

# Package ‘CEDARS’

May 23, 2021

**Type** Package

**Title** Simple and Efficient Pipeline for Electronic Health Record Annotation

**Description** Streamlined annotation pipeline for collection and aggregation of time-to-event data in retrospective clinical studies. 'CEDARS' aims to systematize and accelerate the review of electronic health record (EHR) corpora. It accomplishes those goals by deploying natural language processing as a tool to assist detection and characterization of clinical events by human abstractors. The online user manual presents the necessary steps to install 'CEDARS', process EHR corpora and obtain clinical event dates: <<https://cedars.io>>.

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jsonlite,  
mongolite,  
parallel,  
readr,  
shiny,  
udpipe,  
utils

**License** GPL-3

**URL** <https://cedars.io> (main)  
<https://github.com/simon-hans/CEDARS> (devel)

**BugReports** <https://github.com/simon-hans/CEDARS/issues>

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---

add_end_user	<i>Add a CEDARS End User</i>
--------------	------------------------------

---

## Description

Adds an end user. Password must be at least 8 characters in length.

## Usage

```
add_end_user(
  uri_fun,
  user,
  password,
  host,
  replica_set,
  port,
  database,
  end_user,
  end_user_password
)
```

**Arguments**

uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.
end_user	CEDARS end user name.
end_user_password	CEDARS end user password.

**Value**

Confirmation that requested operation was completed, or error message if attempt failed.

**Examples**

```
## Not run:
add_end_user(uri_fun = mongo_uri_standard, user = 'John', password = 'db_password_1234',
             host = 'server1234', port = NA, database = 'TEST_PROJECT', end_user = 'Mike',
             end_user_password = 'user_pw_5678')

## End(Not run)
```

---

```
automatic_NLP_processor
```

*Process NLP Annotations on the Current Patient Cohort*

---

**Description**

Accepts a list of patient ID's or alternatively can perform NLP annotations on all available patients in the database.

**Usage**

```
automatic_NLP_processor(
  patient_vect = NA,
  text_format = "latin1",
  nlp_engine = "udpipe",
  uri_fun = mongo_uri_standard,
  user,
  password,
  host,
  replica_set,
  port,
  database,
  max_n_grams_length = 7,
```

```

    negex_depth = 6,
    select_cores = NA,
    URL = NA
)

```

### Arguments

patient_vect	Vector of patient ID's. Default is NA, in which case all available patient records will undergo NLP annotation.
text_format	Text format for NLP engine.
nlp_engine	Which NLP engine should be used? UDPipe is the only one supported for now.
uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.
max_n_grams_length	Maximum length of tokens for matching with UMLS concept unique identifiers (CUI's). Shorter values will result in faster processing. If 0 is chosen, UMLS CUI tags will not be provided.
negex_depth	Maximum distance between negation item and token to negate. Shorter distances will result in decreased sensitivity but increased specificity for negation.
select_cores	How many CPU cores should be used for parallel processing? Max allowed is total number of cores minus one. If 1 is entered, parallel processing will not be used.
URL	UDPipe model URL.

### Value

Confirmation that requested operation was completed, or error message if attempt failed.

### Examples

```

## Not run:
automatic_NLP_processor(patient_vect = NA, text_format = 'latin1', nlp_engine = 'udpipe',
  URL = 'models/english-ewt-ud-2.4-190531.udpipe', uri_fun = mongo_uri_standard, user = 'John',
  password = 'db_password_1234', host = 'server1234', port = NA, database = 'TEST_PROJECT',
  max_n_grams_length = 7, negex_depth = 6, select_cores = 1)

## End(Not run)

```

---

create_project	Create a New CEDARS Project
----------------	-----------------------------

---

### Description

Creates a new MongoDB database and collections needed for a CEDARS annotation project. The MongoDB account used must have sufficient privileges.

### Usage

```
create_project(  
  uri_fun,  
  user,  
  password,  
  host,  
  replica_set,  
  port,  
  database,  
  project_name,  
  investigator_name  
)
```

### Arguments

uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.
project_name	Research or QA project name.
investigator_name	Investigator name.

### Value

Confirmation that requested operation was completed, or error message if attempt failed.

### Examples

```
# The code below creates an instance of CEDARS project on a public test MongoDB cluster, populated  
# with fictitious EHR corpora.  
  
# MongoDB credentials  
db_user_name <- "testUser"  
db_user_pw <- "testPW"  
db_host <- "cedars.yvjp6.mongodb.net"  
db_replica_set <- NA
```

```

db_port <- NA

# Using standard MongoDB URL format
uri_fun <- mongo_uri_standard

# Name for MongoDB database which will contain the CEDARS project
# In this case we generate a random name
mongo_database <- find_project_name()

# We create the database and all required collections on a test cluster
create_project(uri_fun, db_user_name, db_user_pw, db_host, db_replica_set, db_port, mongo_database,
"CEDARS Example Project", "Dr Smith")

# Adding one CEDARS end user
add_end_user(uri_fun, db_user_name, db_user_pw, db_host, db_replica_set, db_port, mongo_database,
"John", "strongpassword")

## Not run:

# Negex is included with CEDARS and required for assessment of negation
negex_upload(uri_fun, db_user_name, db_user_pw, db_host, db_replica_set, db_port, mongo_database)

## End(Not run)

# Uploading the small simulated collection of EHR corpora
upload_notes(uri_fun, db_user_name, db_user_pw, db_host, db_replica_set, db_port, mongo_database,
simulated_patients)

# This is a simple query which will report all sentences with a word starting in
# "bleed" or "hem", or an exact match for "bled"
search_query <- "bleed* OR hem* OR bled"
use_negation <- TRUE
hide_duplicates <- TRUE
skip_after_event <- TRUE
save_query(uri_fun, db_user_name, db_user_pw, db_host, db_replica_set, db_port, mongo_database,
search_query, use_negation, hide_duplicates, skip_after_event)

## Not run:

# Running the NLP annotations on EHR corpora
# We are only using one core, for large datasets parallel processing is faster
automatic_NLP_processor(NA, "latin1", "udpipe", uri_fun, db_user_name, db_user_pw,
db_host, db_replica_set, db_port, mongo_database, max_n_grams_length = 0, negex_depth = 6,
select_cores = 1)

# Entering known event dates for 2 individuals
patient_ids <- c("2222222222", "5555555555")
event_dates <- as.Date(c("2016-07-02", "2018-10-13"))
upload_events(uri_fun, db_user_name, db_user_pw, db_host, db_replica_set, db_port,
mongo_database, patient_ids, event_dates)

# Pre-searching based on query
# This is optional but will speed-up the interface
pre_search(patient_vect = NA, uri_fun, db_user_name, db_user_pw, db_host, db_replica_set, db_port,
mongo_database)

# Start the CEDARS GUI locally

```

```

# Your user name is "John", password is "strongpassword"
# Once you have entered those credentials, click on button "ENTER NEW DATE" and CEDARS will
# seek the first record to annotate
# Try out the interface, adjudicating sentences, entering event dates, comments, moving
# between sentences and searching for records
# Once you have entered some data, close the GUI
start_local(db_user_name, db_user_pw, db_host, db_replica_set, db_port, mongo_database)

# Obtaining events and info associated with data entry
# The annotations entered in the GUI are now available in this dataframe
event_output <- download_events(uri_fun, db_user_name, db_user_pw, db_host, db_replica_set, db_port,
mongo_database)

## End(Not run)

# Remove project from MongoDB
terminate_project(uri_fun, db_user_name, db_user_pw, db_host, db_replica_set, db_port,
mongo_database, fast=TRUE)

```

---

delete\_end\_user

Delete a CEDARS End User

---

## Description

Deletes one end user and associated password.

## Usage

```

delete_end_user(
  uri_fun,
  user,
  password,
  host,
  replica_set,
  port,
  database,
  end_user
)

```

## Arguments

uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.
end_user	CEDARS end user name.

**Value**

Confirmation that requested operation was completed, or error message if attempt failed.

**Examples**

```
## Not run:
delete_end_user(uri_fun = mongo_uri_standard, user = 'John', password = 'db_password_1234',
host = 'server1234', port = NA, database = 'TEST_PROJECT', end_user = 'Mike')

## End(Not run)
```

---

download_events	<i>Download Event Data</i>
-----------------	----------------------------

---

**Description**

Downloads patient event data. Typically done after all records have been annotated and the project is complete.

**Usage**

```
download_events(
  uri_fun,
  user,
  password,
  host,
  replica_set,
  port,
  database,
  dates = FALSE
)
```

**Arguments**

uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.
dates	Provide dates of first and last note for each patient; this is needed to assess duration of follow-up, however can take a long time with large cohorts.

**Value**

Object of class `data.frame` containing patient ID for all cohort members, date of recorded event if any, abstractor comments, sentences reviewed along with statistics about review process.



**Examples**

```
## Not run:
download_events(uri_fun = mongo_uri_standard, user = 'John', password = 'db_password_1234',
  host = 'server1234', port = NA)

## End(Not run)
```

---

download\_filtered\_tags

*Download Notes Metadata Summary*


---

**Description**

Downloads text\_tag\_x info for the metadata tags, along with "include" and/or "exclude" criteria in the core CEDARS search query.

**Usage**

```
download_filtered_tags(
  uri_fun,
  user,
  password,
  host,
  replica_set,
  port,
  database,
  eval_query = TRUE
)
```

**Arguments**

uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB server host.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.
eval_query	Should tags be evaluated against stored CEDARS query?

**Value**

List containing one dataframe per text\_tag\_x of interest, indicating selected status. Can take time to download for large datasets.

**Examples**

```
## Not run:
download_filtered_tags(uri_fun = mongo_uri_standard, user = 'John',
  password = 'db_password_1234', host = 'server1234', replica_set = NA, port = NA,
  database = 'TEST_PROJECT')

## End(Not run)
```

---

end_users	<i>Download End User List</i>
-----------	-------------------------------

---

**Description**

Downloads list of CEDARS end users along with their passwords.

**Usage**

```
end_users(uri_fun, user, password, host, replica_set, port, database)
```

**Arguments**

uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.

**Value**

An object of class data.frame, listing all project users along with their associated password. This information is not available if using Active Directory feature because in this case the value pairs would be stored outside of the CEDARS project database.

**Examples**

```
## Not run:
end_users(uri_fun = mongo_uri_standard, user = 'John', password = 'db_password_1234',
  host = 'server1234', port = NA, database = 'TEST_PROJECT')

## End(Not run)
```

---

find_project_name	<i>Generate unique test project name (i.e. DB name) on MongoDB CEDARS testing cluster</i>
-------------------	---

---

**Description**

Parses existing DB names and randomly generates a unique test project name on MongoDB CEDARS testing cluster. This is used for convenience purposes when the R user does not have an existing MongoDB connection. The corresponding database and collections are PUBLIC so no patient information or any other privileged/confidential data should be used! This is for testing on simulated records only.

**Usage**

```
find_project_name()
```

**Details**

No parameter; the operation is performed on a preset server with no user input.

**Value**

An object of class character, the randomly generated name of a test CEDARS project.

**Examples**

```
## Not run:
find_project_name()

## End(Not run)
```

---

get_model	<i>Get a NLP Model</i>
-----------	------------------------

---

**Description**

Downloads a NLP model, presently only UDPipe models supported.

**Usage**

```
get_model(model_name = "english-ewt", platform = "udpipe")
```

**Arguments**

model_name	Name of models to download.
platform	Name of NLP platform, currently only UDPipe is supported.

**Value**

Saves model in inst/models.

---

get\_wrapper

---

*Wrap the get\_data() Function*


---

### Description

Obtain one sentence and related info from MongoDB. Uses DB credentials pre-loaded in the main environment. For use with Shiny or REST GET (latter yet to be implemented).

### Usage

```
get_wrapper(
  database,
  end_user,
  end_user_password,
  html = TRUE,
  position,
  patient_id = NA,
  ldap = FALSE
)
```

### Arguments

database	MongoDB database.
end_user	CEDARS end user name..
end_user_password	CEDARS end user password.
html	Should output keywords/concepts be highlighted with HTML markup? Default is TRUE.
position	Sentence position within the sequence of selected sentences for a given patient.
patient_id	Used if a specific patient record is requested, instead of a search for next record to annotate.
ldap	Is LDAP authentication being used? If so, password will not be checked and access will be granted automatically.

### Value

A list with patient-specific information and a dataframe with selected sentences along with sentence-specific data.

### Examples

```
## Not run:
get_wrapper(database = 'TEST_PROJECT', end_user = 'John', end_user_password = 'db_password_1234',
  html = TRUE, position = NA)

## End(Not run)
```

---

```
initialize_annotations
```

*Initialize Annotations Deletes all NLP annotations and patient-specific information, including clinical event dates. New, empty 'ANNOTATIONS' and 'PATIENTS' collections are created. Dictionaries and original patient notes are preserved.*

---

## Description

Initialize Annotations Deletes all NLP annotations and patient-specific information, including clinical event dates. New, empty 'ANNOTATIONS' and 'PATIENTS' collections are created. Dictionaries and original patient notes are preserved.

## Usage

```
initialize_annotations(  
    uri_fun,  
    user,  
    password,  
    host,  
    replica_set,  
    port,  
    database  
)
```

## Arguments

uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.

## Value

Confirmation that requested operation was completed, or error message if attempt failed.

## Examples

```
## Not run:  
initialize_annotations(uri_fun = mongo_uri_standard, user = 'John', password = 'db_password_1234',  
    host = 'server1234', port = NA, database = 'TEST_PROJECT')  
  
## End(Not run)
```

---

initialize_notes	<i>Initialize EHR Notes</i>
------------------	-----------------------------

---

**Description**

Deletes all patient notes from the database.

**Usage**

```
initialize_notes(uri_fun, user, password, host, replica_set, port, database)
```

**Arguments**

uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.

**Value**

Confirmation that requested operation was completed, or error message if attempt failed.

**Examples**

```
## Not run:
initialize_notes(uri_fun = mongo_uri_standard, user = 'John', password = 'db_password_1234',
host = 'server1234', port = NA, database = 'TEST_PROJECT')

## End(Not run)
```

---

initialize_patients	<i>Initialize Patient List</i>
---------------------	--------------------------------

---

**Description**

All patient-specific information is deleted, including clinical event dates. Original notes and NLP annotations are preserved.

**Usage**

```
initialize_patients(uri_fun, user, password, host, replica_set, port, database)
```

**Arguments**

uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.

**Value**

Confirmation that requested operation was completed, or error message if attempt failed.

**Examples**

```
## Not run:
initialize_patients(uri_fun = mongo_uri_standard, user = 'John', password = 'db_password_1234',
  host = 'server1234', port = NA, database = 'TEST_PROJECT')

## End(Not run)
```

---

initialize_users	<i>Initialize End User List</i>
------------------	---------------------------------

---

**Description**

Deletes all CEDARS end user credentials information.

**Usage**

```
initialize_users(uri_fun, user, password, host, replica_set, port, database)
```

**Arguments**

uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.

**Value**

Confirmation that requested operation was completed, or error message if attempt failed.

## Examples

```
## Not run:
initialize_users(uri_fun = mongo_uri_standard, user = 'John', password = 'db_password_1234',
  host = 'server1234', port = NA, database = 'TEST_PROJECT')

## End(Not run)
```

---

mongo_uri_standard	<i>Prepare MongoDB URI string, most commonly used format</i>
--------------------	--

---

## Description

Formats the MongoDB URI string for use by package mongolite. In this case the 'standard' URI format is used.

## Usage

```
mongo_uri_standard(user, password, host, replica_set = NA, port = NA)
```

## Arguments

user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.

## Value

URI string.

## Examples

```
## Not run:
mongo_uri_standard(user = 'John', password = 'db_password_1234', host = 'server1234', port = NA)

## End(Not run)
```



---

mrconso\_upload*Upload UMLS Dictionary*

---

**Description**

Prepares and uploads UMLS MRCONSO.RRF file. This file is not included in the CEDARS package and can be obtained on the NIH web site at <https://www.nlm.nih.gov/research/umls/index.html>.

**Usage**

```
mrconso_upload(  
  path,  
  language = "ENG",  
  subsets,  
  max_grams = 7,  
  uri_fun,  
  user,  
  password,  
  host,  
  replica_set,  
  port,  
  database  
)
```

**Arguments**

path	Path to file MRCONSO.RRF.
language	Language of biomedical lexicon, default is English (ENG).
subsets	Character vector of lexicon subsets to retain. UMLS is quite large so most applications can use only a few lexicon subsets.
max_grams	Maximum length of token in grams. Tokens above the threshold length will not be retained. Empirically, a value of 7 suffices for most applications.
uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.

**Value**

Progress report of dictionary processing and upload.

## Examples

```
## Not run:
mrconso_upload(path = 'dictionaries/MRCONSO.RRF', language = 'ENG', subsets = c('SNOMEDCT_US',
'MTHICD9', 'ICD9CM', 'ICD10', 'ICD10CM', 'DSM-5', 'MSH', 'RXNORM', 'NCI'), max_grams = 7,
user = 'John', password = 'db_password_1234', host = 'server1234', port = NA,
database = 'TEST_PROJECT')

## End(Not run)
```

---

mrrel\_upload

*Upload UMLS Relationships*


---

## Description

Prepares and uploads UMLS MRREL.RRF file. This file is not included in the CEDARS package and can be obtained on the NIH web site at <https://www.nlm.nih.gov/research/umls/index.html>. It is very large and not currently used by CEDARS.

## Usage

```
mrrel_upload(path, uri_fun, user, password, host, replica_set, port, database)
```

## Arguments

path	Path to file MRREL.RRF.
uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.

## Value

Progress report of UMLS processing and upload.

## Examples

```
## Not run:
mrrel_upload(path = 'dictionaries/MRREL.RRF', uri_fun = mongo_uri_standard, user = 'John',
password = 'db_password_1234', host = 'server1234', port = NA, database = 'TEST_PROJECT')

## End(Not run)
```

---

`negex`*Negex data Apache License 2.0*

---

**Description**

Negex data Apache License 2.0

**Usage**

```
data(negex)
```

**Format**

An object of class 'data.frame'.

**Source**

[Google Code Archive](#)

**References**

Chapman et al. (2013) Stud Health Technol Inform 192:677-681 ([PubMed](#))

**Examples**

```
data(negex)
```

---

`negex_upload`*Upload NegEx*

---

**Description**

Prepares and uploads NegEx negation lexicon. It is not absolutely required for CEDARS to function but in practice will improve search accuracy for most applications.

**Usage**

```
negex_upload(  
  uri_fun,  
  user,  
  password,  
  host,  
  replica_set,  
  port,  
  database,  
  selected_model_path = NA  
)
```

**Arguments**

uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.
selected_model_path	Path to NLP model file.

**Value**

Confirmation of upload.

**Examples**

```
## Not run:
negex_upload(uri_fun = mongo_uri_standard, user = 'John', password = 'db_password_1234',
             host = 'server1234', port = NA, database = 'TEST_PROJECT', NA)

## End(Not run)
```

---

post\_wrapper

---

*Wrap the post\_data() Function*


---

**Description**

Posts results of human reviewer annotation to MongoDB. Uses DB credentials pre-loaded in the main environment. For use with Shiny or REST POST (latter yet to be implemented).

**Usage**

```
post_wrapper(
  database,
  end_user,
  end_user_password,
  position,
  event_date,
  pt_comments,
  ldap = FALSE
)
```

**Arguments**

database	MongoDB database.
end_user	CEDARS end user name.
end_user_password	CEDARS end user password.
position	Sentence position within the sequence of selected sentences for a given patient.
event_date	Date of clinical event as determined by human reviewer.
pt_comments	Patient-specific comments from the reviewer.
ldap	Is LDAP authentication being used? If so, password will not be checked and access will be granted automatically.

**Value**

No return value, called to post data.

**Examples**

```
## Not run:
post_wrapper(database = 'TEST_PROJECT', end_user = 'John', end_user_password = 'db_password_1234',
position = NA, event_date = NA, pt_comments = 'This is a comment')

## End(Not run)
```

---

pre\_search

---

*Execute Search on a Set of Records*


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**Description**

Batches a keyword/CUI search for a cohort of patients. Useful to speed up the process by end users, since search results will be pre-populated. Locks each record before proceeding with search on existing NLP annotations. Patient records with no matching sentences or a known event date at or before the earliest matching sentence will be marked as reviewed. The latter assumes the query orders to skip sentences after events.

**Usage**

```
pre_search(
  patient_vect = NA,
  uri_fun,
  user,
  password,
  host,
  replica_set,
  port,
  database
)
```

**Arguments**

patient_vect	Vector of patient ID's. Default is NA, in which case all unlocked records will be searched.
uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.

**Value**

No return value, called to execute a query in the database.

**Examples**

```
## Not run:
pre_search(patient_vect = NA, uri_fun = mongo_uri_standard, user = 'John',
password = 'db_password_1234', host = 'server1234', database = 'TEST_PROJECT')

## End(Not run)
```

---

save\_credentials

---

*Save MongoDB Credentials*


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**Description**

Saves MongoDB credentials as 'db\_credentials.Rdata' and Shiny app file as 'app.R'. Those two files should be copied to the Shiny Server app directory. Needed only if using Shiny Server; credentials are entered in the command line for local app use.

**Usage**

```
save_credentials(
  user,
  password,
  host,
  replica_set,
  port,
  database,
  LDAP,
  destination_path = getwd()
)
```

**Arguments**

user	MongoDB user name.
password	MongoDB user password.
host	MongoDB server host.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.
LDAP	is LDAP being used? In this case, CEDARS will not prompt for user ID/password and a check will NOT be made on the users table. Access will be granted, relying on LDAP authentication. Annotations will be stamped with LDAP user name.
destination_path	Folder where the files should be saved. Default is working directory.

**Value**

No return value, saves DB administrator credentials in local folder.

**Examples**

```
## Not run:
save_credentials(user = 'John', password = 'db_password_1234', host = 'server1234',
database = 'myDB', LDAP = FALSE, destination_path = getwd())

## End(Not run)
```

---

save\_query

---

*Save Search Query*


---

**Description**

Saves the search query. The query consists of keywords/UMLS concept unique identifiers (CUI's), boolean elements and other operators ('AND', 'OR', '!', '(', or ')').

**Usage**

```
save_query(
  uri_fun,
  user,
  password,
  host,
  replica_set,
  port,
  database,
  search_query,
  use_negation,
  hide_duplicates,
  skip_after_event,
  tag_query = NA
)
```

**Arguments**

uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.
search_query	Medical corpus query containing keywords/CUI's, boolean elements and other operators ('AND', 'OR', '!', '(', or ')').
use_negation	Should negated items be ignored in the keyword/concept search?
hide_duplicates	Should duplicated sentences be removed for search results?
skip_after_event	Should sentences occurring after recorded clinical event be skipped?
tag_query	List with 2 sublists, namely "include" and "exclude", indicating matching strings for metadata tag parameters.

**Value**

Confirmation that requested operation was completed, or error message if attempt failed.

**Examples**

```
## Not run:
save_query(uri_fun = mongo_uri_standard, user = 'John', password = 'db_password_1234',
host = 'server1234', port = NA, database = 'TEST_PROJECT', search_query = 'thrombosis AND venous',
use_negation = TRUE, hide_duplicates = TRUE, skip_after_event = TRUE,
tag_query = list(exact = FALSE, nlp_apply = FALSE, include = list(text_tag_1 = c("admission"),
text_tag_2 = c("impression", "plan")), exclude = NA))

## End(Not run)
```

---

save\_tags

---

*Save Document Tags*


---

**Description**

Save name of EHR document metadata tags. Individual notes or parts of notes can be labelled with up to 10 tags, typically the patient's name at the time, the type of note, the note section, the author, etc. Tags are not mandatory.

**Usage**

```
save_tags(uri_fun, user, password, host, replica_set, port, database, tag_vect)
```



**Arguments**

uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.
tag_vect	Character vector of 10 tag names.

**Value**

MongoDB operation results.

**Examples**

```
## Not run:
save_tags(uri_fun = mongo_uri_standard, user = 'John', password = 'db_password_1234',
host = 'server1234', port = NA, database = 'TEST_PROJECT',
tag_vect = c('note_type', 'note_section', 'author', 'patient_name', NA, NA, NA, NA, NA, NA))

## End(Not run)
```

---

simulated_patients	<i>Simulated patient data GPL-3 license</i>
--------------------	---

---

**Description**

Simulated patient data GPL-3 license

**Usage**

```
data(simulated_patients)
```

**Format**

An object of class 'data.frame'.

**Examples**

```
data(simulated_patients)
```

---

start_local	<i>Start CEDARS Locally</i>
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---

### Description

Starts CEDARS locally from RStudio. This is a functional approach and is easier to implement than a full-fledged Shiny Server. Multiple users can access the same CEDARS project on the MongoDB server using separate local R sessions, however in that case MongoDB credentials would have to be shared to all. The best option for multi-user implementations is to use Shiny Server.

### Usage

```
start_local(user, password, host, replica_set, port, database)
```

### Arguments

user	DB user name.
password	DB password.
host	Host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.

### Value

Launches the CEDARS Shiny app locally (on the desktop computer).

### Examples

```
## Not run:
start_local(user = 'John', password = 'db_password_1234', host = 'server1234', port = NA,
database = 'myDB')

## End(Not run)
```

---

terminate_project	<i>Terminate CEDARS Project</i>
-------------------	---------------------------------

---

### Description

Everything is removed, including dictionaries. MongoDB account used must have sufficient privileges.

**Usage**

```

    terminate_project(
        uri_fun,
        user,
        password,
        host,
        replica_set,
        port,
        database,
        fast = FALSE
    )

```

**Arguments**

uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.
fast	If TRUE, delete everything without asking security questions.

**Value**

Confirmation that requested operation was completed, or error message if attempt failed.

**Examples**

```

## Not run:
terminate_project(uri_fun = mongo_uri_standard, user = 'John', password = 'db_password_1234',
  host = 'server1234', port = NA, database = 'TEST_PROJECT')

## End(Not run)

```

---

unlock_user	<i>Unlock User-Specific Records Removes any pending lock(s) for a specific user. Normally there should not be more than one record locked per user at any given time, but if there were more than one, i.e. DB corruption, all locks would be lifted at once.</i>
-------------	---

---

**Description**

Unlock User-Specific Records Removes any pending lock(s) for a specific user. Normally there should not be more than one record locked per user at any given time, but if there were more than one, i.e. DB corruption, all locks would be lifted at once.

**Usage**

```
unlock_user(
    uri_fun,
    user,
    password,
    host,
    replica_set,
    port,
    database,
    end_user
)
```

**Arguments**

uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.
end_user	CEDARS end user.

**Value**

No return value, unlocks alls records for a specific user in the database.

**Examples**

```
## Not run:
unlock_user(uri_fun = mongo_uri_standard, user = 'John', password = 'db_password_1234',
  host = 'server1234', port= NA, database = 'TEST_PROJECT', end_user = 'Mike')

## End(Not run)
```

---

upload\_events

---

*Upload Event Data*


---

**Description**

Uploads event dates for patients already in the patient list. Useful when some events have already been documented before running CEDARS, for example as a second-line method to catch events missed with a different approach. Only event dates for existing records are altered, missing patient records are not added!

**Usage**

```
upload_events(
  uri_fun,
  user,
  password,
  host,
  replica_set,
  port,
  database,
  patient_ids,
  event_dates
)
```

**Arguments**

uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.
patient_ids	Vector of patient ID's.
event_dates	Vector of clinical event dates.

**Value**

Objects of class character, reporting on completed event uploads.

**Examples**

```
## Not run:
upload_events(uri_fun = mongo_uri_standard, user = 'John', password = 'db_password_1234',
  host = 'server1234', port = NA, database = 'TEST_PROJECT', patient_ids = ids, event_dates = events)

## End(Not run)
```

---

upload_notes	<i>Upload Notes to Database</i>
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---

**Description**

Allows user to populate notes in database from dataframe; could be easily inserted into wrapper batch function to serially download from other DB etc. Notes dataframe must contain: 'patient\_id', 'text\_id' (a unique identifier for each text segment), along with 'text', 'text\_date', 'doc\_id' (designates unique EHR document) and ideally 'text\_sequence' which indicates order of text section within document. 'doc\_section\_name' along 'text\_tag\_1' to 'text\_tag\_10' are optional. 'text\_date' must be in format '%Y-%m-%d'!

**Usage**

```
upload_notes(uri_fun, user, password, host, replica_set, port, database, notes)
```

**Arguments**

uri_fun	Uniform resource identifier (URI) string generating function for MongoDB credentials.
user	MongoDB user name.
password	MongoDB user password.
host	MongoDB host server.
replica_set	MongoDB replica set, if indicated.
port	MongoDB port.
database	MongoDB database name.
notes	Dataframe of EHR documents with metadata. The documents can consist of full notes or note subsections.

**Value**

Confirmation that requested operation was completed, or error message if attempt failed.

**Examples**

```
## Not run:  
upload_notes(uri_fun = mongo_uri_standard, user = 'John', password = 'db_password_1234',  
host = 'server1234', port = NA, database = 'TEST_PROJECT', notes = simulated_patients)  
  
## End(Not run)
```

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