PyHal

API Documentation

April 17, 2017

Contents

1 Package hal

1.1 Modules

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
__package__	**Value:** `None`

3 Module hal.files.models

`Main entities in files, such as documents, folders.`

3.1 Variables

Name	Description
BAD_CHARS	**Value:** `[".", ":", "\"", "\xe2\x80\x99", "&", "720p", "1080p", "y...`
RUSSIAN_CHARS	**Value:** `["\xd1\x88", "\xd0\xb0", "\xd0\xb1", "\xd0\xbb", "\xd0\xb...`
VIDEO_FORMAT	**Value:** `[".", ".3g2", ".3gp", ".amv", ".asf", ".avi", ".drc", ".f...`
ARCHIVE_FORMAT	**Value:** `[".7z", ".??_", ".?Q?", ".?Z?", ".a", ".ace", ".afa", ".a...`
SUBTITLE_FORMAT	**Value:** `[".srt", ".sub", ".sbv"]`
TEXT_FORMAT	**Value:** `[".cnf", ".conf", ".cfg", ".chm", ".epub", ".log", ".asc"...`
IMAGE_FORMAT	**Value:** `[".ani", ".bmp", ".cal", ".fax", ".gif", ".img", ".jbg", ...`
AUDIO_FORMAT	**Value:** `[".3gp", ".aa", ".aac", ".aax", ".act", ".aiff", ".amr", ...`
PATH_SEPARATOR	**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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

3.2.2 Properties

Name	Description
Inherited from object	
__class__	

3.3 Class Document

object

hal.files.models.FileSystem

hal.files.models.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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

3.3.2 Properties

Name	Description
Inherited from object	
__class__	

3.4 Class Directory

object

hal.files.models.FileSystem

hal.files.models.Directory

3.4.1 Methods

__init__(*self*, *path*)

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

Overrides: object.__init__

create_new(*path*)

```
:param path: string
    Path to directory to create
:return: void
    Creates new directory
```

get_path_name(*self*)

```
: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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

3.4.2 Properties

Name	Description
Inherited from object	
__class__	

3.5 Class MP3Song

object

hal.files.models.FileSystem

hal.files.models.MP3Song

```
mp3 song
```

3.5.1 Methods

__init__(*self*, *path*)

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

Overrides: object.__init__ extit(inherited documentation)

set_name(*self*, *name*)

set_artist(*self*, *artist*)

set_album(*self*, *album*)

set_nr_track(*self*, *nr_track*)

set_year(*self*, *year*)

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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

3.5.2 Properties

Name	Description
Inherited from object	
__class__	

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
__package__	**Value:** `None`

5 Module hal.internet.engines

`Abstract search engines.`

5.1 Class SearchEngineResult

object
└ **hal.internet.engines.SearchEngineResult**

5.1.1 Methods

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

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

Overrides: object.__init__ extit(inherited documentation)

__str__(*self*)

`str(x)`

Overrides: object.__str__ extit(inherited documentation)

Inherited from object

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

5.1.2 Properties

Name	Description
Inherited from object	
__class__	

5.2 Class SearchEngine

object
└ **hal.internet.engines.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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

5.2.2 Properties

Name	Description
Inherited from object	
__class__	

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:** open(API_TOKEN_FILE).read().strip()

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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

6.2.2 Properties

Name	Description
Inherited from object	
__class__	

6.3 Class GithubApi

object

hal.internet.github.GithubRawApi

hal.internet.github.GithubApi

```
Wrapper for generic Github API
```

6.3.1 Methods

__init__(*self*, *api_type*)

```
:param api_type: str
    Type of API to build
```

Overrides: object.__init__

get_trending_daily()

```
:return: []
    List of GithubUserRepository
```

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

__getitem__()

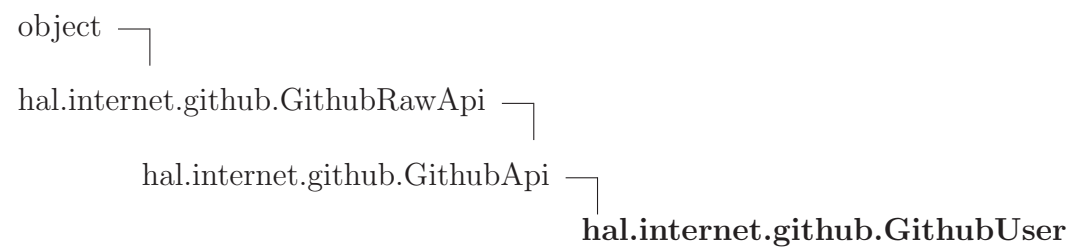
Inherited from object

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

6.3.2 Properties

Name	Description
Inherited from object	
__class__	

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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

6.4.2 Properties

Name	Description
Inherited from object	
__class__	

6.5 Class GithubUserRepository

object

hal.internet.github.GithubRawApi

hal.internet.github.GithubApi

hal.internet.github.GithubUserRepository

```
Model of a generic Github user repository
```

6.5.1 Methods

__init__(*self*, *username*, *repository_name*)

```
:param username: str
    Username of user
:param repository_name: str
    Name of repository
```

Overrides: object.__init__

__**eq**__(*self*, *other*)

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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

6.5.2 Properties

Name	Description
Inherited from object	
__class__	

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
```

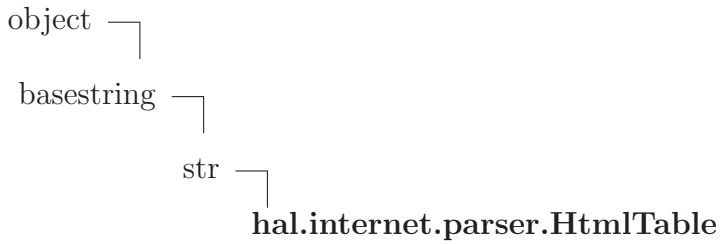
html_stripper(*string*)

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

7.2 Variables

Name	Description
__package__	**Value:** `'hal.internet'`

7.3 Class HtmlTable



7.3.1 Methods

__init__(*self*, *html_source*)

```
:param html_source: string
    Html source of table
```

Overrides: object.__init__

parse(*self*)

```
:return: list of list
    List of list of values in table
```

Inherited from str

__add__(), __contains__(), __eq__(), __format__(), __ge__(), __getattribute__(), __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
Inherited from object	
__class__	

8 Module hal.internet.selenium

Some utils methods for a selenium webdriver

8.1 Variables

Name	Description
__package__	**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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

9.3.2 Properties

Name	Description
Inherited from object	
__class__	

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
__package__	**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__ extit(inherited documentation)

hash(*self*)

`:return: hash plaintext`

Inherited from object

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

12.1.2 Properties

Name	Description
Inherited from object	
__class__	

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 signature`

Overrides: object.__init__ extit(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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

12.2.2 Properties

Name	Description
Inherited from object	
__class__	

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(*self*)

```
:return: sha384 hash
```

hash_sha512(*self*)

```
:return: sha512 hash
```

hash_shasalted(*self*)

```
:return: sha512 hash
```

Inherited from object

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

12.3.2 Properties

Name	Description
Inherited from object	
__class__	

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__ extit(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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

12.4.2 Properties

Name	Description
Inherited from object	
__class__	

12.4.3 Class Variables

Name	Description
ALLOWED_SIZE	**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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

12.5.2 Properties

Name	Description
Inherited from object	
__class__	

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__ extit(inherited documentation)

hash(*self*)

`:return: hash plaintext`

Inherited from object

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

12.6.2 Properties

Name	Description
Inherited from object	
__class__	

12.7 Class HMAC

object
└ **hal.maths.crypt.HMAC**

`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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

12.7.2 Properties

Name	Description
Inherited from object	
__class__	

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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

12.8.2 Properties

Name	Description
Inherited from object	
__class__	

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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

12.9.2 Properties

Name	Description
Inherited from object	
__class__	

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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

12.10.2 Properties

Name	Description
Inherited from object __class__	

12.11 Class Dsa

object
└
hal.maths.crypt.Dsa

`dsa hash`

12.11.1 Methods

__init__(*self*, *string*)

`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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

12.11.2 Properties

Name	Description
Inherited from object __class__	

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
__package__	**Value:** `'hal.maths'`

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__ extit(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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

13.3.2 Properties

Name	Description
Inherited from object	
__class__	

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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

13.4.2 Properties

Name	Description
Inherited from object	
__class__	

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__(), __getattribute__(), __hash__(), __init__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

14.1.2 Properties

Name	Description
Inherited from object	
__class__	

14.2 Class Plot3d

object
└
hal.maths.plotter.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__(), __getattribute__(), __hash__(), __init__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

14.2.2 Properties

Name	Description
Inherited from object	
__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__(), __getattribute__(), __hash__(), __init__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

14.3.2 Properties

Name	Description
Inherited from object	
__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
__package__	**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
```

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
```

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
```

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
__package__	**Value:** `'hal.ml.data'`

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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(),

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

19.3.2 Properties

Name	Description
Inherited from object	
__class__	

19.4 Class CSVParser

object

hal.ml.data.parser.Parser

hal.ml.data.parser.CSVParser

19.4.1 Methods

__init__(*self*, *database_file*)

```
:param database_file: a raw .csv file that contains any data about anything
```

Overrides: object.__init__

parse_data(*self*)

```
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__(), __getattribute__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(), __repr__(), __setattr__(), __sizeof__(), __str__(), __subclasshook__()

19.4.2 Properties

Name	Description
Inherited from object	
__class__	

20 Module hal.ml.features

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

20.1 Functions

select_k_best(x, y, k)

select k best features in dataset

get_best_features(x, y)

finds the optimal number of features

get_features(x, y, $n\_features\_to\_select$)

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

extra_trees_classifier()

random_forest()

knn()

very fast and slightly more accurate than AdaBoost

ada_boost()

fast, accurate but too uncertainty

bayes_gauss()

slower than svr but equally accuarte

bayes_bernoulli()

23 Module hal.ml.models.pipelined

`Prediction methods based on multiple models mixed up.`

23.1 Functions

logistic_rbm()

anova_svm()

24 Module hal.ml.models.regression

Prediction methods based on regression algorithms.

24.1 Functions

support_vector_machine()

super fast and precise

logistic_regression()

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__ extit(inherited documentation)

train(*self*, *x*, *y*)

Inherited from object

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

26.1.2 Properties

Name	Description
Inherited from object	
__class__	

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
__package__	**Value:** `None`

28 Module hal.ml.utils.matrix

Functions to deal with matrices.

28.1 Functions

precision(*matrix*)

```
Calcualtes accuarcy on database

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

recall(*matrix*)

```
Calcualtes recall on database

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

tn_rate(*matrix*)

```
Calcualtes true negative rate on database

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

accuracy(*matrix*)

```
Calcualtes recall on database

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

f1_score(*matrix*)

```
Calcualtes 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*)

```
Calcualtes accuarcy on database

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

recall(*matrix*)

```
Calcualtes recall on database

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

tn_rate(*matrix*)

```
Calcualtes true negative rate on database

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

accuracy(*matrix*)

```
Calcualtes recall on database

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

f1_score(*matrix*)

```
Calcualtes 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`

31 Module hal.profile.performance

Perform benchmarks and tests on your PC.

31.1 Class EightQueenTest

object
└ **hal.profile.performance.EightQueenTest**

Test CPU by solving eight-queen problem

31.1.1 Methods

__init__(*self*, *size*)

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

Overrides: object.__init__ extit(inherited documentation)

welcome()

:return: string
    Welcomes user to this test sessions

introduction()

:return: string
Welcomes user to this test sessions

run_test_with_size(*size*)

:param size: int
    Number of rows in grid
:return: int
    Time to solve problem with given size

update_std_out_and_log(*self*, *string*)

```
:param string: string
    Stuff to print
:return: void
    Prints to stdout and updates log
```

start(*self*)

Inherited from object

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

31.1.2 Properties

Name	Description
Inherited from object	
__class__	

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

how_similar_are(*a*, *b*)

```
:param a: str
    First string
:param b: str
    Second string
:return: float in [0, 1]
    Similarity of a VS b
```

33.2 Variables

Name	Description
__package__	**Value:** `'hal.strings'`

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

handle_exceptions(*function*)

```
:param function: callback function
    function to wrap
:return: callback function return type
    wraps callback function
```

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