

PyHal

API Documentation

April 16, 2017

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1 Package hal

1.1 Modules

- **files** (*Section 2, p. 8*)
 - **models**: Main entities in files, such as documents, folders.
(*Section 3, p. 9*)
- **internet** (*Section 4, p. 18*)
 - **engines**: Abstract search engines.
(*Section 5, p. 19*)
 - **github**: Common classes and entities in Github
(*Section 6, p. 21*)
 - **parser**: Parse anything there is on the Internet.
(*Section 7, p. 26*)
 - **selenium**: Some utils methods for a selenium webdriver
(*Section 8, p. 28*)
 - **web**: Deal with webpages.
(*Section 9, p. 30*)
 - **youtube**: Get rss feed for youtube channel.
(*Section 10, p. 33*)
- **maths**: MATHS: important and scalable math functions
(*Section 11, p. 35*)
 - **crypt**: Perform fast hash, encryption and calculations related to cryptography.
(*Section 12, p. 36*)
 - **maths**: A few elegant and powerful mathematical functions.
(*Section 13, p. 47*)
 - **plotter**: Show elegant plots in any dimension.
(*Section 14, p. 50*)
- **ml** (*Section 15, p. 54*)
 - **analysis** (*Section 16, p. 55*)
 - * **correlation** (*Section 17, p. 56*)
 - **data** (*Section 18, p. 59*)
 - * **parser**: Parsers for raw databases.
(*Section 19, p. 60*)
 - **features**: Collection of methods to find weights of features and select the best ones.
(*Section 20, p. 62*)
 - **models** (*Section 21, p. 63*)
 - * **classification**: Prediction methods based on classification algorithms.
(*Section 22, p. 64*)
 - * **pipelined**: Prediction methods based on multiple models mixed up.
(*Section 23, p. 65*)
 - * **regression**: Prediction methods based on regression algorithms.
(*Section 24, p. 66*)
 - * **time_series**: Multi-purpose prediction methods to be used in time-series.
(*Section 25, p. 67*)
 - **predict**: " General model to make prediction about everything.
(*Section 26, p. 68*)
 - **utils** (*Section 27, p. 69*)
 - * **matrix**: Functions to deal with matrices.
(*Section 28, p. 70*)
 - * **misc**: Various tools and utilities to deal with database and machine learning.

- (Section 29, p. 72)*
- **profile** *(Section 30, p. 74)*
 - **performance**: Perform benchmarks and tests on your PC.
(Section 31, p. 75)
- **strings** *(Section 32, p. 77)*
 - **utils**: Typical operations on strings made easy
(Section 33, p. 78)
- **wrappers** *(Section 34, p. 79)*
 - **methods**: Typical (and useful) function wrappers
(Section 35, p. 80)

1.2 Variables

Name	Description
--package--	Value: None

2 Package *hal.files*

2.1 Modules

- **models:** Main entities in files, such as documents, folders.
(Section 3, p. 9)

2.2 Variables

Name	Description
<code>--package--</code>	Value: None

3 Module `hal.files.models`

Main entities in files, such as documents, folders.

3.1 Variables

Name	Description
<code>BAD_CHARS</code>	Value: [".", ":", "\"", "\xe2\x80\x99", "&", "720p", "1080p", "y...]
<code>RUSSIAN_CHARS</code>	Value: ["\xd1\x88", "\xd0\xb0", "\xd0\xb1", "\xd0\xbb", "\xd0\xba..."]
<code>VIDEO_FORMAT</code>	Value: [".", ".3g2", ".3gp", ".amv", ".asf", ".avi", ".drc", ".f..."]
<code>ARCHIVE_FORMAT</code>	Value: [".7z", "._?_", ".?Q?", ".?Z?", ".a", ".ace", ".afa", ".a..."]
<code>SUBTITLE_FORMAT</code>	Value: [".srt", ".sub", ".sbv"]
<code>TEXT_FORMAT</code>	Value: [".cnf", ".conf", ".cfg", ".chm", ".epub", ".log", ".asc"...]
<code>IMAGE_FORMAT</code>	Value: [".ani", ".bmp", ".cal", ".fax", ".gif", ".img", ".jbg", ...]
<code>AUDIO_FORMAT</code>	Value: [".3gp", ".aa", ".aac", ".aax", ".act", ".aiff", ".amr", ...]
<code>PATH_SEPARATOR</code>	Value: "/" if "posix" in os.name else "\\"

3.2 Class `FileSystem`

object `hal.files.models.FileSystem`

3.2.1 Methods

```
__init__(self, path)

:param path: string
    Path to file
Overrides: object.__init__
```

fix_raw_path(*path*)

```
:param path: string
    Path to fix
:return: string
    Right path
```

remove_year(*name*)

```
:param name: string
    Name to edit
:return: string
    Given string bu with no years.
```

remove_brackets(*name*)

```
:param name: string
    Name to edit
:return: string
    Given string bu with no barckets.
```

extract_name_max_chars(*name*, *max_chars*=64, *blank*=" ")

```
:param name: string
    Name to edit
:param max_chars: int
    Maximum chars of new name
:param blank: string
    Char that represents the blank between words.
:return: string
    Name edited to contain at most max_chars (truncate to nearest word)
```

prettify(*name*, *bad_chars*=BAD_CHARS, *r*=" ")

```
:param name: string
    Name to edit
:param bad_chars: []
    List of bad strings to remove
:param r: string
    Default blanks in name.
:return: string
    Prettier name from given one: replace bad chars with good ones.
```

ls_dir(*path*, *include_hidden*=False)

:param *path*: string
 Path to directory to get list of files and folders
:param *include_hidden*: bool
 Whether to include hidden files in list.
:return: list
 List of paths in given directory.

ls_recurse(*path*, *include_hidden*=False)

:param *path*: string
 Path to directory to get list of files and folders
:param *include_hidden*: bool
 Whether to include hidden files in list.
:return: list
 List of paths in given directory recursively.

ls(*path*, *recurse*, *include_hidden*=False)

:param *path*: string
 Path to directory to get list of files and folders
:param *recurse*: bool
 Whether to recurse into subdirectories or not.
:param *include_hidden*: bool
 Whether to include hidden files in list.
:return: list
 List of paths in given directory recursively.

is_archive_mac(*self*)

:return: True iff document is an MACOSX archive.

is_russian(*self*)

:return: True iff document has a russian name.

trash(*self*)

:return: void
 Trash given file/folder

```
rename(self, new_path)
```

```
:param new_path: string
    New path to use
:return: void
    Rename to new path
```

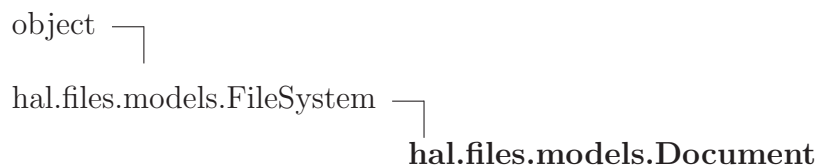
Inherited from object

```
__delattr__(), __format__(), __getattr__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(),
__repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()
```

3.2.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

3.3 Class Document



3.3.1 Methods

```
__init__(self, path)
```

```
:param path: string
    Path to file
Overrides: object.__init__
```

move_file_to_directory(*file_path*, *directory_path*)

```
:param file_path: string
    Path to file to move
:param directory_path: string
    Path to target directory where to move file
:return: void
    Move file to given directory
```

move_file_to_file(*old_path*, *new_path*)

```
:param old_path: string
    Old path of file to move
:param new_path: string
    New path (location) of file
:return: void
    Move file from old location to new one
```

write_data_to_file(*data*, *out_file*)

```
:param data: string
    Data to write to file.
:param out_file: string
    Path to output file.
:return: void
    Writes given data to given path file.
```

extract_name_extension(*file_name*)

```
:param file_name: string
    Name of file
:return: tuple string, string
    Name of file, extension of file
```

get_path_name(*self*)

:return: tuple string, string
Name of path, name of file (or folder)

is_video(*self*)

:return: True iff document is a video.

is_subtitle(*self*)

:return: True iff document is a subtitle.

is_text(*self*)

:return: True iff document is a text file.

is_image(*self*)

:return: True iff document is an image.

is_audio(*self*)

:return: True iff document is an audio.

is_hidden(*self*)

:return: bool
True iff path is hidden

*Inherited from **hal.files.models.FileSystem**(Section 3.2)*

extract_name_max_chars(), fix_raw_path(), is_archive_mac(), is_russian(), ls(), ls_dir(),
ls_recurse(), prettify(), remove_brackets(), remove_year(), rename(), trash()

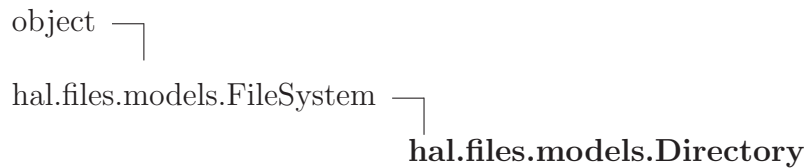
*Inherited from **object***

`__delattr__()`, `__format__()`, `__getattr__()`, `__hash__()`, `__new__()`, `__reduce__()`, `__reduce_ex__()`,
`__repr__()`, `__setattr__()`, `__sizeof__()`, `__str__()`, `__subclasshook__()`

3.3.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

3.4 Class Directory



3.4.1 Methods

<code>__init__(self, path)</code> <hr/> :param path: string Path to file Overrides: <code>object.__init__</code>
<code>create_new(path)</code> <hr/> :param path: string Path to directory to create :return: void Creates new directory
<code>get_path_name(self)</code> <hr/> :return: tuple string, string Name of path, name of file (or folder)

```
is_empty(self)
```

```
:return: Bool
        True iff empty
```

Inherited from hal.files.models.FileSystem(Section 3.2)

```
extract_name_max_chars(), fix_raw_path(), is_archive_mac(), is_russian(), ls(), ls_dir(),
ls_recurse(), prettify(), remove_brackets(), remove_year(), rename(), trash()
```

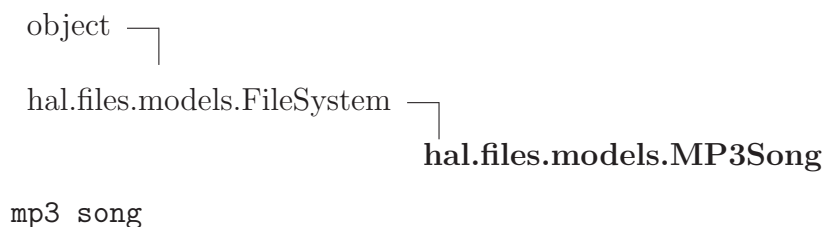
Inherited from object

```
__delattr__(), __format__(), __getattr__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(),
__repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()
```

3.4.2 Properties

Name	Description
<i>Inherited from object</i>	
__class__	

3.5 Class MP3Song



3.5.1 Methods

```
__init__(self, path)
```

```
:param path: string
        Path to file
```

```
Overrides: object.__init__ extit(inherited documentation)
```

```
set_name(self, name)
```


<code>set_artist(self, artist)</code>

<code>set_album(self, album)</code>

<code>set_nr_track(self, nr_track)</code>

<code>set_year(self, year)</code>

Inherited from hal.files.models.FileSystem(Section 3.2)

`extract_name_max_chars()`, `fix_raw_path()`, `is_archive_mac()`, `is_russian()`, `ls()`, `ls_dir()`,
`ls_recurse()`, `prettify()`, `remove_brackets()`, `remove_year()`, `rename()`, `trash()`

Inherited from object

`__delattr__()`, `__format__()`, `__getattr__()`, `__hash__()`, `__new__()`, `__reduce__()`, `__reduce_ex__()`,
`__repr__()`, `__setattr__()`, `__sizeof__()`, `__str__()`, `__subclasshook__()`

3.5.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

4 Package *hal.internet*

4.1 Modules

- **engines**: Abstract search engines.
(Section 5, p. 19)
- **github**: Common classes and entities in Github
(Section 6, p. 21)
- **parser**: Parse anything there is on the Internet.
(Section 7, p. 26)
- **selenium**: Some utils methods for a selenium webdriver
(Section 8, p. 28)
- **web**: Deal with webpages.
(Section 9, p. 30)
- **youtube**: Get rss feed for youtube channel.
(Section 10, p. 33)

4.2 Variables

Name	Description
<code>--package--</code>	Value: None

5 Module *hal.internet.engines*

Abstract search engines.

5.1 Class *SearchEngineResult*



5.1.1 Methods

```
__init__(self, title, link, description="")
```

`x.__init__(...)` initializes `x`; see `help(type(x))` for signature
 Overrides: `object.__init__` `exitit`(inherited documentation)

```
__str__(self)
```

`str(x)`
 Overrides: `object.__str__` `exitit`(inherited documentation)

Inherited from object

`__delattr__()`, `__format__()`, `__getattr__()`, `__hash__()`, `__new__()`, `__reduce__()`, `__reduce_ex__()`,
`__repr__()`, `__setattr__()`, `__sizeof__()`, `__subclasshook__()`

5.1.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

5.2 Class *SearchEngine*



5.2.1 Methods

`__init__(self, url, blank_replace="+")`

:param url: string

Url of search engine used in all query.

:param blank_replace:

Every search engine has to replace blanks in query

Overrides: object.__init__

`parse_query(self, query)`

:param query: string

Query to search engine.

:return: string

Parse given query in order to meet search criteria of search engine.

`get_search_page(self, query, using_tor=False)`

:param query: string

Query to search engine.

:param using_tor: bool

Whether use tor or not to fetch web pages

:return: string

Get HTML source of search page of given query.

Inherited from object

`__delattr__()`, `__format__()`, `__getattr__()`, `__hash__()`, `__new__()`, `__reduce__()`, `__reduce_ex__()`, `__repr__()`, `__setattr__()`, `__sizeof__()`, `__str__()`, `__subclasshook__()`

5.2.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

6 Module hal.internet.github

Common classes and entities in Github

6.1 Variables

Name	Description
GITHUB_URL_BASE	Value: "https://github.com"
API_TOKEN_FILE	Value: "api_token"
API_TOKEN	Value: <code>open(API_TOKEN_FILE).read().strip()</code>

6.2 Class GithubRawApi

object └─ **hal.internet.github.GithubRawApi**

Wrapper for generic Github API

6.2.1 Methods

```
__init__(self, url=API_URL_BASE, get_api_content_now=False)

:param url: str
    Url of API content to get
:param get_api_content_now: bool
    True iff you want to get API content response when building object
Overrides: object.__init__
```

```
__getitem__(self, key)

:param key: str
    Dictionary key to find specific user field
:return: str
    Dictionary value of given key
```

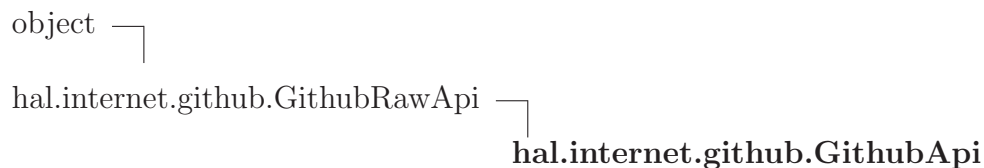
Inherited from object

`__delattr__()`, `__format__()`, `__getattr__()`, `__hash__()`, `__new__()`, `__reduce__()`, `__reduce_ex__()`,
`__repr__()`, `__setattr__()`, `__sizeof__()`, `__str__()`, `__subclasshook__()`

6.2.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

6.3 Class GithubApi



Wrapper for generic Github API

6.3.1 Methods

<code>__init__(self, api_type)</code> <hr/> <p><code>:param api_type: str</code> Type of API to build Overrides: <code>object.__init__</code></p>
<code>get_trending_daily()</code> <hr/> <p><code>:return: []</code> List of GithubUserRepository</p>

Inherited from `hal.internet.github.GithubRawApi`(Section 6.2)

`__getitem__()`

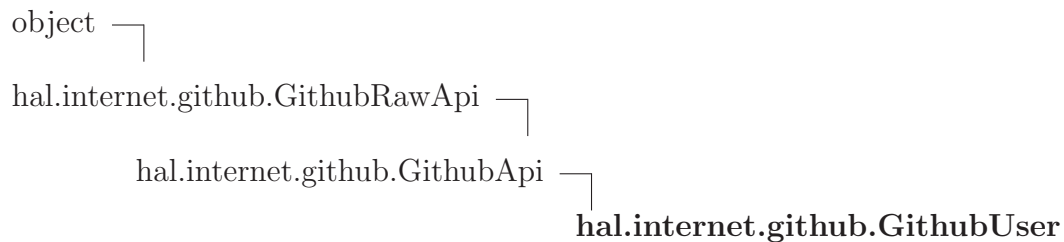
Inherited from object

`__delattr__()`, `__format__()`, `__getattr__()`, `__hash__()`, `__new__()`, `__reduce__()`, `__reduce_ex__()`,
`__repr__()`, `__setattr__()`, `__sizeof__()`, `__str__()`, `__subclasshook__()`

6.3.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

6.4 Class GithubUser



Model of a generic Github user profile

6.4.1 Methods

```

__init__(self, username)

:param username: str
    Username of user
Overrides: object.__init__

```

```

get_repos(self)

:return: []
    List of GithubUserRepository

```

```

get_starred_repos(self)

:return: []
    List of GithubUserRepository

```

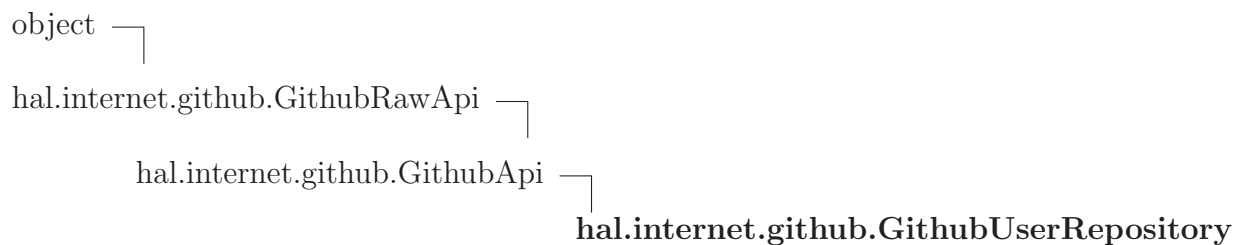
```

get_trending_daily_not_starred(self)

```

Inherited from hal.internet.github.GithubApi(Section 6.3)`get_trending_daily()`***Inherited from hal.internet.github.GithubRawApi(Section 6.2)***`__getitem__()`***Inherited from object***`__delattr__(), __format__(), __getattr__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(),
__repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()`**6.4.2 Properties**

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

6.5 Class GithubUserRepository

Model of a generic Github user repository

6.5.1 Methods

<code>__init__(self, username, repository_name)</code>
<pre> :param username: str Username of user :param repository_name: str Name of repository Overrides: object.__init__ </pre>

<code>--eq--(self, other)</code>

Inherited from hal.internet.github.GithubApi(Section 6.3)

`get_trending_daily()`

Inherited from hal.internet.github.GithubRawApi(Section 6.2)

`--getitem--()`

Inherited from object

`--delattr--()`, `--format--()`, `--getattr--()`, `--hash--()`, `--new--()`, `--reduce--()`, `--reduce_ex--()`,
`--repr--()`, `--setattr--()`, `--sizeof--()`, `--str--()`, `--subclasshook--()`

6.5.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>--class--</code>	

7 Module *hal.internet.parser*

Parse anything there is on the Internet.

7.1 Functions

is_string_well_formatted(*string*)

```
:param string: string
    String to parse
:return: bool
    True iff string is good formatted
```

html_stripper(*string*)

```
:param string: string
    String to parse
:return: string
    Given string with raw HTML elements removed
```

7.2 Variables

Name	Description
<code>--package--</code>	Value: <code>'hal.internet'</code>

7.3 Class *HtmlTable*



7.3.1 Methods

<code>__init__(self, html_source)</code>
--

<code>:param html_source: string</code> Html source of table

Overrides: <code>object.__init__</code>

<code>parse(self)</code>

<code>:return: list of list</code> List of list of values in table

Inherited from str

`__add__()`, `__contains__()`, `__eq__()`, `__format__()`, `__ge__()`, `__getattr__()`, `__getitem__()`,
`__getnewargs__()`, `__getslice__()`, `__gt__()`, `__hash__()`, `__le__()`, `__len__()`, `__lt__()`, `__mod__()`,
`__mul__()`, `__ne__()`, `__new__()`, `__repr__()`, `__rmod__()`, `__rmul__()`, `__sizeof__()`, `__str__()`,
`capitalize()`, `center()`, `count()`, `decode()`, `encode()`, `endswith()`, `expandtabs()`, `find()`,
`format()`, `index()`, `isalnum()`, `isalpha()`, `isdigit()`, `islower()`, `isspace()`, `istitle()`, `isupper()`,
`join()`, `ljust()`, `lower()`, `lstrip()`, `partition()`, `replace()`, `rfind()`, `rindex()`, `rjust()`,
`rpartition()`, `rsplit()`, `rstrip()`, `split()`, `splitlines()`, `startswith()`, `strip()`, `swapcase()`,
`title()`, `translate()`, `upper()`, `zfill()`

Inherited from object

`__delattr__()`, `__reduce__()`, `__reduce_ex__()`, `__setattr__()`, `__subclasshook__()`

7.3.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

8 Module hal.internet.selenium

Some utils methods for a selenium webdriver

8.1 Variables

Name	Description
<code>--package--</code>	Value: None

8.2 Class SeleniumForm

Great and simple static methods to deal with selenium webdrivers.

8.2.1 Methods

fill_form_field(*browser, field_name, field_value*)

```
:param browser: webdriver
    Browser to use to submit form.
:param field_name :string
    Name of field to fill
:param field_value: string
    Value with which to fill field.
:return: void
    Fill given field wiht given value.
```

fill_login_form(*browser, username, username_field, userpassword, userpassword_field*)

```
:param browser: webdriver
    Browser to use to submit form.
:param username: string
    Username of user to login.
:param username_field: string
    Name of field to fill with username.
:param userpassword: string
    Password of user to login.
:param userpassword_field: string
    Name of field to fill with userpassword.
:return: void
    Form filled with given information.
```

submit_form(*browser, button_name*)

```
:param browser: webdriver
    Browser to use to submit form.
:param button_name: string
    Name of button to press to submit form
:return: void
    Submit form.
```

9 Module *hal.internet.web*

Deal with webpages.

9.1 Functions

is_url(*candidate_url*)

```
:param candidate_url: str
    Possible url to check for url
:return: bool
    True iff candidate is a valid url
```


download_url(*url*, *local_file*)

```
:param url: string
    Url to download
:param local_file: string
    Save url as this path
:return: void
    Download link to local file
```

9.2 Variables

Name	Description
CHROME_USER_AGENT	Value: ["Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US) AppleWe...
URL_VALID_REGEX	Value: re.compile(r"^(?:http ftp)s?://"r"(?:([A-Z0-9])(?:[A-Z0...

9.3 Class Webpage

object  **hal.internet.web.Webpage**
 representation of URL (web page)

9.3.1 Methods

`__init__(self, url, using_tor=False)`

:param url: string
 Url of webpage

:param using_tor: bool
 Whether using tor or not to fetch source page

Overrides: object.__init__

`parse_url(raw_url)`

:param raw_url: url to parse
:return: parses correctly url

`get_scheme(self)`

:return: get scheme (HTTP, HTTPS, FTP ..) from given url

`get_hostname(self)`

:return: extract hostname from given url

`get_domain(self)`

:return: get domain from given url

`get_html_source(self, tor=False)`

:return: str
 HTML source of webpage

```
get_links(self, recall, timeout)
```

```
:param recall: max time to attempt to fetch url
:param timeout: max time (s) to wait for web_page response
:return: array of out_links
```

```
open_in_browser(self, times)
```

```
:param times: int
    Times to open webpage in browser
:return: void
    Open a wendrive and go to webpage
```

Inherited from object

```
__delattr__(), __format__(), __getattr__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(),
__repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()
```

9.3.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

10 Module *hal.internet.youtube*

Get rss feed for youtube channel.

10.1 Functions

```
get_channel_page_from_name(channel_name)
```

```
:param channel_name: string
    name of channel (e.g in "https://www.youtube.com/user/caseyneistat" you should t
:param youtube_channel_url: string
    base url of youtube channels.
@return string
    source page of youtube channel.
```

```
get_channel_id_from_name(channel_name)
```

```
:param channel_name: string
    name of channel (e.g in "https://www.youtube.com/user/caseyneistat" you should t
:return string
    id of youtube channel
```

```
get_channel_feed_url_from_id(channel_id)
```

```
:param channel_id: string
    Id of channel (e.g in "https://www.youtube.com/channel/UC2zjki3bJIaXmgV_LBQ2jTg"
:return string
    rss url feed of youtube channel.
```

```
get_channel_feed_url_from_name(channel_name)
```

```
:param channel_name: string
    name of channel (e.g in "https://www.youtube.com/user/caseyneistat" you should t
:return string
    rss url feed of youtube channel.
```

```

get_channel_feed_url_from_video(video_url)

:param video_url: string
    Url of video (e.g in https://www.youtube.com/watch?v=KB_iTbDrkxE)
:return string
    rss url feed of youtube channel.

```

10.2 Variables

Name	Description
YOUTUBE_USER_BASE-URL	Value: "https://www.youtube.com/user/"
YOUTUBE_FEED_BASE-URL	Value: "https://www.youtube.com/feeds/videos.xml?channel_id="

11 Package hal.maths

MATHS: important and scalable math functions

11.1 Modules

- **crypt**: Perform fast hash, encryption and calculations related to cryptography.
(Section 12, p. 36)
- **maths**: A few elegant and powerful mathematical functions.
(Section 13, p. 47)
- **plotter**: Show elegant plots in any dimension.
(Section 14, p. 50)

11.2 Variables

Name	Description
<code>--package--</code>	Value: None

12 Module hal.maths.crypt

Perform fast hash, encryption and calculations related to cryptography.

12.1 Class MD5

```
object └─ hal.maths.crypt.MD5
md5 hash
```

12.1.1 Methods

`__init__(self, string)`
x.__init__(...) initializes x; see help(type(x)) for signature
Overrides: object.__init__ exitit(inherited documentation)

hash(<i>self</i>)
:return: hash plaintext

Inherited from object

```
__delattr__(), __format__(), __getattr__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(),
__repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()
```

12.1.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>--class--</code>	

12.2 Class MD6

```
object └─
        hal.maths.crypt.MD6
```

md6 hash

12.2.1 Methods

__init__(*self*, *string*, *size*)*x*.**__init__**(...) initializes *x*; see `help(type(x))` for signatureOverrides: `object.__init__` `exitit` (inherited documentation)**hash**(*self*)

:return: return md6 hash

hex(*self*, *data*, *size*):param *data*: plaintext:param *size*: bytes

:return: hex representation

raw(*self*, *data*, *size*):param *data*: plaintext:param *size*: bytes

:return: raw representation

Inherited from object

`__delattr__()`, `__format__()`, `__getattr__()`, `__hash__()`, `__new__()`, `__reduce__()`, `__reduce_ex__()`,
`__repr__()`, `__setattr__()`, `__sizeof__()`, `__str__()`, `__subclasshook__()`

12.2.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

12.2.3 Class Variables

Name	Description
ALLOWED_SIZE	Value: [64, 128, 224, 256, 384, 512]

12.3 Class SHA

object —
 hal.maths.crypt.SHA
 general SHA hash

12.3.1 Methods

```
__init__(self, string, size, salt=None)
```

`x.__init__(...)` initializes `x`; see `help(type(x))` for signature
 Overrides: `object.__init__` extit(inherited documentation)

```
hash(self)
```

:return: hash of given size

```
hash_sha1(self)
```

:return: sha1 hash

```
hash_sha224(self)
```

:return: sha224 hash

```
hash_sha256(self)
```

:return: sha256 hash

hash_sha384(<i>self</i>)
:return: sha384 hash

hash_sha512(<i>self</i>)
:return: sha512 hash

hash_shasalted(<i>self</i>)
:return: sha512 hash

Inherited from object

`--delattr--()`, `--format--()`, `--getattr--()`, `--hash--()`, `--new--()`, `--reduce--()`, `--reduce_ex--()`,
`--repr--()`, `--setattr--()`, `--sizeof--()`, `--str--()`, `--subclasshook--()`

12.3.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>--class--</code>	

12.3.3 Class Variables

Name	Description
ALLOWED_SIZE	Value: [1, 224, 256, 384, 512]

12.4 Class DES

```

object └─
          hal.maths.crypt.DES
DES hash
```

12.4.1 Methods

`__init__(self, string, key, size)`

`x.__init__(...)` initializes `x`; see `help(type(x))` for signature

Overrides: `object.__init__` `exitit`(inherited documentation)

`hash(self)`

:return: hash of given size

`hash_des(self)`

:return: des hash

`hash_des3(self)`

:return: des3 hash

Inherited from object

`__delattr__()`, `__format__()`, `__getattr__()`, `__hash__()`, `__new__()`, `__reduce__()`, `__reduce_ex__()`, `__repr__()`, `__setattr__()`, `__sizeof__()`, `__str__()`, `__subclasshook__()`

12.4.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

12.4.3 Class Variables

Name	Description
<code>ALLOWED_SIZE</code>	Value: [1, 3]

12.5 Class ARC

```

object └─
          hal.maths.crypt.ARC

```

ARC hash

12.5.1 Methods

```
__init__(self, string, key, size)
```

`x.__init__(...)` initializes `x`; see `help(type(x))` for signature

Overrides: `object.__init__` `extit`(inherited documentation)

```
hash(self)
```

:return: hash of given size

```
hash_ar2(self)
```

:return: des hash

```
hash_arc4(self)
```

:return: des3 hash

Inherited from object

`__delattr__()`, `__format__()`, `__getattr__()`, `__hash__()`, `__new__()`, `__reduce__()`, `__reduce_ex__()`,
`__repr__()`, `__setattr__()`, `__sizeof__()`, `__str__()`, `__subclasshook__()`

12.5.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

12.5.3 Class Variables

Name	Description
ALLOWED_SIZE	Value: [2, 4]

12.6 Class AES

```

object └─
        hal.maths.crypt.AES
aes hash

```

12.6.1 Methods

```
__init__(self, string, key)
x.__init__(...) initializes x; see help(type(x)) for signature
Overrides: object.__init__ exitit(inherited documentation)
```

```
hash(self)
```

```
:return: hash plaintext
```

Inherited from object

```
__delattr__(), __format__(), __getattr__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(),
__repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()
```

12.6.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>--class--</code>	

12.7 Class HMAC

```
object └─
```

hmac hash

12.7.1 Methods

```
__init__(self, string, key)
```

`x.__init__(...)` initializes `x`; see `help(type(x))` for signature

Overrides: `object.__init__` extit(inherited documentation)

```
hash(self)
```

:return: hash plaintext

Inherited from object

`__delattr__()`, `__format__()`, `__getattr__()`, `__hash__()`, `__new__()`, `__reduce__()`, `__reduce_ex__()`,
`__repr__()`, `__setattr__()`, `__sizeof__()`, `__str__()`, `__subclasshook__()`

12.7.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

12.8 Class BLOWFISH

```

object └─
          hal.maths.crypt.BLOWFISH

```

blowfish hash

12.8.1 Methods

```
__init__(self, string, key)
```

`x.__init__(...)` initializes `x`; see `help(type(x))` for signature

Overrides: `object.__init__` extit(inherited documentation)

```
hash(self)
```

```
:return: hash plaintext
```

Inherited from object

```
__delattr__(), __format__(), __getattr__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(),
__repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()
```

12.8.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

12.9 Class IDEA

```
object └─ hal.maths.crypt.IDEA
```

IDEA hash

12.9.1 Methods

```
__init__(self, string, key)
```

```
x.__init__(...) initializes x; see help(type(x)) for signature
```

```
Overrides: object.__init__ extit(inherited documentation)
```

```
hash(self)
```

```
:return: IDEA hash
```

```
change_key(self, key)
```

```
:param key: new key
```

```
:return: change key
```

```
encrypt(self)
```

```
:return: encrypt with key
```

Inherited from object

```
__delattr__(), __format__(), __getattr__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(),
__repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()
```

12.9.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

12.10 Class CAST128

```
object └─
          hal.maths.crypt.CAST128
```

CAST 128 hash

12.10.1 Methods

```
__init__(self, string, key)
```

```
x.__init__(...) initializes x; see help(type(x)) for signature
```

```
Overrides: object.__init__ extit(inherited documentation)
```

```
encrypt(self)
```

```
decrypt(self)
```

Inherited from object

```
__delattr__(), __format__(), __getattr__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(),
__repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()
```

12.10.2 Properties

13 Module *hal.maths.maths*

A few elegant and powerful mathematical functions.

13.1 Functions

get_prime(*bits*)

:param bits: size of number to generate (bits)
:return: prime number of given size

blumblumshub(*seed, amount, prime0, prime1*)

:param seed: seeder
:param amount: amount of number to generate
:param prime0: one prime number
:param prime1: the second prime number
:return: pseudo-number generator

13.2 Variables

Name	Description
<code>--package--</code>	Value: <code>'hal.maths'</code>

13.3 Class Integer

object └─ **hal.maths.maths.Integer**

13.3.1 Methods

--init--(*self, string*)

`x.__init__(...)` initializes `x`; see `help(type(x))` for signature
Overrides: `object.__init__` `exitit`(inherited documentation)

```
is_probably_prime(self)
```

```
:return: test with miller-rabin
```

```
test_miller_rabin(self, precision)
```

```
:param precision: number of rounds to perform (higher -> better precision)
:return: True iff probably prime
```

Inherited from object

```
__delattr__(), __format__(), __getattr__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(),
__repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()
```

13.3.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

13.3.3 Class Variables

Name	Description
LOW_PRIMES	Value: [2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, ...]

13.4 Class EightQueen

```
object └─ hal.maths.maths.EightQueen
```

8 queen problem solver

13.4.1 Methods

```
__init__(self, board_size)
```

x.__init__(...) initializes x; see help(type(x)) for signature

Overrides: object.__init__ extit(inherited documentation)

```
under_attack(col, queens)
```

```
solve(self, n)
```

Inherited from object

`__delattr__()`, `__format__()`, `__getattr__()`, `__hash__()`, `__new__()`, `__reduce__()`, `__reduce_ex__()`,
`__repr__()`, `__setattr__()`, `__sizeof__()`, `__str__()`, `__subclasshook__()`

13.4.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

14 Module *hal.maths.plotter*

Show elegant plots in any dimension.

14.1 Class *Plot2d*

object —
 hal.maths.plotter.Plot2d

2d plot

14.1.1 Methods

scatter(*vectorx*, *vectory*)

:param *vectorx*: vector in x axis
 :param *vectory*: vector in y axis
 :return: 2d scatter plot

param(*self*, *functionx*, *functiony*, *min*, *max*, *points*)

:param *functionx*: function in x value
 :param *functiony*: function in y value
 ::param *min*: minimum value
 :param *max*: maximum value
 :param *points*: number of points to display
 :return: 2d parametric graph of given function from min to max

plot(*self*, *function*, *min*, *max*, *points*)

:param *function*: function to plot
 :param *min*: minimum value
 :param *max*: maximum value
 :param *points*: number of points
 :return: plot 2d function

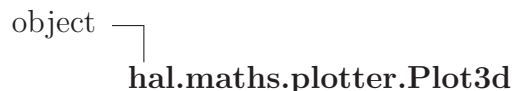
Inherited from object

`__delattr__()`, `__format__()`, `__getattr__()`, `__hash__()`, `__init__()`, `__new__()`, `__reduce__()`,
`__reduce_ex__()`, `__repr__()`, `__setattr__()`, `__sizeof__()`, `__str__()`, `__subclasshook__()`

14.1.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

14.2 Class Plot3d



14.2.1 Methods

scatter(*vectorx, vectory, vectorz*)

```

:param vectorx: vector in x axis
:param vectory: vector in y axis
:param vectorz: vector in z axis
:return: plot 3d scattered points
  
```

param(*self, functionx, functiony, functionz, min, max, points*)

```

:param functionx: function in x
:param functiony: function in y
:param functionz: function in z
:param min: minimum
:param max: maximum
:param points: number of points
:return: 3d parametric graph of given function from min to max
  
```

```
plot(self, function, minx, maxx, pointsx, miny, maxy, pointsy)
```

```
:param function: function to plot
:param minx: minimum of x-values
:param maxx: maximum of x-values
:param pointsx: points in x axis
:param miny: minimum of y-values
:param maxy: maximum of y-values
:param pointsy: points in y axis
:return: plot 3d function
```

Inherited from object

```
__delattr__(), __format__(), __getattr__(), __hash__(), __init__(), __new__(), __reduce__(),
__reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()
```

14.2.2 Properties

Name	Description
<i>Inherited from object</i>	
__class__	

14.3 Class Plot4d

```
object └─ hal.maths.plotter.Plot4d
```

14.3.1 Methods

```
scatter(vectorx, vectory, vectorz, vectorw)
```

```
:param vectorx: vector in x axis
:param vectory: vector in y axis
:param vectorz: vector in z axis
:param vectorw: vector in w axis
:return: plot 4d scattered points
```

param(*self, functionx, functiony, functionz, functionw, min, max, points*)

```
:param functionx: function in x
:param functiony: function in y
:param functionz: function in z
:param functionw: function in w
:param min: minimum
:param max: maximum
:param points: number of points
:return: 4d parametric graph of given function from min to max
```

plot(*self, function, minx, maxx, miny, maxy, minz, maxz, precision, kind*)

```
:param function: function to plot
:param minx: minimum of x-values
:param maxx: maximum of x-values
:param miny: minimum of y-values
:param maxy: maximum of y-values
:param minz: minimum of z-values
:param maxz: maximum of z-values
:param precision: precision
:param kind: slice: x cont -> 3d plot with y,z variables in plane and w as "z"-axis
              contour: x cont -> 3d plot with y,z variables in plane and w colored
:return: plot 4d function
```

Inherited from object

```
__delattr__(), __format__(), __getattr__(), __hash__(), __init__(), __new__(), __reduce__(),
__reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()
```

14.3.2 Properties

Name	Description
<i>Inherited from object</i>	
__class__	

15 Package hal.ml

15.1 Modules

- **analysis** (*Section 16, p. 55*)
 - **correlation** (*Section 17, p. 56*)
- **data** (*Section 18, p. 59*)
 - **parser**: Parsers for raw databases.
(*Section 19, p. 60*)
- **features**: Collection of methods to find weights of features and select the best ones.
(*Section 20, p. 62*)
- **models** (*Section 21, p. 63*)
 - **classification**: Prediction methods based on classification algorithms.
(*Section 22, p. 64*)
 - **pipelined**: Prediction methods based on multiple models mixed up.
(*Section 23, p. 65*)
 - **regression**: Prediction methods based on regression algorithms.
(*Section 24, p. 66*)
 - **time_series**: Multi-purpose prediction methods to be used in time-series.
(*Section 25, p. 67*)
- **predict**: " General model to make prediction about everything.
(*Section 26, p. 68*)
- **utils** (*Section 27, p. 69*)
 - **matrix**: Functions to deal with matrices.
(*Section 28, p. 70*)
 - **misc**: Various tools and utilities to deal with database and machine learning.
(*Section 29, p. 72*)

15.2 Variables

Name	Description
--package--	Value: None

16 Package *hal.ml.analysis*

16.1 Modules

- **correlation** (*Section 17, p. 56*)

16.2 Variables

Name	Description
<code>--package--</code>	Value: None

17 Module *hal.ml.analysis.correlation*

17.1 Functions

get_correlation_matrix(*matrix*)

:param matrix: [] of []
List of features to get correlation matrix
:return: [] of []
correlation matrix

show_correlation_matrix(*correlation_matrix*, *title*, *feature_list*)

:param correlation_matrix: [] of []
Correlation matrix of features
:param title: str
Title of plot
:param feature_list: [] of str
List of names of features
:return: void
shows the given correlation matrix as image

create_visual_correlation_matrix(*correlation_matrix*, *title*, *feature_list*)

:param correlation_matrix: [] of []
Correlation matrix of features
:param title: str
Title of plot
:param feature_list: [] of str
List of names of features
:return: void
shows the given correlation matrix as image

get_correlation_matrix_of_columns(*headers_to_test*, *headers*, *data*)

:param *headers_to_test*: [] of str
List of columns to get correlation matrix of

:param *headers*: [] of str
List of all headers in matrix

:param *data*: [] of []
Matrix of float values

:return: [] of []
Correlation matrix of selected columns

show_correlation_matrix_of_columns(*title*, *headers_to_test*, *headers*, *data*)

:param *title*: str
Title to show

:param *headers_to_test*: [] of str
List of columns to get correlation matrix of

:param *headers*: [] of str
List of all headers in matrix

:param *data*: [] of []
Matrix of float values

:return: void
Shows on screen correlation matrix of selected headers

save_correlation_matrix_of_columns(*title*, *headers_to_test*, *headers*, *data*, *out_file*)

:param *title*: str
Title to show

:param *headers_to_test*: [] of str
List of columns to get correlation matrix of

:param *headers*: [] of str
List of all headers in matrix

:param *data*: [] of []
Matrix of float values

:param *out_file*: str
Output file

:return: void
Saves correlation matrix of selected headers

save_correlation_matrix_of_data_files_in_folder(*folder_path*)

:param folder_path: str
 Folder containing logs data
:return: void
 Saves each file's correlation matrix of common headers

18 Package *hal.ml.data*

18.1 Modules

- **parser**: Parsers for raw databases.
(Section 19, p. 60)

18.2 Variables

Name	Description
--package--	Value: None

19 Module *hal.ml.data.parser*

Parsers for raw databases.

19.1 Functions

parse_csv_file(*file_path*)

```
:param file_path: str
    Path to file to parse
:return: tuple [], [] of []
    headers of csv file and data
```

19.2 Variables

Name	Description
<code>--package--</code>	Value: <code>'hal.ml.data'</code>

19.3 Class Parser

object —
 hal.ml.data.parser.Parser

Known Subclasses: *hal.ml.data.parser.CSVParser*

19.3.1 Methods

--init--(*self*, *database_file*)

```
:param database_file: a raw .csv file that contains any data about anything
Overrides: object.--init--
```

get_lines(*self*)

Inherited from object

```
--delattr--(), --format--(), --getattrattribute--(), --hash--(), --new--(), --reduce--(), --reduce_ex--(),
```

`__repr__()`, `__setattr__()`, `__sizeof__()`, `__str__()`, `__subclasshook__()`

19.3.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

19.4 Class CSVParser



19.4.1 Methods

<code>__init__(self, database_file)</code>
:param database_file: a raw .csv file that contains any data about anything
Overrides: <code>object.__init__</code>

<code>parse_data(self)</code>
store values in array, store lines in array; the result is a 2D matrix

Inherited from hal.ml.data.parser.Parser(Section 19.3)

`get_lines()`

Inherited from object

`__delattr__()`, `__format__()`, `__getattr__()`, `__hash__()`, `__new__()`, `__reduce__()`, `__reduce_ex__()`, `__repr__()`, `__setattr__()`, `__sizeof__()`, `__str__()`, `__subclasshook__()`

19.4.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

20 Module *hal.ml.features*

Collection of methods to find weights of features and select the best ones.

20.1 Functions

<code>select_k_best(x, y, k)</code>
select k best features in dataset

<code>get_best_features(x, y)</code>
finds the optimal number of features

<code>get_features($x, y, n_features_to_select$)</code>
finds the optimal features

21 Package *hal.ml.models*

21.1 Modules

- **classification**: Prediction methods based on classification algorithms.
(Section 22, p. 64)
- **pipelined**: Prediction methods based on multiple models mixed up.
(Section 23, p. 65)
- **regression**: Prediction methods based on regression algorithms.
(Section 24, p. 66)
- **time_series**: Multi-purpose prediction methods to be used in time-series.
(Section 25, p. 67)

21.2 Variables

Name	Description
--package--	Value: None

22 Module `hal.ml.models.classification`

Prediction methods based on classification algorithms.

22.1 Functions

<code>extra_trees_classifier()</code>

<code>random_forest()</code>

<code>knn()</code>

very fast and slightly more accurate than AdaBoost
--

<code>ada_boost()</code>

fast, accurate but too uncertainty

<code>bayes_gauss()</code>

slower than svr but equally accurate

<code>bayes_bernoulli()</code>

23 Module `hal.ml.models.pipelined`

Prediction methods based on multiple models mixed up.

23.1 Functions

<code>logistic_rbm()</code>

<code>anova_svm()</code>

24 Module `hal.ml.models.regression`

Prediction methods based on regression algorithms.

24.1 Functions

<code>support_vector_machine()</code>

<code>super fast and precise</code>

<code>logistic_regression()</code>

25 Module `hal.ml.models.time_series`

Multi-purpose prediction methods to be used in time-series.

25.1 Functions

```
test_stationarity(timeseries)
```

```
arma(dates, values, start=None, end=None, plot=False)
```

Predict days values using ARMA algorithm.
:param *dates*: list of str date
:param *values*: list of float values
:param *start*: start predicting in this day
:param *end*: end of prediction
:param *plot*: whether to plot or not values in graph

```
arima(dates, values, start=None, end=None)
```

Predict days values using ARIMA algorithm.
:param *dates*: list of str date
:param *values*: list of float values
:param *start*: start predicting in this day
:param *end*: end of prediction

```
var(dates, values, start=None, end=None)
```

Predict days values using ARIMA algorithm.
:param *dates*: list of str date
:param *values*: list of float values
:param *start*: start predicting in this day
:param *end*: end of prediction

```
dynamic_var(dates, values, start=None, end=None)
```

Predict days values using ARIMA algorithm.
:param *dates*: list of str date
:param *values*: list of float values
:param *start*: start predicting in this day
:param *end*: end of prediction

26 Module *hal.ml.predict*

" General model to make prediction about everything.

26.1 Class *BasePrediction*

```
object └─
        hal.ml.predict.BasePrediction
```

26.1.1 Methods

```
__init__(self, model, rounds)
```

x.**__init__**(...) initializes *x*; see `help(type(x))` for signature

Overrides: `object.__init__` `exitit`(inherited documentation)

```
train(self, x, y)
```

Inherited from object

```
__delattr__(), __format__(), __getattr__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(),  
__repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()
```

26.1.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

27 Package `hal.ml.utils`

27.1 Modules

- **matrix**: Functions to deal with matrices.
(Section 28, p. 70)
- **misc**: Various tools and utilities to deal with database and machine learning.
(Section 29, p. 72)

27.2 Variables

Name	Description
<code>--package--</code>	Value: None

28 Module *hal.ml.utils.matrix*

Functions to deal with matrices.

28.1 Functions

precision(*matrix*)

Calculates accuracy on database

:param matrix: 2x2 matrix that looks like

True Positive - False Negative

| - |

False Positive - True Negative

recall(*matrix*)

Calculates recall on database

:param matrix: 2x2 matrix that looks like

True Positive - False Negative

| - |

False Positive - True Negative

tn_rate(*matrix*)

Calculates true negative rate on database

:param matrix: 2x2 matrix that looks like

True Positive - False Negative

| - |

False Positive - True Negative

accuracy(*matrix*)

Calculates recall on database

:param matrix: 2x2 matrix that looks like

True Positive - False Negative

| - |

False Positive - True Negative

f1_score(*matrix*)

Calculates f1 score on database

:param matrix: 2x2 matrix that looks like
True Positive - False Negative
| - |
False Positive - True Negative

get_column_of_matrix(*column_index, matrix*)

:param column_index: int >= 0
 Column index to take
:param matrix: [] of []
 Matrix
:return: []
 Column of array at position given

get_subset_of_matrix(*headers_to_sample, all_headers, data*)

:param headers_to_sample: [] of str
 List of columns to get
:param all_headers: [] of str
 List of all headers in matrix
:param data: [] of []
 Matrix of float values
:return: [] of []
 Correlation matrix of selected columns

29 Module *hal.ml.utils.misc*

Various tools and utilities to deal with database and machine learning.

29.1 Functions

precision(*matrix*)

Calculates accuracy on database

:param matrix: 2x2 matrix that looks like

True Positive - False Negative

False Positive - True Negative

recall(*matrix*)

Calculates recall on database

:param matrix: 2x2 matrix that looks like

True Positive - False Negative

False Positive - True Negative

tn_rate(*matrix*)

Calculates true negative rate on database

:param matrix: 2x2 matrix that looks like

True Positive - False Negative

False Positive - True Negative

accuracy(*matrix*)

Calculates recall on database

:param matrix: 2x2 matrix that looks like

True Positive - False Negative

False Positive - True Negative

f1_score(*matrix*)

Calculates f1 score on database

:param matrix: 2x2 matrix that looks like

True Positive - False Negative

	-	
False Positive	-	True Negative

pearson(*x*, *y*)

Pearson coefficient of arrays

30 Package hal.profile

30.1 Modules

- **performance:** Perform benchmarks and tests on your PC.
(Section 31, p. 75)

30.2 Variables

Name	Description
--package--	Value: None

update_std_out_and_log (<i>self</i> , <i>string</i>)

<pre> :param string: string Stuff to print :return: void Prints to stdout and updates log </pre>
--

start (<i>self</i>)

Inherited from object

`__delattr__()`, `__format__()`, `__getattr__()`, `__hash__()`, `__new__()`, `__reduce__()`, `__reduce_ex__()`,
`__repr__()`, `__setattr__()`, `__sizeof__()`, `__str__()`, `__subclasshook__()`

31.1.2 Properties

Name	Description
<i>Inherited from object</i>	
<code>__class__</code>	

32 Package *hal.strings*

32.1 Modules

- **utils**: Typical operations on strings made easy
(*Section 33, p. 78*)

32.2 Variables

Name	Description
--package--	Value: None

33 Module *hal.strings.utils*

Typical operations on strings made easy

33.1 Functions

<pre>how_similar_are(<i>a</i>, <i>b</i>)</pre> <hr/> <pre>:param <i>a</i>: str First string :param <i>b</i>: str Second string :return: float in [0, 1] Similarity of <i>a</i> VS <i>b</i></pre>
--

33.2 Variables

Name	Description
<code>__package__</code>	Value: <code>'hal.strings'</code>

34 Package *hal.wrappers*

34.1 Modules

- **methods:** Typical (and useful) function wrappers
(*Section 35, p. 80*)

34.2 Variables

Name	Description
--package--	Value: None

35 Module *hal.wrappers.methods*

Typical (and useful) function wrappers

35.1 Functions

<code>handle_exceptions(<i>function</i>)</code>
<code>:param function: callback function function to wrap</code>
<code>:return: callback function return type wraps callback function</code>

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