

PyHal

API Documentation

April 29, 2017

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1 Package hal

1.1 Modules

- **charts** (Section 2, p. 8)
 - **bar** (Section 3, p. 9)
 - **correlation** (Section 4, p. 10)
 - **plotter**: Show elegant plots in any dimension.
(Section 5, p. 11)
- **files** (Section 6, p. 15)
 - **models**: Main entities in files, such as documents, folders.
(Section 7, p. 16)
 - **save_as** (Section 8, p. 26)
- **internet** (Section 9, p. 27)
 - **engines**: Abstract search engines.
(Section 10, p. 28)
 - **github**: Common classes and entities in Github
(Section 11, p. 30)
 - **parser**: Parse anything there is on the Internet.
(Section 12, p. 35)
 - **selenium**: Some utils methods for a selenium webdriver
(Section 13, p. 37)
 - **web**: Deal with webpages.
(Section 14, p. 39)
 - **youtube**: Get rss feed for youtube channel.
(Section 15, p. 42)
- **maths**: MATHS: important and scalable math functions
(Section 16, p. 44)
 - **crypt**: Perform fast hash, encryption and calculations related to cryptography.
(Section 17, p. 45)
 - **maths**: A few elegant and powerful mathematical functions.
(Section 18, p. 56)
- **ml** (Section 19, p. 59)
 - **analysis** (Section 20, p. 60)
 - * **correlation** (Section 21, p. 61)
 - **data** (Section 22, p. 63)
 - * **parser**: Parsers for raw databases.
(Section 23, p. 64)
 - **features**: Collection of methods to find weights of features and select the best ones.
(Section 24, p. 66)
 - **models** (Section 25, p. 67)
 - * **classification**: Prediction methods based on classification algorithms.
(Section 26, p. 68)
 - * **pipelined**: Prediction methods based on multiple models mixed up.
(Section 27, p. 69)
 - * **regression**: Prediction methods based on regression algorithms.
(Section 28, p. 70)
 - * **time_series**: Multi-purpose prediction methods to be used in time-series.
(Section 29, p. 71)
 - **predict**: " General model to make prediction about everything.
(Section 30, p. 72)

- **utils** (*Section 31, p. 73*)
 - * **matrix**: Functions to deal with matrices.
(*Section 32, p. 74*)
 - * **misc**: Various tools and utilities to deal with database and machine learning.
(*Section 33, p. 77*)
- **profile** (*Section 34, p. 79*)
 - **mem** (*Section 35, p. 80*)
 - **performance**: Perform benchmarks and tests on your PC.
(*Section 36, p. 81*)
- **strings** (*Section 37, p. 83*)
 - **utils**: Typical operations on strings made easy
(*Section 38, p. 84*)
- **time** (*Section 39, p. 85*)
 - **profile** (*Section 40, p. 86*)
 - **utils** (*Section 41, p. 87*)
- **wrappers** (*Section 42, p. 88*)
 - **methods**: Typical (and useful) function wrappers
(*Section 43, p. 89*)

1.2 Variables

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

2 Package hal.charts

2.1 Modules

- **bar** (*Section 3, p. 9*)
- **correlation** (*Section 4, p. 10*)
- **plotter**: Show elegant plots in any dimension.
(*Section 5, p. 11*)

2.2 Variables

Name	Description
__package__	Value: None

3 Module *hal.charts.bar*

3.1 Functions

```
create_bar_chart(title, x_labels, y_values, y_label)
```

```
:param title: str  
    Title of chart  
:param x_labels: [] of str  
    Names for each variable  
:param y_values: [] of float  
    Values of x labels  
:param y_label: str  
    Label of y axis  
:return: Subplot  
    Bar chart
```

```
create_multiple_bar_chart(title, x_labels, mul_y_values, mul_y_labels, normalize=False)
```

```
:param title: str  
    Title of chart  
:param x_labels: [] of str  
    Names for each variable  
:param mul_y_values: [] of [] of float  
    List of values of x labels  
:param mul_y_labels: [] of str  
    List of labels for each y value  
:param normalize: bool  
    True iff you want to normalize each y series  
:return: Subplot  
    Bar chart
```

```
create_symlog_bar_chart(title, x_labels, y_values, y_label)
```

```
:param title: str  
    Title of chart  
:param x_labels: [] of str  
    Names for each variable  
:param y_values: [] of float  
    Values of x labels  
:param y_label: str  
    Label of y axis  
:return: return  
    Symlog bar chart
```

4 Module *hal.charts.correlation*

4.1 Functions

create_correlation_matrix_plot(*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
```

5 Module `hal.charts.plotter`

Show elegant plots in any dimension.

5.1 Class `Plot2d`

object 
`hal.charts.plotter.Plot2d`
 2d plot

5.1.1 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__()
```

5.1.2 Properties

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

5.2 Class Plot3d



5.2.1 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--()
```

5.2.2 Properties

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

5.3 Class Plot4d

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

5.3.1 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__()
```

5.3.2 Properties

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

6 Package *hal.files*

6.1 Modules

- **models:** Main entities in files, such as documents, folders.
(Section 7, p. 16)
- **save_as** (Section 8, p. 26)

6.2 Variables

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

7 Module *hal.files.models*

Main entities in files, such as documents, folders.

7.1 Variables

Name	Description
BAD_CHARS	Value: [".", ":", "\"", "\xe2\x80\x99", "&", "720p", "1080p", "y...]
RUSSIAN_CHARS	Value: ["\xd1\x88", "\xd0\xb0", "\xd0\xb1", "\xd0\xbb", "\xd0\xba...]
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 "\\"

7.2 Class *FileSystem*

object —
 hal.files.models.FileSystem

7.2.1 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

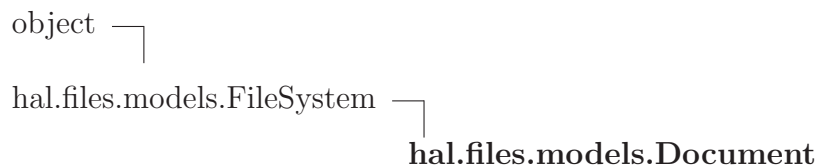
Inherited from object

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

7.2.2 Properties

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

7.3 Class Document



7.3.1 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 (<i>self</i>)
:return: True iff document is an image.

is_audio (<i>self</i>)
:return: True iff document is an audio.

is_hidden (<i>self</i>)
:return: bool True iff path is hidden

Inherited from hal.files.models.FileSystem(Section 7.2)

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

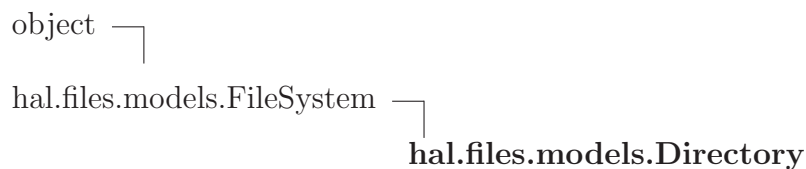
Inherited from object

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

7.3.2 Properties

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

7.4 Class Directory



7.4.1 Methods

<code>__init__(self, path)</code>

: param path: string Path to file

Overrides: object.__init__

<code>create_new(path)</code>

: param path: string Path to directory to create

: return: void Creates new directory

<code>get_path_name(self)</code>

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

<code>is_empty(self)</code>

: return: Bool True iff empty

Inherited from `hal.files.models.FileSystem` (Section 7.2)

`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__()`

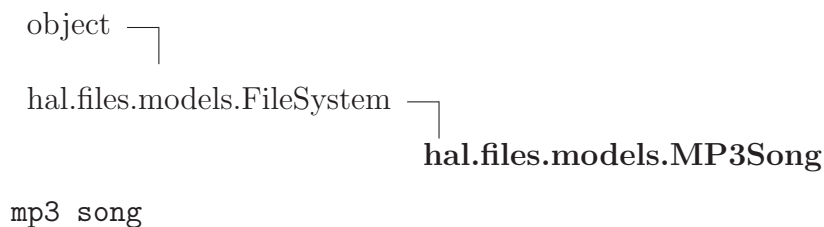
7.4.2 Properties

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

continued on next page

Name	Description
<code>--class--</code>	

7.5 Class MP3Song



7.5.1 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 7.2)

```

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__()

```

7.5.2 Properties

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

8 Module *hal.files.save_as*

8.1 Functions

save_dicts_to_csv(*dicts*, *output_file*)

```
:param dicts: [] of {}
    Dictionaries with same values
:param output_file: str
    Path to output file to write data
:return: void
    Saves .csv file with posts data
```

save_matrix_to_csv(*headers*, *data*, *output_file*)

```
:param headers: [] of str
    Column names
:param data: matrix ([] of [])
    Data
:param output_file: str
    Path to output file to write data
:return: void
    Saves .csv file with data
```

8.2 Variables

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

9 Package *hal.internet*

9.1 Modules

- **engines**: Abstract search engines.
(Section 10, p. 28)
- **github**: Common classes and entities in Github
(Section 11, p. 30)
- **parser**: Parse anything there is on the Internet.
(Section 12, p. 35)
- **selenium**: Some utils methods for a selenium webdriver
(Section 13, p. 37)
- **web**: Deal with webpages.
(Section 14, p. 39)
- **youtube**: Get rss feed for youtube channel.
(Section 15, p. 42)

9.2 Variables

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

10 Module *hal.internet.engines*

Abstract search engines.

10.1 Class *SearchEngineResult*



10.1.1 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__(), __getattr__(), __hash__(), __new__(), __reduce__(), __reduce_ex__(),
__repr__(), __setattr__(), __sizeof__(), __subclasshook__()
```

10.1.2 Properties

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

10.2 Class *SearchEngine*



10.2.1 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__()
```

10.2.2 Properties

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

11 Module hal.internet.github

Common classes and entities in Github

11.1 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()

11.2 Class GithubRawApi

object └─
 hal.internet.github.GithubRawApi

Wrapper for generic Github API

11.2.1 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
```

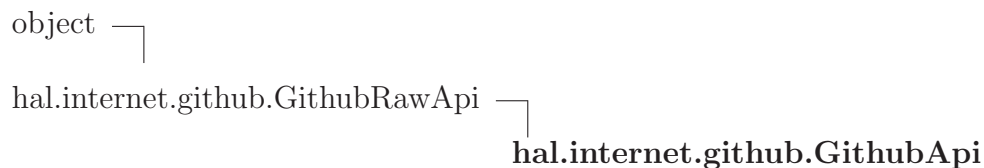
Inherited from object

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

11.2.2 Properties

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

11.3 Class GithubApi



Wrapper for generic Github API

11.3.1 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 11.2)

`__getitem__()`

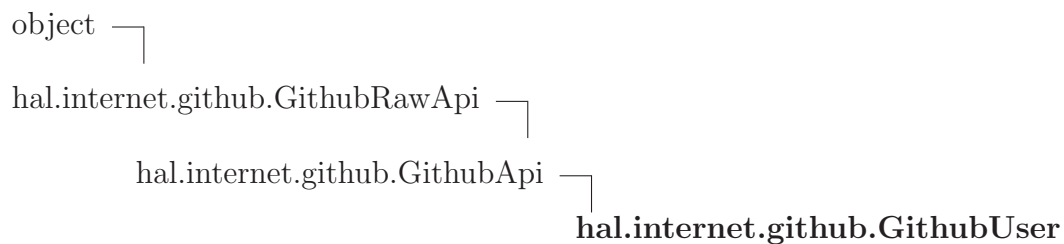
Inherited from object

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

11.3.2 Properties

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

11.4 Class GithubUser



Model of a generic Github user profile

11.4.1 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 11.3)

get_trending_daily()

Inherited from hal.internet.github.GithubRawApi(Section 11.2)

__getitem__()

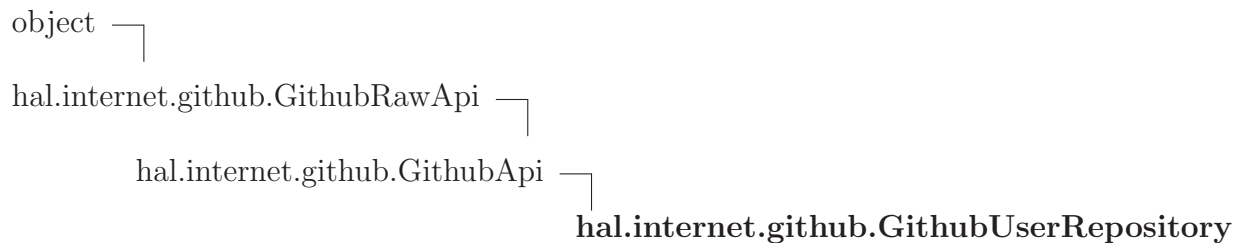
Inherited from object

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

11.4.2 Properties

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

11.5 Class GithubUserRepository



Model of a generic Github user repository

11.5.1 Methods

__init__(self, username, repository_name)

```

:param username: str
    Username of user
:param repository_name: str
    Name of repository
Overrides: object.__init__
  
```

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

Inherited from hal.internet.github.GithubApi(Section 11.3)

`get_trending_daily()`

Inherited from hal.internet.github.GithubRawApi(Section 11.2)

`--getitem--()`

Inherited from object

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

11.5.2 Properties

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

12 Module *hal.internet.parser*

Parse anything there is on the Internet.

12.1 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
```

12.2 Variables

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

12.3 Class *HtmlTable*



12.3.1 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__()`

12.3.2 Properties

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

13 Module hal.internet.selenium

Some utils methods for a selenium webdriver

13.1 Variables

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

13.2 Class SeleniumForm

Great and simple static methods to deal with selenium webdrivers.

13.2.1 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.
```

14 Module *hal.internet.web*

Deal with webpages.

14.1 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
```

download_pdf_to_file(*url*, *local_file*, *chunk_size*=1024)

```
:param url: string
    PDF url to download
:param local_file: string
    Save url as this path
:param chunk_size: int
    Download file in this specific chunk size
:return: void
    Download link to local file
```

14.2 Variables

Name	Description
CHROME_USER_AGENT	Value: ["Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US) AppleWe..."]

continued on next page

Name	Description
URL_VALID_REGEX	Value: <code>re.compile(r"^(?:http ftp)s?://" + r"(?:[A-Z0-9](?:[A-Z0-9...</code>

14.3 Class Webpage

object  **hal.internet.web.Webpage**

representation of URL (web page)

14.3.1 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__()
```

14.3.2 Properties

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

15 Module *hal.internet.youtube*

Get rss feed for youtube channel.

15.1 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.

```

15.2 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="

16 Package *hal.maths*

MATHS: important and scalable math functions

16.1 Modules

- **crypt**: Perform fast hash, encryption and calculations related to cryptography.
(Section 17, p. 45)
- **maths**: A few elegant and powerful mathematical functions.
(Section 18, p. 56)

16.2 Variables

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

17 Module hal.maths.crypt

Perform fast hash, encryption and calculations related to cryptography.

17.1 Class MD5

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

17.1.1 Methods

```
__init__(self, string)
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__()
```

17.1.2 Properties

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

17.2 Class MD6

```
object └─
```

md6 hash

17.2.1 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__()`**17.2.2 Properties**

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

17.2.3 Class Variables

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

17.3 Class SHA

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

17.3.1 Methods

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

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

17.3.2 Properties

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

17.3.3 Class Variables

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

17.4 Class DES

```

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

17.4.1 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__()`

17.4.2 Properties

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

17.4.3 Class Variables

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

17.5 Class ARC

```

object └─
          hal.maths.crypt.ARC

```

ARC hash

17.5.1 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__()`

17.5.2 Properties

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

17.5.3 Class Variables

hmac hash

17.7.1 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__()`

17.7.2 Properties

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

17.8 Class BLOWFISH

```

object └─
          hal.maths.crypt.BLOWFISH

```

blowfish hash

17.8.1 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__()
```

17.8.2 Properties

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

17.9 Class IDEA

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

IDEA hash

17.9.1 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__()
```

17.9.2 Properties

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

17.10 Class CAST128

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

CAST 128 hash

17.10.1 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__()
```

17.10.2 Properties

18 Module *hal.maths.maths*

A few elegant and powerful mathematical functions.

18.1 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

18.2 Variables

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

18.3 Class Integer

object └─ **hal.maths.maths.Integer**

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

18.3.2 Properties

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

18.3.3 Class Variables

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

18.4 Class EightQueen

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

8 queen problem solver

18.4.1 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__()`

18.4.2 Properties

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

19 Package hal.ml

19.1 Modules

- **analysis** (*Section 20, p. 60*)
 - **correlation** (*Section 21, p. 61*)
- **data** (*Section 22, p. 63*)
 - **parser**: Parsers for raw databases.
(*Section 23, p. 64*)
- **features**: Collection of methods to find weights of features and select the best ones.
(*Section 24, p. 66*)
- **models** (*Section 25, p. 67*)
 - **classification**: Prediction methods based on classification algorithms.
(*Section 26, p. 68*)
 - **pipelined**: Prediction methods based on multiple models mixed up.
(*Section 27, p. 69*)
 - **regression**: Prediction methods based on regression algorithms.
(*Section 28, p. 70*)
 - **time_series**: Multi-purpose prediction methods to be used in time-series.
(*Section 29, p. 71*)
- **predict**: " General model to make prediction about everything.
(*Section 30, p. 72*)
- **utils** (*Section 31, p. 73*)
 - **matrix**: Functions to deal with matrices.
(*Section 32, p. 74*)
 - **misc**: Various tools and utilities to deal with database and machine learning.
(*Section 33, p. 77*)

19.2 Variables

Name	Description
--package--	Value: None

20 Package *hal.ml.analysis*

20.1 Modules

- **correlation** (*Section 21, p. 61*)

20.2 Variables

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

21 Module *hal.ml.analysis.correlation*

21.1 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

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
```

22 Package *hal.ml.data*

22.1 Modules

- **parser**: Parsers for raw databases.
(Section 23, p. 64)

22.2 Variables

Name	Description
--package--	Value: None

23 Module *hal.ml.data.parser*

Parsers for raw databases.

23.1 Functions

parse_csv_file(*file_path*)

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

23.2 Variables

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

23.3 Class Parser

object —
 hal.ml.data.parser.Parser

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

23.3.1 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__()`

23.3.2 Properties

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

23.4 Class CSVParser



23.4.1 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 23.3)

`get_lines()`

Inherited from object

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

23.4.2 Properties

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

24 Module *hal.ml.features*

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

24.1 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

25 Package *hal.ml.models*

25.1 Modules

- **classification**: Prediction methods based on classification algorithms.
(Section 26, p. 68)
- **pipelined**: Prediction methods based on multiple models mixed up.
(Section 27, p. 69)
- **regression**: Prediction methods based on regression algorithms.
(Section 28, p. 70)
- **time_series**: Multi-purpose prediction methods to be used in time-series.
(Section 29, p. 71)

25.2 Variables

Name	Description
--package--	Value: None

26 Module `hal.ml.models.classification`

Prediction methods based on classification algorithms.

26.1 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>

27 Module `hal.ml.models.pipelined`

Prediction methods based on multiple models mixed up.

27.1 Functions

<code>logistic_rbm()</code>

<code>anova_svm()</code>

28 Module `hal.ml.models.regression`

Prediction methods based on regression algorithms.

28.1 Functions

<code>support_vector_machine()</code>

<code>super fast and precise</code>

<code>logistic_regression()</code>

29 Module `hal.ml.models.time_series`

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

29.1 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

30 Module *hal.ml.predict*

" General model to make prediction about everything.

30.1 Class *BasePrediction*

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

30.1.1 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__()
```

30.1.2 Properties

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

31 Package hal.ml.utils

31.1 Modules

- **matrix**: Functions to deal with matrices.
(Section 32, p. 74)
- **misc**: Various tools and utilities to deal with database and machine learning.
(Section 33, p. 77)

31.2 Variables

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

32 Module *hal.ml.utils.matrix*

Functions to deal with matrices.

32.1 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

remove_column_from_matrix(*headers, header_to_remove, data*)

:param headers: [] of str
 Column names
 :param header_to_remove: str
 Name of column to remove
 :param data: matrix ([] of [])
 Data
 :return: headers, data
 Headers without header removed and data without column removed

add_columns_to_matrix(*headers, data, new_headers, new_columns*)

```
:param headers: headers: [] of str
    Column names
:param data: matrix ([] of [])
    Data
:param new_headers: [] of str
    Names of new columns
:param new_columns: ([] of [])
    New columns to add
:return: headers, data
    New headers (with new headers) and data with new columns
```

33 Module *hal.ml.utils.misc*

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

33.1 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

normalize_array(*a*)

:param a: [] of float

Array of floats

:return: [] of float

Normalized (in [0, 1]) input array

34 Package hal.profile

34.1 Modules

- **mem** (*Section 35, p. 80*)
- **performance**: Perform benchmarks and tests on your PC.
(*Section 36, p. 81*)

34.2 Variables

Name	Description
__package__	Value: None

35 Module *hal.profile.mem*

35.1 Functions

<code>get_memory_usage()</code>
<hr/>
<code>:return: float</code> MB of memory used by this process

<code>force_garbage_collect()</code>
<hr/>
<code>:return: void</code> Releases memory used

36 Module hal.profile.performance

Perform benchmarks and tests on your PC.

36.1 Class EightQueenTest

```
object └─ hal.profile.performance.EightQueenTest
```

Test CPU by solving eight-queen problem

36.1.1 Methods

```
__init__(self, size)

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

36.1.2 Properties

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

37 Package *hal.strings*

37.1 Modules

- **utils**: Typical operations on strings made easy
(Section 38, p. 84)

37.2 Variables

Name	Description
--package--	Value: None

38 Module *hal.strings.utils*

Typical operations on strings made easy

38.1 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
```

get_average_length_of_word(*words*)

```
:param words: [] of str
    Words
:return: float
    Average length of word on list
```

38.2 Variables

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

39 Package hal.time

39.1 Modules

- **profile** (*Section 40, p. 86*)
- **utils** (*Section 41, p. 87*)

39.2 Variables

Name	Description
--package--	Value: None

40 Module *hal.time.profile*

40.1 Functions

```
get_time_eta(total_done, total, start_time)
```

```
:param total_done: int
    Item processed
:param total: int
    Total number of items to process
:param start_time: time
    Time of start processing items
:return: time
    Time to go
```

```
print_item_info(details)
```

```
:param details: {}
    Details of AthletePerformance
:return: void
    Prints debug info to screen
```

```
print_time_eta(time_to_go)
```

```
:param time_to_go: {}
    Result of a call get_time_eta(...)
:return: void
    Prints debug info to screen
```

40.2 Variables

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

41 Module *hal.time.utils*

41.1 Functions

parse_hh_mm_ss(*h*)

```
:param h: str
    Hours, minutes and seconds in the form hh:mm:ss to parse
:return: datetime.time
    Time parsed
```

get_seconds(*s*)

```
:param s: str
    Datetime in the form %H:%M:%S
:return: int
    Seconds in time
```

parse_hh_mm(*h*)

```
:param h: str
    Hours and minutes in the form hh:mm to parse
:return: datetime.time
    Time parsed
```

41.2 Variables

Name	Description
MONTHS_NAMES	Value: [datetime.strftime(datetime(year=1, month= m, day= 1), "...
MONTHS	Value: {i+ 1: MONTHS_NAMES [i] for i in range(len(MONTHS_NAMES))}

42 Package *hal.wrappers*

42.1 Modules

- **methods:** Typical (and useful) function wrappers
(*Section 43, p. 89*)

42.2 Variables

Name	Description
--package--	Value: None

43 Module *hal.wrappers.methods*

Typical (and useful) function wrappers

43.1 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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