

Package ‘taxadb’

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Title A High-Performance Local Taxonomic Database Interface

Description Creates a local database of many commonly used taxonomic authorities and provides functions that can quickly query this data.

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clean_names	<i>Clean taxonomic names</i>
-------------	------------------------------

Description

A utility to sanitize taxonomic names to increase probability of resolving names.

Usage

```
clean_names(
  names,
  fix_delim = TRUE,
  binomial_only = TRUE,
  remove_sp = TRUE,
  ascii_only = TRUE,
  lowercase = TRUE,
  remove_punc = FALSE
)
```

Arguments

names	a character vector of taxonomic names (usually species names)
fix_delim	Should we replace separators ., _, - with spaces? e.g. 'Homo.sapiens' becomes 'Homo sapiens'. logical, default TRUE.
binomial_only	Attempt to prune name to a binomial name, e.g. Genus and species (specific epithet), e.g. Homo sapiens sapiens becomes Homo sapiens. logical, default TRUE .
remove_sp	Should we drop unspecified species epithet designations? e.g. Homo sp. becomes Homo (thus only matching against genus level ids). logical, default TRUE .
ascii_only	should we coerce strings to ascii characters? (see stringi::stri_trans_general())
lowercase	should names be coerced to lower-case to provide case-insensitive matching?
remove_punc	replace all punctuation but apostrophes with a space, remove apostrophes

Details

Current implementation is limited to handling a few common cases. Additional extensions may be added later. A goal of the `clean_names` function is that any modification rule of the name strings be precise, atomic, and toggle-able, rather than relying on clever but more opaque rules and arbitrary scores. This utility should always be used with care, as indiscriminate modification of names may result in successful but inaccurate name matching. A good pattern is to only apply this function to the subset of names that cannot be directly matched.

Examples

```
clean_names(c("Homo sapiens sapiens", "Homo.sapiens", "Homo sp."))
```

common_contains	<i>common name starts with</i>
-----------------	--------------------------------

Description

common name starts with

Usage

```
common_contains(
  name,
  provider = getOption("taxadb_default_provider", "itis"),
  version = latest_version(),
  db = td_connect(),
  ignore_case = TRUE
)
```

Arguments

name	vector of names (scientific or common, see by) to be matched against.
provider	from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using options(default_taxadb_provider=...). See [td_create] for a list of recognized providers.
version	Which version of the taxadb provider database should we use? defaults to latest. See tl_import for details.
db	a connection to the taxadb database. See details.
ignore_case	should we ignore case (capitalization) in matching names? default is TRUE.

Examples

```
common_contains("monkey")
```

```
common_starts_with      common name starts with
```

Description

common name starts with

Usage

```
common_starts_with(
  name,
  provider = getOption("taxadb_default_provider", "itis"),
  version = latest_version(),
  db = td_connect(),
  ignore_case = TRUE
)
```

Arguments

name	vector of names (scientific or common, see by) to be matched against.
provider	from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using options(default_taxadb_provider=...). See [td_create] for a list of recognized providers.
version	Which version of the taxadb provider database should we use? defaults to latest. See tl_import for details.
db	a connection to the taxadb database. See details.
ignore_case	should we ignore case (capitalization) in matching names? default is TRUE.

Examples

```
common_starts_with("monkey")
```

filter_by	<i>Creates a data frame with column name given by by, and values given by the vector x, and then uses this table to do a filtering join, joining on the by column to return all rows matching the x values (scientificNames, taxonIDs, etc).</i>
-----------	--

Description

Creates a data frame with column name given by by, and values given by the vector x, and then uses this table to do a filtering join, joining on the by column to return all rows matching the x values (scientificNames, taxonIDs, etc).

Usage

```
filter_by(
  x,
  by,
  provider = getOption("taxadb_default_provider", "itis"),
  schema = c("dwc", "common"),
  version = latest_version(),
  collect = TRUE,
  db = td_connect(),
  ignore_case = TRUE
)
```

Arguments

x	a vector of values to filter on
by	a column name in the taxa_tbl (following Darwin Core Schema terms). The filtering join is executed with this column as the joining variable.
provider	from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using options(default_taxadb_provider=...). See [td_create] for a list of recognized providers.
schema	One of "dwc" (for Darwin Core data) or "common" (for the Common names table.)
version	Which version of the taxadb provider database should we use? defaults to latest. See tl_import for details.
collect	logical, default TRUE. Should we return an in-memory data.frame (default, usually the most convenient), or a reference to lazy-eval table on disk (useful for very large tables on which we may first perform subsequent filtering operations.)

db a connection to the taxadb database. See details.
ignore_case should we ignore case (capitalization) in matching names? default is TRUE.

Value

a data.frame in the Darwin Core tabular format containing the matching taxonomic entities.

See Also

Other filter_by: [filter_common\(\)](#), [filter_id\(\)](#), [filter_name\(\)](#), [filter_rank\(\)](#)

Examples

```
sp <- c("Trochalopteron henrici gucenense",  
      "Trochalopteron elliotii")  
filter_by(sp, "scientificName")  
  
filter_by(c("ITIS:1077358", "ITIS:175089"), "taxonID")  
  
filter_by("Aves", "class")
```

filter_common	<i>Look up taxonomic information by common name</i>
---------------	---

Description

Look up taxonomic information by common name

Usage

```
filter_common(  
  name,  
  provider = getOption("taxadb_default_provider", "itis"),  
  version = latest_version(),  
  collect = TRUE,  
  ignore_case = TRUE,  
  db = td_connect()  
)
```

Arguments

name	a character vector of common (vernacular English) names, e.g. "Humans"
provider	from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using options(default_taxadb_provider=...). See [td_create] for a list of recognized providers.
version	Which version of the taxadb provider database should we use? defaults to latest. See tl_import for details.
collect	logical, default TRUE. Should we return an in-memory data.frame (default, usually the most convenient), or a reference to lazy-eval table on disk (useful for very large tables on which we may first perform subsequent filtering operations.)
ignore_case	should we ignore case (capitalization) in matching names? default is TRUE.
db	a connection to the taxadb database. See details.

Value

a data.frame in the Darwin Core tabular format containing the matching taxonomic entities.

See Also

Other filter_by: [filter_by\(\)](#), [filter_id\(\)](#), [filter_name\(\)](#), [filter_rank\(\)](#)

Examples

```
filter_common("Pied Tamarin")
```

filter_id

Return a taxonomic table matching the requested ids

Description

Return a taxonomic table matching the requested ids

Usage

```
filter_id(
  id,
  provider = getOption("taxadb_default_provider", "itis"),
  type = c("taxonID", "acceptedNameUsageID"),
  version = latest_version(),
```

```

    collect = TRUE,
    db = td_connect()
)

```

Arguments

id	taxonomic id, in prefix format
provider	from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using options(default_taxadb_provider=...). See [td_create] for a list of recognized providers.
type	id type. Can be taxonID or acceptedNameUsageID, see details.
version	Which version of the taxadb provider database should we use? defaults to latest. See tl_import for details.
collect	logical, default TRUE. Should we return an in-memory data.frame (default, usually the most convenient), or a reference to lazy-eval table on disk (useful for very large tables on which we may first perform subsequent filtering operations.)
db	a connection to the taxadb database. See details.

Details

Use type="acceptedNameUsageID" to return all rows for which this ID is the accepted ID, including both synonyms and accepted names (since both all synonyms of a name share the same acceptedNameUsageID.) Use taxonID (default) to only return those rows for which the Scientific name corresponds to the taxonID.

Some providers (e.g. ITIS) assign taxonIDs to synonyms, most others only assign IDs to accepted names. In the latter case, this means requesting taxonID will only match accepted names, while requesting matches to the acceptedNameUsageID will also return any known synonyms. See examples.

Value

a data.frame with id and name of all matching species

See Also

Other filter_by: [filter_by\(\)](#), [filter_common\(\)](#), [filter_name\(\)](#), [filter_rank\(\)](#)

Examples

```

filter_id(c("ITIS:1077358", "ITIS:175089"))
filter_id("ITIS:1077358", type="acceptedNameUsageID")

```

filter_name	<i>Look up taxonomic information by scientific name</i>
-------------	---

Description

Look up taxonomic information by scientific name

Usage

```
filter_name(
  name,
  provider = getOption("taxadb_default_provider", "itis"),
  version = latest_version(),
  collect = TRUE,
  ignore_case = TRUE,
  db = td_connect()
)
```

Arguments

name	a character vector of scientific names, e.g. "Homo sapiens"
provider	from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using options(default_taxadb_provider=...). See [td_create] for a list of recognized providers.
version	Which version of the taxadb provider database should we use? defaults to latest. See tl_import for details.
collect	logical, default TRUE. Should we return an in-memory data.frame (default, usually the most convenient), or a reference to lazy-eval table on disk (useful for very large tables on which we may first perform subsequent filtering operations.)
ignore_case	should we ignore case (capitalization) in matching names? default is TRUE.
db	a connection to the taxadb database. See details.

Details

Most but not all authorities can match against both species level and higher-level (or lower, e.g. subspecies or variety) taxonomic names. The rank level is indicated by taxonRank column.

Most authorities include both known synonyms and accepted names in the scientificName column, (with the status indicated by taxonomicStatus). This is convenient, as users will typically not know if the names they have are synonyms or accepted names, but will want to get the match to the accepted name and accepted ID in either case.

Value

a data.frame in the Darwin Core tabular format containing the matching taxonomic entities.

See Also

Other filter_by: [filter_by\(\)](#), [filter_common\(\)](#), [filter_id\(\)](#), [filter_rank\(\)](#)

Examples

```
sp <- c("Trochalopteron henrici gucenense",
       "Trochalopteron elliotii")
filter_name(sp)
```

filter_rank

Get all members (descendants) of a given rank level

Description

Get all members (descendants) of a given rank level

Usage

```
filter_rank(
  name,
  rank,
  provider = getOption("taxadb_default_provider", "itis"),
  version = latest_version(),
  collect = TRUE,
  ignore_case = TRUE,
  db = td_connect()
)
```

Arguments

name	taxonomic scientific name (e.g. "Aves")
rank	taxonomic rank name. (e.g. "class")
provider	from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using <code>options(default_taxadb_provider=...)</code> . See <code>[td_create]</code> for a list of recognized providers.
version	Which version of the taxadb provider database should we use? defaults to latest. See tl_import for details.
collect	logical, default TRUE. Should we return an in-memory data.frame (default, usually the most convenient), or a reference to lazy-eval table on disk (useful for very large tables on which we may first perform subsequent filtering operations.)
ignore_case	should we ignore case (capitalization) in matching names? default is TRUE.
db	a connection to the taxadb database. See details.

Value

a data.frame in the Darwin Core tabular format containing the matching taxonomic entities.

See Also

Other filter_by: [filter_by\(\)](#), [filter_common\(\)](#), [filter_id\(\)](#), [filter_name\(\)](#)

Examples

```
filter_rank("Aves", "class")
```

fuzzy_filter

Match names that start or contain a specified text string

Description

Match names that start or contain a specified text string

Usage

```
fuzzy_filter(
  name,
  by = c("scientificName", "vernacularName"),
  provider = getOption("taxadb_default_provider", "itis"),
  match = c("contains", "starts_with"),
  version = latest_version(),
  db = td_connect(),
  ignore_case = TRUE,
  collect = TRUE
)
```

Arguments

name	vector of names (scientific or common, see by) to be matched against.
by	a column name in the taxa_tbl (following Darwin Core Schema terms). The filtering join is executed with this column as the joining variable.
provider	from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using options(default_taxadb_provider=...). See [td_create] for a list of recognized providers.
match	should we match by names starting with the term or containing the term anywhere in the name?

version	Which version of the taxadb provider database should we use? defaults to latest. See tl_import for details.
db	a connection to the taxadb database. See details.
ignore_case	should we ignore case (capitalization) in matching names? default is TRUE.
collect	logical, default TRUE. Should we return an in-memory data.frame (default, usually the most convenient), or a reference to lazy-eval table on disk (useful for very large tables on which we may first perform subsequent filtering operations.)

Details

Note that fuzzy filter will be fast with an single or small number of names, but will be slower if given a very large vector of names to match, as unlike other `filter_` commands, fuzzy matching requires separate SQL calls for each name. As fuzzy matches should all be confirmed manually in any event, e.g. not every common name containing "monkey" belongs to a primate species.

This method utilizes the database operation `%like%` to filter tables without loading into memory. Note that this does not support the use of regular expressions at this time.

Examples

```
## match any common name containing:
name <- c("woodpecker", "monkey")
fuzzy_filter(name, "vernacularName")

## match scientific name
fuzzy_filter("Chera", "scientificName",
             match = "starts_with")
```

get_ids

get_ids

Description

A drop-in replacement for `[taxize::get_ids()]`

Usage

```
get_ids(
  names,
  db = getOption("taxadb_default_provider", "itis"),
  format = c("prefix", "bare", "uri"),
  version = latest_version(),
  taxadb_db = td_connect(),
```

```

    ignore_case = TRUE,
    warn = TRUE,
    ...
)

```

Arguments

names	a list of scientific names (which may include higher-order ranks in most authorities).
db	abbreviation code for the provider. See details.
format	Format for the returned identifier, one of <ul style="list-style-type: none"> • prefix (e.g. NCBI:9606, the default), or • bare (e.g. 9606, used in <code>taxize::get_ids()</code>), • uri (e.g. <code>http://ncbi.nlm.nih.gov/taxonomy/9606</code>).
version	Which version of the taxadb provider database should we use? defaults to latest. see <code>[available_releases()]</code> for details.
taxadb_db	Connection to from <code>[td_connect()]</code> .
ignore_case	should we ignore case (capitalization) in matching names? default is TRUE.
warn	should we display warnings on NAs resulting from multiply-resolved matches? (Unlike unmatched names, these NAs can usually be resolved manually via <code>filter_id()</code>)
...	additional arguments (currently ignored)

Details

Note that some taxize authorities: `nbn`, `tropicos`, and `eol`, are not recognized by taxadb and will throw an error here. Meanwhile, taxadb recognizes several authorities not known to `[taxize::get_ids()]`. Both include `itis`, `ncbi`, `col`, and `gbif`.

Like all taxadb functions, this function will run fastest if a local copy of the provider is installed in advance using `[td_create()]`.

Value

a vector of IDs, of the same length as the input names Any unmatched names or multiply-matched names will return as **NAs**. To resolve multi-matched names, use `[filter_name()]` instead to return a table with a separate row for each separate match of the input name.

See Also

`filter_name`

Other get: `get_names()`

Examples

```
get_ids("Midas bicolor")
get_ids(c("Midas bicolor", "Aves"), format = "prefix")
get_ids("Midas bicolor", format = "uri")
```

get_names

get_names

Description

Translate identifiers into scientific names

Usage

```
get_names(
  id,
  db = getOption("taxadb_default_provider", "itis"),
  version = latest_version(),
  format = c("guess", "prefix", "bare", "uri"),
  taxadb_db = td_connect()
)
```

Arguments

id	a list of taxonomic identifiers.
db	abbreviation code for the provider. See details.
version	Which version of the taxadb provider database should we use? defaults to latest. see [available_releases()] for details.
format	Format for the returned identifier, one of <ul style="list-style-type: none"> • prefix (e.g. NCBI:9606, the default), or • bare (e.g. 9606, used in taxize::get_ids()), • uri (e.g. http://ncbi.nlm.nih.gov/taxonomy/9606).
taxadb_db	Connection to from [td_connect()].

Details

Like all taxadb functions, this function will run fastest if a local copy of the provider is installed in advance using [td_create()].

Value

a vector of names, of the same length as the input ids. Any unmatched IDs will return as [NAs](#).

See Also

Other get: [get_ids\(\)](#)

Examples

```
get_names(c("ITIS:1025094", "ITIS:1025103"), format = "prefix")
```

mutate_db

Add new variables to a database

Description

[dplyr::mutate\(\)](#) cannot pass arbitrary R functions over a database connection. This function provides a way to work around this, by querying the data in chunks and applying the function to each chunk, which is then appended back out to a temporary table.

Usage

```
mutate_db(.data, r_fn, col, new_column, n = 5000L, ...)
```

Arguments

.data	A dplyr::tbl that uses a database connection, <code>tbl_dbi</code> class.
r_fn	any R function that can be called on a vector (column) of the table
col	the name of the column to which the R function is applied. (Note, dplyr::mutate() can operate on an arbitrary list of columns, this function only operates on a single column at this time...)
new_column	column name for the new column.
n	the number of rows included in each chunk, see DBI::dbFetch()
...	named arguments to be passed to r_fn

Value

a dplyr tbl connection to the temporary table in the database

name_contains	<i>return all taxa in which scientific name contains the text provided</i>
---------------	--

Description

return all taxa in which scientific name contains the text provided

Usage

```
name_contains(
  name,
  provider = getOption("taxadb_default_provider", "itis"),
  version = latest_version(),
  db = td_connect(),
  ignore_case = TRUE
)
```

Arguments

name	vector of names (scientific or common, see by) to be matched against.
provider	from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using options(default_taxadb_provider=...). See [td_create] for a list of recognized providers.
version	Which version of the taxadb provider database should we use? defaults to latest. See tl_import for details.
db	a connection to the taxadb database. See details.
ignore_case	should we ignore case (capitalization) in matching names? default is TRUE.

Examples

```
name_contains("Chera")
```

name_starts_with	<i>scientific name starts with</i>
------------------	------------------------------------

Description

scientific name starts with

Usage

```
name_starts_with(
  name,
  provider = getOption("taxadb_default_provider", "itis"),
  version = latest_version(),
  db = td_connect(),
  ignore_case = TRUE
)
```

Arguments

name	vector of names (scientific or common, see by) to be matched against.
provider	from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using options(default_taxadb_provider=...). See [td_create] for a list of recognized providers.
version	Which version of the taxadb provider database should we use? defaults to latest. See tl_import for details.
db	a connection to the taxadb database. See details.
ignore_case	should we ignore case (capitalization) in matching names? default is TRUE.

Examples

```
name_starts_with("Chera")
```

taxa_tbl

Return a reference to a given table in the taxadb database

Description

Return a reference to a given table in the taxadb database

Usage

```
taxa_tbl(
  provider = getOption("taxadb_default_provider", "itis"),
  schema = c("dwc", "common"),
  version = latest_version(),
  db = td_connect()
)
```

Arguments

provider	from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using options(default_taxadb_provider=...). See [td_create] for a list of recognized providers.
schema	One of "dwc" (for Darwin Core data) or "common" (for the Common names table.)
version	Which version of the taxadb provider database should we use? defaults to latest. See tl_import for details.
db	a connection to the taxadb database. See details.

Examples

```
## default schema is the dwc table
taxa_tbl()

## common names table
taxa_tbl(schema = "common")
```

td_connect	<i>Connect to the taxadb database</i>
------------	---------------------------------------

Description

Connect to the taxadb database

Usage

```
td_connect(
  dbdir = taxadb_dir(),
  driver = Sys.getenv("TAXADB_DRIVER", "duckdb"),
  read_only = FALSE
)
```

Arguments

dbdir	Path to the database.
driver	Default driver, one of "duckdb", "MonetDBLite", "RSQLite". taxadb will select the first one of those it finds available if a driver is not set. This fallback can be overwritten either by explicit argument or by setting the environmental variable TAXADB_DRIVER.

read_only logical, should the database be opened read_only? Prevents importing but will allow concurrent access from multiple sessions.

Details

This function provides a default database connection for taxadb. Note that you can use taxadb with any DBI-compatible database connection by passing the connection object directly to taxadb functions using the db argument. td_connect() exists only to provide reasonable automatic defaults based on what is available on your system.

duckdb or MonetDBLite will give the best performance, and regular users taxadb will work with the built-in RSQLite, and with other database connections such as Postgres or MariaDB, but queries (filtering joins) will be much slower on these non-columnar databases.

For performance reasons, this function will also cache and restore the existing database connection, making repeated calls to td_connect() much faster and more failsafe than repeated calls to [DBI::dbConnect](#)

Value

Returns a DBI connection to the default duckdb database

Examples

```
## OPTIONAL: you can first set an alternative home location,
## such as a temporary directory:
Sys.setenv(TAXADB_HOME=tempdir())

## Connect to the database:
db <- td_connect()
```

td_create	<i>create a local taxonomic database</i>
-----------	--

Description

create a local taxonomic database

Usage

```
td_create(
  provider = getOption("taxadb_default_provider", "itis"),
  schema = c("dwc", "common"),
  version = latest_version(),
  overwrite = TRUE,
  lines = 1e+05,
  dbdir = taxadb_dir(),
```

```

    db = td_connect(dbdir)
)

```

Arguments

provider	a list (character vector) of provider to be included in the database. By default, will install <code>itis</code> . See details for a list of recognized provider. Use <code>provider="all"</code> to install all available provider automatically.
schema	One of "dwc" (for Darwin Core data) or "common" (for the Common names table.)
version	Which version of the taxadb provider database should we use? defaults to latest. See tl_import for details.
overwrite	Should we overwrite existing tables? Default is TRUE. Change to "ask" for interactive interface, or TRUE to force overwrite (i.e. updating a local database upon new release.)
lines	number of lines that can be safely read in to memory at once. Leave at default or increase for faster importing if you have plenty of spare RAM.
dbdir	a location on your computer where the database should be installed. Defaults to user data directory given by <code>[rappdirs::user_data_dir]</code> .
db	connection to a database. By default, taxadb will set up its own fast database connection.

Details

Authorities currently recognized by taxadb are:

- `itis`: Integrated Taxonomic Information System, <https://www.itis.gov>
- `ncbi`: National Center for Biotechnology Information, <https://www.ncbi.nlm.nih.gov/taxonomy>
- `col`: Catalogue of Life, <http://www.catalogueoflife.org/>
- `tpl`: The Plant List, <http://www.theplantlist.org/>
- `gbif`: Global Biodiversity Information Facility, <https://www.gbif.org/>
- `fb`: FishBase, <https://www.fishbase.de/>
- `slb`: SeaLifeBase, <http://sealifebase.org>
- `wd`: Wikidata: <https://www.wikidata.org>
- `ott`: OpenTree Taxonomy: <https://github.com/OpenTreeOfLife/reference-taxonomy>
- `iucn`: IUCN Red List, <https://iucnredlist.org>
- `itis_test`: a small subset of ITIS, cached locally with the package for testing purposes only

Value

path where database has been installed (invisibly)

Examples

```
## Install the ITIS database
td_create()

## force re-install:
td_create( overwrite = TRUE)
```

td_disconnect	<i>Disconnect from the taxadb database.</i>
---------------	---

Description

Disconnect from the taxadb database.

Usage

```
td_disconnect(db = td_connect())
```

Arguments

db database connection

Details

This function manually closes a connection to the taxadb database.

Examples

```
## Disconnect from the database:
td_disconnect()
```

tl_import	<i>Import taxonomic database tables</i>
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Description

Downloads the requested taxonomic data tables and return a local path to the data in `tsv.gz` format. Downloads are cached and identified by content hash so that `tl_import` will not attempt to download the same file multiple times.

Usage

```
tl_import(
  provider = getOption("tl_default_provider", "itis"),
  schema = c("dwc", "common"),
  version = latest_version(),
  prov = paste0("https://raw.githubusercontent.com/",
    "boettiger-lab/taxadb-cache/master/prov.json")
)
```

Arguments

provider	from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using <code>options(default_taxadb_provider=...)</code> . See <code>[td_create]</code> for a list of recognized providers.
schema	One of "dwc" (for Darwin Core data) or "common" (for the Common names table.)
version	Which version of the taxadb provider database should we use? defaults to latest. See tl_import for details.
prov	Address (URL) to provenance record

Details

`tl_import` parses a DCAT2/PROV-O record to determine the correct version to download. If offline, `tl_import` will attempt to resolve against its own provenance cache. Users can also examine / parse the prov JSON-LD file directly to determine the provenance of the data products used.

Value

path(s) to the downloaded files in the cache

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