# PyHal

API Documentation

January 20, 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. 8)*

## 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', 'yi...` |
| 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:** `'/'` |
| __package__ | **Value:** `'hal.files'` |

## 3.2 Class FileSystem

object
└ **hal.files.models.FileSystem**

**Known Subclasses:** hal.files.models.Directory, hal.files.models.Document, hal.files.models.MP3Song

### 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*=['.', ':', '"', '\xe2\x80\x99', '&', '720p', '1080p', 'yi..., *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()

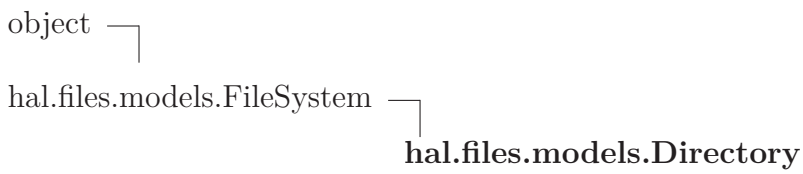
***Inherited from object***

___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




#### 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. 18)*
- **parser**: Parse anything there is on the Internet.
  *(Section 6, p. 20)*
- **selenium**: Some utils methods for a selenium webdriver
  *(Section 7, p. 22)*
- **web**: Deal with webpages.
  *(Section 8, p. 24)*
- **youtube**: Get rss feed for youtube channel.
  *(Section 9, p. 27)*

## 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.parser

```
Parse anything there is on the Internet.
```

## 6.1 Functions

**is_string_well_formatted**(*string*)

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

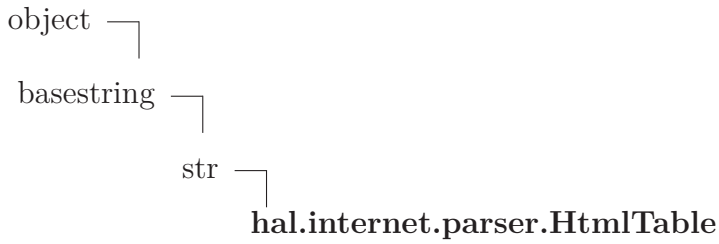
**html_stripper**(*string*)

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

## 6.2 Variables

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

## 6.3 Class HtmlTable



#### 6.3.1 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___()

#### 6.3.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

# 7 Module hal.internet.selenium

Some utils methods for a selenium webdriver

## 7.1 Variables

| Name | Description |
|---|---|
| ___package___ | **Value:** None |

## 7.2 Class SeleniumForm

Great and simple static methods to deal with selenium webdrivers.

### 7.2.1 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.
```

# 8 Module hal.internet.web

Deal with webpages.

## 8.1 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
```

## 8.2 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...` |

## 8.3 Class Webpage

object
└ **hal.internet.web.Webpage**

representation of URL (web page)

### 8.3.1 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___()

#### 8.3.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

# 9 Module hal.internet.youtube

Get rss feed for youtube channel.

## 9.1 Functions

**get_channel_page**(*channel_name*, *youtube_channel_url*="https://www.youtube.com/user/")

```
: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**(*channel_name*, *channel_id_field*="data-channel-external-id")

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

**get_channel_feed_url**(*channel_name*, *base_feed_url*="https://www.youtube.com/feeds/videos.xml?channel_id=")

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

# 10 Package hal.maths

`MATHS: important and scalable math functions`

## 10.1 Modules

- **crypt**: Perform fast hash, encryption and calculations related to cryptography.
  *(Section 11, p. 29)*
- **maths**: A few elegant and powerful mathematical functions.
  *(Section 12, p. 41)*
- **plotter**: Show elegant plots in any dimension.
  *(Section 13, p. 44)*

## 10.2 Variables

| Name | Description |
|---|---|
| ___package___ | **Value:** `None` |

# 11 Module hal.maths.crypt

`Perform fast hash, encryption and calculations related to cryptography.`

## 11.1 Variables

| Name | Description |
|---|---|
| ___package___ | **Value:** `'hal.maths'` |

## 11.2 Class MD5

object
└ **hal.maths.crypt.MD5**

`md5 hash`

### 11.2.1 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___()

### 11.2.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

## 11.3 Class MD6

object
└ **hal.maths.crypt.MD6**

`md6 hash`

### 11.3.1 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___()

### 11.3.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| __class__ | |

#### 11.3.3 Class Variables

| Name | Description |
|---|---|
| ALLOWED_SIZE | **Value:** `[64, 128, 224, 256, 384, 512]` |

### 11.4 Class SHA

object
└ **hal.maths.crypt.SHA**

`general SHA hash`

#### 11.4.1 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___()

#### 11.4.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

#### 11.4.3 Class Variables

| Name | Description |
|---|---|
| ALLOWED_SIZE | **Value:** `[1, 224, 256, 384, 512]` |

## 11.5 Class DES

object
└ **hal.maths.crypt.DES**

`DES hash`

### 11.5.1 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_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___()

### 11.5.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

#### 11.5.3 Class Variables

| Name | Description |
|---|---|
| ALLOWED_SIZE | **Value:** `[1, 3]` |

## 11.6 Class ARC

object
└ **hal.maths.crypt.ARC**

`ARC hash`

#### 11.6.1 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___()

#### 11.6.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

#### 11.6.3 Class Variables

| Name | Description |
|---|---|
| ALLOWED_SIZE | **Value:** `[2, 4]` |

### 11.7 Class AES

object
└
**hal.maths.crypt.AES**

`aes hash`

#### 11.7.1 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___()

#### 11.7.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |

*continued on next page*

| Name | Description |
|---|---|
| ___class___ | |

## 11.8 Class HMAC

object
└
**hal.maths.crypt.HMAC**

`hmac hash`

### 11.8.1 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___()

### 11.8.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

## 11.9 Class BLOWFISH

object
└
**hal.maths.crypt.BLOWFISH**

`blowfish hash`

#### 11.9.1 Methods

**___init___**(*self*, *string*, *key*)

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

Overrides: object.___init___ extit(inherited documentation)

**hash**(*self*)

`:return: hash plaintext`

***Inherited from object***

___delattr___(), ___format___(), ___getattribute___(), ___hash___(), ___new___(), ___reduce___(), ___reduce_ex___(), ___repr___(), ___setattr___(), ___sizeof___(), ___str___(), ___subclasshook___()

#### 11.9.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

### 11.10 Class IDEA

object
└ **hal.maths.crypt.IDEA**

`IDEA hash`

#### 11.10.1 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___()

#### 11.10.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

### 11.11 Class CAST128

object
└ **hal.maths.crypt.CAST128**

```
CAST 128 hash
```

#### 11.11.1 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___()

#### 11.11.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

### 11.12 Class Dsa

object
└ **hal.maths.crypt.Dsa**

`dsa hash`

#### 11.12.1 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___()

#### 11.12.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

# 12 Module hal.maths.maths

A few elegant and powerful mathematical functions.

## 12.1 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
```

## 12.2 Variables

| Name | Description |
|---|---|
| __package__ | **Value:** `'hal.maths'` |

## 12.3 Class Integer

object
└ **hal.maths.maths.Integer**

### 12.3.1 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___()

#### 12.3.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

#### 12.3.3 Class Variables

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

### 12.4 Class EightQueen

object
└ **hal.maths.maths.EightQueen**

```
8 queen problem solver
```

#### 12.4.1 Methods

**___init___**(*self*, *board_size*)

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

Overrides: object.___init___ extit(inherited documentation)

**under_attack**(*self*, *col*, *queens*)

**solve**(*self*, *n*)

***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___ | |

# 13 Module hal.maths.plotter

Show elegant plots in any dimension.

## 13.1 Class Plot2d

object
└ **hal.maths.plotter.Plot2d**

2d plot

### 13.1.1 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___()

#### 13.1.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

## 13.2 Class Plot3d

object
└
**hal.maths.plotter.Plot3d**

#### 13.2.1 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___()

#### 13.2.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

## 13.3 Class Plot4d

object
└ **hal.maths.plotter.Plot4d**

#### 13.3.1 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___()

#### 13.3.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

# 14 Package hal.ml

## 14.1 Modules

- **data** *(Section 15, p. 49)*
  - **parser**: Parsers for raw databases.
    *(Section 16, p. 50)*
- **features**: Collection of methods to find weights of features and select the best ones.
  *(Section 17, p. 52)*
- **models** *(Section 18, p. 53)*
  - **classification**: Prediction methods based on classification algorithms.
    *(Section 19, p. 54)*
  - **pipelined**: Prediction methods based on multiple models mixed up.
    *(Section 20, p. 55)*
  - **regression**: Prediction methods based on regression algorithms.
    *(Section 21, p. 56)*
  - **time_series**: Multi-purpose prediction methods to be used in time-series.
    *(Section 22, p. 57)*
- **predict**: " General model to make prediction about everything.
  *(Section 23, p. 58)*
- **utils**: Various tools and utilities to deal with database and machine learning.
  *(Section 24, p. 59)*

## 14.2 Variables

| Name | Description |
|---|---|
| ___package___ | **Value:** `None` |

# 15 Package hal.ml.data

## 15.1 Modules

- **parser**: Parsers for raw databases.
  *(Section 16, p. 50)*

## 15.2 Variables

| Name | Description |
|---|---|
| ___package___ | **Value:** `None` |

# 16 Module hal.ml.data.parser

`Parsers for raw databases.`

## 16.1 Variables

| Name | Description |
|---|---|
| ___package___ | **Value:** `None` |

## 16.2 Class Parser

object
└ **hal.ml.data.parser.Parser**

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

### 16.2.1 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___()

### 16.2.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

## 16.3 Class CSVParser

object
hal.ml.data.parser.Parser
**hal.ml.data.parser.CSVParser**

### 16.3.1 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 16.2)***

get_lines()

***Inherited from object***

___delattr___(), ___format___(), ___getattribute___(), ___hash___(), ___new___(), ___reduce___(), ___reduce_ex___(), ___repr___(), ___setattr___(), ___sizeof___(), ___str___(), ___subclasshook___()

### 16.3.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

# 17 Module hal.ml.features

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

## 17.1 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`

## 17.2 Variables

| Name | Description |
|---|---|
| ___package___ | **Value:** `'hal.ml'` |

# 18 Package hal.ml.models

## 18.1 Modules

- **classification**: Prediction methods based on classification algorithms.
  *(Section 19, p. 54)*
- **pipelined**: Prediction methods based on multiple models mixed up.
  *(Section 20, p. 55)*
- **regression**: Prediction methods based on regression algorithms.
  *(Section 21, p. 56)*
- **time_series**: Multi-purpose prediction methods to be used in time-series.
  *(Section 22, p. 57)*

## 18.2 Variables

| Name | Description |
|---|---|
| __package__ | **Value:** `None` |

# 19 Module hal.ml.models.classification

`Prediction methods based on classification algorithms.`

## 19.1 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**()

## 19.2 Variables

| Name | Description |
|---|---|
| ___package___ | **Value:** `'hal.ml.models'` |

# 20 Module hal.ml.models.pipelined

`Prediction methods based on multiple models mixed up.`

## 20.1 Functions

**logistic_rbm**()

**anova_svm**()

## 20.2 Variables

| Name | Description |
|---|---|
| ___package___ | **Value:** `'hal.ml.models'` |

# 21 Module hal.ml.models.regression

`Prediction methods based on regression algorithms.`

## 21.1 Functions

**support_vector_machine**()

`super fast and precise`

**logistic_regression**()

## 21.2 Variables

| Name | Description |
|---|---|
| ___package___ | **Value:** `'hal.ml.models'` |

# 22 Module hal.ml.models.time_series

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

## 22.1 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
```

# 23 Module hal.ml.predict

```
" General model to make prediction about everything.
```

## 23.1 Variables

| Name | Description |
|---|---|
| ___package___ | **Value:** `'hal.ml'` |

## 23.2 Class BasePrediction

object
└ **hal.ml.predict.BasePrediction**

### 23.2.1 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___()

### 23.2.2 Properties

| Name | Description |
|---|---|
| *Inherited from object* | |
| ___class___ | |

# 24 Module hal.ml.utils

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

## 24.1 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
```

**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
```

# 25 Package hal.profile

## 25.1 Modules

- **performance**: Perform benchmarks and tests on your PC.
*(Section 26, p. 62)*

## 25.2 Variables

| Name | Description |
|---|---|
| ___package___ | **Value:** `None` |

# 26 Module hal.profile.performance

`Perform benchmarks and tests on your PC.`

## 26.1 Variables

| Name | Description |
|---|---|
| ___package___ | **Value:** `'hal.profile'` |

## 26.2 Class EightQueenTest

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

`test CPU by solving eight-queen problem`

### 26.2.1 Methods

**___init___**(*self*, *size*)

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

Overrides: object.___init___ extit(inherited documentation)

**welcome**()

`:return: introduce script`

**introduction**()

`:return: introduce 8 queen problem`

**run**(*self*)

***Inherited from object***

___delattr___(), ___format___(), ___getattribute___(), ___hash___(), ___new___(), ___reduce___(), ___reduce_ex___(), ___repr___(), ___setattr___(), ___sizeof___(), ___str___(), ___subclasshook___()

### 26.2.2 Properties

| Name | Description |
| --- | --- |
| *Inherited from object* | |
| ___class___ | |

# 27 Package hal.wrappers

## 27.1 Modules

- **methods**: Typical (and useful) function wrappers
*(Section 28, p. 65)*

## 27.2 Variables

| Name | Description |
|---|---|
| ___package___ | **Value:** `None` |

# 28 Module hal.wrappers.methods

Typical (and useful) function wrappers

## 28.1 Functions

**handle_exceptions**(*function*)

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

## Index