution
plot.statis.plane(evolution$points, evolution$inertia, evolution$labels, evolution$title)
```

---

statis.dual *STATIS DUAL Analysis*

Description

Implementation of the STATIS DUAL method for the joint analysis of multiple tables that share the same variables. This approach allows evaluating the common structure between tables (inter-structure), building a compromise (weighted average of structures), and analyzing the trajectories of variables across the tables.

Usage

```
statis.dual(tables, labels.tables = NULL)
```

Arguments

tables	A list of matrices or data frames with the same columns (variables). Each element represents a "table".
labels.tables	A vector of length equal to the number of tables, used to name the tables in the results. If NULL, labels like ("T1", "T2", ...) are auto-generated.

Details

The STATIS DUAL method allows:

- Evaluating structural coherence across multiple tables using the interstructure
- Constructing a representative compromise of the set of tables
- Analyzing the behavior of the variables across the set (trajectories)

Internally, the tables are centered and normalized considering uniform observation weights. The R matrices capture the internal structure of each table. The interstructure is based on scalar products between these matrices.

Value

A list with the following elements:

labels.tables	Vector with the table labels
interstructure	K x 2 matrix with the coordinates of the tables in the interstructure space
supervariables	p x 2 matrix with the coordinates of the variables in the compromise
trajectories	List of p K x 2 matrices, one per variable, showing its trajectory across the tables
vars.names	Names of the variables (common columns)
S	Interstructure similarity matrix
R	List of R matrices for each table
Comp	Compromise matrix (weighted combination of R matrices)
eigenvalues.compromise	Eigenvalues of the compromise (inertia per axis)
eigenvectors.compromise	Eigenvectors of the compromise
beta.weights	Weights of each table in the construction of the compromise

See Also

plot.statis.dual.circle, plot.statis.dual.trajectories

Examples

```
data(Tuis5_95, Tuis5_96, Tuis5_97, Tuis5_98)
labels = c("95","96","97","98")

res <- statis.dual(list(Tuis5_95, Tuis5_96, Tuis5_97, Tuis5_98), labels.tables = labels)

# How to use res
t <- ggplot2::ggtitle("Correlation (all variables)")
plot.statis.dual.circle(list(res$supervariables), labels = row.names(res$supervariables)) + t

t <- ggplot2::ggtitle("Trajectories (all variables)")
plot.statis.dual.trajectories(res$vars.names, res$trajectories, res$labels.tables) + t
```

STATIS_TABLE1 *Physicochemical Variables Dataset for STATIS Analysis*

Description

This dataset belongs to a project called "Development and application of effective, low-cost methods for the biological monitoring of Costa Rican rivers" by the National University, and contains measurements of various physicochemical variables collected across several sampling sites. It is intended to be used in the examples and demonstrations of the main functions of the package, particularly those related to multivariate analysis and STATIS methodology.

Usage

```
data(STATIS_TABLE1)
```

Format

A data frame with 14 columns and multiple rows (one per sampling site):

NIT Total nitrogen level.

FOS Phosphorus level.

CAL Calcium level.

STO Sodium level.

PH pH measurement.

MN Manganese concentration.

ZN Zinc concentration.

SS Suspended solids.

ALC Alkalinity.

CL Chlorine level.

CAU Exchangeable calcium or equivalent measurement.

DBO Biological oxygen demand.

POR Porosity or related percentage.

Examples

```
data(STATIS_TABLE1)
head(STATIS_TABLE1)
```

STATIS_TABLE2 *Physicochemical Variables Dataset for STATIS Analysis*

Description

This dataset belongs to a project called "Development and application of effective, low-cost methods for the biological monitoring of Costa Rican rivers" by the National University, and contains measurements of various physicochemical variables collected across several sampling sites. It is intended to be used in the examples and demonstrations of the main functions of the package, particularly those related to multivariate analysis and STATIS methodology.

Usage

```
data(STATIS_TABLE1)
```

Format

A data frame with 14 columns and multiple rows (one per sampling site):

NIT Total nitrogen level.

FOS Phosphorus level.

CAL Calcium level.

STO Sodium level.

PH pH measurement.

MN Manganese concentration.

ZN Zinc concentration.

SS Suspended solids.

ALC Alkalinity.

CL Chlorine level.

CAU Exchangeable calcium or equivalent measurement.

DBO Biological oxygen demand.

POR Porosity or related percentage.

Examples

```
data(STATIS_TABLE2)
head(STATIS_TABLE2)
```

STATIS_TABLE3 *Physicochemical Variables Dataset for STATIS Analysis*

Description

This dataset belongs to a project called "Development and application of effective, low-cost methods for the biological monitoring of Costa Rican rivers" by the National University, and contains measurements of various physicochemical variables collected across several sampling sites. It is intended to be used in the examples and demonstrations of the main functions of the package, particularly those related to multivariate analysis and STATIS methodology.

Usage

```
data(STATIS_TABLE3)
```

Format

A data frame with 14 columns and multiple rows (one per sampling site):

NIT Total nitrogen level.

FOS Phosphorus level.

CAL Calcium level.

STO Sodium level.

PH pH measurement.

MN Manganese concentration.

ZN Zinc concentration.

SS Suspended solids.

ALC Alkalinity.

CL Chlorine level.

CAU Exchangeable calcium or equivalent measurement.

DBO Biological oxygen demand.

POR Porosity or related percentage.

Examples

```
data(STATIS_TABLE3)
head(STATIS_TABLE3)
```

STATIS_TABLE4 *Physicochemical Variables Dataset for STATIS Analysis*

Description

This dataset belongs to a project called "Development and application of effective, low-cost methods for the biological monitoring of Costa Rican rivers" by the National University, and contains measurements of various physicochemical variables collected across several sampling sites. It is intended to be used in the examples and demonstrations of the main functions of the package, particularly those related to multivariate analysis and STATIS methodology.

Usage

```
data(STATIS_TABLE4)
```

Format

A data frame with 14 columns and multiple rows (one per sampling site):

NIT Total nitrogen level.

FOS Phosphorus level.

CAL Calcium level.

STO Sodium level.

PH pH measurement.

MN Manganese concentration.

ZN Zinc concentration.

SS Suspended solids.

ALC Alkalinity.

CL Chlorine level.

CAU Exchangeable calcium or equivalent measurement.

DBO Biological oxygen demand.

POR Porosity or related percentage.

Examples

```
data(STATIS_TABLE4)
head(STATIS_TABLE4)
```

statisR *STATIS and STATIS Dual Multivariate Methods*

Description

STATIS is a multivariate technique developed in France in the 1970s by L'Hermier des Plantes and Escoufier, designed to analyze multiple data tables. This package provides an implementation of methods for the joint analysis of multiple data tables sharing the same set of observations. Includes functions for performing inter-structure and intra-structure analyses, as well as graphical representations of compromise structures and the shared variability across different groups of variables.

Details

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Type:	Package
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References

Abdi, H., & Valentin, D. (2007). The STATIS method. Encyclopedia of measurement and statistics, 955-962.

González, J., & Rodrıguez, O. (1995). Algoritmo e implementación del método Statis. In IX Simposio Métodos Matemáticos Aplicados a las Ciencias. UCR-ITCR, Turrialba.

Elizondo, W. C., & Varela, J. G. (1998). Stadis dual: software y análisis de datos reales. Revista de Matemática: Teoría y Aplicaciones, 5(2), 149-162.

Abdi, H. (2007). RV coefficient and congruence coefficient. Encyclopedia of measurement and statistics, 849(853), 92.

Abdi, H. (2007). Singular value decomposition (SVD) and generalized singular value decomposition. Encyclopedia of measurement and statistics, 907(912), 44.

Xiang, G. (2007). Fast algorithms for computing statistics under interval uncertainty, with applications to computer science and to electrical and computer engineering. The University of Texas at El Paso.

McHale, D., & Lavit, C. (1990). Analyse Conjointe de Tableaux Quantitatifs. Biometrics, 46(2), 542.

Tuis5_95 *Physicochemical Quality Data (Tuis5_95)*

Description

This dataset contains physicochemical measurements collected from a Sugarcane Fertilizer experiment in Costa Rica. The values represent indicators measured during a monitoring campaign. The dataset is useful for illustrating multivariate methods, STATIS analyses, or environmental data exploration workflows.

Usage

```
data(Tuis5_95)
```

Format

A data frame with 10 observations and 19 variables:

Ph pH value of the sample.

Temp Temperature (°C).

Na Sodium concentration.

Ka Potassium concentration.

Ca Calcium concentration.

Mg Magnesium concentration.

Si02 Silica concentration.

OD Dissolved oxygen.

DBO Biochemical oxygen demand (BOD).

SD Dissolved solids.

ST Total solids.

PO4 Phosphate concentration.

Cl Chloride concentration.

NO3 Nitrate concentration.

SO45 Sulfate concentration.

HC03 Bicarbonate concentration.

DT Total hardness or related measurement.

POD Dissolved oxygen percentage or related measure.

Cal Calcium-related parameter (likely residual hardness).

Examples

```
data(Tuis5_95)
head(Tuis5_95)
```

`Tuis5_96` *Physicochemical Quality Data (Tuis5_96)*

Description

This dataset contains physicochemical measurements collected from a Sugarcane Fertilizer experiment in Costa Rica. The values represent indicators measured during a monitoring campaign. The dataset is useful for illustrating multivariate methods, STATIS analyses, or environmental data exploration workflows.

Usage

```
data(Tuis5_96)
```

Format

A data frame with 12 observations and 19 variables:

Ph pH value of the water sample.

Temp Temperature (°C).

Na Sodium concentration.

Ka Potassium concentration.

Ca Calcium concentration.

Mg Magnesium concentration.

Si02 Silica concentration.

OD Dissolved oxygen.

DBO Biochemical oxygen demand (BOD).

SD Dissolved solids.

ST Total solids.

PO4 Phosphate concentration.

Cl Chloride concentration.

NO3 Nitrate concentration.

SO45 Sulfate concentration.

HC03 Bicarbonate concentration.

DT Total hardness or related parameter.

POD Dissolved oxygen percentage or related measurement.

Cal Calcium-related parameter (e.g., residual hardness).

Examples

```
data(Tuis5_96)
head(Tuis5_96)
```

Tuis5_97 *Physicochemical Quality Data (Tuis5_97)*

Description

This dataset contains physicochemical measurements collected from a Sugarcane Fertilizer experiment in Costa Rica. The values represent indicators measured during a monitoring campaign. The dataset is useful for illustrating multivariate methods, STATIS analyses, or environmental data exploration workflows.

Usage

```
data(Tuis5_97)
```

Format

A data frame with 12 observations and 19 variables:

Ph pH value of the water sample.

Temp Temperature (°C).

Na Sodium concentration.

Ka Potassium concentration.

Ca Calcium concentration.

Mg Magnesium concentration.

Si02 Silica concentration.

OD Dissolved oxygen.

DBO Biochemical oxygen demand (BOD).

SD Dissolved solids.

ST Total solids.

PO4 Phosphate concentration.

Cl Chloride concentration.

NO3 Nitrate concentration.

SO45 Sulfate concentration.

HC03 Bicarbonate concentration.

DT Total hardness or related parameter.

POD Dissolved oxygen percentage or related measure.

Cal Calcium-related parameter (e.g., residual hardness).

Examples

```
data(Tuis5_97)
head(Tuis5_97)
```

`Tuis5_98` *Physicochemical Quality Data (Tuis5_98)*

Description

This dataset contains physicochemical measurements collected from a Sugarcane Fertilizer experiment in Costa Rica. The values represent indicators measured during a monitoring campaign. The dataset is useful for illustrating multivariate methods, STATIS analyses, or environmental data exploration workflows.

Usage

```
data(Tuis5_98)
```

Format

A data frame with 12 observations and 19 variables:

Ph pH value of the water sample.

Temp Temperature (°C).

Na Sodium concentration.

Ka Potassium concentration.

Ca Calcium concentration.

Mg Magnesium concentration.

Si02 Silica concentration.

OD Dissolved oxygen.

DBO Biochemical oxygen demand (BOD).

SD Dissolved solids.

ST Total solids.

PO4 Phosphate concentration.

Cl Chloride concentration.

NO3 Nitrate concentration.

SO45 Sulfate concentration.

HC03 Bicarbonate concentration.

DT Total hardness or related parameter.

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Examples

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data(Tuis5_98)
head(Tuis5_98)
```

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