

Package ‘rols’

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Type Package

Title An R interface to the Ontology Lookup Service

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Description The rols package is an interface to the Ontology Lookup Service (OLS) to access and query hundred of ontologies directly from R.

Depends methods

Imports httr, progress, jsonlite, utils, Biobase, BiocGenerics (>= 0.23.1)

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BugReports <https://github.com/lgatto/rols/issues>

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methods-OlsSearch.R methods-Ontologies.R methods-Terms.R
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.properties	<i>Constructs the query for all properties from a given ontology</i>
-------------	----------------------------------------------------------------------

Description

Constructs the query for all properties from a given ontology

Usage

```
.properties(oid, pagesize = 200)
```

Arguments

oid	A character with an ontology or an ontology
pagesize	How many results per page to return

Value

An object of class Terms

.term	<i>Constructs the query for a single term from a given ontology</i>
-------	---------------------------------------------------------------------

Description

Constructs the query for a single term from a given ontology

Usage

```
.term(oid, termid)
```

Arguments

oid	A character with an ontology or an ontology
termid	A character with a term id

Value

An object of class Term

.terms	<i>Constructs the query for all term from a given ontology</i>
--------	----------------------------------------------------------------

Description

Constructs the query for all term from a given ontology

Usage

.terms(oid, pagesize = 1000)

Arguments

oid	A character with an ontology or an ontology
pagesize	How many results per page to return

Value

An object of class Terms

CVParam-class	<i>Class "CVParam"</i>
---------------	------------------------

Description

CVParam objects instantiate controlled vocabulary entries.

Usage

CVParam(label, name, accession, value, exact = TRUE)

Arguments

label	A character with the ontology label. If missing, a user-defined parameter is created.
name	A character with the name of the CVParam to be constructed. This argument can be omitted if accession is used and label is not missing.
accession	A character with the accession of the CVParam to be constructed. This argument can be omitted if name is used. Ignored for user-defined instances.
value	A character with the value of the CVParam to be constructed. This argument is optional.
exact	A logical defining whether the query to retrieve the accession (when name is used) should be an exact match.

Objects from the Class

Objects can be created with the CVParam constructor.

Slots

label: Object of class "character" that defines the label of the instance, i.e the ontology abbreviation/prefix. See [Ontologies](#) to generate a list of available ontologies and [olsPrefix](#) for existing labels.

accession: Object of class "character" with the parameter's valid label ontology accession number. See below for validity constrains.

name: Object of class "character" with the instance's valid name, i.e matching with the accession. name and accession must follow `term(accession, label) == name` for the instance to be valid.

value: Object of class "character" with the CVParams value, if applicable, of empty string ("") otherwise.

user: Object of class "logical" defining if the instance is a user-defined parameter (also called User params).

.__classVersion__: Object of class "[Versions](#)" describing the instance's class definition version. For development use.

Extends

Class "[Versioned](#)", directly.

Methods

charIsCVParam(x) Checks if x, a character of the form "[ONTO, ACCESSION, NAME, VALUE]", is a valid (possibly user-defined) CVParam. "ONTO" is the ontology label (prefi), "ACCESSION" is the term accession number, "NAME" is the term's name and "VALUE" is the value. Note that only syntax validity is verified, not semantics. See example below.

Methods

coerce signature(from = "CVParam", to = "character"): Coerces CVParam from to a character of the following form: [label, accession, name,value]. `as.character` is also defined.

coerce signature(from = "character", to = "CVParam"): Coerces character from to a CVParam. `as.CVParam` is also defined. If a label is absent, the character is converted to a User param, else, the label and accession are used to query the Ontology Lookup Service (see [OlsSearch](#)). If a name is provided and does not match the retrieved name, a warning is thrown.

This function is vectorised; if the from character is of length greater than 1, then a list of CVParam is returned. The queries to the OLS are processed one-by-one, though.

show signature(object = "CVParam"): Prints the CVParam instance as text.

rep signature(x = "CVParam", times = "numeric"): Replicates the CVParam x times times.

Author(s)

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Examples

```
## a user param
CVParam(name = "A user param", value = "the value")
## a CVParam from PSI's Mass Spectrometry ontology
term("MS", "MS:1000073")
CVParam(label = "MS", accession = "MS:1000073")
CVParam(label = "MS", name = "electrospray ionization")
CVParam(label = "MS", name = "ESI") ## using a synonym

## From a CVParam object to a character
cv <- as(CVParam(label = "MS", accession = "MS:1000073"), "character")
cv

## From a character object to a CVParam
as(cv, "CVParam")
as("[MS, MS:1000073, , ]", "CVParam") ## no name
as("[MS, MS:1000073, ESI, ]", "CVParam") ## name does not match
as(c(cv, cv), "CVParam") ## more than 1 character

x <- c("[MS, MS:1000073, , ]", ## valid CV param
      "[, , Hello, world]", ## valid User param
      "[this, one is, not, valid]", ## not valid
      "[ , , , ]") ## not valid

stopifnot(charIsCVParam(x) == c(TRUE, TRUE, FALSE, FALSE))

## A list of expected valid and non-valid entries
rols::validCVchars
rols::notvalidCVchars
```

makeOntologies	<i>Makes an Ontologies instance based on the response from api/ontologies @return</i>
----------------	---------------------------------------------------------------------------------------

Description

Makes an Ontologies instance based on the response from api/ontologies @return

Usage

```
makeOntologies(pagesize = 150)
```

Arguments

pagesize	A numeric indicating the number of elements per page (default in method is 150).
----------	----------------------------------------------------------------------------------

Value

An object of class Ontologies

makeOntology	<i>Makes an Ontology instance based on the response from /api/ontologies/ontology_id</i>
--------------	------------------------------------------------------------------------------------------

Description

Makes an Ontology instance based on the response from /api/ontologies/ontology_id

Usage

makeOntology(x)

Arguments

x A valid ontology prefix

Value

An object of class Ontology

makeProperty	<i>Makes a Property instance based on the response from /api/ontologies/ontology/terms/iri</i>
--------------	------------------------------------------------------------------------------------------------

Description

Makes a Property instance based on the response from /api/ontologies/ontology/terms/iri

Usage

makeProperty(x)

Arguments

x The content from the response

Value

An object of class Property

makeTerm	<i>Makes a Term instance based on the response from /api/ontologies/ontology/terms/iri</i>
----------	--------------------------------------------------------------------------------------------

Description

Makes a Term instance based on the response from /api/ontologies/ontology/terms/iri

Usage

```
makeTerm(x)
```

Arguments

x	The content from the response
---	-------------------------------

Value

An object of class Term

01sSearch-class	<i>Class "01sSearch"</i>
-----------------	--------------------------

Description

Searching the OLS is done using the 01sSearch data structure.

Objects from the Class

Objects can be created with the constructor function 01sSearch.

Slots

```
q: Object of class "character" ~~
ontology: Object of class "character" ~~
type: Object of class "character" ~~
slim: Object of class "character" ~~
fieldList: Object of class "character" ~~
queryFields: Object of class "character" ~~
exact: Object of class "logical" ~~
groupField: Object of class "logical" ~~
obsoletes: Object of class "logical" ~~
local: Object of class "character" ~~
childrenOf: Object of class "character" ~~
rows: Object of class "integer" ~~
start: Object of class "integer" ~~
url: Object of class "character" ~~
numFound: Object of class "integer" ~~
response: Object of class "data.frame" ~~
```

Methods and functions

coerce signature(from = "OlsSearch", to = "data.frame"): ...

coerce signature(from = "OlsSearch", to = "Terms"): ...

show signature(object = "OlsSearch"): ...

olsRows signature(object = "OlsSearch"): ... The value can be updated with the `olsRows` replacement method. To request all responses, use `allRows`.

Author(s)

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Examples

```
OlsSearch(q = "trans-golgi")
OlsSearch(q = "cell")
OlsSearch(q = "cell", exact = TRUE)
OlsSearch(q = "cell", exact = TRUE, ontology = "go")
OlsSearch(q = "cell", exact = TRUE, ontology = "GO")

OlsSearch(q = "electrospray", ontology = "MS")
OlsSearch(q = "ionization", ontology = "MS")
OlsSearch(q = "electrospray ionization", ontology = "MS")
OlsSearch(q = "electrospray ionization", ontology = "MS", exact=TRUE)

## Request 5 results instead of 20 (default)
OlsSearch(q = "plasma,membrane", ontology = "go", rows = 5)

## or, once the object was created
(res <- OlsSearch(q = "plasma,membrane", ontology = "go"))
olsRows(res) <- 5
res
## all results
res <- allRows(res)
res

res <- OlsSearch(q = "trans-golgi", ontology = "go", rows = 5)
res
res <- olsSearch(res)
res
as(res, "data.frame")
res <- as(res, "Terms")
res
termPrefix(res)
termId(res)
```

Ontology-class

Class "Ontology"

Description

Ontologies are stored as `Ontology` and `Ontologies` instances, and contain various information as provided by the Ontology Lookup Service.

Details

Ontologies are referred to by their namespace, which is lower case: the Gene Ontology is "go", the Mass spectrometry ontology is "ms", etc. The ontologies also have prefixes, which are upper case: the Gene Ontology prefix "GO", the Mass spectrometry ontology prefix "MS". The only exception to this rule is the Drosophila Phenotype Ontology, whose namespace and prefix are "dpo" and "FBcv" respectively. This is particularly confusing as the FlyBase Controlled Vocabulary has "fbcv" and "FBcv" as namespace and prefix respectively.

When using a character to initialise an ontology or query a term, "fbcv" (this is case insensitive) will refer to the the FlyBase Controlled Vocabulary. The the Drosophila Phenotype Ontology will have to be referred as "dpo" (also case insensitive).

Objects from the Class

Objects can be created in multiple ways. The `Ontologies` function will initialise all available ontologies as an `Ontologies` object, while a call to `Ontology` with an ontology namespace or prefix (but see Details section) as argument will initialise the ontology of interest as an `Ontology` instance.

`Ontologies` instances can be subset with `[]` and `[[` (using their namespace, see Details) and iterated over with `lapply`. `Ontologies` can be converted into a simple `data.frame` containing the ontology prefixes, namespaces and titles using `as(., "data.frame")`. An `Ontologies` can also be coerced to lists of `Ontology` objects with `as(., "list")`.

Slots

loaded: Object of class `NULL` or `character` containing the date the ontology was loaded on the backend side. Accessed with the `olsLoaded` method.

updated: Object of class `NULL` or `character` containing the date the ontology was last updated on the backend side. Accessed with the `olsUpdated` method.

status: Object of class `NULL` or `character` documenting the status of the ontology on the backend side. For example "LOADED", "FAILED" or "NOTLOADED". Accessed with the `olsStatus` method.

message: Object of class `NULL` or `character` documentating the status of the ontology on the backend side.

version: Object of class `NULL` or `character` documenting the version of the ontology. Note that there is also a `version` field in the `config` slot below. Use `olsVersion` to access the appropriate date.

numberOfTerms: Object of class "integer" documenting the number of terms available in the ontology.

numberOfProperties: Object of class "integer" documenting the number of properties available in the ontology.

numberOfIndividuals: Object of class "integer" documenting the number of individuals available in the ontology.

config: Object of class "list" containing further ontology configuration and metadata.

Methods and functions

Ontologies signature(object = "numeric"):

Ontology signature(object = "character"):

olsDesc signature(object = "Ontology"): returns the description of an ontology. Also works for `Ontologies` objects and `character` describing an ontology namespace or prefix (see Details).

- olsPrefix** signature(object = "Ontology"): retruns the prefix of an ontology. Also works for Ontologies objects describing an ontology namespace or prefix (see Details).
- olsRoot** signature(object = "Ontology"): returns the root of the ontology as a [Terms](#) instance. object could also be a character with an ontology namespace or prefix (see Details). If object is of class Ontologies, it returns a list of [Terms](#).
- olsVersion** signature(object = "Ontology"): returns the version of the ontology. Also works with an ontology namespace or prefix (see Details) as a character or an object of class Ontologies, in which case it returns a list of versions.
- olsLoaded** signature(object = "Ontology"): returns the loading date of the ontology. Also works with a character containing the ontology namespace or prefix (see Details) or an object of class Ontologies.
- olsUpdated** signature(object = "Ontology"): returns the update date of the ontology. Also works with a character containing the ontology namespace or prefix (see Details) or an object of class Ontologies.
- olsStatus** signature(object = "Ontology"): returns the status of the ontology. Also works with a character containing the ontology namespace or prefix (see Details) or an object of class Ontologies.
- olsStatus** signature(object = "Ontology"): returns the namespace of the ontology. Also works with a character containing the ontology namespace or prefix (see Details) or an object of class Ontologies.
- olsTitle** signature(object = "Ontology"): returns the title of an ontology. Also works with a character containing the ontology namespace or prefix (see Details) or an object of class Ontologies.
- show** signature(object = "Ontology"): prints a short summary of Ontology and Ontologies objects.
- length** signature(object = "Ontologies"): returns the number of ontolgies described by the Ontologies object.
- all.equal** signature(target = "Ontologies", current = "Ontologies"): ...

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Examples

```
## Get all ontolgies
ol <- Ontologies()
ol

head(as(ol, "data.frame"))
length(ol)

## Individual ontologies
(go <- ol[["go"]])
(efo <- ol[["efo"]])

## some basic information
olsVersion(go)
olsDesc(go)
olsTitle(go)
olsPrefix(go)
```

```

olsNamespace(go)

olsRoot(go)

## works with Ontology objects or their namespace
identical(olsRoot("go"), olsRoot(go))
identical(olsVersion("go"), olsVersion(go))

## Directly initialise a single ontology
go1 <- Ontology("go") ## using the namespace (preferred)
go2 <- Ontology("G0") ## using the prefix (see Details)
all.equal(go, go1)
all.equal(go, go2)

```

Properties-class	Class "Properties"
------------------	--------------------

Description

Properties (relationships) between terms can be queried for complete [Ontology](#) objects and [Term/Terms](#) instances, and the results are stored as objects of class `Property` or `Properties`.

Objects from the Class

Objects can be created by calls to `properties`, as described below.

Slots

See the [Term](#) and [Terms](#) classes.

Extends

Class ["Terms"](#), directly.

Methods and functions

properties signature(object = "Ontology", pagesize = 200): ... Also works with a character with the ontology namespace. See [Ontology](#) for details.

properties signature(object = "Term"): retrieves the properties of term object and returns a `Properties` object. Returns `NULL` when no properties are available.

proteties signature(object = "Terms", ...): retrieves the properties of each term of object and returns a list of `Properties` (or `NULL`) items.

show signature(object = "Properties"): shows a textual summary of the object.

length signature(object = "Properties"): returns the number of properties in object.

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Examples

```
trm <- term("uberon", "UBERON:0002107")
trm
properties(trm)

trm2 <- term("GO", "GO:0005326")
trm2
properties(trm2)
```

Term-class	<i>Class "Term"</i>
------------	---------------------

Description

The Term class describes an ontology term. A set of terms are instantiated as a Terms class.

Objects from the Class

Objects can be created using the `term` and `terms` functions. The latter is used with an object of class `Ontology` or a character describing a valid ontology prefix to download and instantiate all terms of an ontology of interest. The former takes an `Ontology` object (or an ontology prefix) and a term identifier to instantiate that specific term. See also the 'Methods and functions' sections.

For any given Term object, the children, parents, ancestors, descendants, `partOf` and `derivesFrom` terms can be generated and returned as Terms objects.

Terms instances can be subset with `[]` and `[[` and iterated over with `lapply`.

Slots

```
iri: Object of class "character" ~~
label: Object of class "character" ~~
description: Object of class "NullOrList" ~~
annotation: Object of class "list" ~~
synonym: Object of class "NullOrList" ~~
ontology_name: Object of class "character" ~~
ontology_prefix: Object of class "character" ~~
ontology_iri: Object of class "character" ~~
is_obsolete: Object of class "logical" ~~
is_defining_ontology: Object of class "logical" ~~
has_children: Object of class "logical" ~~
is_root: Object of class "logical" ~~
short_form: Object of class "character" ~~
obo_id: Object of class "NullOrChar" ~~
links: Object of class "list" ~~
```

Methods and functions

term signature(object = "Ontology", id = "character"): ...

terms signature(x = "Ontology", pagesize = "numeric"): ...

termDesc signature(object = "Term"): ...

termLabel signature(object = "Term"): ...

termPrefix signature(object = "Term"): ...

termSynonym signature(object = "Term"): ...

termNamespace signature(object = "Term"): ...

termOntology signature(object = "Term"): ...

isRoot signature(object = "Term"): ...

isObsolete signature(object = "Term"): ...

termId signature(object = "Term"): ...

children signature(object = "Term"): Returns a new Terms instance with the object's children. NULL if there are not children.

parents signature(object = "Term"): Returns a new Terms instance with the object's parents. NULL if there are not parents.

ancestors signature(object = "Term"): Returns a new Terms instance with the object's ancestors. NULL if there are not ancestors.

descendants signature(object = "Term"): Returns a new Terms instance with the object's descendants. NULL if there are not descendants.

partOf signature(object = "Term"): Returns a new Terms instance with terms the object's is a part of. NULL if none.

derivesFrom signature(object = "Term"): Returns a new Terms instance with terms the object's is derived from. NULL if none.

show signature(object = "Term"): ...

show signature(object = "Terms"): ...

all.equal signature(target = "Term", current = "Term"): ...

all.equal signature(target = "Terms", current = "Terms"): ...

length signature(object = "Terms"): returns the number of ontologies described by the Terms object.

unique signature(x = "Terms"): returns a new Terms object where all duplicated Term instances, i.e. those with the same term id (even when stemming from different ontologies), have been removed (only the first occurrence is retained).

as(x, "data.frame") Coerces a single Term or Terms into a data.frame of length 1 (for the former) or length length(x) for the latter. The result will contain the following columns: id, label, description of the term(s), their ontology, whether they are obsolete, have children or are root node, the first synonym only, their iri and whether they are defining the ontology. Any missing value will be reported as NA.

Author(s)

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Examples

```

## (all) terms
(gotrms <- terms("go", pagesize = 10000))

## Not run:
## or, using on ontology object
go <- Ontology("go")
gotrms <- terms(go, pagesize = 10000)

## End(Not run)

as(gotrms[1:10], "data.frame") ## data,frame with 10 rows

## (one) term
(trm <- gotrms[[1]])
termPrefix(trm)
gotrms[1:3]
gotrms[["GO:0005230"]]

as(trm, "data.frame") ## data,frame with 1 row

## using an Ontology object
go <- Ontology("GO")
term(go, "GO:0032801")
## using an ontology prefix
term("GO", "GO:0032801")

isObsolete(gotrms[["GO:0005230"]])
isObsolete(gotrms[["GO:0005232"]])

isRoot(gotrms[["GO:0005230"]])
isRoot(gotrms[["GO:0005232"]])

i <- isRoot(gotrms) & !isObsolete(gotrms)
gotrms[i]
for (ii in which(i))
  show(gotrms[[ii]])

## or, directly querying the ontology
olsRoot(go)

parents(trm)
ancestors(trm)
children(trm)
descendants(trm)

partOf(gotrms[["GO:0044429"]])
partOf(term("BTO", "BTO:0000142"))

derivesFrom(term("BTO", "BTO:0002600"))
derivesFrom(term("BTO", "BTO:0001023"))

```

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