

# Package ‘struct’

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**Type** Package

**Title** Statistics in R Using Class-based Templates

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**Description** Defines and includes a set of class-based templates for developing and implementing data processing and analysis workflows, with a strong emphasis on statistics and machine learning. The templates can be used and where needed extended to 'wrap' tools and methods from other packages into a common standardised structure to allow for effective and fast integration. Model objects can be combined into sequences, and sequences nested in iterators using overloaded operators to simplify and improve readability of the code. Ontology lookup has been integrated and implemented to provide standardised definitions for methods, inputs and outputs wrapped using the class-based templates.

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'DatasetExperiment\_class.R' 'entity\_class.R'  
'entity\_stato\_class.R' 'enum\_class.R' 'enum\_stato\_class.R'  
'output\_class.R' 'model\_class.R' 'example\_objects.R'  
'model\_list\_class.R' 'metric\_class.R' 'iterator\_class.R'  
'optimiser\_class.R' 'preprocess\_class.R' 'resampler\_class.R'  
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---

struct-package

*struct: Statistics in R Using Class-based Templates*


---

## Description

Defines and includes a set of class-based templates for developing and implementing data processing and analysis workflows, with a strong emphasis on statistics and machine learning. The templates can be used and where needed extended to 'wrap' tools and methods from other packages into a common standardised structure to allow for effective and fast integration. Model objects can be combined into sequences, and sequences nested in iterators using overloaded operators to simplify and improve readability of the code. Ontology lookup has been integrated and implemented to provide standardised definitions for methods, inputs and outputs wrapped using the class-based templates.

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Authors:

- Ralf Johannes Maria Weber <r.j.weber@bham.ac.uk>

---

`.DollarNames.struct_class`  
*autocompletion*

---

## Description

This function returns slotnames for autocompletion when using \$ syntax

## Usage

```
## S3 method for class 'struct_class'
.DollarNames(x, pattern = "")

## S4 method for signature 'struct_class'
.DollarNames(x, pattern = "")

## S3 method for class 'chart'
.DollarNames(x, pattern = "")

## S4 method for signature 'chart'
.DollarNames(x, pattern = "")

## S3 method for class 'DatasetExperiment'
.DollarNames(x, pattern = "")

## S4 method for signature 'DatasetExperiment'
.DollarNames(x, pattern = "")

## S3 method for class 'model'
.DollarNames(x, pattern = "")

## S4 method for signature 'model'
.DollarNames(x, pattern = "")

## S3 method for class 'metric'
.DollarNames(x, pattern = "")

## S4 method for signature 'metric'
.DollarNames(x, pattern = "")

## S3 method for class 'iterator'
.DollarNames(x, pattern = "")

## S4 method for signature 'iterator'
.DollarNames(x, pattern = "")

## S3 method for class 'optimiser'
.DollarNames(x, pattern = "")

## S4 method for signature 'optimiser'
.DollarNames(x, pattern = "")
```

```
## S3 method for class 'preprocess'
.DollarNames(x, pattern = "")

## S4 method for signature 'preprocess'
.DollarNames(x, pattern = "")

## S3 method for class 'resampler'
.DollarNames(x, pattern = "")

## S4 method for signature 'resampler'
.DollarNames(x, pattern = "")
```

### Arguments

|         |                                                 |
|---------|-------------------------------------------------|
| x       | a struct_class object                           |
| pattern | the text used to compare against the slot names |

### Value

A vector of slot names

---

as.code

*Convert to code*


---

### Description

Prints a block of code that can be used to replicate the input object.

### Usage

```
as.code(M, start = "M = ", mode = "compact", quiet = FALSE)

## S4 method for signature 'struct_class'
as.code(M, start = "M = ", mode = "compact", quiet = FALSE)

## S4 method for signature 'model_seq'
as.code(M, start = "M = ", mode = "compact", quiet = FALSE)

## S4 method for signature 'iterator'
as.code(M, start = "M = ", mode = "compact", quiet = FALSE)
```

### Arguments

|       |                                                                                                                                                                                  |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| M     | a struct model, model_seq or iterator object                                                                                                                                     |
| start | text prepended to the code. Default is "M = "                                                                                                                                    |
| mode  | "compact" will use the least amount of lines, "expanded" will put each object and input on a new line. "neat" will produce an output somewhere between "compact" and "expanded". |
| quiet | TRUE or FALSE to print code to console                                                                                                                                           |

**Value**

A string of code to reproduce the input object.  
 a string of code to reproduce the model  
 a string of code to reproduce the model sequence  
 a string of code to reproduce the iterator

**Examples**

```
M = example_model(value_1 = 10)
as.code(M)
M = example_model()
as.code(M)
M = example_model()
as.code(M)
M = example_model()
as.code(M)
```

---

as.DatasetExperiment    *Convert a SummarizedExperiment to DatasetExperiment*

---

**Description**

Converts a SummarizedExperiment to DatasetExperiment. The assay data is transposed, and colData and rowData switched to match. struct specific slots such as "name" and "description" are extracted from the metaData.

**Usage**

```
as.DatasetExperiment(obj)
```

**Arguments**

obj                    a SummarizedExperiment object

**Value**

a DatasetExperiment object

---

as.DatasetExperiment, SummarizedExperiment-method  
                                  *Convert a SummarizedExperiment to DatasetExperiment*

---

**Description**

The assay data is transposed, and colData and rowData switched to match. struct specific slots such as "name" and "description" are extracted from the metaData if available. NB Any additional metadata will be lost during this conversion.

**Usage**

```
## S4 method for signature 'SummarizedExperiment'  
as.DatasetExperiment(obj)
```

**Arguments**

obj                    a SummarizedExperiment object

**Value**

a DatasetExperiment object

---

as.SummarizedExperiment

*Convert a DatasetExperiment to a SummarizedExperiment*

---

**Description**

Converts a DatasetExperiment to SummarizedExperiment. The assay data is transposed, and col-Data and rowData switched to match. struct specific slots such as "name" and "description" are stored in the metaData.

**Usage**

```
as.SummarizedExperiment(obj)
```

**Arguments**

obj                    a DatasetExperiment object

**Value**

a SummarizedExperiment object

---

as.SummarizedExperiment, DatasetExperiment-method

*Convert a DatasetExperiment to SummarizedExperiment*

---

**Description**

Converts a DatasetExperiment to SummarizedExperiment. The assay data is transposed, and col-Data and rowData switched to match. struct specific slots such as "name" and "description" are stored in the metaData.

**Usage**

```
## S4 method for signature 'DatasetExperiment'  
as.SummarizedExperiment(obj)
```

**Arguments**

obj                    a DatasetExperiment object

**Value**

a SummarizedExperiment object

---

|               |                              |
|---------------|------------------------------|
| as_data_frame | <i>convert to data.frame</i> |
|---------------|------------------------------|

---

**Description**

Most often used with univariate statistics to gather all the different outputs in a consistent format.

**Usage**

```
as_data_frame(M, ...)
```

**Arguments**

M                    a struct object  
 ...                  other inputs passed through this function

**Value**

a data.frame containing outputs from an object

---

|                        |                                |
|------------------------|--------------------------------|
| c,ontology_list-method | <i>catenate ontology_lists</i> |
|------------------------|--------------------------------|

---

**Description**

ontology\_lists can be catenated with other ontology lists or with ontology\_items.

**Usage**

```
## S4 method for signature 'ontology_list'
c(x, ...)
```

**Arguments**

x                    an ontology\_list()  
 ...                  any number of ontology\_list() or ontology\_item() objects to catenate

**Value**

an ontology\_list()

---

`calculate`*Calculate metric*

---

**Description**

A class for metrics to assess performance of e.g. models, iterators. Not intended to be called directly, this class should be inherited to provide functionality for method-specific classes.

**Usage**

```
calculate(obj, ...)

value(obj)

value(obj) <- value

max_length(obj) <- value

metric(...)

## S4 method for signature 'metric'
calculate(obj, Y, Yhat)

## S4 method for signature 'metric'
value(obj)

## S4 replacement method for signature 'metric'
value(obj) <- value
```

**Arguments**

|                    |                               |
|--------------------|-------------------------------|
| <code>obj</code>   | a metric object               |
| <code>...</code>   | named slots and their values. |
| <code>value</code> | value                         |
| <code>Y</code>     | the true class labels         |
| <code>Yhat</code>  | the predicted class labels    |

**Value**

value the calculated value of a metric  
a metric object

**Examples**

```
MET = metric()
calculate(MET)
MET = metric()
M = metric()
calculate(M,Y,Yhat)
MET = metric()
```

```
value(MET)
MET = metric()
value(MET) = 10
```

---

chart

---

*Constructor for struct chart objects*


---

## Description

A base class in the **struct** package. Should not be called directly.

## Usage

```
chart(...)
```

## Arguments

...                      named slots and their values that get passed to struct\_class

## Details

The chart class provides a template for figures, charts and plots associated with other objects. For example, a DatasetExperiment object could have a histogram plotted for a specified column.

Charts can have parameters but not outputs (other than the figure itself), as chart objects are not intended to be used for calculations. The chart\_plot method can be used to display a chart for an object, and chart\_names can be used to list all chart objects associated with an object.

Classes that inherit the stato class have STATO integration enabled, allowing stato\_id to be set and formal names and descriptions pulled from the STATO ontology database.

## Value

a chart object

a struct\_class object

## Examples

```
C = example_chart()
```

---

|             |                    |
|-------------|--------------------|
| chart_names | <i>chart names</i> |
|-------------|--------------------|

---

**Description**

Returns a list of valid charts for a struct object

**Usage**

```
chart_names(obj, ret = "char")

## S4 method for signature 'struct_class'
chart_names(obj, ret = "char")
```

**Arguments**

|     |                                                                                                                         |
|-----|-------------------------------------------------------------------------------------------------------------------------|
| obj | An object derived from the struct_class object                                                                          |
| ret | A string indicating whether a list of objects ('obj') or a list of chart names ('char') is returned. 'char' is default. |

**Details**

The chart\_names method searches for chart objects associated with the unput object.

**Value**

list of chart names, or a list of chart objects

**Examples**

```
M = example_model()
chart_names(M) # 'example_chart'
chart_names(M, 'char') # as above
chart_names(M, 'obj') # returns a list of chart objects
```

---

|            |                   |
|------------|-------------------|
| chart_plot | <i>chart_plot</i> |
|------------|-------------------|

---

**Description**

Plots a chart object

**Usage**

```
chart_plot(obj, dobj, ...)
```

```
## S4 method for signature 'chart,ANY'
chart_plot(obj, dobj)
```

**Arguments**

|      |                                     |
|------|-------------------------------------|
| obj  | A chart object                      |
| dobj | An object derived from struct_class |
| ...  | optional inputs                     |

**Details**

The optional optional inputs depend on the input object/chart, but might include an additional dataset object or a second model object, for example.

**Value**

a plot object

**Methods (by class)**

- chart\_plot(obj = chart, dobj = ANY):

**Examples**

```
C = example_chart()
chart_plot(C, iris_DatasetExperiment())
```

---

citations

*Citations for an object*


---

**Description**

All struct objects have a "citations" slot, which is a list of references in bibtex format. The citations method gathers citations from an object and all struct objects that it inherits to generate a complete list.

**Usage**

```
citations(obj)

## S4 method for signature 'struct_class'
citations(obj)
```

**Arguments**

|     |                 |
|-----|-----------------|
| obj | a struct object |
|-----|-----------------|

**Value**

a character array of citations

**Examples**

```
D = iris_DatasetExperiment()
D$citations # the list specifically defined for this object
citations(D) # the list for this object and all inherited ones
```

---

|                   |                                |
|-------------------|--------------------------------|
| DatasetExperiment | <i>DatasetExperiment class</i> |
|-------------------|--------------------------------|

---

## Description

An object for holding raw data and associated meta data

## Usage

```
DatasetExperiment(
  data = data.frame(),
  sample_meta = data.frame(),
  variable_meta = data.frame(),
  ...
)

## S4 method for signature 'DatasetExperiment'
x$name

## S4 replacement method for signature 'DatasetExperiment'
x$name <- value
```

## Arguments

|               |                                                             |
|---------------|-------------------------------------------------------------|
| data          | A data frame with samples in rows and features in columns   |
| sample_meta   | A data frame with samples in rows and meta data in columns  |
| variable_meta | A data frame with features in rows and meta data in columns |
| ...           | named slot values to pass through to struct_class           |
| x             | A DatasetExperiment object                                  |
| name          | DatasetExperiment slot to get/set                           |
| value         | the value to assign to the named slot                       |

## Details

The DatasetExperiment object is an extension of the SummarizedExperiment object from the SummarizedExperiment package (found on Bioconductor). It incorporates the basic functionality of struct objects, containing fields such as Description, Name and Type with features of SummarizedExperiment such as subsetting.

There are some important differences between DatasetExperiment and SummarizedExperiment:

- In DatasetExperiment data is stored as Samples (rows) x Features (columns)
- DatasetExperiment currently only supports a single assay
- length(DatasetExperiment) returns the number of samples

## Value

DatasetExperiment

**Slots**

name Name of the dataset  
 description Brief description of the dataset  
 type The type of dataset e.g. single\_block

---

|              |                           |
|--------------|---------------------------|
| entity_stato | <i>entity_stato class</i> |
|--------------|---------------------------|

---

**Description**

A base class in the **struct** package. Should not be called directly.

**Usage**

```
entity_stato(
  name,
  description = character(0),
  type = "character",
  value = NULL,
  max_length = Inf,
  stato_id
)
```

**Arguments**

|             |                                            |
|-------------|--------------------------------------------|
| name        | the name of the object                     |
| description | a description of the object                |
| type        | the type of the struct object              |
| value       | The value of the parameter/outputs         |
| max_length  | Maximum length of value vector (default 1) |
| stato_id    | The STATO ID for the entity                |

**Details**

Extends the `entity` class to include `stato` functionality.

**Value**

an `entity_stato` object

**See Also**

Refer to [entity](#) and [stato](#) for further info.

## Examples

```
E = entity_stato(
  name = 'example',
  description = 'this is an example',
  type = 'numeric',
  value = 1,
  stato_id='XYZ000001'
)
```

---

enum

*Enum objects*


---

## Description

A base class in the **struct** package. Not normally called directly.

## Usage

```
enum(
  name,
  description = character(0),
  type = "character",
  value = character(0),
  max_length = 1,
  allowed,
  ...
)
```

```
## S4 replacement method for signature 'enum'
value(obj) <- value
```

## Arguments

|             |                                              |
|-------------|----------------------------------------------|
| name        | the name of the object                       |
| description | a description of the object                  |
| type        | the type of the struct object                |
| value       | value of the enum                            |
| max_length  | Maximum length of value vector (default 1)   |
| allowed     | A list of allowed values                     |
| ...         | additional inputs to the struct_class object |
| obj         | an enum object                               |

## Details

An enum object is a special type of entity object that ensures the value must be one from a list of allowed values.

Enum objects are usually defined in the prototype of another object, but can be extracted using `param_obj` and `output_obj`.

Value

an enum object

Examples

```
# Create a new enum object
E = enum(
    name = 'example',
    description = 'this is an example',
    type = 'character',
    value = 'hello',
    allowed = c('hello', 'world')
)

# Get/set the value of the entity object
value(E)
value(E) = 'world'
```

---

|            |                         |
|------------|-------------------------|
| enum_stato | <i>enum_stato class</i> |
|------------|-------------------------|

---

Description

A base class in the **struct** package. Should not be called directly.

Usage

```
enum_stato(
  name,
  description = character(0),
  type = "character",
  value = character(0),
  max_length = 1,
  allowed,
  stato_id
)
```

Arguments

|             |                                            |
|-------------|--------------------------------------------|
| name        | the name of the object                     |
| description | a description of the object                |
| type        | the type of the struct object              |
| value       | The value of the parameter/outputs         |
| max_length  | Maximum length of value vector (default 1) |
| allowed     | A list of allowed values                   |
| stato_id    | The STATO ID for the entity                |

Details

Extends the enum class to include stato functionality.

**Value**

an enum\_stato object

**See Also**

Refer to [enum](#) and [stato](#) for further info.

**Examples**

```
E = enum_stato(
    name='example',
    allowed=list('choice_1','choice_2'),
    value='choice_1',
    type='character',
    stato_id='XYZ000001'
)
```

---

|               |                             |
|---------------|-----------------------------|
| example_chart | <i>example chart object</i> |
|---------------|-----------------------------|

---

**Description**

an example of a chart object for documentation purposes

**Usage**

```
example_chart(...)

## S4 method for signature 'example_chart,example_model'
chart_plot(obj, dobj)
```

**Arguments**

|      |                               |
|------|-------------------------------|
| ...  | named slots and their values. |
| obj  | a chart object                |
| dobj | a example_model object        |

**Value**

a chart object

**Examples**

```
C = example_chart()
chart_plot(C,example_model())
```

---

example\_iterator-class

Example iterator

---

**Description**

An example iterator for testing  
runs the example iterator, which just returns a value of 3.142

**Usage**

```
## S4 method for signature 'example_iterator,DatasetExperiment,metric'  
run(I, D, MET)
```

**Arguments**

|     |                         |
|-----|-------------------------|
| I   | example_iterator object |
| D   | dataset object          |
| MET | metric object           |

**Value**

test iterator object  
dataset object

**Examples**

```
I = example_iterator()  
  
I = example_iterator()  
D = iris_DatasetExperiment()  
MET = metric()  
I = run(I,D,MET)
```

---

example\_model

Example model

---

**Description**

An example model for testing. Training this model adds value\_1 to a data set, and prediction using this model adds value\_2.  
trains the example model, which adds value\_1 to the raw data of a dataset  
predicts using the example model, which adds value\_2 to the raw data of a dataset

**Usage**

```
example_model(value_0 = 0, value_1 = 10, value_2 = 20, ...)

## S4 method for signature 'example_model,DatasetExperiment'
model_train(M, D)

## S4 method for signature 'example_model,DatasetExperiment'
model_predict(M, D)
```

**Arguments**

|         |                               |
|---------|-------------------------------|
| value_0 | a numeric value               |
| value_1 | a numeric value               |
| value_2 | a numeric value               |
| ...     | named slots and their values. |
| M       | A struct model object         |
| D       | A DatasetExperiment object    |

**Value**

modified example\_model object  
 dataset object  
 dataset object

**Examples**

```
M = example_model()
M = example_model(value_1 = 10, value_2 = 20)
D = iris_DatasetExperiment()
M = example_model(value_1 = 10, value_2 = 20)
M = model_train(M,D)
D = iris_DatasetExperiment()
M = example_model(value_1 = 10, value_2 = 20)
M = model_predict(M,D)
```

---

|             |                                       |
|-------------|---------------------------------------|
| export_xlsx | <i>write a dataset object to file</i> |
|-------------|---------------------------------------|

---

**Description**

Exports a dataset object to an excel file with sheets for data, sample\_meta and variable\_meta

**Usage**

```
export_xlsx(object, outfile, transpose = TRUE)

## S4 method for signature 'DatasetExperiment'
export_xlsx(object, outfile, transpose = TRUE)
```

**Arguments**

|           |                                                      |
|-----------|------------------------------------------------------|
| object    | a dataset object                                     |
| outfile   | the filename (including path) to write the data to   |
| transpose | TRUE (default) or FALSE to transpose the output data |

**Value**

an excel file with sheets for data and meta data

**Examples**

```
## Not run:  
D = iris_DatasetExperiment() # example dataset  
export_xlsx(D, 'iris_DatasetExperiment.xlsx')  
  
## End(Not run)
```

---

get\_description

*Get struct object help description*

---

**Description**

This function is to help developers including struct objects in their own R packages, and isnt intended for general use. Use with roxygen 2 '@eval' tags this function generates a detailed description of a struct object generated by extracting names, descriptions etc from slots in a suitable format.

**Usage**

```
get_description(id)
```

**Arguments**

|    |                                                                       |
|----|-----------------------------------------------------------------------|
| id | (character) the name of a struct object to generate documentation for |
|----|-----------------------------------------------------------------------|

**Value**

a character string of roxygen formatted documentation for the object

**Examples**

```
get_description('example_model')
```

---

```
iris_DatasetExperiment
```

*Fisher's Iris data*

---

**Description**

Fisher's Iris data as a DatasetExperiment object

**Usage**

```
iris_DatasetExperiment()
```

**Value**

DatasetExperiment object

**Examples**

```
D = iris_DatasetExperiment()
```

---

```
is_output
```

*Verify output*

---

**Description**

Verify that the name of a output is valid for an object

**Usage**

```
is_output(obj, name)

## S4 method for signature 'struct_class'
is_output(obj, name)
```

**Arguments**

|      |                                                                   |
|------|-------------------------------------------------------------------|
| obj  | A model or iterator object derived from the <i>*struct*</i> class |
| name | Name of output                                                    |

**Value**

TRUE if output name is valid, FALSE if not

**Examples**

```
M = example_model()
is_output(M, 'result_1') # TRUE
is_output(M, 'result_0') # FALSE
```

---

|          |                         |
|----------|-------------------------|
| is_param | <i>Verify parameter</i> |
|----------|-------------------------|

---

**Description**

Verify that the input name is a valid input parameter for an object

**Usage**

```
is_param(obj, name)

## S4 method for signature 'struct_class'
is_param(obj, name)
```

**Arguments**

|      |                                     |
|------|-------------------------------------|
| obj  | An object derived from struct_class |
| name | Name of parameter                   |

**Value**

TRUE if parameter name is valid, FALSE if not

**Examples**

```
M = example_model()
is_param(M, 'value_1') # TRUE
is_param(M, 'alpha')  # FALSE
```

---

|           |                                |
|-----------|--------------------------------|
| libraries | <i>Libraries for an object</i> |
|-----------|--------------------------------|

---

**Description**

All struct objects have a "libraries" slot, which is a character array of libraries required to use the object. The `libraries` method gathers libraries from an object and all struct objects that it inherits to generate a complete list.

**Usage**

```
libraries(obj)

## S4 method for signature 'struct_class'
libraries(obj)
```

**Arguments**

|     |                 |
|-----|-----------------|
| obj | a struct object |
|-----|-----------------|

**Value**

a character array of R packages needed by the object

**Examples**

```
M = example_model()
libraries(M)
```

---

|            |                                                      |
|------------|------------------------------------------------------|
| max_length | <i>get the max value vector length for an entity</i> |
|------------|------------------------------------------------------|

---

**Description**

A base class in the **struct** package. Not normally called directly. An entity object is used to store information about a parameter or output. The standard 'name', 'description' and 'type' slots are included, along with 'value' for storing the value of the parameter and 'max\_length' for restricting the length of 'value' if needed.

**Usage**

```
max_length(obj)

entity(
  name,
  description = character(0),
  type = "character",
  value = NULL,
  max_length = Inf,
  ...
)

## S4 method for signature 'entity'
value(obj)

## S4 replacement method for signature 'entity'
value(obj) <- value

## S4 method for signature 'entity'
max_length(obj)

## S4 replacement method for signature 'entity'
max_length(obj) <- value
```

**Arguments**

|             |                                    |
|-------------|------------------------------------|
| obj         | An entity object                   |
| name        | the name of the object             |
| description | a description of the object        |
| type        | the type of the struct object      |
| value       | The value of the parameter/outputs |

|            |                                              |
|------------|----------------------------------------------|
| max_length | Maximum length of value vector (default 1)   |
| ...        | additional inputs to the struct_class object |

### Details

Entity objects are usually defined in the prototype of another object, but can be extracted using `param_obj` and `output_obj`.

### Value

max value vector length for an entity

An entity object

### Examples

```
# Create a new entity object
E = entity(
  name = 'example',
  description = 'this is an example',
  type = 'numeric',
  value = 1
)

# Get/set the value of the entity object
value(E)
value(E) = 10
```

---

|       |                    |
|-------|--------------------|
| model | <i>model class</i> |
|-------|--------------------|

---

### Description

A class for models that can be trained/applied to datasets e.g. PCA, PLS etc. Also used for preprocessing steps that require application to test sets. not intended to be called directly, this class should be inherited to provide functionality for method-specific classes.

### Usage

```
model(
  predicted = character(0),
  seq_in = "data",
  seq_fcn = function(x) {
    return(x)
  },
  ...
)

## S4 method for signature 'model,DatasetExperiment'
model_train(M, D)

## S4 method for signature 'model,DatasetExperiment'
model_predict(M, D)
```

```
## S4 method for signature 'model,DataSetExperiment'
model_apply(M, D)

## S4 method for signature 'model,DataSetExperiment'
model_reverse(M, D)

## S4 method for signature 'model'
predicted(M)

## S4 method for signature 'model'
seq_in(M)

## S4 replacement method for signature 'model,character'
seq_in(M) <- value

## S4 method for signature 'model'
predicted_name(M)

## S4 replacement method for signature 'model,character'
predicted_name(M) <- value
```

### Arguments

|           |                                                                                                                                                    |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| predicted | The name of an output slot to return when using predicted() (see details)                                                                          |
| seq_in    | the name of an output slot to connect with the "predicted" output of another model (see details)                                                   |
| seq_fcn   | a function to apply to seq_in before inputting into the next model. Typically used to extract a single column, or convert from factor to char etc. |
| ...       | named slots and their values.                                                                                                                      |
| M         | A struct model object                                                                                                                              |
| D         | A DataSetExperiment object                                                                                                                         |
| value     | The value to assign                                                                                                                                |

### Value

trained model object

model object with test set results

trained model object

dataset dataset object with the reverse model applied

the predicted output, as specified by predicted\_name

the id of the input parameter to be replaced by the predicted output of the previous model in a model sequence. Reserved keyword 'data' means that the input data used by model\_train, model\_apply etc is used. seq\_in = 'data' is the default setting.

the modified model object

the id of the output returned by predicted()

the modified model object

**predicted slot**

The "predicted" slot is a slots for use by users to control the flow of model sequences. The `predicted()` function is used to return a default output and from a model. Typically it is a `DatasetExperiment` object that is passed directly into the next model in a sequence as the data for that model.

**seq\_in slot**

In a sequence of models (see `model_seq`) the "predicted" slot is connected to the `DatasetExperiment` input of the next model. `seq_in` can be used to control flow and connect the "predicted" output to the input parameter of the next model. Default is the keyword 'data', and can otherwise be replaced by any input slot from the model. The slot `seq_fcn` can be used to apply a transformation to the output before it is used as an input. This allows you to e.g. convert between types, extract a single column from a `data.frame` etc.

**Examples**

```
M = model()
D = DatasetExperiment()
M = model()
M = model_train(M,D)
D = DatasetExperiment()
M = model()
M = model_train(M,D)
M = model_predict(M,D)
D = DatasetExperiment()
M = model()
M = model_apply(M,D)
D = DatasetExperiment()
M = model()
M = model_train(M,D)
M = model_predict(M,D)
M = model_reverse(M,D)
D = DatasetExperiment()
M = example_model()
M = model_train(M,D)
M = model_predict(M,D)
p = predicted(M)
D = DatasetExperiment()
M = example_model()
seq_in(M) = 'data'
M = example_model()
seq_in(M) = 'value_1'
M = example_model()
predicted_name(M)
M = example_model()
predicted_name(M) = 'result_2'
```

---

models

*Get/set models of a model\_seq*


---

**Description**

Returns the list of models in a `model_seq` object

**Usage**

```
models(ML)

models(ML) <- value
```

**Arguments**

|       |                                      |
|-------|--------------------------------------|
| ML    | a model_seq object                   |
| value | a list containing only model objects |

**Value**

models(ML) returns a list of models in the model sequence

models(ML)<- sets the list of models in the model sequence

**Examples**

```
# Create a model sequence
ML = model_seq()
models(ML) = list(example_model(), example_model())
models(ML)
```

---

|             |                      |
|-------------|----------------------|
| model_apply | <i>Apply a model</i> |
|-------------|----------------------|

---

**Description**

Applies a method to the input dataset

**Usage**

```
model_apply(M, D, ...)
```

**Arguments**

|     |                                  |
|-----|----------------------------------|
| M   | a 'method' object                |
| D   | another object used by the first |
| ... | other optional inputs            |

**Value**

Returns a modified method object

**Examples**

```
M = example_model()
M = model_apply(M, iris_DatasetExperiment())
```

---

|               |                         |
|---------------|-------------------------|
| model_predict | <i>Model prediction</i> |
|---------------|-------------------------|

---

**Description**

Apply a model using the input dataset. Assumes the model is trained first.

**Usage**

```
model_predict(M, D, ...)
```

**Arguments**

|     |                       |
|-----|-----------------------|
| M   | a model object        |
| D   | a dataset object      |
| ... | other optional inputs |

**Value**

Returns a modified model object

**Examples**

```
M = example_model()
M = model_predict(M, iris_DatasetExperiment())
```

---

|               |                              |
|---------------|------------------------------|
| model_reverse | <i>Reverse preprocessing</i> |
|---------------|------------------------------|

---

**Description**

Reverse the effect of a preprocessing step on a dataset\_

**Usage**

```
model_reverse(M, D, ...)
```

**Arguments**

|     |                       |
|-----|-----------------------|
| M   | a model object        |
| D   | a dataset object      |
| ... | other optional inputs |

**Value**

Returns a modified dataset object

**Examples**

```
M = example_model()
D = model_reverse(M, iris_DatasetExperiment())
```

---

model\_seq

*model\_seq class*


---

**Description**

A class for (ordered) lists of models

**Usage**

```

model_seq(...)

## S4 method for signature 'model_seq,DatasetExperiment'
model_train(M, D)

## S4 method for signature 'model_seq,DatasetExperiment'
model_predict(M, D)

## S4 method for signature 'model_seq,ANY,ANY,ANY'
x[i]

## S4 replacement method for signature 'model_seq,ANY,ANY,ANY'
x[i] <- value

## S4 method for signature 'model_seq'
models(ML)

## S4 replacement method for signature 'model_seq,list'
models(ML) <- value

## S4 method for signature 'model_seq'
length(x)

## S4 method for signature 'model,model_seq'
e1 + e2

## S4 method for signature 'model_seq,model'
e1 + e2

## S4 method for signature 'model,model'
e1 + e2

## S4 method for signature 'model_seq'
predicted(M)

## S4 method for signature 'model_seq,DatasetExperiment'
model_apply(M, D)

```

**Arguments**

|     |                               |
|-----|-------------------------------|
| ... | named slots and their values. |
| M   | a model object                |

|       |                             |
|-------|-----------------------------|
| D     | a dataset object            |
| x     | a model_seq object          |
| i     | index                       |
| value | value                       |
| ML    | a model_seq object          |
| e1    | a model or model_seq object |
| e2    | a model or model_seq object |

### Value

model sequence  
 model sequence  
 model at the given index in the sequence  
 model sequence with the model at index i replaced  
 a list of models in the sequence  
 a model sequence containing the input models  
 the number of models in the sequence  
 a model sequence with the additional model appended to the front of the sequence  
 a model sequence with the additional model appended to the end of the sequence  
 a model sequence  
 the predicted output of the last model in the sequence

### Examples

```

MS = model_seq()
MS = model() + model()
MS = example_model() + example_model()
MS = model_train(MS, DatasetExperiment())
D = DatasetExperiment()
MS = example_model() + example_model()
MS = model_train(MS, D)
MS = model_predict(MS, D)
MS = model() + model()
MS[2]

MS = model() + model()
MS[3] = model()

MS = model() + model()
L = models(MS)

MS = model_seq()
L = list(model(), model())
models(MS) = L

MS = model() + model()
length(MS) # 2

MS = model() + model()
M = model()
```

```

MS = M + MS

MS = model() + model()
M = model()
MS = MS + M

MS = model() + model()

D = DatasetExperiment()
M = example_model()
M = model_train(M,D)
M = model_predict(M,D)
p = predicted(M)
D = DatasetExperiment()
MS = example_model() + example_model()
MS = model_apply(MS,D)

```

---

|             |                      |
|-------------|----------------------|
| model_train | <i>Train a model</i> |
|-------------|----------------------|

---

## Description

Trains a model using the input dataset

## Usage

```
model_train(M, D, ...)
```

## Arguments

|     |                       |
|-----|-----------------------|
| M   | a model object        |
| D   | a dataset object      |
| ... | other optional inputs |

## Value

Returns a modified model object

## Examples

```

M = example_model()
M = model_train(M,iris_DatasetExperiment())

```

---

|            |                                                     |
|------------|-----------------------------------------------------|
| new_struct | <i>Generate a <b>struct</b> object from a Class</i> |
|------------|-----------------------------------------------------|

---

### Description

This function creates a newly allocated object from the class identified by the first argument. It works almost identically to `new` but is specific to objects from the **struct** package and ensures that entity slots have their values assigned correctly. This function is usually called by class constructors and not used directly.

### Usage

```
new_struct(class, ...)
```

### Arguments

|                    |                                      |
|--------------------|--------------------------------------|
| <code>class</code> | The class of struct object to create |
| <code>...</code>   | named slots and values to assign     |

### Value

An object derived from `struct_class`

### Examples

```
S = new_struct('struct_class')
```

---

|          |                               |
|----------|-------------------------------|
| ontology | <i>Ontology for an object</i> |
|----------|-------------------------------|

---

### Description

All struct objects have an "ontology" slot, which is a list of ontology items for the object. The `ontology` method gathers ontology items from an object and all struct objects that it inherits to generate a complete list.

A base class in the **struct** package. Stores ontology information e.g. term, description, id etc for struct objects and provides methods for populating these fields using the 'rols' package.

A base class in the **struct** package. Stores multiple 'ontology\_term' objects.

### Usage

```
ontology(obj, cache = NULL)
```

```
ontology_term(
  id,
  ontology = character(),
  label = character(),
  description = character(),
  iri = character(),
```

```

    rols = TRUE
  )

ontology_list(terms = list())

## S4 method for signature 'ontology_list,ANY,ANY,ANY'
x[i]

## S4 replacement method for signature 'ontology_list,ANY,ANY,ANY'
x[i] <- value

## S4 method for signature 'ontology_list'
length(x)

## S4 method for signature 'struct_class'
ontology(obj, cache = NULL)

```

### Arguments

|             |                                                                                                                                                                                                       |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| obj         | a struct object                                                                                                                                                                                       |
| cache       | a named list of ontology_terms for offline use. Terms from the cache are search based on the name of the list items matching the ontology id. If cache=NULL then the OLS API is used to lookup terms. |
| id          | (character) The ontology term id e.g. 'STATO:0000555'                                                                                                                                                 |
| ontology    | (character) The ontology the term is a member of e.g. 'stato'                                                                                                                                         |
| label       | (character) The label for the ontology term                                                                                                                                                           |
| description | (character) The description of the term                                                                                                                                                               |
| iri         | (character) The Internationalized Resource Identifier for the term                                                                                                                                    |
| rols        | (logical) TRUE or FALSE to query the Ontology Lookup Service for missing label, description or iri if not provided as input. Default rols = TRUE                                                      |
| terms       | A list of ontology_term objects.                                                                                                                                                                      |
| x           | the list                                                                                                                                                                                              |
| i           | The list item index                                                                                                                                                                                   |
| value       | an ontology_term() object                                                                                                                                                                             |

### Value

model at the given index in the sequence  
 model sequence with the model at index i replaced  
 the number of models in the sequence

### Examples

```

M = example_model()
ontology(M, cache=NULL)
## Not run:
OT = ontology_term(id='STATO:0000555')

## End(Not run)
## Not run:

```

```
OT = ontology_list(terms=list(
    ontology_term(ontology='obi',id = 'OBI:0200051'),
    ontology_term(ontology='stato',id = 'STAT0:0000555')
)

## End(Not run)
## Not run:
OL = ontology_list('STAT0:0000555')
OL[1]

## End(Not run)

## Not run:
OL = ontology_list('STAT0:0000555')
OL[1] = ontology_term('STAT0:0000302')

## End(Not run)
## Not run:
OL = ontology_list()
length(OL) # 0

## End(Not run)
```

---

optimiser

*optimiser class*

---

## Description

A special class of iterator for selecting optimal parameter values not intended to be called directly, this class should be inherited to provide functionality for method-specific classes.

## Usage

```
optimiser(...)
```

## Arguments

...                    named slots and their values.

## Value

an optimiser object

## Examples

```
OPT = optimiser()
```

---

|            |                           |
|------------|---------------------------|
| output_ids | <i>Output identifiers</i> |
|------------|---------------------------|

---

**Description**

return a list of valid output ids for an object

**Usage**

```
output_ids(obj)

## S4 method for signature 'struct_class'
output_ids(obj)
```

**Arguments**

obj                      A model or iterator object derived from the *\*struct\** class

**Value**

list of output ids

**Examples**

```
M = example_model()
output_ids(M)
```

---

|             |                    |
|-------------|--------------------|
| output_list | <i>output list</i> |
|-------------|--------------------|

---

**Description**

get/set a named list of outputs and their current value for an object

**Usage**

```
output_list(obj)

output_list(obj) <- value

## S4 method for signature 'struct_class'
output_list(obj)

## S4 replacement method for signature 'struct_class,list'
output_list(obj) <- value
```

**Arguments**

obj                      An object derived from *struct\_class*  
value                    A named list of outputs and corresponding values

**Value**

A named list of outputs and corresponding values

struct object

**Examples**

```
M = example_model()
L = output_list(M)
M = example_model()
output_list(M) = list('result_1' = DatasetExperiment(), 'result_2' = DatasetExperiment())
```

---

|             |                    |
|-------------|--------------------|
| output_name | <i>output name</i> |
|-------------|--------------------|

---

**Description**

return a the name for a output, if available

**Usage**

```
output_name(obj, name)

## S4 method for signature 'struct_class,character'
output_name(obj, name)
```

**Arguments**

|      |                                                                   |
|------|-------------------------------------------------------------------|
| obj  | A model or iterator object derived from the <i>*struct*</i> class |
| name | Name of output                                                    |

**Value**

name of output

**Examples**

```
M = example_model()
output_name(M, 'result_1')
```

---

|            |                       |
|------------|-----------------------|
| output_obj | <i>Output objects</i> |
|------------|-----------------------|

---

**Description**

Gets or sets the object of an output e.g. to an entity() object.

**Usage**

```
output_obj(obj, name)

output_obj(obj, name) <- value

## S4 method for signature 'struct_class,character'
output_obj(obj, name)

## S4 replacement method for signature 'struct_class,character'
output_obj(obj, name) <- value
```

**Arguments**

|       |                                                                   |
|-------|-------------------------------------------------------------------|
| obj   | A model or iterator object derived from the <i>*struct*</i> class |
| name  | Name of output                                                    |
| value | A valid value for the output being set                            |

**Value**

output\_obj(M,name) returns the named output as an object  
 output\_obj(M,name)<- sets the named output of an object  
 the modified object

**Examples**

```
# get the output as an object
M = example_model()
obj = output_obj(M, 'result_1')

# set a output as an object
output_obj(M, 'result_1') = entity(value = 15,type = 'numeric',name = 'result_1')
```

---

|              |                      |
|--------------|----------------------|
| output_value | <i>output values</i> |
|--------------|----------------------|

---

**Description**

get/set the values for an output\_

**Usage**

```

output_value(obj, name)

output_value(obj, name) <- value

## S4 method for signature 'struct_class,character'
output_value(obj, name)

## S4 replacement method for signature 'struct_class,character'
output_value(obj, name) <- value

```

**Arguments**

|       |                                                                   |
|-------|-------------------------------------------------------------------|
| obj   | A model or iterator object derived from the <i>*struct*</i> class |
| name  | Name of output                                                    |
| value | A valid value for the output being set                            |

**Value**

Value of output  
 struct object

**Examples**

```

M = example_model()
output_value(M, 'result_1')
M = example_model()
output_value(M, 'result_1') = DatasetExperiment()

```

---

|           |                              |
|-----------|------------------------------|
| param_ids | <i>Parameter identifiers</i> |
|-----------|------------------------------|

---

**Description**

return a list of valid parameter ids for an object

**Usage**

```

param_ids(obj)

## S4 method for signature 'struct_class'
param_ids(obj)

```

**Arguments**

|     |                                     |
|-----|-------------------------------------|
| obj | An object derived from struct_class |
|-----|-------------------------------------|

**Value**

list of parameter ids

**Examples**

```
M = example_model()
param_ids(M)
```

---

|            |                       |
|------------|-----------------------|
| param_list | <i>Parameter list</i> |
|------------|-----------------------|

---

**Description**

get/set a named list of parameters and thier current value for an object

**Usage**

```
param_list(obj)

param_list(obj) <- value

## S4 method for signature 'struct_class'
param_list(obj)

## S4 replacement method for signature 'struct_class,list'
param_list(obj) <- value
```

**Arguments**

|       |                                                     |
|-------|-----------------------------------------------------|
| obj   | An object derived from struct_class                 |
| value | A named list of parameters and corresponding values |

**Value**

A named list of parameters names and corresponding values

**Examples**

```
M = example_model()
L = param_list(M)

M = example_model()
param_list(M) = list('value_1' = 15, 'value_2' = 20)
```

---

|            |                       |
|------------|-----------------------|
| param_name | <i>Parameter name</i> |
|------------|-----------------------|

---

### Description

Returns the name for a parameter, if available

### Usage

```
param_name(obj, name)
```

```
## S4 method for signature 'struct_class,character'
param_name(obj, name)
```

### Arguments

|      |                                     |
|------|-------------------------------------|
| obj  | An object derived from struct_class |
| name | Name of parameter                   |

### Value

name of parameter

### Examples

```
M = example_model()
param_name(M, 'value_1')
```

---

|           |                          |
|-----------|--------------------------|
| param_obj | <i>Parameter objects</i> |
|-----------|--------------------------|

---

### Description

Gets or sets the object of a parameter e.g. to an entity() object.

### Usage

```
param_obj(obj, name)
```

```
param_obj(obj, name) <- value
```

```
## S4 replacement method for signature 'struct_class,character'
param_obj(obj, name) <- value
```

```
## S4 method for signature 'struct_class,character'
param_obj(obj, name)
```

**Arguments**

|       |                                           |
|-------|-------------------------------------------|
| obj   | An object derived from struct_class       |
| name  | Name of parameter                         |
| value | A valid value for the parameter being set |

**Value**

param\_obj(M,name) Returns the named parameter as an object  
 param\_obj(M,name)<- Sets the named parameter of an object

**Examples**

```
# get the parameter as an object
M = example_model()
obj = param_obj(M, 'value_0')

# set a parameter as an object
param_obj(M, 'value_0') = entity(value = 15,type = 'numeric',name='value_0')
```

---

|             |                         |
|-------------|-------------------------|
| param_value | <i>Parameter values</i> |
|-------------|-------------------------|

---

**Description**

get/set the values for a parameter.

**Usage**

```
param_value(obj, name)

param_value(obj, name) <- value

## S4 method for signature 'struct_class,character'
param_value(obj, name)

## S4 replacement method for signature 'struct_class,character'
param_value(obj, name) <- value
```

**Arguments**

|       |                                                     |
|-------|-----------------------------------------------------|
| obj   | A model or iterator object derived from structclass |
| name  | Name of parameter                                   |
| value | A valid value for the parameter being set           |

**Value**

Value of parameter

**Examples**

```
M = example_model()
param_value(M, 'value_1')

M = example_model()
param_value(M, 'value_1') = 0.95
```

---

|           |                          |
|-----------|--------------------------|
| predicted | <i>Prediction output</i> |
|-----------|--------------------------|

---

**Description**

returns the prediction output for a model\_ This is supplied as input to the next model when used in a model\_seq

**Usage**

```
predicted(M)
```

**Arguments**

M                      a model object

**Value**

The value returned varies depending on the output\_

**Examples**

```
M = example_model()
M = model_train(M, iris_DatasetExperiment())
M = model_predict(M, iris_DatasetExperiment())
predicted(M)
```

---

|                |                              |
|----------------|------------------------------|
| predicted_name | <i>Predicted output name</i> |
|----------------|------------------------------|

---

**Description**

get/set the prediction output for a model\_ This determines which outputs from this model are supplied as inputs to the next model when used in a model\_seq

**Usage**

```
predicted_name(M)

predicted_name(M) <- value
```

**Arguments**

|       |                                  |
|-------|----------------------------------|
| M     | a model object                   |
| value | name of an output for this model |

**Value**

predicted\_name returns the name of the predicted output

predicted\_name<- sets the name of the predicted output

**Examples**

```
M = example_model()
predicted_name(M)
predicted_name(M) = 'result_2'
```

---

|            |                            |
|------------|----------------------------|
| preprocess | <i>preprocessing class</i> |
|------------|----------------------------|

---

**Description**

A class used for preprocessing steps that require application to test sets. not intended to be called directly, this class should be inherited to provide functionality for method-specific classes.

**Usage**

```
preprocess(...)
```

```
## S4 method for signature 'preprocess,DatasetExperiment'
model_reverse(M, D)
```

**Arguments**

|     |                               |
|-----|-------------------------------|
| ... | named slots and their values. |
| M   | a model object                |
| D   | a dataset object              |

**Value**

dataset object

**Examples**

```
M = preprocess()
D = DatasetExperiment()
M = model()
D2 = model_reverse(M,D)
```

---

|           |                        |
|-----------|------------------------|
| resampler | <i>resampler class</i> |
|-----------|------------------------|

---

**Description**

A class for resampling methods such as cross-validation. not intended to be called directly.

**Usage**

```
resampler(...)
```

**Arguments**

...                      named slots and their values.

**Value**

a resampler object

**Examples**

```
R = resampler()
```

---

|        |                        |
|--------|------------------------|
| result | <i>Iterator result</i> |
|--------|------------------------|

---

**Description**

Returns the results of an iterator. This is used to control model flow in a similar way to predict for model and model\_seq objects.

**Usage**

```
result(M)
```

**Arguments**

M                      an iterator object

**Value**

the returned output varies with the algorithm implemented

**Examples**

```
D = iris_DatasetExperiment() # get some data
MET = metric() # use a metric
I = example_iterator() # initialise iterator
models(I) = example_model() # set the model
I = run(I,D,MET) # run
result(I)
```

---

|             |                                                             |
|-------------|-------------------------------------------------------------|
| result_name | <i>get/set output name as prediction output for a model</i> |
|-------------|-------------------------------------------------------------|

---

### Description

get/set the prediction output for a model\_ This determines which outputs from this model are supplied as inputs to the next model when used in a model\_seq

### Usage

```
result_name(M)

result_name(I) <- value
```

### Arguments

|       |                                  |
|-------|----------------------------------|
| M     | an iterator object               |
| I     | an iterator object               |
| value | name of an output for iterator M |

### Value

result\_name(M) returns the name of the output for this iterator (equivalent to predicted for model objects)

result\_name(I)<- sets the default output for an iterator

### Examples

```
I = example_iterator() # initialise iterator
result_name(I)
result_name(I) = 'result_1'
```

---

|     |                     |
|-----|---------------------|
| run | <i>Run iterator</i> |
|-----|---------------------|

---

### Description

Runs an iterator, applying the chosen model multiple times.

Evaluates an iterator by e.g. averaging over all iterations. May be deprecated in a future release as evaluate is applied by run anyway.

A class for iterative approaches that involve the training/prediction of a model multiple times. Not intended to be called directly, this class should be inherited to provide functionality for method-specific classes.

**Usage**

```

run(I, D, MET)

evaluate(I, MET)

iterator(...)

## S4 method for signature 'iterator,DatasetExperiment,metric'
run(I, D, MET = NULL)

## S4 method for signature 'iterator,metric'
evaluate(I, MET)

## S4 method for signature 'iterator'
models(ML)

## S4 replacement method for signature 'iterator,model_OR_iterator'
models(ML) <- value

## S4 replacement method for signature 'iterator,character'
result_name(I) <- value

## S4 method for signature 'iterator'
result(M)

## S4 method for signature 'iterator'
result_name(M)

## S4 method for signature 'iterator,model_OR_iterator'
e1 * e2

## S4 method for signature 'iterator,ANY,ANY,ANY'
x[i]

## S4 replacement method for signature 'iterator,ANY,ANY,ANY'
x[i] <- value

```

**Arguments**

|       |                               |
|-------|-------------------------------|
| I     | an iterator object            |
| D     | a dataset object              |
| MET   | a metric object               |
| ...   | named slots and their values. |
| ML    | a model sequence object       |
| value | value                         |
| M     | a model object                |
| e1    | an iterator object            |
| e2    | an iterator or a model object |
| x     | a sequence object             |
| i     | index into sequence           |

## Details

Running an iterator will apply the iterator a number of times to a dataset\_ For example, in cross-validation the same model is applied multiple times to the same data, splitting it into training and test sets. The input metric object can be calculated and collected for each iteration as an output\_

## Value

Modified iterator object  
 Modified iterator object  
 the modified model object  
 model at the given index in the sequence  
 iterator with the model at index i replaced

## Examples

```
D = iris_DatasetExperiment() # get some data
MET = metric() # use a metric
I = example_iterator() # initialise iterator
models(I) = example_model() # set the model
I = run(I,D,MET) # run
D = iris_DatasetExperiment() # get some data
MET = metric() # use a metric
I = example_iterator() # initialise iterator
models(I) = example_model() # set the model
I = run(I,D,MET) # run
I = evaluate(I,MET) # evaluate
I = iterator()
I = iterator() * model()
D = DatasetExperiment()
MET = metric()
I = iterator() * model()
I = run(I,D,MET)

I = iterator()
result_name(I) = 'example'
MS = model() + model()
I = iterator() * MS
I[2] # returns the second model() object

MS = model() + model()
I = iterator() * MS
I[2] = model() # sets the second model to model()
```

---

seq\_in

Sequence input

---

## Description

get/set the input parameter replaced by the output of the previous model in a model sequence. Default is "data" which passes the output as the data input for methods such as model\_train and model\_apply.

**Usage**

```
seq_in(M)

seq_in(M) <- value
```

**Arguments**

|       |                                  |
|-------|----------------------------------|
| M     | a model object                   |
| value | name of an output for this model |

**Value**

seq\_in returns the name of the input parameter replaced when used in a model sequence  
 seq\_in<- sets the name of the input parameter replaced when used in a model sequence

**Examples**

```
M = example_model()
seq_in(M)
seq_in(M) = 'value_1'
```

---

|                |                                          |
|----------------|------------------------------------------|
| set_obj_method | <i>update method for a struct object</i> |
|----------------|------------------------------------------|

---

**Description**

a helper function to update methods for a struct object

**Usage**

```
set_obj_method(
  class_name,
  method_name,
  definition,
  where = toparent(parent.frame()),
  signature = c(class_name, "DatasetExperiment")
)
```

**Arguments**

|             |                                                                                                              |
|-------------|--------------------------------------------------------------------------------------------------------------|
| class_name  | the name of the to update the method for                                                                     |
| method_name | the name of the method to update. Must be an existing method for the object.                                 |
| definition  | the function to replace the method with. This function will be used when the method is called on the object. |
| where       | the environment to create the object in. default where = toparent(parent.frame())                            |
| signature   | a list of classes that this object requires as inputs. Default is c(class_name,'DatasetExperiment')          |

**Value**

a method is created in the specified environment

**Examples**

```

set_struct_obj(
  class_name = 'add_two_inputs',
  struct_obj = 'model',
  params = c(input_1 = 'numeric', input_2 = 'numeric'),
  outputs = c(result = 'numeric'),
  prototype = list(
    input_1 = 0,
    input_2 = 0,
    name = 'Add two inputs',
    description = 'example class that adds two values together')
)

```

---

set\_obj\_show

*a helper function to update the show method for a struct object*


---

**Description**

a helper function to update the show method for a struct object

**Usage**

```
set_obj_show(class_name, extra_string, where = topenv(parent.frame()))
```

**Arguments**

|              |                                                                                                                         |
|--------------|-------------------------------------------------------------------------------------------------------------------------|
| class_name   | the name of the to update the method for                                                                                |
| extra_string | a function that returns an extra string using the input object as an input e.g. function(object)return = 'extra_string' |
| where        | the environment to create the object in. default where = topenv(parent.frame())                                         |

**Value**

a method is created in the specified environment

**Examples**

```

# create an example object first
set_struct_obj(
  class_name = 'add_two_inputs',
  struct_obj = 'model',
  params = c(input_1 = 'numeric', input_2 = 'numeric'),
  outputs = c(result = 'numeric'),
  prototype = list(
    input_1 = 0,
    input_2 = 0,
    name = 'Add two inputs',
    description = 'example class that adds two values together')
)

# now update the method
set_obj_show(
  class_name = 'add_two_inputs',

```

```
extra_string = function(object) {return('The extra text')}
)
```

---

|                |                                   |
|----------------|-----------------------------------|
| set_struct_obj | <i>define a new struct object</i> |
|----------------|-----------------------------------|

---

## Description

a helper function to create new struct objects

## Usage

```
set_struct_obj(
  class_name,
  struct_obj,
  params = character(0),
  outputs = character(0),
  private = character(0),
  prototype = list()
)
```

## Arguments

|            |                                                                                                                                                                                                                                             |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| class_name | the name of the new class to create                                                                                                                                                                                                         |
| struct_obj | the struct obj to inherit e.g. 'model', 'metric' etc                                                                                                                                                                                        |
| params     | a named character vector of input parameters where each element specifies the type of value that will be in the slot e.g. c(example = 'character')                                                                                          |
| outputs    | a named character vector of outputs where each element specifies the type of value that will be in the slot e.g. c(example = 'character')                                                                                                   |
| private    | a named character vector of private slots where each element specifies the type of value that will be in the slot e.g. c(example = 'character'). These are intended for internal use by the object and generally not available to the user. |
| prototype  | a named list with initial values for slots.                                                                                                                                                                                                 |

## Value

a new class definition. to create a new object from this class use `X = new_class_name()`

---

|          |                                       |
|----------|---------------------------------------|
| stato_id | <i>get the stato_id for an object</i> |
|----------|---------------------------------------|

---

## Description

A base class in the **struct** package. Provides several fundamental methods and should not be called directly.

## Usage

```
stato_id(obj)

stato_name(obj)

stato_definition(obj)

stato_summary(obj)

stato(stato_id)

## S4 method for signature 'stato'
stato_id(obj)

## S4 method for signature 'stato'
stato_name(obj)

## S4 method for signature 'stato'
stato_definition(obj)

## S4 method for signature 'stato'
stato_summary(obj)
```

## Arguments

|          |                                         |
|----------|-----------------------------------------|
| obj      | An object derived from the stato object |
| stato_id | A STATO ID e.g. OBI:0000001             |

## Details

STATO is the statistical methods ontology. It contains concepts and properties related to statistical methods, probability distributions and other concepts related to statistical analysis, including relationships to study designs and plots (see <http://stato-ontology.org/>).

This class provides access to a version of the STATO ontology database that can be searched by ontology id to provide formal names and definitions for methods, models, iterators, metrics and charts.

This class makes use of the ontologyIndex package to search a copy of the STATO database included in this package.

**Value**

id the stato id

name the stato name

def the stato description

Value returned depends on the method used.

**Examples**

```
M = example_model()
stato_id(M)
stato_name(M)
stato_definition(M)
stato_summary(M)
# an example stato object
M = example_model()

# the stato id assigned to object M
stato_id(M) # OBI:0000011

# the name associated with that id
stato_name(M)

# the STATO definition for that id
stato_definition(M)

# a summary of the STATO database entry for the id, and any parameters or
# outputs that also have stato ids.
stato_summary(M)
```

---

struct\_class

---

*Constructor for struct\_class objects*


---

**Description**

Creates a new [struct\\_class](#) object and populates the slots. Not intended for direct use.

**Usage**

```
struct_class(
  name = character(0),
  description = character(0),
  type = character(0),
  citations = list(),
  ontology = character(0)
)
```

**Arguments**

|             |                                                                   |
|-------------|-------------------------------------------------------------------|
| name        | the name of the object                                            |
| description | a description of the object                                       |
| type        | the type of the struct object                                     |
| citations   | a list of citations for the object in "bibentry" format           |
| ontology    | a list of ontology items for the object in "ontology_item" format |

**Value**

a struct\_class object

---

|                    |                                       |
|--------------------|---------------------------------------|
| struct_class-class | struct_class <i>object definition</i> |
|--------------------|---------------------------------------|

---

**Description**

Defines the struct class base template. This class is inherited by other objects and not intended for direct use. It defines slots and methods common to all **struct** objects.

**Value**

Returns a **struct** object

**Public slots**

Public slots can be accessed using shorthand \$ notation and are intended for users building workflows.

name character() A short descriptive name of the struct object  
description character() A longer description of the struct object and what it does  
type character() A keyword that describes the type of struct object  
libraries character() A (read only) list of R packages used by this struct object  
citations list of bibentry A (read only) list of citations relevant to this struct object, in Bibtex format.

**Private slots**

Private slots are not readily accessible to users and are intended for developers creating their own struct objects. Any slot not listed within `‘.params’` or `‘.outputs’` is considered a private slot.

.params character() A list of additional slot names that can be get/set by the user for a specific struct object. These are used as input parameters for different methods.  
.outputs character() a list of additional slot names that can be get by the user. These are used to store the results of a method.

**Examples**

```
S = struct_class(name = 'Example',description = 'An example object')
```

---

|                 |                         |
|-----------------|-------------------------|
| struct_template | <i>StRUCT templates</i> |
|-----------------|-------------------------|

---

**Description**

Create a struct template

**Usage**

```
struct_template(  
  template = "model",  
  output,  
  in_editor = TRUE,  
  overwrite = FALSE  
)
```

**Arguments**

|           |                                                           |
|-----------|-----------------------------------------------------------|
| template  | the type of object you want a template for e.g. 'model'   |
| output    | the name/path of the output file                          |
| in_editor | TRUE/FALSE to open the created file in the default editor |
| overwrite | = TRUE/FALSE to overwrite file if exists already          |

**Value**

A template is created at the output location specified

**Examples**

```
## Not run:  
struct_template('model', 'example.R', FALSE)  
  
## End(Not run)
```

---

|                   |                       |
|-------------------|-----------------------|
| test_metric-class | <i>Example metric</i> |
|-------------------|-----------------------|

---

**Description**

An example metric for testing  
calculates a metric, which just returns a value of 3.142

**Usage**

```
## S4 method for signature 'test_metric'  
calculate(obj)
```

## Arguments

obj                      metric object

## Value

test metric object

dataset object

## Examples

```
MET = test_metric()
```

```
MET = test_metric()
```

```
MET = calculate(MET)
```

---

\$,ontology\_list-method

*Get/set ontology\_list slots*

---

## Description

Dollar syntax can be used to as a shortcut for getting values for ontology\_list objects.

## Usage

```
## S4 method for signature 'ontology_list'
x$name
```

## Arguments

x                      An ontology\_term object

name                   The name of the slot to access

## Value

Slot value

## Examples

```
## Not run:
OL = ontology_list('STAT0:0000555')
OL$terms
```

```
## End(Not run)
```

---

\$,ontology\_term-method

*Get/set ontology term slots*

---

### Description

Dollar syntax can be used to as a shortcut for getting values for ontology\_term objects.

### Usage

```
## S4 method for signature 'ontology_term'
x$name
```

### Arguments

|      |                                |
|------|--------------------------------|
| x    | An ontology_term object        |
| name | The name of the slot to access |

### Value

Slot value

### Examples

```
## Not run:
OT = ontology_term(ontology='stato',id='STAT0:0000555')

## End(Not run)
```

---

\$,struct\_class-method *Get/set parameter or output values*

---

### Description

Dollar syntax can be used to as a shortcut for getting/setting input parameter and output values for struct objects.

### Usage

```
## S4 method for signature 'struct_class'
x$name
```

### Arguments

|      |                                     |
|------|-------------------------------------|
| x    | An object derived from struct_class |
| name | The name of the slot to access      |

### Value

Parameter/output value

**Examples**

```
M = example_model()
M$value_1 = 10
M$value_1 # 10
```

---

`$<-,struct_class-method`*Get/set parameter or output values*

---

**Description**

Dollar syntax can be used to as a shortcut for getting/setting input parameter and output values for struct objects.

**Usage**

```
## S4 replacement method for signature 'struct_class'
x$name <- value
```

**Arguments**

|                    |                                                  |
|--------------------|--------------------------------------------------|
| <code>x</code>     | An object derived from <code>struct_class</code> |
| <code>name</code>  | The name of the slot to access                   |
| <code>value</code> | The value to assign                              |

**Value**

Parameter/output value

**Examples**

```
M = example_model()
M$value_1 = 10
M$value_1 # 10
```

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