Geist

A multimodal data transformation, query, and reporting language

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Table of contents

1. Welcome to Geist documentation	3
1.1 Features	3
1.2 Demo for SciPy 2024	3
2. Setup	4
3. Geist Templates	5
3.1 Geist Templates	5
3.2 Tags	7
4. CLI	19
4.1 Command report	19
4.2 Command create	21
4.3 Command destroy	23
4.4 Command export	24
4.5 Command graph	25
4.6 Command load	26
4.7 Command query	27
5. Python API	29
5.1 Class Connection	29
5.2 Functions	40
6. Changelog	51

1. Welcome to Geist documentation

Geist is a new templating language for declarative data manipulation, query, and report generation. Building on the Jinja2 template engine, Geist is designed to support diverse data backends and query engines via predefined tags and filters, and may be extended with custom tags. A single Geist template may include multiple queries expressed in different languages, e.g. SQL and SPARQL, to leverage the strengths of each for clarity and ease of maintenance. Because Geist both can generate reports in diverse formats and perform inserts and updates on new or existing databases during template expansion, Geist templates may orchestrate data extraction, transformation, and load operations spanning multiple tools and data storage systems. The Geist Python package can be installed easily and accessed via the command line. If your dataset is stored in DuckDB and SPARQL queries are more suitable for your problem, then Geist might be for you! Check out our Poster for SciPy 2024!

At the moment, Geist supports DuckDB and RDFLib. More types of data backends will be available in the near future.

1.1 Features

Both CLI and Python API provide the following features:

• report feature: expand a report using dataset(s)

• create feature: create a new dataset

• destroy feature: delete a dataset

• export feature: export a graph

• graph feature: visualize a dataset

• load feature: import data into a dataset

 \bullet $\,$ query feature: perform a query on a dataset

1.2 Demo for SciPy 2024

A Geist report that employs two different query languages. We demonstrate how Geist can be used to extract triples from a relational database, store them as a RDF dataset, and perform SPARQL queries on it. Instead of purely in-memory operations, Geist can be used to migrate data. With the hamming numbers dataset stored in DuckDB as an input, we generate a report to describe the original dataset and the subgraph extracted via SQL and SPARQL queries using a single Geist script.

2. Setup

Before installing Geist, please make sure Graphviz is installed.

Example: GitHub Codespaces

sudo apt-get update && sudo apt-get install -y graphviz graphviz-dev

Example: Google Colab (Jupyter Notebook)

apt install libgraphviz-dev

Install Geist:

pip install geist-p

To check Geist is working, run geist in the command line. You should get the following output:

```
Usage: geist [OPTIONS] COMMAND [ARGS]...

Options:
--help Show this message and exit.

Commands:
create Create a new dataset
destroy Delete a dataset
export Export a dataset
graph Visualize a dataset
load Import data into a dataset
query Perform a query on a dataset
report Expand a report using dataset(s)
```

3. Geist Templates

3.1 Geist Templates

3.1.1 What is a Geist template?

A Geist template is a text file without a specific extension requirement although adding a <code>.geist</code> extension is recommended. It is an extension of a Jinja template, therefore it follows the default Jinja delimiters:

- {% ... %} for Statements
- $\{\{\ldots\}\}$ for Expressions to print to the template output
- $\{\# \dots \#\}$ for Comments not included in the template output

3.1.2 How to write a Geist template?

A Geist template relies on tags and filters.

Tags

Tags are used within the statements, i.e., $\{\% \dots \%\}$. There are two types of tags, StandaloneTag and ContainerTag. While the StandaloneTag does not require a closing tag, the ContainerTag does. Besides the Jinja predefined tags (e.g., for), Geist supports the following tags:

StandaloneTag:

- destroy
- graph
- graph2
- use

ContainerTag:

- create
- load
- query
- component
- map
- html
- img
- table

Custom tags can be defined through files with the use tag.

Filters

Filters are used to modify variables. Each filter can only take one variable as input. Multiple filters can be applied to a single variable in sequence. For example, $\{\{var|filter1|filter2|filter3\}\}$ denotes the variable var will be processed through filter1 first, then filter2, and filter3 at the end.

Besides the Jinja predefined filters, Geist supports the following filters:

- head: extract the first 5 rows of a Pandas data frame
- csv2df: convert a CSV string to a Pandas data frame
- ullet dict2df: convert a dictionary to a Pandas data frame
- json2df: convert a JSON string to a Pandas data frame
- json2dict: convert a JSON string to a dictionary
- df2json: convert a Pandas data frame to a JSON string
- df2htmltable: convert a Pandas data frame to an HTML table
- escape_quotes: escape both double and single quotation
- process_str_for_html: preprocess a string to be displayed within an HTML document, e.g., replace < with <

3.1.3 How to execute (expand) a Geist template?

CLI Python API

report command can expand a report (Geist template) using dataset(s).

Here are options of the report command:

```
Usage: geist report [OPTIONS]

Expand a report using dataset(s)

Options:
-ifile, --inputfile FILENAME remplate to expand [required]
-oroot, --outputroot TEXT expanded
-oroot, --outputroot TEXT expanded
-oroot, --outputroot TEXT rexpanded
-oroot, --outputroot TEXT rexpanded
-oroot, --outputroot TEXT rexpanded
-oroot, --outputroot TEXT rexpanded
-oroot, --outputroot TEXT replate to expand [required]
-oroot, --outputroot TEXT remplate to expand [required]
-oroot, --outputroot TEXT remplate to expand [required]
-oroot, --outputroot TEXT replate to expand [required]
-oroot, --outputroot TEXT remplate to expand [required]
-oroot, --outputroot, --outputroot,
```

Example 1: expand a report from stdin Y

Example 2: expand a report from a file \(\sigma \)

3.2 Tags

3.2.1 Tag create

The create tag creates a dataset based on the given string. By default, the given string is a file path. However, it can be updated by setting the isfilepath field to False. Here are parameters of the create tag:

Name	Description
dataset	Name of RDF dataset to create (by default, kb)
datastore	Data backend. duckdb and rdflib are available for now. (by default, rdflib)
inputformat	Format of the file to be loaded as triples (by default, json-ld). It has to be one of { xml, n3, turtle, nt, pretty-xml, trix, trig, nquads, json-ld, hext, csv }
infer	Inference to perform on update choosing from { none, rdfs, owl, rdfs_owl} (by default, none). Please check OWL-RL document for detailed information.
isfilepath	A bool value to denote if the given data is a file path or not (by default: True, which denotes the given data is a file path)
table	Table name. Available for duckdb data backend only.
colnames	Column names of triples with the format of [[subject1, predicate1, object1], [subject2, predicate2, object2],] when the input format is csv (by default, None). Available for rdflib data backend only.

Example 1: the given string is not a file path

Here is the test.nt file: <http://example.com/drewp> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://xmlns.com/foaf/0.1/Person> . <http://example.com/drewp> <http://example.com/says> "Hello World" . Code: {% create "test", datastore="rdflib", inputformat="nt", isfilepath=True %} test.nt {% endcreate %}

3.2.2 Tag destroy

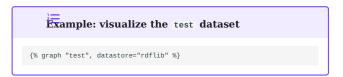
Name	Description
dataset	Name of RDF dataset to be removed (default $ \mbox{kb} \mbox{)}$
datastore	Data backend. duckdb and rdflib are available for now. (by default, rdflib)
quiet	Suppress error messages if the provided dataset does not exist



3.2.3 Tag graph

The $\ensuremath{\mathsf{graph}}$ tag visualizes a dataset. Here are parameters of the $\ensuremath{\mathsf{graph}}$ tag:

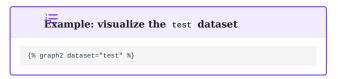
NT	December 11 and
Name	Description
dataset	Name of RDF dataset to be
	visualized (default kb)
datastore	Data backend. duckdb and
	rdflib are available for now. (by
	default, rdflib)
rankdir	Direction of the graph (default
	TB): TB Or BT Or LR Or RL
mappings	File of the mappings to shorten
	text (str): path of a JSON file,
	where the key is the original text
	and the value is the shorter text.
on	Column(s) to be mapped (default
	None, which means all columns
	will be mapped)
samecolor	A bool value to denote if all
	edges are filled with the same
	color (default: True)



3.2.4 Tag graph2

The graph2 tag visualizes a dataset. It does not rely on the PyGraphviz pacakge, which makes it more flexible compared to the graph tag. Here are parameters of the graph2 tag:

Name	Description
dataset	Name of RDF dataset to be visualized (default kb)
rankdir	Direction of the graph (default TB): TB or BT or LR or RL
mappings	File of the mappings to shorten text (str): path of a JSON file, where the key is the original text and the value is the shorter text.
on	Column(s) to be mapped (default None, which means all columns will be mapped)
	Graph attributes of Graphviz



3.2.5 Tag load

The load tag imports data into a dataset. Here are parameters of the load tag:

Name	Description
dataset	Name of RDF dataset to be removed (default \mbox{kb})
datastore	Data backend. duckdb and rdflib are available for now. (by default, rdflib)
inputformat	Format of the file to be loaded as triples (default json-ld)
isfilepath	A bool value to denote if the given data is a file path or not (default True, which denotes the given data is a file path)
table	Table name to be loaded. Available for duckdb data backend only.
colnames	Column names of triples with the format of [[subject1, predicate1, object1], [subject2, predicate2, object2],] when the input format is csv. Available for rdflib data backend only.

Example: load a file into the test dataset

{% load "test", datastore="rdflib" %} test_add.jsonld {% endload %}

3.2.6 Tag query

The query tag performs a query on a dataset and returns a Pandas DataFrame. Here are parameters of the query tag:

Name	Description
dataset	Name of a dataset to query (default \mbox{kb})
datastore	Data backend. duckdb and rdflib are available for now. (by default, rdflib)
isfilepath	A bool value to denote if the given data is a file path or not (default True, which denotes the given data is a file path)

Example 1: the given string is not a file path

Example 2: the given string is a file path

```
\mbox{\ensuremath{\$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}}\mbox{\ensuremath{$\#$}
```

Here is the query_file's content:

3.2.7 Tag component

The component tag finds connected components in a graph. It will return a dict where the key is the index of a component (e.g., 0, 1, 2, ...) and the value is a connected component. By default, the given string is a file path.

However, it can be updated by setting the isfilepath field to False. Here are parameters of the component tag:

Name	Description
isfilepath	A bool value to denote if the given data is a file path or not (by default: True, which denotes the given data is a file path)
edges	A list of list. [[start_node1, end_node1], [start_node2, end_node2],] or [[start_node1, end_node1, label1], [start_node2, end_node2, label2],] where these items are column names

3.2.8 Tag map

The map replaces the original string (JSON string) on selected columns (if provides) with the shorter ones based on the given mappings. By default, the given string is a file path. However, it can be updated by setting the <code>isfilepath</code> field to False. A Pandas DataFrame will be returned. Here are parameters of the map tag:

Name	Description
isfilepath	A bool value to denote if the given data is a file path or not (by default: True, which denotes the given data is a file path)
mappings	File of the mappings to shorten text (str): path of a JSON file, where the key is the original text and the value is the shorter text.
on	A column or a list of selected columns. All columns will be selected by default (None)

```
"v1": {"0":"test_a1", "1":"test_b1", "2":"test_c1"},
   "v2": {"0":"test_a2", "1":"test_b2", "2":"test_c2"),
   "v3": {"0":"test_a3", "1":"test_b3", "3":"test_c3"}
}
```

```
### apping.json

{"test_": ""}
```

```
Example 1: replace all columns

{%- map mappings="mappings.json" as res %} data.json {% endmap %} {{ res }}

Expected output:

v1,v2,v3
a1,a2,a3
b1,b2,b3
c1,c2,c3
```

```
% map mappings="mappings.json", on=["v1","v2"] as res %} data.json {%
endmap %}
{{ res }}

Expected output:

v1,v2,v3
a1,a2,test_a3
b1,b2,test_b3
c1,c2,test_c3

If only "v1" column need to be replaced, you can replace
on=["v1","v2"] with on="v1".
```

3.2.9 Tag html

The $\,\mbox{html}$ tag formats and saves the string as a HTML file. Here is a parameter of the $\,\mbox{html}$ tag:

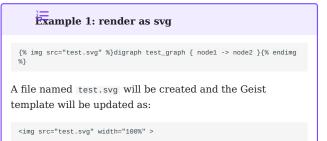
Name	Description
path	Path of the HTML file to be saved. By default, report.html

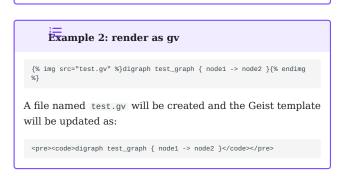


3.2.10 Tag img

The $\,\,\mathrm{img}\,$ tag renders Graphviz code as an image and embeds it into HTML. Here are parameters of the $\,\mathrm{img}\,$ tag:

Name	Description
src	Path of the rendered image to be saved. Various extensions are supported. Check PyGraphviz Docs for the whole list. Note: dot or gv will show code directly.
	Attributes of the HTML or the HTML tag





3.2.11 Tag table

The table tag embeds query results to HTML as a table. Please make sure the stdin is a JSON string. Here are parameters of the table tag:

Name	Description
mappings	File of the mappings to shorten text (str): path of a JSON file, where the key is the original text and the value is the shorter text.
on	A column or a list of selected columns. All columns will be selected by default (None)

Example: embed query results as a table

It can also be done with the df2htmltable filter:

3.2.12 Tag use

The use tag can be used to define custom tags. Here is a parameter of the use tag:

Name	Description
filepath	Path of a file to define custom tags

Here is the structure of tags to be defined within the file at the path filepath:

```
{% template TAG_NAME PARAM1 PARAM2 %}
   CONTENT
{% endtemplate %}
```

You need to update TAG_NAME, PARAM1, PARAM2, and CONTENT based on your use case. TAG_NAME must be unique, which means you cannot define multiple tags with the same name. You can have any number of parameters, which means {% template TAG_NAME %} and {% template TAG_NAME PARAM1 PARAM2 PARAM3 %} are also valid. Nested tags are also supported, which means you can put another tag within the CONTENT part.

Example: define predicate_term and format_output tags

- Write {% use "templates.geist" %} at the beginning of a
 Geist template, where you want to use the custom tags, i.e.,
 predicate_term and format_output tags.
- Define custom tags in file with the path of "templates.geist":

```
{% template predicate_term %}says{% endtemplate %}

{% template format_output person sent %}
   {{ person }} {% predicate_term %} {{sent}}

{% endtemplate %}
```

3. Use custom tags in the Geist template as other predefined tags (e.g., create)

4. Expected output:

```
<http://example.com/test1> says Hello World.
<http://example.com/test2> says What a Nice Day.
```

4. CLI

4.1 Command report

report command can expand a report (Geist template) using dataset(s).

Here are options of the *report* command:

```
Usage: geist report [OPTIONS]

Expand a report using dataset(s)

Options:
-ifile, --inputfile FILENAME
-oroot, --outputroot TEXT
-oroot, --outputroot TEXT
-so, --suppressoutput BOOLEAN
-a, --args <TEXT TEXT>...

Path of the file containing the report template to expande [required]
Path of the directory to store the expanded report (default: current directory)

Suppress output or not (default: False)
Arguments to be passed to the report template, e.g., (arg, value) indicates that {arg}} in the report template will be replaced by value

Show this message and exit.
```

Example 1: expand a report from stdin

Example 2: expand a report from a file

```
geist report --inputfile report.geist
```

Here is the report.geist file:

Example 3: expand a report from a file with external arguments

```
geist report --inputfile report.geist --args sentence "Hello World" --args feeling Happy
```

Here is the report.geist file:

4.2 Command create

The *create* command has two subcommands, both of which create a new dataset on disk. The dataset name <code>:memory:</code> is a reserved value for datasets that exist only in memory and is not allowed in the CLI.

```
Usage: geist create [OPTIONS] COMMAND [ARGS]...

Create a new dataset

Options:
--help Show this message and exit.

Commands:
duckdb Create a new SQL dataset using DuckDB
rdflib Create a new RDF dataset using RDFLib
```

eist create duckdb [OPTIONS]

```
Usage: geist create duckdb [OPTIONS]

Create a new SQL dataset using DuckDB

Options:
-d, --dataset TEXT
-ifile, --inputfile FILENAME
-iformat, --inputformat [csv|json]

Format of the file to be loaded as a Pandas
DataFrame [required]
-iformat, --inputformat [csv|json]

Format of the file to be loaded as a Pandas
DataFrame (default csv)
-t, --table TEXT

Name of the table to be created (default
"df")
--help
Show this message and exit.
```

Example 1: create a test SQL dataset from stdin

```
geist create duckdb --dataset test --inputformat csv --table df << __END_INPUT__
v1,v2,v3
1,2,3
4,5,6
7,8,9
__END_INPUT__
```

Example 2: create a test dataset from a file

Here is the test.csv file:

```
v1, v2, v3
1, 2, 3
4, 5, 6
7, 8, 9
```

Code:

geist create duckdb --dataset test --inputfile test.csv --inputformat csv --table df

geist create rdflib [OPTIONS]

```
Create a new RDF dataset

Options:
-d, --dataset TEXT Name of RDF dataset to create (default "kb")
-ifile, --inputfile FILENAME [required]
-iformat, --inputformat [xml|n3|turtle|nt|pretty-xml|trix|trig|nquads|json-ld|hext|csv]
Format of the file to be loaded as triples (default json-ld)
--colnames TEXT Column names of triples with the format of [[subject1, predicate1, object1], [subject2, predicate2, object2], ...] when the input format is csv
--infer [none|rdfs|owl|rdfs_owl]
Inference to perform on update [none, rdfs, owl, rdfs_owl] (default "none")
--help Show this message and exit.
```

Example 1: create a test RDF dataset from stdin

```
geist create rdflib --dataset test --inputformat nt --infer none << __END_INPUT__

<http://example.com/drewp> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://xmlns.com/foaf/0.1/Person> .

<http://example.com/drewp> <http://example.com/says> "Hello World" .

_END_INPUT__
```

Example 2: create a test dataset from a file

Here is the test.nt file:

Code:

geist create rdflib --dataset test --inputfile test.nt --inputformat nt --infer none

4.3 Command destroy

destroy command can delete a dataset. The .duckdb or the .pkl file of the corresponding dataset will be discarded.

There are two subcommands for destroy:

```
Usage: geist destroy [OPTIONS] COMMAND [ARGS]...

Delete a dataset

Options:
--help Show this message and exit.

Commands:
duckdb Delete a SQL dataset
rdflib Delete an RDF dataset
```

geist destroy duckdb [OPTIONS]

```
Usage: geist destroy duckdb [OPTIONS]

Delete a SQL dataset

Options:
-d, --dataset TEXT Name of SQL dataset to be removed (default "kb")
-q, --quiet Suppress error messages if the provided dataset does not exist
--help Show this message and exit.
```

Example: delete the test dataset

```
geist destroy duckdb --dataset test
```

The .geistdata/duckdb/test.duckdb file will be removed after this operation. By default, you will get an error message if the provided dataset (in this case, it is the test dataset) does not exist. To suppress this error message, you can add --quiet:

geist destroy duckdb --dataset test --quiet

geist destroy rdflib [OPTIONS]

```
Usage: geist destroy rdflib [OPTIONS]

Delete an RDF dataset

Options:
-d, --dataset TEXT Name of RDF dataset to be removed (default "kb")
-q, --quiet Suppress error messages if the provided dataset does not exist
--help Show this message and exit.
```

Example: delete the test dataset

```
geist destroy rdflib --dataset test
```

The .geistdata/rdflib/test.pkl file will be removed after this operation. By default, you will get an error message if the provided dataset (in this case, it is the test dataset) does not exist. To suppress this error message, you can add --quiet:

geist destroy rdflib --dataset test --quiet

4.4 Command export

export command can export a dataset.

There are two subcommands for export:

```
Usage: geist export [OPTIONS] COMMAND [ARGS]...

Export a dataset

Options:
--help Show this message and exit.

Commands:
duckdb Export a SQL dataset
rdflib Export an RDF dataset
```

geist export duckdb [OPTIONS]

```
Usage: geist export duckdb [OPTIONS]

Export a SQL dataset

Options:
-d, --dataset TEXT
Name of SQL dataset to be exported (default "kb")

-oroot, --outputroot TEXT
Path of the directory to store the exported table (default: current directory). If the given path (i.e., -outputfile) is None or a relative path, it will be ignored.

-ofile, --outputfile TEXT
Path of the file to store the exported table (default: None)

-oformat, --outputformat [csv|json]
Format of the exported table (default csv)
Name of the table to be exported (default "df")

--help
Show this message and exit.
```

Example: export the df table in test dataset

By default, the exported table will be printed in terminal:

geist export duckdb --dataset test --table df

eist export rdflib [OPTIONS]

Example: export the test dataset

By default, the exported triples will be printed in terminal:

geist export rdflib --dataset test

4.5 Command graph

graph command can visualize a dataset. Only rdflib is supported for now.

```
Usage: geist graph [OPTIONS] COMMAND [ARGS]...

Visualize a dataset

Options:
--help Show this message and exit.
```

Usage: geist graph rdflib [OPTIONS] Visualize an RDF dataset Options: -d, --dataset TEXT -r, --rankdir [TB|BT|LR|RL] BY or LR or RL -m, --mappings TEXT -on, --on TEXT -on, --on TEXT -sc, --samecolor -oroot, --outputroot TEXT -ofile, --outputfel TEXT -ofile, --outputformat [none] svg|png|gv] -oformat, --outputformat [none] svg|png|gv] -oformat, --outputformat [none] svg|png|gv] Fixample: visualize the test dataset Laxample: visualize the test dataset

geist graph rdflib --dataset test --outputformat svg

4.6 Command load

load command can import data into an existing dataset.

There are two subcommands for load:

```
Usage: geist load [OPTIONS] COMMAND [ARGS]...

Import data into a dataset

Options:
--help Show this message and exit.

Commands:
duckdb Import data into a SQL dataset
rdflib Import data into a RDF dataset
```

geist load duckdb [OPTIONS]

```
Usage: geist load duckdb [OPTIONS]

Import data into a SQL dataset

Options:
-d, --dataset TEXT Name of SQL dataset to load a file (default "kb")
-ifile, --inputfile FILENAME [required]
-iformat, --inputformat [csv|json]
Format of the file to be loaded as a table (default csv)
-t, --table TEXT Name of the table to be created [required]
-help Show this message and exit.
```

Example: load a file into the test dataset

geist load duckdb --dataset test --inputfile test_add.csv --inputformat csv --table df

eist load rdflib [OPTIONS]

Here are options of the *load* command:

```
Usage: geist load rdflib [OPTIONS]

Import data into a RDF dataset

Options:
-d, --dataset TEXT
Name of RDF dataset to load a file (default "kb")
-ifile, --inputfile FILENAME
-iformat, --inputformat [xml|n3|turtle|nt|pretty-xml|trix|trig|nquads|json-ld|hext|csv]
Format of the file to be loaded as triples
(default "kb")

--colnames TEXT
Column names of triples with the format of
[[subject1, predicate1, object1], [subject2, predicate2, object2], ...] when the input
format is csv
--help
Show this message and exit.
```

Example: load a file into the test dataset

geist load rdflib --dataset test --inputfile test_add.jsonld

4.7 Command query

query command can perform a query on a dataset.

There are two subcommands for query:

```
Usage: geist query [OPTIONS] COMMAND [ARGS]...

Perform a query on a dataset

Options:
--help Show this message and exit.

Commands:
duckdb Perform a SQL query on a dataset
rdflib Perform a SPARQL query on a dataset
```

geist query duckdb [OPTIONS]

```
Usage: geist query duckdb [OPTIONS]

Perform a SQL query on a dataset

Options:
-d, --dataset TEXT

Name of RDF dataset to be queried (default "kb")

-ifile, --inputfile FILENAME

-oroot, --outputroot TEXT

Path of the directory to store the query results (default: current directory). If the given path (i.e., --outputfile) is None or a relative path, it will be ignored.

-ofile, --outputfile TEXT

-ofile, --outputfile TEXT

-ofile, --outputfile TEXT

Show this message and exit.
```

Example 1: all rows of the df table in test dataset from stdin

```
geist query duckdb --dataset test << __END_QUERY_

SELECT * FROM df

__END_QUERY__
```

Example 2: all rows of the test dataset from a query file

```
geist query duckdb --dataset test --inputfile query_file
```

Here is the query_file's content:

SELECT * FROM df

geist query rdflib [OPTIONS]

```
Usage: geist query rdflib [OPTIONS]

Perform a SPARQL query on a dataset

Options:
-d, --dataset TEXT Name of RDF dataset to be queried (default "kb")

-ifile, --inputfile FILENAME Specify either the path of the file containing the SPARQL query to execute or provide the SPARQL query itself via stdin [required]

-oroot, --outputroot TEXT Path of the directory to store the query results (default: current directory). If the given path (i.e., --outputfile) is None or a relative path, it will be ignored.

-ofile, --outputfile TEXT Path of the file to store the query results (default: None)

Show this message and exit.
```

Example 1: all triples of the test dataset from stdin

```
geist query rdflib --dataset test << _END_QUERY__

SELECT ?s ?p ?o
WHERE {
    ?s ?p ?o
}
ORDER BY ?s ?p ?o
_END_QUERY__
```

Example 2: all triples of the test dataset from a query file

```
geist query rdflib --dataset test --inputfile query_file
```

Here is the query_file's content:

5. Python API

5.1 Class Connection

 $\textbf{Connection} \ class \ can \ interact \ with \ a \ dataset \ with \ \textit{create} \ , \ \textit{close} \ , \ \textit{destroy} \ , \ \textit{export} \ , \ \textit{graph} \ , \ \textit{load} \ , \ \textit{and} \ \ \textit{query} \ \ \textit{methods}.$

5.1.1 What is a Connection class?

Approach 1: use the create function, then initialize the Connection class

A Connection class has three attributes:

Name	Туре	Description	Default
datastore	string	A backend datastore, i.e., rdflib or duckdb	[required]
dataset	string	Name of the dataset. Note that :memory: is a reserved value for datasets that exist only in memory	[required]
conn	object	A DuckPyConnection object OR a GeistGraph object	None

5.1.2 How to instantiate a Connection class?

If the dataset exists, the *Connection* class can be instantiated using its **connect** method:

 $\label{eq:connection} \mbox{$\#$ connection object to an existing dataset named test connection = ${\tt geist.Connection.connect(datastore='duckdb', dataset='test')}$

If the dataset does not exist, there are two approaches to create and connect:

monto franctica	create a new dataset	on diels on in	datastore: duckd	b datastore: rdflib		
reate function can d nemory.	create a new dataset	on disk or in	Key	Туре	Descript	tion
arameters description	on for <i>create()</i> :		table	string	Name of table to h	
Name	Туре	Description	I		created	
datastore	string	A backend	Key	Туре	Descript	tion
		datastore, i.e., rdflib or duckdb	colnames	string	Column i	
dataset	string	Name of the dataset to be created. Note that :memory: is a reserved value for	infer	string	Inference rl.readtl RDFSClose (https:// #Reasonie [rdfs_ow] Combined	hedocs.ioure.html; /www.w3.o ng_in_OW l](https
		datasets that exist only in				
		memory	I— Evample 1	: create a test SQL datase	t on	
inputfile	string	A file to be loaded	[requiredisk from	a string		
inputformat	string	Format of the file to be loaded	[required]	luckdb/test.duckdb file is creat nnection object is returned.	ted	
isinputpath	bool	True if the inputfile is the file path, otherwise the inputfile is the content		e(datastore='duckdb', dataset='test', inputformat="csv", isinputpath=False		
config	dict	A dictionary	see below			
		with configurations for certain	Example 2 disk from	: create a test SQL datase a file	t on	
		backend store	and a DuckDBPyCo Here is the test v1, v2, v3 1, 2, 3 4, 5, 6 7, 8, 9 Code: import geist # Create a DuckPyConn = geist.creat	onnection object e(datastore='duckdb', dataset='test', /", inputformat="csv", isinputpath=Tr		

Example 3: create a SQL dataset in memory from a string

A DuckDBPyConnection object is returned.

```
import geist

csv_str = """
v1,v2,v3
1,2,3
4,5,6
7,8,9
"""

# Create a DuckPyConnection object
conn = geist.create(datastore='duckdb', dataset=':memory:', inputfile=csv_str, inputformat="csv", isinputpath=False, config={"table": "df"})
```

Example 4: create a SQL dataset in memory from a file

A DuckDBPyConnection object is returned.

Here is the test.csv file:

```
V1, V2, V3
1, 2, 3
4, 5, 6
7, 8, 9
```

Code:

```
import geist

# Create a DuckPyConnection object
conn = geist.create(datastore='duckdb', dataset=':memory:',
inputfile="test.csv", inputformat="csv", isinputpath=True,
config={"table": "df"})
```

```
import geist

csv_str = """
v1,v2,v3
1,2,3
7,8,9
"""

# create a Connection object
conn = geist.create(datastore='duckdb', dataset=':memory:',
inputfile=csv_str, inputformat="csv", isinputpath=False,
config=("table": "df"))
connection = geist.Connection(datastore='duckdb', dataset=':memory:',
conn=conn)
```

Approach 2: use the create method of the Connection class

Description

Create method of the Connection class

create method of the *Connection* class creates a new dataset on disk or in memory. It is very similar to the create() function. The only difference is that the datastore and the dataset parameters do not need to be passed as they have already been specified while initialzing the *Connection* class.

Parameters description for create method of the Connection class:

Name	Туре	Description
inputfile	string	A file to be loaded
inputformat	string	Format of the file to be loaded
isinputpath	bool	True if the inputfile is the file path, otherwise the inputfile is the content
config	dict	A dictionary

with

configurations

for certain backend store

Description for the *config* parameter:

datastore: duckdb

Key

import geist

Key	Туре	Description
table	string	Name of the table to be created

Type

datastore: rdflib

colnames	string	Column names of triples with the format of [[subject1, predicate1, object1], [subject2, predicate2, object2],]
infer	string	Inference to perform on update, i.e., none, rdfs, owl, or rdfs_owl

see below
Example 1: create a test SQL dataset
from a string

Juckdb/test.duckdb file is created and a Connection instance is returned.

csv_str = """
v1,v2,v3
1,2,3
4,5,6
7,8,9
"""

Create a Connection instance
connection = geist.Connection(datastore='duckdb',
dataset='test')
connection.create(inputfile=csv_str, inputformat="csv",
isinputpath=False, config={"table": "df"})

Example 2: create a test SQL dataset from a file

The .geistdata/duckdb/test.duckdb file is created and a Connection instance is returned.

Here is the test.csv file:

```
v1,v2,v3
1,2,3
4,5,6
7,8,9
```

Code:

```
import geist

# Create a Connection instance
connection = geist.Connection(datastore='duckdb',
dataset='test')
connection.create(inputfile="test.csv", inputformat="csv",
isinputpath=True, config={"table": "df"})
```

Example 3: create a SQL dataset in memory from a string

A Connection instance is returned.

```
import geist

csv_str = """
v1,v2,v3
1,2,3
4,5,6
7,8,9
"""

# Create a Connection instance
connection = geist.Connection(datastore='duckdb',
dataset=':memory:')
connection.create(inputfile=csv_str, inputformat="csv",
isinputpath=False, config={"table": "df"})
```

Example 4: create a SQL dataset in memory from a file

A Connection instance is returned.

Here is the test.csv file:

```
v1,v2,v3
1,2,3
4,5,6
7,8,9
```

Code:

```
import geist
# Create a Connection instance
connection = geist.Connection(datastore='duckdb',
dataset=':memory:')
connection.create(inputfile="test.csv", inputformat="csv",
isinputpath=True, config={"table": "df"})
```

```
import geist

csv_str = """
v1,v2,v3
1,2,3
7,8,9
"""
```

```
# create a Connection object
connection = geist.Connection(datastore='duckdb', dataset=':memory:')
connection.create(inputfile=csv_str, inputformat="csv",
isinputpath=False, config={"table": "df"})
```

5.1.3 How to interact with a Connection class?

Once a Connection class is instantiated, we can interact with it using close, destroy, export, graph, load, and query methods.

close method

close method of the *Connection* class is to close the dataset connection, i.e., reset all attributes to None. No parameters are required.

Example: close the connection

Suppose connection is the instance of the *Connection* class.

Close the connection
connection.close()

all stroy method

destroy method of the *Connection* class is to delete the dataset and close the dataset connection.

Example: delete the dataset and close the connection

Suppose connection is the instance of the Connection class for a DuckDB dataset named test stored on disk. The following code will delete the .geistdata/duckdb/test.duckdb file.

Delete the dataset and close the connection connection.destroy()

export method

 \boldsymbol{export} method of the Connection class exports a dataset. It is very similar to the $\ensuremath{\,\text{export}(\,)\,}$ function. The only difference is that the $\mbox{datastore}$ and the $\mbox{dataset}$ parameters do not need to be passed as they have already been specified while initialzing the Connection class.

Parameters description for export method of the Connection class:

Name	Туре	Description
hasoutput	bool	True to export as a file or print it out
config	dict	A dictionary with configurations for certain backend store

Description for the ${\it config}$ parameter:

	datastore: duckdb	datastore: rdflib	
	Key	Туре	Description
	outputroot	string	Path of the directory to store the exported table
I	outputfile	string	Path of the file to store the exported table
[:	outputformat	string	Format of the exported table, i.e., 'csv' or 'json'
	table	string	Name of the table to be exported
	Key	Туре	Description
	outputroot	string	Path of the directory to store these exported triples
	outputfile	string	Path of the file to store these exported triples
	outputformat	string	Format of the exported triples, i.e., 'json-ld', 'n3', 'nquads', 'nt', 'hext', 'pretty-xml', 'trig', 'trix', 'turtle', 'longturtle', or 'xml'.

Example 1: export all rows of the df table in test dataset on disk

There exist a file with the path of .geistdata/duckdb/ test.duckdb. The following code returns a Pandas data frame named data.

import geist

Create a Connection instance
connection = geist.Connection.connect(datastore='duckdb',
dataset='test')
Export the df table of the test dataset
data = connection.export(hasoutput=False, config={'table': 'df'})

Example 2: export all rows of the df table in test dataset in memory

Suppose conn is a DuckPyConnection object points to a DuckDB dataset in memory. The following code returns a Pandas data frame named $\,$ data .

```
import geist

# Create a Connection instance
connection = geist.Connection(datastore='duckdb',
dataset=':memory:', conn=conn)
# Export the df table of the test dataset
data = connection.export( hasoutput=False, config={'table':
'df'})
```



graph method of the *Connection* class exports a dataset. Only rdflib is supported for now. It is very similar to the graph() function. The only difference is that the datastore and the dataset parameters do not need to be passed as they have already been specified while initialzing the *Connection* class.

Parameters description for $\operatorname{\operatorname{\it graph}}$ method of the $\operatorname{\it Connection}$ class:

Name	Туре	Description
datastore	string	A backend datastore, i.e., rdflib or duckdb
dataset	string OR GeistGraph object	Dataset to load an object: (1) A string indicates the name of the dataset stored on disk OR (2) a GeistGraph object for dataset in memory
hasoutput	bool	True to export as a file or print it out
config	dict	A dictionary with configurations for certain backend store

Description for the *config* parameter: Example 2: visualize the test dataset in datastore: rdflib Key **Type** Description **Default** a DuckPyConnection object points to a in memory. The following code rankdir Direction of 'TB' string st dataset as a graph and saves it as the graph: TB or BT or LR or RLimport geist File of the $No \mbox{ \# Create a Connection instance} \\ \mbox{connection = geist.Connection(datastore='duckdb',} \\$ mappings string mappings to dataset=':memory:', conn=conn' # Visualize the test dataset shorten text $\verb|connection.graph| (\verb|hasoutput=True|, config={"outputformats"}; \\$ ['svg']}) (str): path of a JSON file, where the key is the original text and the value is the shorter text None on string Column(s) to be mapped samecolor bool True to use the True same color for same edges, otherwise False outputroot string Path of the './' directory to store the graph outputfile Path of the file 'res' string without extension to store the graph outputformats list Format of the ['none'] graph: 'none' or 'svg' or 'png' or 'gv'

Example 1: visualize the test dataset on disk

There exist a file with the path of <code>.geistdata/duckdb/test.duckdb</code> . The following code visualizes the test dataset as a graph and saves it as the res.svg file.

import geist

Create a Connection instance
connection = geist.Connection.connect(datastore='duckdb',
dataset='test')

Visualize the test dataset
connection.graph(hasoutput=True, config={'outputformats':
['svg']})

lad method

 ${f load}$ method of the ${\it Connection}$ class imports data into an existing dataset on disk or in memory. It is very similar to the load() function. The only difference is that datastore, dataset, and inmemory parameters do not need to be passed as they have already been specified while initialzing the Connection class.

Parameters description for load method of the Connection class:

Example: load a table into the test dataset

There exist a file with the path of .geistdata/duckdb/ test.duckdb. The csv_str will be imported into the df table. Note that the order of table columns should be consistent with the imported data.

import geist csv_str = """ v1, v2, v3 1,1,1 3,3,3

Name	Туре	Description	De
inputfile	string	A file to be loaded	[re

Create a Connection instance connection = geist.Connection.connect(datastore='duckdb', dataset='test')
Load csv_str to the df table of the test dataset connection.load(inputfile=csv_str, inputformat='csv',
isinputpath=False, config={'table': 'df'})

inputformat Format of the [required] string file to be loaded True if the isinputpath bool [required] inputfile is the file path, otherwise the inputfile is the content config dict A dictionary see below with configurations for certain backend store

Description for the *config* parameter:

datastore: rdflib datastore: duckdb

Key	Туре	Description	Default
table	string	Name of the table to be loaded	[required]
Key	Туре	Description	Default
colnames	string	Column names of triples with the format of [[subject1, predicate1, object1], [subject2, predicate2, object2],]	<pre>[required] when inputformat ='Csv'</pre>

aery method

query method of the *Connection* class can query a dataset stored on disk or in memory. It is very similar to the query() function. The only difference is that the datastore and the dataset parameters do not need to be passed as they have already been specified while initialze the *Connection* class.

Parameters description for $\it query$ method of the $\it Connection$ class:

Example 2: all rows of the df table in test dataset on disk (query from a file)

There exist a file with the path of <code>.geistdata/duckdb/</code> test.duckdb . The following code returns a Pandas data frame named <code>res</code> with query results.

Here is the query.txt file:

SELECT * FROM df;

Code:

Name	Туре	Description	import geist
inputfile	string	File containing the query	<pre># Create a Connection instance connection = geist.Connection.connect(datastore='duckdb', dataset='test') # Query the df table of the test dataset</pre>
isinputpath	bool	True if the inputfile is the file path, otherwise the inputfile is the content	res = connection.query(inputfile="query.txt", isinputpath=True, hasoutput=False) Example 3: all rows of the df table in test dataset in memory (query from a string)
hasoutput	bool	True to store the query results as a CSV file or print them out	[required] ckPyConnection object points to a emory. The following code returns named res with query results.
config	dict	A dictionary with configurations when hasoutput=True	<pre>import geist # Create a Connection instance connection = geist.Connection(datastore='duckdb', dataset=':memory:', conn=conn) # Query the df table of the test dataset res = connection.query(inputfile="SELECT * FROM df;",</pre>
scription for the <i>con</i>	<i>fia</i> parameter:		isinputpath=False, hasoutput=False)

Description for the *config* parameter:

Key	Туре	Description	Default = Example 4: all rows of the df table in test
outputroot	string	Path of the	dataset in memory (query from a file)
		directory to store the query results	a DuckPyConnection object points to a in memory. The following code returns ame named res with query results.
outputfile	string	Path of the file to store the	None y.txt file:
		query results	SELECT * FROM df;

Example 1: all rows of the df table in test dataset on disk (query from a string)

There exist a file with the path of <code>.geistdata/duckdb/</code> test.duckdb . The following code returns a Pandas data frame named <code>res</code> with query results.

```
# Create a Connection instance
connection = geist.Connection.connect(datastore='duckdb',
dataset='test')
# Query the df table of the test dataset
res = connection.query(inputfile="SELECT * FROM df;",
isinputpath=False, hasoutput=False)
```

import geist

Code:

import geist

Create a Connection instance
connection = geist.Connection(datastore='duckdb',
dataset=':memory:', conn=conn)
Query the df table of the test dataset
res = connection.query(inputfile="query.txt", isinputpath=True,
hasoutput=False)

Example 1: expand a report from a string

import geist

report = """

5.2 Functions

5.2.1 Function report

report function can expand a report (Geist template) using dataset(s).

Parameters descriptio	n for report():		{% create "test", datastore="rdflib", inputformat="nt", isfilepath=False %} >><a ,="" all_triples<="" as="" datastore="rdflib" href="h</th></tr><tr><td>Name</td><td>Туре</td><td>Description</td><td><pre>pe syntax-ns#type> <http://xmlns.com/foaf/0.1/Person> .</td></tr><tr><td>inputfile</td><td>string</td><td>A report to be expanded</td><td>[ref [% endcreate %] [% query " isfilepath="False" td="" test",="">
isinputpath	bool	True if the inputfile is the file path, otherwise the inputfile is the content	<pre>%} SELECT ?s ?p ?o WHERE {</pre>
outputroot	string	Path of the directory to store the expanded report	<pre>cu {% destroy "test", datastore="rdflib" %} dir """ ./ # Return the expanded report as a string variable named expanded_report expanded_report = geist.report(inputfile=report)</pre>
suppressoutput	bool	True to suppress output	True Example 2: expand a report from a file
args	dict	External arguments, e.g., {"arg1": "value1",	<pre>import geist # Return the expanded report as a string variable named expanded_report expanded_report = geist.report(inputfile='report.geist', isinputpath=True)</pre>
		"arg2": "value2"}	rt.geist file:
		denotes that {{ arg1 }} and {{ arg2 }} in the report template will be replaced by value1 and value2 respectively	<pre>{% create "test", datastore="rdflib", inputformat="nt", isfilepath=False %} <http: drewp="" example.com=""> <http: 02="" 1999="" 22-rdf-="" syntax-ns#type="" www.w3.org=""> <http: 0.1="" foaf="" person="" xmlns.com=""> . <http: drewp="" example.com=""> <http: example.com="" says=""> "Hello World" . {% endcreate %} {% query "test", datastore="rdflib", isfilepath=False as all_triples %} SELECT ?s ?p ?o WHERE {</http:></http:></http:></http:></http:></pre>
			Subject: {{ row["s"] }}, Predicate: {{ row["p"] }}, Object: {{ row["o"] }}. {% endfor %} {% destroy "test", datastore="rdflib" %}

Example 3: expand a report from a file with external arguments

```
import geist

# Return the expanded report as a string variable named
expanded_report
expanded_report = geist.report(
    inputfile='report.geist',
    isinputpath=True,
    args={
        "sentence": "Hello World",
        "feeling": "Happy"
    }
)
```

Here is the report.geist file:

5.2.2 Function create

create function can create a new dataset on disk or in

Description for the ${\it config}$ parameter:

datastore: rdflib

datastore: duckdb

create function can	create a new datas	set on disk or in		www.ee.ewilliw		
memory.			Key	Туре	Description	n I
Parameters descript	ion for <i>create()</i> :		table	string	Name of the table to be	9 (
Name	Туре	Description	I		created	
datastore	string	A backend	Key	Туре	Description	n
		datastore, i.e., rdflib or duckdb	colnames	string		nes of triples
dataset	string	Name of the dataset to be created. Note that :memory: is a reserved value for datasets that	infer	string	rl.readthedd RDFSClosure (https://www #Reasoning_: [rdfs_owl](o perform on ocs.io/en/lat.html#owlrl.Fw.w3.org/TR/cin_OWL_2_RL_Ehttps://owl-rsure.html#owl
		exist only in memory	1			
inputfile	string	A file to be loaded	Exampl [requir fffom a	le 1: create a test SQL da string	ntaset on disk	
inputformat	string	Format of the file to be loaded	[required]	Juckdb/test.duckdb file is on object is returned.	created and a	
isinputpath	bool	True if the inputfile is the file path, otherwise the inputfile is the content	conn = geist.c	:kPyConnection object reate(datastore='duckdb', dataset= .srr, inputformat="csv", isinputpat		
config	dict	A dictionary with	see below	ui ;;		
		configurations for certain backend store	Example from a	le 2: create a test SQL da file	ntaset on disk	
			DuckDBPyConn Here is the 1 v1,v2,v3 1,2,3 4,5,6 7,8,9 Code: import geist # Create a Ducconn = geist.conn = geist.conn	:kPyConnection object rreate(datastore='duckdb', dataset= st.csv", inputformat="csv", isinput	'test',	

Example 3: create a SQL dataset in memory from a string

A DuckDBPyConnection object is returned.

```
import geist

csv_str = """
v1,v2,v3
1,2,3
4,5,6
7,8,9
"""

# Create a DuckPyConnection object
conn = geist.create(datastore='duckdb', dataset=':memory:', inputfile=csv_str, inputformat="csv", isinputpath=False, config={"table": "df"})
```

Example 4: create a SQL dataset in memory from

A DuckDBPyConnection object is returned.

Here is the test.csv file:

```
v1, v2, v3
1, 2, 3
4, 5, 6
7, 8, 9
```

Code:

```
import geist

# Create a DuckPyConnection object
conn = geist.create(datastore='duckdb', dataset=':memory:',
inputfile="test.csv", inputformat="csv", isinputpath=True,
config={"table": "df"})
```

5.2.3 Function destroy

destroy function can delete a dataset.

Parameters description for destroy():

Example: delete the test dataset

import geist
geist.destroy(datastore='rdflib', dataset='test')

Name datastore	Type string	Description A backend	Default [required]	y default, you will get an error message if aset (in this case, it is the test dataset) o suppress this error message, you can set
		datastore, i.e., rdflib or duckdb	import geist geist.destro	y(datastore='rdflib', dataset='test', quiet=True)
dataset	string	Name of the dataset to be removed.	[required]	
quiet	bool	True to suppress error messages if the provided dataset does not exist	False	

5.2.4 Function export

export function can export a dataset.

Parameters description for export():

Туре	Description
string	A backend datastore, i.e., rdflib or duckdb
string OR DuckPyConnection object OR GeistGraph object	Dataset to load an object: (1) A string indicates the name of the dataset stored on disk OR (2) a DuckPyConnection object OR a GeistGraph object for dataset in memory
bool	True to export as a file or print it out
dict	A dictionary with configurations for certain backend store
	string OR DuckPyConnection object OR GeistGraph object

Description for the *config* parameter:

datastore: rdflib

datastore: duckdb

datastore, duckub	datastore, rumb	
Key	Туре	Description
outputroot	string	Path of the directory to store the exported table
outputfile	string	Path of the file to store the exported table
outputformat	string	Format of the exported table, i.e., csv or json
table	string	Name of the table to be exported
Key	Туре	Description
outputroot	string	Path of the directory to these exported triples
outputfile	string	Path of the file to store exported triples
outputformat	string	Format of the exported i.e., json-ld, n3, nquac hext, pretty-xml, trig turtle, longturtle, or

Example 1: export all rows of the df table in test dataset on disk

There exist a file with the path of <code>.geistdata/duckdb/</code> test.duckdb. The following code returns a Pandas data frame named <code>data</code> and the <code>DuckPyConnection object conn`.</code>

import geist

Export the df table of the test dataset
(data, conn) = geist.export(datastore='duckdb', dataset='test',
hasoutput=False, config={'table': 'df'})

Example 2: export all rows of the df table in test dataset in memory

Suppose conn is a DuckPyConnection object points to a DuckDB dataset in memory. The following code returns a Pandas data frame named data and the same DuckPyConnection object conn`.

import geist

Export the df table of the test dataset
(data, conn) = geist.export(datastore='duckdb', dataset=conn,
hasoutput=False, config={'table': 'df'})

5.2.5 Function graph

graph function can visualize a dataset. Only rdflib is supported for now.

Parameters description for *export()*:

Name	Туре	Description	Ι
datastore	string	A backend datastore, i.e., rdflib or duckdb	
dataset	string OR GeistGraph object	Dataset to load an object: (1) A string indicates the name of the dataset stored on disk OR (2) a GeistGraph object for dataset in memory	
hasoutput	bool	True to export as a file or print it out	
config	dict	A dictionary with configurations for certain backend store	S

Description for the *config* parameter:

datastore: rdflib

Key	Туре	Description	Ι
rankdir	string	Direction of the graph: TB or BT or LR or RL	[]
mappings	string	File of the mappings to shorten text (str): path of a JSON file, where the key is the original text and the value is the shorter text	1
on	string	Column(s) to be mapped	1
samecolor	bool	True to use the same color for same edges, otherwise False	1
outputroot	string	Path of the directory to store the graph	
outputfile	string	Path of the file without extension to store the graph	1
outputformats	list	Format of the graph: none or svg or png or gv	

Example: visualize the test dataset

Visualize the test dataset as a graph and save it as the res.svg
file
geist.graph(datastore='rdflib', dataset='test', hasoutput=True,
config={'outputformats': ['svg']})

Ι

Ι

5.2.6 Function load

load function can import data into an existing dataset.

Parameters description for query():

Туре	Description
string	A backend
	datastore, i.e.,
	rdflib Or duckdb
string OR	Dataset to load
DuckPyConnection	an object: (1) A
,	string indicates
· ·	the name of the
	dataset stored on
	disk OR (2) a
	DuckPyConnection
	object OR a
	GeistGraph object
	for dataset in
	memory
string	File to be loaded
string	Format of the file
	to be loaded
haal	True if the
10001	
	inputfile is the file
	path, otherwise
	the inputfile is
	the content
	string OR DuckPyConnection object OR GeistGraph object

Description for the *config* parameter:

datastore: duckdb	datastore: rdflib	
Key	Туре	Description
table	string	Name of the table to be loaded
Key	Туре	Description
inmemory	bool	True if the new dataset (after loading data) is stored in memory only, otherwise it is stored on disk
colnames	string	Column names of triples with the format of [[subject1, predicate1, object1], [subject2, predicate2, object2],]
	Key table Key inmemory	Key Type table string Key Type inmemory bool

Example: load a table into the test dataset

e path of .geistdata/duckdb/ r will be imported into the df er of table columns should be orted data.

import geist

see below

csv_str = """ csv_str = v1,v2,v3 1,1,1 2,2,2 3,3,3

configurations for

certain backend

store

Load csv_str to the df table of the test dataset
geist.load(datastore='duckdb', dataset='test', inputfile=csv_str,
inputformat='csv', isinputpath=False, config={'table': 'df'})

5.2.7 Function query

query function can perform a query on a dataset.

Parameters description for query():

Example 1: all rows of the df table in test dataset on disk (query from a string)

There exist a file with the path of <code>.geistdata/duckdb/test.duckdb</code> . The following code returns a Pandas data

Name	Туре	Description	Default	ery results, and a
datastore	string	A backend datastore, i.e.,	import geist # Query the df table of the	
dataset string OR DuckPyConnection object OR GeistGraph object	(1) A string indicates the name of the dataset stored on disk OR (2) a	(res, conn) = geist.query(datastore='duckdb', dataset='test', inputfile="SELECT * FROM df;", isinputpath=False, hasoutput=False) [required] Example 2: all rows of the df table in test dataset on disk (query from a file)		
		DuckPyConnection object OR a GeistGraph object for dataset in memory		path of .geistdata/duckdb/ g code returns a Pandas data ery results, and a
inputfile	string	File containing the query	[required]	
isinputpath bool	bool	True if the inputfile is the file path,	select * FROM df; [required]	
		otherwise the inputfile is the content		test dataset tastore='duckdb', dataset='test', utpath=True, hasoutput=False)
hasoutput bool	bool	True to store the query results as a	[required]	
		CSV file or print them out	-	ws of the df table in test y (query from a string)
config	dict	A dictionary with configurations when hasoutput=True	see below	onnection object points to a y. The following code returns a res with guery results, and the
	confia parameter:		same DuckPyConnection (1 3

Description for the config parameter:

import geist Key Type Description # Query the df table of the test dataset
(res, conn) = geist.query(datastore='duckdb', dataset=conn,
inputfile="SELECT * FROM df;", isinputpath=False, hasoutput=False) outputroot string Path of the directory to store the query results outputfile string Path of the file None to store the query results

Example 4: all rows of the df table in test dataset in memory (query from a file)

Suppose conn is a DuckPyConnection object points to a DuckDB dataset in memory. The following code returns a Pandas data frame named res with query results, and the same DuckPyConnection object.

Here is the query.txt file:

SELECT * FROM df;

Code:

import geist

Query the df table of the test dataset
(res, conn) = geist.query(datastore='duckdb', dataset=conn,
inputfile="query.txt", isinputpath=True, hasoutput=False)

6. Changelog

v0.3.1 (2025-01-06)

- Fix minor bug of the report feature: update TAGS and filters
- · Add external arguments for the report feature: {{ arg }} will be replaced by value in the report template

v0.3.0 (2024-12-26)

- Code refactoring: datastore -> api -> commands (e.g., code under the api folder is based on code under the datastore folder)
- Add Python API: (1) Connection class with create, close, destroy, export, graph, load, and query methods; and (2) create, destroy, export, graph, load, query, and report functions
- Update CLI of report and query commands: replace --file with --inputfile
- Update the documentation

v0.2.1 (2024-08-17)

- Add the Geist Poster for SciPy 2024
- Update the documentation: add descriptions for the demo of SciPy 2024

v0.2.0 (2024-03-15)

- SQL queries are supported by GEIST based on duckdb
- Update ContainerTag: return objects of any type, not just strings

v0.1.0 (2024-03-04)

- Add documentation
- · Add the component tag to extract connected components of a given graph
- Add the process_str_for_html filter
- Make the map tag more flexible: make it possible to map selected columns
- Fix the quotes bug: keep the cell's original format

v0.0.1 (2023-09-21)

- $\bullet \ \ \text{The first version of GEIST with create, load, query, destroy, graph, graph2, map, use, html, img, and table tags$
- SPARQL queries are supported by GEIST based on RDFLib